Lori Rowe

From: PUBCOMMENT-OCC
Sent: Thursday, September 9, 2021 3:01 PM
To: PUBCOMMENT-WPD; PUBCOMMENT-ELD; PUBCOMMENT-OCC2; PUBCOMMENT-OPIC
Subject: FW: Public comment on Permit Number 2406

H

From: ashleyakins2015@hotmail.com <ashleyakins2015@hotmail.com>
Sent: Thursday, September 9, 2021 11:56 AM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Ashley Akins

E-MAIL: ashleyakins2015@hotmail.com

COMPANY:

ADDRESS: 8308 HALL RD
PATTISON TX 77423-2124

PHONE: 4696478288

FAX:

COMMENTS: September 9, 2021 Office of Chief Clerk MC 105 Texas Commission on Environmental Quality P.O. Box 13087 Austin, Texas 78711-3087 Dear Chief Clerk, I urge you to amend Permit #2406, Peach Creek Municipal Landfill (PCML), to include the access road and hold a contested case hearing on this proposal because: I am concerned that unacceptable environmental impacts will occur on Sam Houston National Forest, Wood Duck Farm, and private homesteads due to PCML. (if you have visited SHNF tell TCEQ this, why you visit, and what it means to you; if you have

bought WDF produce state why you did so and what this means to you; if you live near the PCML site, tell TCEQ and describe how close you are). I am concerned about road access, water, air, noise, odor, litter, and scenic pollutions, flooding, fires, road overuse/damage, and other environmental impacts that PCML may have. (expand on these environmental concerns or add other issues that you are concerned about). Because of these problems I oppose Permit #2406. I look forward to hearing from you soon about my request to amend Permit #2406 to include the access road and hold a contested case hearing. Thank you. Sincerely, Ashley Akins 8308 Hall Rd Brookshire, Tx 77423 469-647-8288 ashleyakins2015@hotmail.com

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Monday, March 7, 2022 9:40 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

MSW
117709

H

From: lucas42@rocketmail.com <lucas42@rocketmail.com>
Sent: Friday, March 4, 2022 5:57 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Lara Alves

E-MAIL: lucas42@rocketmail.com

COMPANY:

ADDRESS: 2911 BRIGHT SKY CT
SPRING TX 77386-3360

PHONE: 8322878269

FAX:

COMMENTS: Date: 03/04/22 Office of Chief Clerk MC 105 Texas Commission on Environmental Quality P.O. Box 13087 Austin, Texas 78711-3087 Dear Chief Clerk, I urge you to deny Permit #2406, Peach Creek Municipal Landfill (PCML). I am concerned that unacceptable environmental impacts will occur in Sam Houston National Forest, Wood Duck Farm, and private homesteads due to PCML. My family and I love visiting Sam Houston National Forest. My husband and I got married at Double Lake in 2004. Taking my son to see and experience the beauty of Sam Houston National Forest is one

of my favorite joys. It is a place full of wildlife and plant life we can't see elsewhere, and should be protected for future generations. All of SHNF is sacred and special, and needs to be protected from pollution and encroachment. The endangered species that live there need protection. There is no way to adequately protect the area if the landfill is allowed to be there. All of the environmental impacts that PCML has are unacceptable and cannot be safely mitigated. Wood Duck Farm is an 87-acre sustainable farm near the site, and must be allowed to produce its food without contamination! We need MORE places where sustainable practices bring healthy food, not to destroy what we have now. Our ground water needs to be kept safe, without drainage from pollutants from the landfill. Keep landfills away from water bodies and the opportunity to get into ground water! Because of these problems I oppose Permit #2406 and TCEQ should deny this permit. I look forward to hearing from you soon about my request to deny PCML Permit #2406. If TCEQ does not deny this permit it should hold a contested case hearing so that those who will suffer environmental impacts due to the PCML can be heard. Thank you. Sincerely, Lara Alves 2911 Bright Sky Ct. Spring, TX 77386 832-287-8269 Lucas42@rocketmail.com

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Wednesday, April 28, 2021 9:20 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

RFR

From: mrsbusymomee@yahoo.com <mrsbusymomee@yahoo.com>
Sent: Monday, April 26, 2021 1:22 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: MRS Margaret Beck

E-MAIL: mrsbusymomee@yahoo.com

COMPANY:

ADDRESS: 21562 BIG BUCK DR
CLEVELAND TX 77328-8888

PHONE: 7138238844

FAX:

COMMENTS: Our communities Peach Creek Plantation, Peach Creek Estates, and surrounding communities is now plagued with the prospect of a TOXIC Landfill being built that will pollute our air, and potentially the water aquifers(including that of PCP),Peach Creek, San Jacinto River, and ultimately Lake Houston that Houston and surrounding areas use as their source of drinking water. There are already 2 landfills within 7 miles of the proposed #2406 landfill. Why do we need another? I'm concerned that this LF is being built on the Evangeline water aquifer that

supplies water to Houston; the Landfill is being built with 100 feet of the FEMA flood plain which has not been updated since 2010 and we've had floods since then. I beg you to please reconsider having this landfill built as it will contaminate our resources, and decrease our property values as well.

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Wednesday, September 29, 2021 9:05 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

H

From: frankblake@juno.com <frankblake@juno.com>
Sent: Tuesday, September 28, 2021 9:07 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: MR Frank Blake

E-MAIL: frankblake@juno.com

COMPANY:

ADDRESS: 1010 PEDEN ST Apt 3
HOUSTON TX 77006-1358

PHONE: 7135282896

FAX:

COMMENTS: Office of Chief Clerk MC 105 Texas Commission on Environmental Quality P.O. Box 13087 Austin, Texas 78711-3087 Dear Chief Clerk, I would request that you amend Permit #2406, Peach Creek Municipal Landfill (PCML), to include the access road and that you hold a contested case hearing on this proposal. I am very concerned that unacceptable environmental impacts will occur on the Sam Houston National Forest, and also to Wood Duck Farm, and the private homesteads in the vicinity due to PCML. I enjoy hiking and camping in the Sam Houston National Forest, and

greatly value the natural values of the area. I also don't want to see local sustainable farms negatively impacted. It is important that local sustainable agriculture be viable in our region. I am concerned about the road access to this landfill, and the impacts of large truck traffic to the site and other area roads. I have concerns about the resulting air, odor, and noise pollution from truck traffic; potential litter, etc. I am also very concerned about the potential contaminants that could end up in a landfill at this site. I know that it is hard to fully monitor what actually ends up in a landfill, and there is the potential for toxic or inappropriate materials to get mixed in as a result of ignorance or accident. I am therefore very concerned about potential groundwater contamination, run off, etc. The area of the Sam Houston National Forest is an important watershed for the Houston region. It is important to see to the protection of our regional watersheds. Because of all of these possible problems, I oppose Permit #2406. I would appreciate hearing from you soon about my request to amend Permit #2406 to include the access road, and to hold a contested case hearing. Thank you. Sincerely, Frank Blake 1010 Peden St., #3 Houston, TX 77006

Melissa Schmidt

From: PUBCOMMENT-OCC
Sent: Monday, August 9, 2021 8:51 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Petition to amend Permit #2406 for the Peach Creek Landfill (PCL)

H

From: CHIEFCLK <chiefclk@tceq.texas.gov>
Sent: Friday, August 6, 2021 5:10 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: FW: Petition to amend Permit #2406 for the Peach Creek Landfill (PCL)

From: frankblake@juno.com <frankblake@juno.com>
Sent: Friday, August 6, 2021 3:04 PM
To: CHIEFCLK <chiefclk@tceq.texas.gov>
Subject: Petition to amend Permit #2406 for the Peach Creek Landfill (PCL)

August 6, 2021

Office of Chief Clerk
MC 105
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

Dear Chief Clerk,

I urge you to amend Permit #2406, Peach Creek Landfill (PCL), to include the access road and hold a contested case hearing on this proposal for the following reasons:

First, I am concerned that unacceptable environmental impacts will occur on the Sam Houston National Forest, Wood Duck Farm, and private homesteads due to PCL.
The Sam Houston National Forest is an important public recreational and biodiversity resource and a very important watershed for protecting regional water quality. Wood Duck Farm an important local sustainable farm whose future will be adversely affected by the proximity of a new landfill.

Additionally, I am concerned about road access, water, air, noise, litter, and scenic pollutions, flooding, fires, road overuse/damage, and other environmental impacts that PCL may have on neighbors, communities, and landowners in the vicinity.

I look forward to hearing from you soon about my request to amend Permit #2406 to include the access road and hold a contested case hearing. Thank you.

Sincerely,

Frank Blake

1010 Peden St., #3
Houston, TX 77006
713-528-2896
frankblake@juno.com

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Wednesday, October 21, 2020 10:22 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

H

From: Candicebonn@yahoo.com <Candicebonn@yahoo.com>
Sent: Tuesday, October 20, 2020 9:25 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: MRS Candice Bonn

E-MAIL: Candicebonn@yahoo.com

COMPANY:

ADDRESS: 2001 SNOW HILL RD
COLDSPRING TX 77331-5582

PHONE: 8329929257

FAX: 9363772206

COMMENTS: I oppose the development of permit number 2406, Peach Creek Environmental Park in San Jacinto County, Texas. The proposed site is in the Sam Houston National Forrest, full of wildlife, including the Federally listed endangered Red-cockaded woodpecker, the threatened Timber rattlesnake, and a list that includes more than 11 other sensitive species. The health and well-being of county residents, alongside the wildlife species is of great concern, especially in regards to the water and air supplies. I am a resident of this county for a number of reasons, particularly because I am the parent of five children, one with a very rare genetic disorder that affects numerous body systems and

the National Forest provided a safe, clean, and healthy location for us to reside. I refuse to be involuntarily subjected to air and water pollution, contamination, and hazardous waste. I demand a public hearing be set so the residents concerns can be heard and those with no voice can be advocated for!

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Friday, October 23, 2020 8:10 AM
To: Candicebonn@yahoo.com
Subject: Public comment on Permit Number 2406

Thank you for your comments.

A copy of your email will be forwarded to the Texas Commission on Environmental Quality (TCEQ) staff responsible for reviewing the application. All timely filed comments will be considered by the staff prior to the final decision on the application. You will be added to the mailing list for this application. After the opportunity to submit comments ends, a copy of the formal written response to all timely filed comments will be mailed to you.

All requests for hearings, if timely filed and authorized by statute or rule, are considered by the Commissioners. The Commissioners will consider your request during a regularly scheduled Commission meeting that is open to the public, and a determination will be made as to whether or not the request will be granted. You will be notified in writing when your request is scheduled for consideration. If your request is granted, the matter will be referred to the State Office of Administrative Hearings (SOAH). The SOAH hearing will be a formal, legal proceeding, conducted in a manner similar to civil trials in state district court. While not required, parties are usually represented by legal counsel. In order for an issue to be considered at a contested case hearing, it must have been first raised in a comment or in a request for a contested case hearing during the public comment period by the affected person or group requesting the hearing.

The TCEQ appreciates your interest in environmental issues. If you have any further questions, please feel free to contact the Public Education Program staff at 800-687-4040.

Sincerely,
Office of the Chief Clerk

NOTE: Please do not respond to this email; it will not be answered. If you would like to submit additional comments, please use the online eComments system at: https://www.tceq.texas.gov/agency/decisions/cc/comments.html

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: MRS Candice Bonn

E-MAIL: Candicebonn@yahoo.com

COMPANY:

ADDRESS: 2001 SNOW HILL RD
COLDSPRING TX 77331-5582

PHONE: 8329929257

FAX: 9363772206

COMMENTS: I oppose the development of permit number 2406, Peach Creek Environmental Park in San Jacinto County, Texas. The proposed site is in the Sam Houston National Forrest, full of wildlife, including the Federally listed endangered Red-cockaded woodpecker, the threatened Timber rattlesnake, and a list that includes more than 11 other sensitive species. The health and well-being of county residents, alongside the wildlife species is of great concern, especially in regards to the water and air supplies. I am a resident of this county for a number of reasons, particularly because I am the parent of five children, one with a very rare genetic disorder that affects numerous body systems and the National Forest provided a safe, clean, and healthy location for us to reside. I refuse to be involuntarily subjected to air and water pollution, contamination, and hazardous waste. I demand a public hearing be set so the residents concerns can be heard and those with no voice can be advocated for!

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Tuesday, April 27, 2021 1:10 PM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

H

From: Jamesbridges0184@gmail.com <Jamesbridges0184@gmail.com>
Sent: Friday, April 23, 2021 4:08 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: James Bridges

E-MAIL: Jamesbridges0184@gmail.com

COMPANY:

ADDRESS: 201 MAY COX RD
CLEVELAND TX 77328-8480

PHONE: 8326307127

FAX:

COMMENTS: Defend the farm! Defend our land! Defend our home! Defend our health! Defend our air! Defend our water! Defend our endangered species! Defend our native habitat! Defend out State Park! Defend our property values! I formally request a public hearing, as well as to be notified of any public hearings.

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Friday, December 3, 2021 12:40 PM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: TCEQ MSW permit #2406

From: CHIEFCLK <chiefclk@tceq.texas.gov>
Sent: Friday, December 3, 2021 9:44 AM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: FW: TCEQ MSW permit #2406

From: james bridges <jamesbridges0184@gmail.com>
Sent: Friday, December 3, 2021 9:37 AM
To: CHIEFCLK <chiefclk@tceq.texas.gov>
Subject: TCEQ MSW permit #2406

TCEQ Office of the Chief Clerk, MC-105
P.O. Box 13087
Austin, Texas 78711-3087

Re: Peach Creek Environmental Park (PCEP) Proposed Landfill Permit Application No. Permit #2406

I am writing to request that the permit for Peach Creek EP Landfill MSW No 2406 be denied. There are three main concerns that form the basis for my comments. 1) The SHNF sits on the east and north side of the proposed landfill. The USFS was started to help provide clean water to our country. When it rains, the SHNF acts as a filter to cleanse water going downstream to Lake Houston. The leachate tanks are to sit on the north side of the LF, within a few feet of the FEMA 100-year floodplain. Storm water overflow, leachate, and VOCs will make the Jayhawker Creek floodplain a conduit for contamination which will impact drinking water downstream. 2) Dr. HC Clark wrote a geological assessment to the TCEQ back in August, to quote him "The application implicitly recognizes the gravel location restriction insofar as Class I nonhazardous is not listed as waste to be accepted. Will the permit explicitly state that Class I waste may not be and never will be accepted here because of this hydrogeologic limitation?" ..... "The sink created by pumping will draw water into the landfill rather than allowing it to pass beneath the liner and detect a leak as that groundwater moves through the point of compliance. Water will move inward rather than out."...."How will this problem be addressed?" 3) It is a fact that millions of seagulls feast at LF across North America. South Wake MSW landfill in NC is comprised of approximately 179 acres and has an estimated seagull population of 50,000. Phase 1 of this 2406 LF will be about 124 acres, or almost 37% smaller which equates to almost 31,500 seagulls as an estimated flock number. Studies from Duke Univ School for the Environment determined that these seagulls dropped over a ton of droppings each year. A year-round fruit and vegetable operation, Wood Duck Farm is located bordering the 2406 LF from the east. What are the plans to keep seagull droppings off farm produce growing in the field? What are the plans to keep seagulls from eating the crops? What type of disease vector plan might be implemented? How will the applicant mitigate wild animal scavenging? How will the extra nitrogen and phosphorus impact the SHNF?
http://www.newsobserver.com/news/local/counties/wake-county/article158475619.html I strongly request that you take the next logical step and reject this current Application No. MSW-2406. Thank you for your consideration.

Sincerely,

James Bridges
201 May Cox Rd, Cleveland, TX 77328

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Wednesday, September 29, 2021 9:28 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

H

From: rebecca77anne@gmail.com <rebecca77anne@gmail.com>
Sent: Tuesday, September 28, 2021 10:24 AM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Rebecca Bridges

E-MAIL: rebecca77anne@gmail.com

COMPANY:

ADDRESS: 201 MAY COX RD
CLEVELAND TX 77328-8480

PHONE: 8323349586

FAX:

COMMENTS: We have a hearing scheduled for today for Permit #2406. Peach Creek submitted their written response that includes answers to many of the questions we have asked yesterday, the 27th. With the response from Peach Creek submitted yesterday and the hearing being today, there is not sufficient time for the public nor TCEQ to review the information they provided and address the new information provided. Therefore, we are requesting an additional public

hearing at a later time. It is important that the public have time to research and check the information they have provided for accuracy, and information should not be provided at the last minute to put the public at a disadvantage.

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Tuesday, April 27, 2021 1:08 PM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

H

From: Rebecca77anne@gmail.com <Rebecca77anne@gmail.com>
Sent: Friday, April 23, 2021 4:24 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Rebecca Bridges

E-MAIL: Rebecca77anne@gmail.com

COMPANY:

ADDRESS: 201 MAY COX RD
CLEVELAND TX 77328-8480

PHONE: 8323349586

FAX:

COMMENTS: I am formally requesting a public hearing, and to be notified of any public hearings regarding the application #2406.

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Wednesday, September 29, 2021 9:03 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

From: Rebecca77anne@gmail.com <Rebecca77anne@gmail.com>
Sent: Wednesday, September 29, 2021 3:33 AM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Rebecca Bridges

E-MAIL: Rebecca77anne@gmail.com

COMPANY:

ADDRESS: 201 MAY COX RD
CLEVELAND TX 77328-8480

PHONE: 8323349586

FAX:

COMMENTS: My name is Rebecca Bridges. I was unable to provide my comments at the public meeting due to not having a computer so please accept my written comments with the same esteem given the ones at the public meeting. Upon learning of Permit #2406, our community has been angry and scared that a Type 1 Landfill has been proposed, and is in the stages of being permitted, so close to our homes and without our knowledge. Most residents of this area are on well water. Our children play outside and we are thankful for the fresh air. The thought of a landfill, quite frankly, strikes

fear in our hearts because it jeopardizes all the things we love about our way of life. We can't trust our well water to be safe to drink if a landfill is leaching toxic waste into the ground. We can't trust the air we breathe if it is tainted by the stench of chemicals and decay. We can't hope to raise our children in good health, if we can't trust the air they breathe and the water they drink. Many people here make their livelihoods on their land, raising livestock and growing produce. Wood Duck Farm is a family farm that is beloved locally, as well by all the people the farm supplies organically grown produce to in the greater Houston area. The location of the proposed landfill is within minutes of Wood Duck Farm. Wood Duck Farm's fight to stop this landfill has been featured on the front page of the Houston Chronicle. They have also been interviewed for a segment with Fox 26 News. Their plight is one of many, since many members of this community grow produce and raise animals, both of which need clean, fresh water to survive. We can't, in good conscious, sell our produce as organically grown if a landfill nearby has contaminated the soil. Besides the landfill being in proximity to our homes, there are other factors specific to the type of landfill and the proposed location of the landfill that are highly concerning. The types of waste allowed in a Type 1 Landfill include dead animals and slaughterhouse waste, asbestos-containing materials, contaminated soil, sludge, pesticide containers, and waste from oil, gas, and geothermal activities. A Type 1 Landfill also allows "special waste" which is defined as waste materials that if improperly handled, stored, or disposed of may create a potential hazard to human health and environment. These types of waste simply cannot be allowed so close to people's homes. No one knows the affects these chemicals and wastes will have on the residents of this area. Months, and then years, of these wastes invading our bodies through VOCs in the air and contaminated water will surely have devastating consequences. We don't want to find out what will happen; We know the outcome will be tragic for our families. Currently, parts of the landfill's proposed location are located within 100 feet of a flood plain and access roads to the landfill are located within the flood plain. However, the flood plain map has not been updated in over 10 years and many additional areas would likely be added to the flood plain if it were to be remapped today, possibly putting some or all of the proposed landfill in a flood plain. Many residents have pictures of the area flooded during Harvey, as well as during Tropical Storm Imelda and occasionally during typical rain events. A landfill with toxic waste in an area prone to flooding would be catastrophic. A landfill can not withstand the force of flood waters, and toxic waste would be washed out even further into more communities and ecosystems. Furthermore, the landfill's proposed location is on top of the Evangeline water aquifer that supplies water to Houston as well as Peach Creek, the San Jacinto River, and Lake Houston which provides drinking water for Houston residents and other surrounding areas. If waste matters were to reach the water sources providing water to Houston and surrounding areas the effects would be devastating and far-reaching. The location for the proposed landfill is also in proximity to Sam Houston National Forest, where the integrity of the land and wildlife should be preserved, honored, and respected.There are over 57 endangered species on the San Jacinto County endangered species list, some of them living within a 1 mile radius of this proposed landfill, and inside the landfill's potential perimeter. The endangered species that call this land home include the Red-Cockaded Woodpecker and the Bald Eagle. These species and our National Forest need our continued respect and protection. A toxic landfill will only serve to destroy the preservation of this land and the endangered species and wildlife that inhabit it. Unfortunately, there simply is not a way for people and wildlife to live safely next to this kind of landfill. Peach Creek Environmental Park cannot guarantee the safety of not only my community, but the wildlife and the ecosystem that we have the duty to protect. When taking into account the landfills proximity to water aquifers and the potential for flooding, the proposed landfill would be hazardous to the health of many more than just the residents of South San Jacinto County. To the TCEQ, thank you for taking the time to hear the concerns of the residents of this area. The TCEQ is called to step in during circumstances exactly as these, when the environment and health of people and ecosystems are being put at risk by the undertakings of a corporation. Prevention of the only appropriate course of action here. Please halt the proceedings of Application #2406 in order to protect the people, wildlife, land, and water from irreparable harm.

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Monday, September 27, 2021 10:30 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: TCEQ MSW permit #2406

From: Rebecca Bridges 4332 <rebecca77anne@gmail.com>
Sent: Friday, September 24, 2021 12:53 PM
To: CHIEFCLK <chiefclk@tceq.texas.gov>
Subject: TCEQ MSW permit #2406

I am writing to you to inform you of a matter that is of great importance to the residents of Cleveland, TX in South San Jacinto County. A landfill has been proposed and is in the process of being permitted in my community. The proposed landfill would be detrimental to the health and livelihood of many people in this area, as well as have devastating impacts on the environment and the endangered species that live here. Under certain conditions, it has the potential to negatively impact a much greater area, beyond our own community. I am asking you, on behalf of my community in South San Jacinto County, for your attention to this matter.

The initial submittal for the landfill was submitted by Peach Creek Environmental Park, an investment company based in Mississippi, in September 2019. The location of the proposed landfill is approximately seven miles northwest of the intersection of Highway 59 and SH 105. The members of our community were not informed of the proposition of the landfill until November 2020, at which point the Notice of Intent was published and mailed, although many families did not receive the Notice of Intent by mail.

Upon learning of this, our community has been angry and scared that a Type 1 Landfill has been proposed, and is in the stages of being permitted, so close to our homes and without our knowledge. Most residents of this area are on well water. Our children play outside and we are thankful for the fresh air. The thought of a landfill, quite frankly, strikes fear in our hearts because it jeopardizes all the things we love about our way of life. We can't trust our well water to be safe to drink if a landfill is leaching toxic waste into the ground. We can't trust the air we breathe if it is tainted by the stench of chemicals and decay. We can't hope to raise our children in good health, if we can't trust the air they breathe and the water they drink.

Many people here make their livelihoods on their land, raising livestock and growing produce. Wood Duck Farm is a family farm that is beloved locally, as well by all the people the farm supplies organically grown produce to in the greater Houston area. The location of the proposed landfill is within minutes of Wood Duck Farm. Wood Duck Farm's fight to stop this landfill has been featured on the front page of the Houston Chronicle. They have also been interviewed for a segment with Fox 26 News. Their plight is one of many, since many members of this community grow produce and raise animals, both of which need clean, fresh water to survive. We can't, in good conscious, sell our produce as organically grown if

a landfill nearby has contaminated the soil.

Besides the landfill being in proximity to our homes, there are other factors specific to the type of landfill and the proposed location of the landfill that are highly concerning.

First and foremost, the type of landfill being proposed is a Type 1 Landfill. The types of waste allowed in a Type 1 Landfill include dead animals and slaughterhouse waste, asbestos-containing materials, contaminated soil, municipal hazardous waste, sludge, pesticide containers, waste from oil, gas, and geothermal activities. A Type 1 Landfill also allows "special waste" which is defined as waste materials that if improperly handled, stored, or disposed of may create a potential hazard to human health and environment. These types of waste simply cannot be allowed so close to people's homes. No one knows the affects these chemicals and wastes will have on the residents of this area. Months, and then years, of these wastes invading our bodies through VOCs in the air and contaminated water will surely have devastating consequences. We don't want to find out what will happen; We know the outcome will be tragic for our families.

Currently, parts of the landfill's proposed location are located within 100 feet of a flood plain and access roads to the landfill are located within the flood plain. However, the flood plain map has not been updated in over 10 years and many additional areas would likely be added to the flood plain if it were to be remapped today, possibly putting some or all of the proposed landfill in a flood plain. Many residents have pictures of the area flooded during Harvey, as well as during Tropical Storm Imelda and occasionally during typical rain events. A landfill with toxic waste in an area prone to flooding would be catastrophic. A landfill can not withstand the force of flood waters, and toxic waste would be washed out even further into more communities and ecosystems. Furthermore, the landfill's proposed location is on top of the Evangeline water aquifer that supplies water to Houston as well as Peach Creek, the San Jacinto River, and Lake Houston which provides drinking water for Houston residents and other surrounding areas. If waste matters were to reach the water sources providing water to Houston and surrounding areas the effects would be devastating and far-reaching.

The location for the proposed landfill is also in proximity to Sam Houston National Forest, where the integrity of the land and wildlife should be preserved, honored, and respected.There are over 57 endangered species on the San Jacinto County endangered species list, some of them living within a 1 mile radius of this proposed landfill, and inside the landfill's potential perimeter. The endangered species that call this land home include the Red-Cockaded Woodpecker and the Bald Eagle. These species and our National Forest need our continued respect and protection. A toxic landfill will only serve to destroy the preservation of this land and the endangered species and wildlife that inhabit it.

Unfortunately, there simply is not a way for people and wildlife to live safely next to this kind of landfill. Peach Creek Environmental Park cannot guarantee the safety of not only my community, but the wildlife and the ecosystem that we have the duty to protect. When taking into account the landfills proximity to water aquifers and the potential for flooding, the proposed landfill would be hazardous to the health of many more than just the residents of South San Jacinto County.

We have fought and are continuing to fight this landfill with every effort, but we need your support in this matter urgently, as the process of this landfill

being permitted keeps moving forward. Please support the people of South San Jacinto County in our fight for the health of our families and the integrity of the land we love.

I am providing links and resources for you to access more information.

1. Documents from Peach Creek Environmental Parks website regarding the permit-

https://peachcreekep.com/resources/

2. Fox 26 News Segment, aired Monday April 26

https://www.fox26houston.com/video/926322

3. Houston Chronicle Cover Page Story, Thursday April 22nd

https://www.houstonchronicle.com/news/houston-texas/environment/article/david-and-goliath-fight-cleveland-texas-landfill-16119195.php

4. Wood Duck Farm's new website providing information to the public on their battle against the landfill

https://defendthefarm.com/

Thank you,

Rebecca Bridges

Phone: 832 334 9586

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Wednesday, April 28, 2021 2:36 PM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

PM

From: Rebecca77anne@gmail.com <Rebecca77anne@gmail.com>
Sent: Wednesday, April 28, 2021 12:37 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Rebecca Bridges

E-MAIL: Rebecca77anne@gmail.com

COMPANY:

ADDRESS: 201 MAY COX RD
CLEVELAND TX 77328-8480

PHONE: 8323349586

FAX:

COMMENTS: I would like to again request a public meeting specifically to address the inaccuracies in the coordinates given in the application for permit #2406. The applicant needs to provide correct information to the TCEQ in order for your agency to approve this application, as well as for public awareness. I am also requesting to be on the mailing list for future notices regarding this application. Thank you

Deornette Monteleone

From: PUBCOMMENT-OCC
Sent: Thursday, May 13, 2021 8:52 AM
To: Rebecca77anne@gmail.com
Subject: Public comment on Permit Number 2406

Thank you for your comments.

A copy of your email will be forwarded to the Texas Commission on Environmental Quality (TCEQ) staff responsible for reviewing the application. All timely filed comments will be considered by the staff prior to the final decision on the application. You will be added to the mailing list for this application. After the opportunity to submit comments ends, a copy of the formal written response to all timely filed comments will be mailed to you. If a decision is made to hold a public meeting, you will receive a hard copy of the public meeting notice in the mail.

The TCEQ appreciates your interest in environmental issues. You may track the status of matters pending before the Commission for approval or view comments and requests by visiting the following website: https://www14.tceq.texas.gov/epic/eCID/. If you have any further questions, please feel free to contact the Public Education Program staff at 800-687-4040.

Sincerely,
Office of the Chief Clerk

NOTE: Please do not respond to this email; it will not be answered. If you would like to submit additional comments, please use the online eComments system at: https://www.tceq.texas.gov/agency/decisions/cc/comments.html

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Rebecca Bridges

E-MAIL: Rebecca77anne@gmail.com

COMPANY:

ADDRESS: 201 MAY COX RD
CLEVELAND TX 77328-8480

PHONE: 8323349586

FAX:

COMMENTS: I would like to again request a public meeting specifically to address the inaccuracies in the coordinates given in the application for permit #2406. The applicant needs to provide correct information to the TCEQ in order for your agency to approve this application, as well as for public awareness. I am also requesting to be on the mailing list for future notices regarding this application. Thank you

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Monday, April 12, 2021 10:34 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

From: Rebecca77anne@gmail.com <Rebecca77anne@gmail.com>
Sent: Sunday, April 11, 2021 3:15 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Rebecca Bridges

E-MAIL: Rebecca77anne@gmail.com

COMPANY:

ADDRESS: 201 MAY COX RD
CLEVELAND TX 77328-8480

PHONE: 8323349586

FAX:

COMMENTS: We just recently purchased a property in the area of the proposed location for this landfill. We were excited to get on well water and leave behind the pollution of the city, only to soon find out that a landfill is being proposed close by. And landfill that will leak chemicals into our groundwater and send VOCs into our air. Not only does this affect the residents of this area, you have proposed a landfill right next to a state park? Where land integrity and quality is meant to be preserved, you have introduced a plan to destroy the land for generations to come. No one evens

knows how the chemicals and VOCs will negatively impact this land for future generations. The fact that this has reached the point of permitting applications is a disgrace. It should be obvious that this location right next to a state park and residents on well water, is NOT the right location for a landfill. Please put a stop to this, and tell them to find a more suitable location where there is less chance of harm to people and wildlife. Thank you, Rebecca

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Wednesday, April 21, 2021 9:26 AM
To: Rebecca77anne@gmail.com
Subject: Public comment on Permit Number 2406

Thank you for your comments.

A copy of your email will be forwarded to the Texas Commission on Environmental Quality (TCEQ) staff responsible for reviewing the application. All timely filed comments will be considered by the staff prior to the final decision on the application. You will be added to the mailing list for this application. After the opportunity to submit comments ends, a copy of the formal written response to all timely filed comments will be mailed to you.

The TCEQ appreciates your interest in environmental issues. You may track the status of matters pending before the Commission for approval or view comments and requests by visiting the following website: https://www14.tceq.texas.gov/epic/eCID/. If you have any further questions, please feel free to contact the Public Education Program staff at 800-687-4040.

Sincerely,
Office of the Chief Clerk

NOTE: Please do not respond to this email; it will not be answered. If you would like to submit additional comments, please use the online eComments system at: https://www.tceq.texas.gov/agency/decisions/cc/comments.html

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Rebecca Bridges

E-MAIL: Rebecca77anne@gmail.com

COMPANY:

ADDRESS: 201 MAY COX RD
CLEVELAND TX 77328-8480

PHONE: 8323349586

FAX:

COMMENTS: We just recently purchased a property in the area of the proposed location for this landfill. We were excited to get on well water and leave behind the pollution of the city, only to soon find out that a landfill is being proposed close by. And landfill that will leak chemicals into our groundwater and send VOCs into our air. Not only does this affect the residents of this area, you have proposed a landfill right next to a state park? Where land integrity and quality is meant to be preserved, you have introduced a plan to destroy the land for generations to come. No one evens knows how the chemicals and VOCs will negatively impact this land for future generations. The fact that this has reached the point of permitting applications is a disgrace. It should be obvious that this location right next to a state park and residents on well water, is NOT the right location for a landfill. Please put a stop to this, and tell them to find a more suitable location where there is less chance of harm to people and wildlife. Thank you, Rebecca

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Wednesday, September 22, 2021 1:50 PM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: TECQ PERMIT 2406

H

From: CHIEFCLK <chiefclk@tceq.texas.gov>
Sent: Wednesday, September 22, 2021 1:40 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: FW: TECQ PERMIT 2406

From: Jessica Parker <lacodagirl@gmail.com>
Sent: Wednesday, September 22, 2021 12:50 PM
To: CHIEFCLK <chiefclk@tceq.texas.gov>
Subject: TECQ PERMIT 2406

Dear Chief Clerk,

I urge you to amend Permit #2406, Peach Creek Landfill (PCL), to include the access road and hold a contested case hearing on this proposal because:

1. I am concerned that unacceptable environmental impacts will occur on Sam Houston National Forest, Wood Duck Farm, and private homesteads due to PCL.

2. I am concerned about road access, water, air, noise, litter, and scenic pollutions, flooding, fires, road overuse/damage, and other environmental impacts that PCL may have. I moved here from South Houston in 1988 to get away from the chemical plants and to be away from the nature of things like this landfill.

The landfill will cause problems to the water table including but not limited to possibly poisoning of water wells to people and farms in this area. The impact to nature and the water table for said wildlife will decimate the wildlife population. Which in turn leads to other wildlife populations being out of control. The amount of trash including but not limited to bio-hazards and flammables will lead to a higher probability of wildfires which will stretch limited firefighting capabilities way too thin. The roads which are already in utter disrepair to even worse conditions and cause problems for not only the residents but any emergency responders to the area. Please take all this into consideration and understand that the community will lose out in this situation.

I look forward to hearing from you soon about my request to amend Permit #2406 to include the access road and hold a contested case hearing. Thank you.

Sincerely,

Patricia Burkett

1911 Fostoria Tram Rd

Cleveland Tx

lisa Guerra

·om:	PUBCOMMENT-OCC
ɜnt:	Tuesday, November 10, 2020 1:36 PM
ɔ:	PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
ıbject:	FW: Public comment on Permit Number 2406

·om: pburkettx@gmail.com <pburkettx@gmail.com>
ɜnt: Tuesday, November 10, 2020 12:24 PM
ɔ: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
ıbject: Public comment on Permit Number 2406

EGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

N NUMBER: RN110843042

ERMIT NUMBER: 2406

OCKET NUMBER:

OUNTY: SAN JACINTO

RINCIPAL NAME: PC-II LLC

N NUMBER: CN605694611

:OM

AME: Patricia Doris Burkett

MAIL: pburkettx@gmail.com

OMPANY:

DDRESS: 1911 FOSTORIA TRAM RD
EVELAND TX 77328-7935

ONE: 2815925470

X:

OMMENTS: I am requesting a contested hearing on permit 2406. This is located on Rayjack Rd in Cleveland Tx. I live ht where the garbage trucks will turn I suffer from allergies and extremely sensitive to chemicals. With the increased ıffic naxoius, toxic chemical fumes will be dangerous for me. Which could lead to death. That is why I'm requesting a ntested hearing.

lisa Guerra

rom: PUBCOMMENT-OCC
ent: Tuesday, November 10, 2020 10:49 AM
o: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
ubject: FW: Public comment on Permit Number 2406

rom: pburkettx@gmail.com <pburkettx@gmail.com>
ent: Tuesday, November 10, 2020 10:00 AM
o: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
ubject: Public comment on Permit Number 2406

EGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

N NUMBER: RN110843042

ERMIT NUMBER: 2406

OCKET NUMBER:

OUNTY: SAN JACINTO

RINCIPAL NAME: PC-II LLC

N NUMBER: CN605694611

ROM

AME: Patricia Doris Burkett

MAIL: pburkettx@gmail.com

OMPANY:

DDRESS: 1911 FOSTORIA TRAM RD
.EVELAND TX 77328-7935

HONE: 2814329437

AX:

OMMENTS: I am requesting a contested hearing. My name is Patricia Burkett, address 1911 Fostoria Tram Rd. Phone # 2814329437. Applicants name is Peach Creek Environmental Park, permit 2406. My location is on Fostoria Tram Rd nd I'm about three fourth of a mile from the landfills location. I'm located right where the garbage trucks will turn. This ill increase activity of noxious toxic chemical fumes. I'm extremely sensitive to chemicals. Continuous exposure can ad up to death. For this I'm requesting a contested hearing.

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Monday, October 11, 2021 11:13 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Landfill permit 2406

From: CHIEFCLK <chiefclk@tceq.texas.gov>
Sent: Sunday, October 10, 2021 7:52 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: FW: Landfill permit 2406

From: Pat Burkett <pburketttx@gmail.com>
Sent: Saturday, October 9, 2021 5:43 PM
To: CHIEFCLK <chiefclk@tceq.texas.gov>
Subject: Landfill permit 2406

I did not know that this landfill was open for dumping. I've seen 3 dump trucks go up Jayhawker with loads. Is this landfill open.

Patricia Burkett.
1911 Fostoria Tram Rd
Cleveland tx
281 806 1150

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Tuesday, October 27, 2020 7:59 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

From: pburkettx@gmail.com <pburkettx@gmail.com>
Sent: Monday, October 26, 2020 5:42 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Pat D Burkett

E-MAIL: pburkettx@gmail.com

COMPANY:

ADDRESS: 1911 FOSTORIA TRAM RD
CLEVELAND TX 77328-7935

PHONE: 2814329437

FAX:

COMMENTS: I'm against the Peach Creek Environmental Park landfill that's trying to be put in. This will destroy the forest around it. It will destroy the wildlife there. We have over 50 endangered species living there. The National Forest is supposed to be a sanctuary for the animals. There's the potential to contaminate the three creeks running through it along with our water Wells. This landfill will do so much damage to the forest and the land around it.

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Friday, October 30, 2020 9:43 AM
To: pburkettx@gmail.com
Subject: Public comment on Permit Number 2406

Thank you for your comments.

A copy of your email will be forwarded to the Texas Commission on Environmental Quality (TCEQ) staff responsible for reviewing the application. All timely filed comments will be considered by the staff prior to the final decision on the application. You will be added to the mailing list for this application. After the opportunity to submit comments ends, a copy of the formal written response to all timely filed comments will be mailed to you.

The TCEQ appreciates your interest in environmental issues. If you have any further questions, please feel free to contact the Public Education Program staff at 800-687-4040.

Sincerely,
Office of the Chief Clerk

NOTE: Please do not respond to this email; it will not be answered. If you would like to submit additional comments, please use the online eComments system at: https://www.tceq.texas.gov/agency/decisions/cc/comments.html

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Pat D Burkett

E-MAIL: pburkettx@gmail.com

COMPANY:

ADDRESS: 1911 FOSTORIA TRAM RD
CLEVELAND TX 77328-7935

PHONE: 2814329437

FAX:

COMMENTS: I'm against the Peach Creek Environmental Park landfill that's trying to be put in. This will destroy the forest around it. It will destroy the wildlife there. We have over 50 endangered species living there. The National Forest is supposed to be a sanctuary for the animals. There's the potential to contaminate the three creeks running through it along with our water Wells. This landfill will do so much damage to the forest and the land around it.

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Monday, October 19, 2020 2:09 PM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

From: pburkettx@gmail.com <pburkettx@gmail.com>
Sent: Monday, October 19, 2020 1:52 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Pat D. Burkett

E-MAIL: pburkettx@gmail.com

COMPANY:

ADDRESS: 1911 FOSTORIA TRAM RD
CLEVELAND TX 77328-7935

PHONE: 2814329437

FAX:

COMMENTS: We are opposed to this land fill being put in. . Not good for the environment, our Wells and the wildlife. So much timber would be wasted not to mention our roads

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Wednesday, September 15, 2021 3:40 PM
To: PUBCOMMENT-WPD; PUBCOMMENT-ELD; PUBCOMMENT-OCC2; PUBCOMMENT-OPIC
Subject: CORRECTION: Public comment on Permit Number 2406

H

From: PUBCOMMENT-OCC
Sent: Monday, September 13, 2021 7:21 AM
To: PUBCOMMENT-WPD <pubcomment-wpd@tceq.texas.gov>; PUBCOMMENT-ELD <pubcomment-eld@tceq.texas.gov>; PUBCOMMENT-OCC2 <pubcomment-occ2@tceq.texas.gov>; PUBCOMMENT-OPIC <pubcomment-opic@tceq.texas.gov>
Subject: FW: Public comment on Permit Number 2406

From: Don.burroway@yahoo.com <Don.burroway@yahoo.com>
Sent: Friday, September 10, 2021 8:57 AM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Don Burrowy

E-MAIL: Don.burroway@yahoo.com

COMPANY:

ADDRESS: 12642 ROYAL SHORES DR
CONROE TX 77303-2622

PHONE: 8479708845

FAX:

COMMENTS: Office of Chief Clerk MC 105 Texas Commission on Environmental Quality P.O. Box 13087 Austin, Texas 78711-3087 Dear Chief Clerk, I urge you to amend Permit #2406, Peach Creek Municipal Landfill (PCML), to include the access road and hold a contested case hearing on this proposal because: I am concerned that unacceptable environmental impacts will occur on Sam Houston National Forest, Wood Duck Farm, and private homesteads due to PCML. (if you have visited SHNF tell TCEQ this, why you visit, and what it means to you; if you have bought WDF produce state why you did so and what this means to you; if you live near the PCML site, tell TCEQ and describe how close you are). I am concerned about road access, water, air, noise, odor, litter, and scenic pollutions, flooding, fires, road overuse/damage, and other environmental impacts that PCML may have. (expand on these environmental concerns or add other issues that you are concerned about). Because of these problems I oppose Permit #2406. I look forward to hearing from you soon about my request to amend Permit #2406 to include the access road and hold a contested case hearing. Thank you. Sincerely, Don Burroway Former Secretary-Jelkes Creek Watershed Coalition, Kane County, Illinois

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Monday, September 13, 2021 7:21 AM
To: PUBCOMMENT-WPD; PUBCOMMENT-ELD; PUBCOMMENT-OCC2; PUBCOMMENT-OPIC
Subject: FW: Public comment on Permit Number 2406

From: Don.burroway@yahoo.com <Don.burroway@yahoo.com>
Sent: Friday, September 10, 2021 8:57 AM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Don Burrowy

E-MAIL: Don.burroway@yahoo.com

COMPANY:

ADDRESS: 12642 ROYAL SHORES DR
CONROE TX 77303-2622

PHONE: 8479708845

FAX:

COMMENTS: Office of Chief Clerk MC 105 Texas Commission on Environmental Quality P.O. Box 13087 Austin, Texas 78711-3087 Dear Chief Clerk, I urge you to amend Permit #2406, Peach Creek Municipal Landfill (PCML), to include the access road and hold a contested case hearing on this proposal because: I am concerned that unacceptable environmental impacts will occur on Sam Houston National Forest, Wood Duck Farm, and private homesteads due to PCML. (if you have visited SHNF tell TCEQ this, why you visit, and what it means to you; if you have bought WDF produce

state why you did so and what this means to you; if you live near the PCML site, tell TCEQ and describe how close you are). I am concerned about road access, water, air, noise, odor, litter, and scenic pollutions, flooding, fires, road overuse/damage, and other environmental impacts that PCML may have. (expand on these environmental concerns or add other issues that you are concerned about). Because of these problems I oppose Permit #2406. I look forward to hearing from you soon about my request to amend Permit #2406 to include the access road and hold a contested case hearing. Thank you. Sincerely, Don Burroway Former Secretary-Jelkes Creek Watershed Coalition, Kane County, Illinois

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Wednesday, September 29, 2021 9:04 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

H

From: jrdn_branch@yahoo.com <jrdn_branch@yahoo.com>
Sent: Tuesday, September 28, 2021 9:21 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Jordan Combs

E-MAIL: jrdn_branch@yahoo.com

COMPANY:

ADDRESS: 341 WARE RD
CLEVELAND TX 77328-4575

PHONE: 9727415108

FAX:

COMMENTS: I am a resident of San Jacinto county and my 40 acres will be nearly two miles from the proposed site. What I see missing here is Integrity. Where's the integrity of TCEQ to do the due diligence to protect Texans and the Environment. Allowing outdated maps and terms like "adequate roads" when you don't even know the roads around here. PC-II wasn't truthful about the road conditions, most of the roads proposed are just dirt not paved, how will you know if they'll be truthful about anything else on this process?! Awww How is TCEQ going to hold them accountable for

this?! Where's the integrity of the leaders of PC-II to think about the consequences and repercussions when the landfill contaminants the ground, air and water around us. Just because timber is no longer a lucrative business doesn't mean destroying hundreds of lives is the next best option. If one simple leak happens it'll be like a drain in a bath tub into our water supply. There's no coming back from that. You are hurting endangered species (I only say that because that's something TCEQ actually cares about) but more importantly my three small children, my livestock, and our livelihood. We have put everything we have into this property and farm. With two other landfills already in close proximity (under 10 miles away) what studies or considerations have been taken for soils, ground water, and aquifer by adding a third huge landfill? Or studies done with landfills that have two active, year round creeks and a major watershed going through it? When will TCEQ start caring about protecting Texas citizens and our environment, instead of protecting business who clearly don't understand what "don't mess with Texas means"? I want a contested hearing.

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Tuesday, April 27, 2021 1:02 PM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

PM
H

From: jrdn_branch@yahoo.com <jrdn_branch@yahoo.com>
Sent: Friday, April 23, 2021 2:25 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Jordan Combs

E-MAIL: jrdn_branch@yahoo.com

COMPANY:

ADDRESS: 341 WARE RD
CLEVELAND TX 77328-4575

PHONE: 9727415108

FAX:

COMMENTS: There's needs to be a public meeting where you can see the faces and hear the voices of the people you are trying to harm with this landfill. I want to know when the contested case hearing regarding this landfill will be.

From:	PUBCOMMENT-OCC
To:	PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject:	FW: Permit #2406
Date:	Thursday, May 2, 2024 4:48:38 PM
Attachments:	attachment 2.pdf attachment 3.pdf attachment 4.pdf attachment 5.pdf

---

Jesús Bárcena
Office of the Chief Clerk
Texas Commission on Environmental Quality
Office Phone: 512-239-3319

How is our customer service? Fill out our online customer satisfaction survey at:
www.tceq.texas.gov/customersurvey

From: CHIEFCLK <chiefclk@tceq.texas.gov>
Sent: Thursday, May 2, 2024 3:47 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: FW: Permit #2406

From: Jordan <jrdn_branch@yahoo.com>
Sent: Thursday, May 2, 2024 3:40 PM
To: CHIEFCLK <chiefclk@tceq.texas.gov>
Subject: Permit #2406

Hello,

The San Jacinto County area has had some rain, but the creeks and rivers that flow through this area are flooding out of their banks. Why? Because the lakes in Conroe and Livingston are releasing water at an alarming rate. This creates a horrible downstream flooding in San Jacinto County, specifically on FM 1725, Fostoria, and Jayhawker roads where proposed landfill #2406 is located. The site where proposed landfill #2406 is completely under water. You should deny the permit based on the added burden to not only surrounding, but also downstream communities. I've attached a mailer I received from Texas A&M concerning the watershed and forestry protection for our area, that TCEQ has put their name on as a partner. There are already concerns of water quality and contaminants in this area that will only become a greater issue with a landfill in a flood zone.

Jordan Combs
341 Ware Rd.
Cleveland, Texas 77328

TEXAS A&M FOREST SERVICE

THE TEXAS WATER SOURCE

UPDATING EAST FORK SAN JACINTO WATERSHED LANDOWNERS ON LAND MANAGEMENT & WATER ISSUES

March 2024

East Fork San Jacinto River Watershed Partnership

Who are They?

The East Fork San Jacinto River Watershed Partnership is a group of stakeholders consisting of local governments, businesses, residents, community groups, and other interested parties. Voluntary membership allows stakeholders direct involvement in the development and implementation of a Watershed Protection Plan to address the water quality concerns in the East Fork of the San Jacinto River and its tributaries.

This Partnership is supported by the Texas Commission on Environmental Quality (TCEQ) and the Houston-Galveston Area Council (HGAC). The watershed area covers San Jacinto, Walker, Liberty, Montgomery, and Harris Counties which includes a large part of the Sam Houston National Forest.

What Water Quality Issues are We Facing?

Both humans and natural sources of contamination can threaten a water source. For the East Fork of the San Jacinto River a few notable contaminants are fecal waste, trash, sediment, and flow changes. The river and some of its tributaries have fecal amounts above the standard level set by the state for waterways used for contact recreation. Like many waterways trash enters the river from dumping and stormwater which effects wildlife habitat, flooding potential, and the rivers appeal to the public. Both development and natural erosion lead to higher levels of sediment which can cause water flow to be effected, and can make it more difficult to treat the water.

What is a Watershed Protection Plan?

Due to ongoing water quality issues the East Fork of the San Jacinto River does not meet the minimum quality standards set in Texas the East Fork Partnership is developing and implementing a Watershed Protection Plan to address these issues. The minimum quality standards are set to protect the health of local communities and the environment.

A Watershed Protection Plan is a coordinated framework for implementing integrated water quality protection and restoration strategies driven by environmental objectives. Watershed protection planning is a locally driven mechanism for voluntarily addressing complex water quality problems that cross multiple jurisdictions. A Watershed protection Plan is a way for communities to use both local knowledge and scientific analyses to improve water quality in the area. This is done by developing voluntary and effective solutions to address the current and future contamination sources specific to the area.

For more information:

- https://eastforkpartnership.weebly.com/
- www.tceq.texas.gov/waterquality/nonpoint-source/mgmt-plan/watershed-pp.html

Regional Water Planning with the Texas Water Development Board

The Texas Water Development Board (TWDB) has been charged with the state's water needs since 1957. Their main responsibilities are to collect and disseminate water related data, assist with regional water supply and flood planning, and administer cost-effective financial programs for constructing water supply, wastewater treatment, flood control, and agricultural water conservation projects. The TWDB mission is to lead the state's efforts in ensuring a secure water future for Texas.

The TWDB has a Regional Water Planning Department whose mission is to guide and support the planning of the state's water resources by administering and assisting in the development of the regional and state water plans. There are 16 planning groups coordinating the water planning process, one for each regional planning area. There are approximately 20 members of each planning group that represent a variety of interests, including agriculture, industry, environment, public, municipalities, business, water districts, river authorities, water utilities, counties, groundwater management areas, and power generation.

Planning groups hold open meetings, special public meetings, and hearings before adopting their regional water plans. The publics involvement helps to direct the planning and determine what water management strategies to recommend. Once the regional water plan is developed it is approved by the TWDB and used along with the other regions plans and other resources to develop the state water plan.

Texas Water
Development Board

For more information:

- Regional Water Planning | Texas Water Development Board www.twdb.texas.gov/waterplanning/rwp/index.asp

Region H Water Planning Group

The East Fork San Jacinto Watershed is part of Region H which has their own website for interested members of the public to use and learn about upcoming meetings, who is in your regions planning group, and the planning area for region H.

Region H is located along the upper Texas coast and consists of all or part of 15 counties. The region covers three rivers and four coastal basins within southeast Texas.

Region H has 7 committees including groundwater supply, surface water supply, water management strategy, population demands, non-population demands, an executive committee, and region H nominating committee. They have both voting and non-voting membership which cover the variety of interested parties.

The planning effort is a consensus based effort to include local concerns in the statewide planning effort. If you are interested in attending meetings or looking into previous meeting content visit the website below.

For more information:

- Region H TX (regionhwater.org)

Sam Houston National Forest

History

The Sam Houston National Forest contains 163,037 acres across Montgomery, Walker, and San Jacinto counties. There is evidence of human occupation in the area dating back to 12,000 years ago. The San Jacinto and Trinity Rivers were home to Atakapan speaking groups including Bidai, Patiri, Deadose, and Akokisa. Due to pressure from European settlers and disease the groups became extinct in the early 1800's. There is evidence of occupants from as early as 7,000 years ago up to the twentieth century that have been documented by archaeological sites within the national forest. Please do not disturb any sites, cemeteries, or structures you come across during your visit. If you discover any artifacts on the national forest please leave them in place and contact the Sam Houston Ranger District Office. The national forests in Texas were established in 1933 by an act of the Texas legislature which authorized the purchase of lands for the national forest system.

Land Management

The national forest is managed under the multiple-use concept which means, by law, it must consider all resources of the forest equally and no one resource can be emphasized to the detriment of others. The uses include fish and wildlife, timber, grazing, soil and water, and minerals, managed to maintain a balance among the benefits.

Timber is managed on a sustained yield principle meaning the forest will continuously produce timber products for local and national needs. The money from timber removal is sent to the U.S. Treasury and a portion of funds is returned to the counties for schools and roads.

The U.S. Forest Service and the Texas A&M Forest Service have a cooperative agreement and action plan for the prevention, law enforcement, aerial detection, and suppression of wildfire. Fire has an ecological role in the development and management of the forest as well as rangelands and is used as a tool on the national forest. Prescribed fire reduces forest fuel loads which minimizes the damage from a wildfire event and after burning wildlife habitat is improved. Wildlife like the bald eagle who winters around Lake Conroe and the national forest around it and the red-cockaded woodpecker who is found throughout the national forest.

Plan your Visit!

There are many activities to be done at the Sam Houston National Forest including hunting, biking, camping, fishing, hiking, and watching the wildlife. Many ride horses through the trails or bring their kids to explore the outdoors.

The Sam Houston National Forest Wildlife Management Area is available for hunting under certain rules and regulations. Hunters must have a valid hunting license, the appropriate tags and stamps, and the annual public hunting permit. Further details on the rules can be found in the public hunting lands map booklet.

There are landowner workshops and field days presented at the national forest. Groups can schedule an educational tour to learn more about the Sam Houston National Forest and the management practices used.

For more information:

- Www.tf.usda.gov/detail/Texas/about-forest/districts/?cid=fswdev3_008443
- Or google Sam Houston National Forest USDA

Texas A&M Forest Service
Water Resources
P. O. Box 310
Lufkin, TX 75902-0310

Email: julia.schmidt@tfs.tamu.edu

TEXAS A&M FOREST SERVICE

Non-Profit Organization
US Postage
Paid
College Station, TX
77843
Permit No. 215

RETURN SERVICE REQUESTED

Texas A&M Forest Service is an Affirmative Action/Equal Opportunity Employer committed to Excellence Through Diversity.

169 1

Combs Carson Stale & Jordan Rebekah
341 Ware Rd
Cleveland TX 77328-4575

FIND US ON THE WEB AT: HTTP://TFSWEB.TAMU.EDU/BMP

Distribution of *The Texas Water Source* is provided free of charge to forest landowners of Texas. This publication is funded by the Texas State Soil and Water Conservation Board through a Clean Water Act §319(h) grant from the U.S. Environmental Protection Agency. PLEASE ADVISE US IF YOU WISH YOUR NAME TO BE REMOVED FROM OUR MAILING LIST.

Texas A&M Forest Service
office serving you

Julia Schmidt– Water Resources Forester, East Texas
(979) 587-8873
Julia.schmidt@tfs.tamu.edu

Matthew Garrison– District Forester
Liberty and San Jacinto Counties
(936) 265-9050
Matthew.garrison@tfs.tamu.edu

Ben Plunkett– District Forester
Walker County
(936) 295-5688
bplunkett@tfs.tamu.edu

East and West Forks of the San Jacinto River TMDL and Implementation Plan

This is a project initiated through a contract between TCEQ and the Texas Institute for Applied Environmental Research. The project considered bacteria impairments in four water bodies including Lake Houston, East Fork San Jacinto River, West Fork San Jacinto River, and Crystal Creek. Interested parties and watershed stakeholders met between 2014 and 2017 to discuss the total maximum daily loads (TMDL) to consider the best approach to reduce fecal bacteria and join the bacteria implementation group (BIG). The East and West Fork of the San Jacinto River joined BIG in October 2016.

Www.h-gac.com/bacteria-implementation-group

www.h-gac.com/watershed-based-plans/east-and-west-forks-of-the-san-jacinto-river-tmdl-and-implementation-plan

BIG
BACTERIA IMPLEMENTATION GROUP

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Friday, January 21, 2022 1:47 PM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

From: jrdn_branch@yahoo.com <jrdn_branch@yahoo.com>
Sent: Friday, January 21, 2022 12:48 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Jordan Combs

E-MAIL: jrdn_branch@yahoo.com

COMPANY:

ADDRESS: 341 WARE RD
CLEVELAND TX 77328-4575

PHONE: 9727415108

FAX:

COMMENTS: In the end, we will remember not the words of our enemies, but the silence of our friends. – Martin Luther King Jr. Dear TCEQ, You have been given so many examples and arguments as to why landfill permit #2406 should not go through. I've been told that simply saying "the landfill near my home is a bad idea" isn't enough, but all I am able to bring to the situation is a human element. After all, this is my livelihood you are affecting. Not just mine, but my family line for generations. I don't have the resources to hire attorney's, environmental scientists, or have traffic studies done.

Morality has to be involved in the decision making process because of all the negative ramifications if this fails. And it really isn't a question of "if this fails" is it, no matter what measures of safety are written on paper, you know that it's not enough for a guarantee. The permit investors have changed the number of how many cars go down my road, Fostoria, on every single draft permit (remember you've given them chance after chance to "get it right"). They didn't come down here, they didn't even send someone down here to see if the number was even close. How is that considered solid data, but my account of flooding in this area and letting you know that adding one of the biggest landfills in Texas where permit #2406 is drafted to be, will be catastrophic for the Sam Houston National Forest, my home, and my neighbors. How come the FEMA Flood plain map from 2010 is considered solid data, when we have had events like Harvey and Imelda that changed the topography. But me, a Texas resident that will live within a one to two mile radius of the landfill tells you that even the lightest rain floods this area and there's standing water at the proposed landfill site and the roads leading up to it, isn't viable data. When a landfill is built and trash starts piling up, common sense tells you that the water on the roads and properties around it will only get worse. TCEQ needs to update the criteria for an application to reflect current times, like not putting landfills near where people live. The "scientific data" the investors bought so they could carry on with the next phase should be questioned. The safety measures they've put in their paperwork is to ensure they won't flood. They didn't have their scientist propose a plan on how to protect us living around it from flooding. You can't account for, on paper, the flash flood rains we get in this area. On paper ensuring there won't be a liner tear that will contaminate our water supply isn't enough of a security when we're talking about poisoning hundreds of people who use the aquifer underneath the site. You have to consider the moral responsibility you have in this. You are, after all, a governmental entity set up to PROTECT Texas residents' health and natural resources. With two landfills already within an 8 mile radius of the proposed site, this isn't about sustainable economic development, it's purely a money grab. With the investors continually not making the residents near by aware of their intentions, lying about the conditions of the roads, and manipulating data to fit their needs, it's common sense that they are not going to be able to build this landfill safely or effectively. The first public meeting residents were made aware of, after the process had already been more than half way completed, had 158 people in attendance. The biggest virtual public meeting TCEQ has had to date. But you want to see more of a local turn out. Since you do not live here, let me paint a picture. Me and the majority of my "neighbors" moved to this area to get away from the city life and have space. I live on forty acres. My neighbor to my left lives on 20 acres and the neighbor to my right lives on 80 acres. This isn't like a conventional neighborhood where you have hundreds of residents in a condensed area. We are spread out, living amongst the trees, enjoying the sounds of nature. Many of whom do not have access to internet because we live out here to get away from the evil in the world, yet its still been able to find us, dressed as bureaucrats. If you're looking for one hundred residents within a mile of the proposed site to be in attendance of a public meeting, that isn't a possibility. But the people who do live close are showing up. The Texas residents that live downstream and will be affected by the landfill failure are showing up. The rangers in charge of protecting the Sam Houston National Forest are showing up. Our Texas representatives are showing up. Our friends are showing up. It's time for the leadership at TCEQ to show up and deny permit #2406.

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Wednesday, September 29, 2021 9:00 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

From: jrdn_branch@yahoo.com <jrdn_branch@yahoo.com>
Sent: Wednesday, September 29, 2021 4:21 AM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Jordan Combs

E-MAIL: jrdn_branch@yahoo.com

COMPANY:

ADDRESS: 341 WARE RD
CLEVELAND TX 77328-4575

PHONE: 9727415108

FAX:

COMMENTS: Our county and surrounding counties have burn bans in the dry months to help prevent uncontrollable forest fires. The landfill will be right next to the Sam Houston National Forest and surrounded by trees. Landfills have to have a constant fire going to burn off gas emitted by the trash. How will TCEQ ensure the safety of the residents and the National forest during those burn bans?

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Tuesday, April 27, 2021 12:59 PM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

From: jrdn_branch@yahoo.com <jrdn_branch@yahoo.com>
Sent: Friday, April 23, 2021 11:21 AM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Jordan Combs

E-MAIL: jrdn_branch@yahoo.com

COMPANY:

ADDRESS: 341 WARE RD
CLEVELAND TX 77328-4575

PHONE: 9727415108

FAX:

COMMENTS: I am in opposition of Peach Creek Environmental Park and the permit related to #2406. I live approximately 1 mile away from the proposed site of this landfill. While this is an unrestricted area, this is a rural residential location with homes, farms, and national forest surrounding this potential landfill. This permit is requesting the right to dump potentially hazardous materials into our streams that contain over 50 endangered and/or threatened animals. In addition, this location is located in a flood plain and has two streams that flow through the property

increasing the risk of flooding and contamination. While there are stipulations to the type of pollutants that can be discharged from the site, as well as checks that will be required, it is not a 100% guarantee that other extremely hazardous materials will not be mixed in, especially with the potential for flooding. This area flooded without a hurricane, with our recent tropic storm Imelda, and can clearly not be a location for a landfill, especially one with a 5 year permit. Additionally, upon reading the application process, Peach Creek Environmental Park was required to send letters to every person on the county mailing this. This did not happen, which I believe, is a violation of this application's process. We have a well, the majority of families and farms do too. This landfill will harm not only humans but the livestock which in turn contaminates the food chain to spread beyond our local community. You are potentially poisoning my small children and affecting their livelihood. Many families and farms rely solely on their own animals, which is why the majority of us moved to this location. As a small Homestead with the plans to potentially earn an income through selling organic produce and animals, this landfill would destroy and eliminate any possibility of that due to the potential hazards and contaminants that would arise. This landfill is an imminent and long term threat to the people in this area, as well as all whom visit or purchase products produced by these farms. Thank you in advance for your time in reading this comment, and I look forward to receiving all updates that involve the imminent threat this landfill hold on myself, my family, and my community.

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Tuesday, April 27, 2021 12:58 PM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

From: jrdn_branch@yahoo.com <jrdn_branch@yahoo.com>
Sent: Friday, April 23, 2021 12:15 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Jordan Combs

E-MAIL: jrdn_branch@yahoo.com

COMPANY:

ADDRESS: 341 WARE RD
CLEVELAND TX 77328-4575

PHONE: 9727415108

FAX:

COMMENTS: I am in opposition of Peach Creek Environmental Park and the permit related to #2406. I live approximately 1 mile away from the proposed site of this landfill. While this is an unrestricted area, this is a rural residential location with homes, farms, and national forest surrounding this potential landfill. This permit is requesting the right to dump potentially hazardous materials into our streams that contain over 50 endangered and/or threatened animals. In addition, this location is located in a flood plain and has two streams that flow through the property

increasing the risk of flooding and contamination. While there are stipulations to the type of pollutants that can be discharged from the site, as well as checks that will be required, it is not a 100% guarantee that other extremely hazardous materials will not be mixed in, especially with the potential for flooding. This area flooded without a hurricane, with our recent tropic storm Imelda, and can clearly not be a location for a landfill, especially one with a 5 year permit. Additionally, upon reading the application process, Peach Creek Environmental Park was required to send letters to every person on the county mailing this. This did not happen, which I believe, is a violation of this application's process. We have a well, the majority of families and farms do too. This landfill will harm not only humans but the livestock which in turn contaminates the food chain to spread beyond our local community. You are potentially poisoning my small children and affecting their livelihood. Many families and farms rely solely on their own animals, which is why the majority of us moved to this location. As a small Homestead with the plans to potentially earn an income through selling organic produce and animals, this landfill would destroy and eliminate any possibility of that due to the potential hazards and contaminants that would arise. This landfill is an imminent and long term threat to the people in this area, as well as all whom visit or purchase products produced by these farms. Thank you in advance for your time in reading this comment, and I look forward to receiving all updates that involve the imminent threat this landfill hold on myself, my family, and my community.

Melissa Schmidt

From: PUBCOMMENT-OCC
Sent: Tuesday, May 25, 2021 2:17 PM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406
Attachments: IMG_8867 (3)_Moment1.pdf

From: jrdn_branch@yahoo.com <jrdn_branch@yahoo.com>
Sent: Tuesday, May 25, 2021 11:31 AM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Jordan Combs

E-MAIL: jrdn_branch@yahoo.com

COMPANY:

ADDRESS: 341 WARE RD
CLEVELAND TX 77328-4575

PHONE: 9727415108

FAX:

COMMENTS: How come someone in Mississippi gets to say they want to put everyone's trash in my backyard and someone sitting in their house in Austin gets to tell them it's ok? Neither of you have been here to see the state this area is already in. You have no idea what is going on here. But me as a home owner with three small children, livestock, and our entire lives work wrapped up in this property a mile from the landfill site gets zero say. How broken is this system?!

This area is flooded with just a normal summer rain. The image attached shows that the street where the proposed site will be is completely under water. What will clear cutting 2,000 acres worth of tress and putting in 636 acres of impermeable liner down, plus pavement for buildings and parking lots do?! One tree soaks up 11,000 gallons of water a year. One acre can have up to 100 trees. That's a ton of water the landfill site currently soaks up. Trees hold the sand and silt in place so it doesn't run into rivers. This location is in a major watershed with two creeks running through. You know what's going to happen?! Flooding. Unimaginable flooding. The FEMA floodplain maps they used are from 2010! Eleven years ago. Since then this area has had huge growth and two catastrophic storms Harvey and Imelda. Those storms alone have changed the River and Creek routes and topography. You in good conscience can not allow this landfill to be built. This landfill will inevitably flood my home and homes around me. You will flood my home with my babies inside. You have to deny the permit or people will die. There are more concerns regarding fires being in the middle of the National Forest, our roads can not accommodate all the garbage trucks that will be driving around all day, and the air and water quality will have major impacts on residents and wildlife. This safety issue isn't something that can just be checked off on a permit list. You don't live here! The investors don't live here! You don't know the devastation you will cause, but it will be catastrophic. You have to deny permit 2406. I need YOU to save my babies and my home. The investors put the notice in a newspaper that does not circulate this area. This right there should completely disqualify them from being permitted to continue. They are already doing things dirty. And you expect them to "take care of business" down here?! We have well water. All it takes is one leak and it'll be like a drain in a bathtub. It will contaminate our entire water system. Are they going to provide a safe water opportunity for this area? Our shallow water table and soil we have here can not accommodate a landfill. We are farmers and homesteaders out here. With two big creeks running through the landfill site, any rain will bring trash sludge into our creeks contaminating the water for our crops and livestock. I understand landfills are needed, but putting one in this area just because "we're in the middle of nowhere", is only going to cause major problems and devastation in the future. Please deny this permit. We need your help. Please save us! Save my children!!

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Wednesday, March 23, 2022 9:51 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

From: jrdn_branch@yahoo.com <jrdn_branch@yahoo.com>
Sent: Tuesday, March 22, 2022 9:05 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Jordan Combs

E-MAIL: jrdn_branch@yahoo.com

COMPANY:

ADDRESS: 341 WARE RD
CLEVELAND TX 77328-4575

PHONE: 9727415108

FAX:

COMMENTS: The Texas Commission on Environmental Quality mission statement says you strive to protect our state's public health and natural resources consistent with sustainable economic development. That your goal is clean air, clean water, and the safe management of waste. In your agency's philosophy to accomplish that mission you base decisions on the law, common sense, sound science, and fiscal responsibility. To break it down: •Sustainable Economic Development attempts to satisfy the needs of humans but in a manner that sustains natural resources and the

environment for future generations. There are already two landfills within a 10 miles radius of the proposed landfill site. Being in the National forest and in a watershed plus on top of a aquifer that provides water for hundreds of families in the area, the placement of landfill will not be able to meet needs without compromising the safety and wellbeing of future generations. •Safe management of waste – The investors have had to re-do their application multiple times to meet tceq requirements. They've flat out lied (by not make the public aware and putting the notifications in a paper that doesn't circulate this area, they didn't have the newest application at the local library for viewing until someone asked for it. They lied about the road conditions in our area on the application and manipulated data (using a traffic report from 2015, but changed how much traffic actually comes through here on every application until tceq was satisfied). If they can't safely and effectively fill out an application, how can they safely and effectively run a landfill. It's TCEQ job to vet these people and letting them write whatever they want without following through if they are being honest is extremely concerning and not safe management. •Based decisions on the law – When you are letting the investors use floodplain maps from 2010 and we've had historic flooding since then that changed the floodplains and topography of the area, when you let them use old traffic data, when you let them get away with not notifying the public of their intentions, and lie about the road conditions – There has to be a point when someone at TCEQ challenges that the laws in place need to catch up with current environmental circumstances and have some moral integrity to protect these lands and people. •Sound science – putting a landfill next to a protected national forest, in a flood plain that has two active watersheds to a major water source for the city of Houston, and on top of a used aquifer - no matter how flowery the investors engineers word their application to make this site sound safe, there are no words to justify the placement of the proposed landfill. But, if you read the comment section for the permit so many neighbors and qualified people who are standing up for us have put in real data, facts, questions, and genuine concerns for the placement of this landfill in this area and that needs to have serious consideration. •We bought our land specifically in the national forest thinking we could live organically and always be protected from such evils. Yet here we are. I want to formally say that I do not consent to a landfill being built in my backyard. Last public meeting was the biggest virtual meeting tceq has ever had, but you want more locals to actively saying that they do not consent. That will be hard to come by. Most people in this area aren't English speakers, have a low socioeconomic situation and the internet out here is too expensive and hardly ever works, so it's hard for locals to participate. There are thousands of people from all over participating to speak up for the ones who can't. Shame on Tceq and the peach creek investors for taking advantage of my neighbors in such way. •Lastly, using common sense is a prerequisite for tceq to review and consider an application. It's common sense that this area is not suitable for a landfill, our infrastructure cannot handle the heavy traffic that a landfill will bring, and the investors have been less than forthcoming. I understand that common sense is subjective, but this one feels like a no brainer. Deny Permit #2406!

Melissa Schmidt

From: PUBCOMMENT-OCC
Sent: Monday, May 3, 2021 1:17 PM
To: PUBCOMMENT-WPD; PUBCOMMENT-ELD; PUBCOMMENT-OCC2; PUBCOMMENT-OPIC
Subject: FW: Public comment on Permit Number 2406

From: jrdn_branch@yahoo.com <jrdn_branch@yahoo.com>
Sent: Saturday, May 1, 2021 7:39 AM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Jordan Combs

E-MAIL: jrdn_branch@yahoo.com

COMPANY:

ADDRESS: 341 WARE RD
CLEVELAND TX 77328-4575

PHONE: 9727415108

FAX:

COMMENTS: I was told over the phone by someone at TECQ that you read the comments and take into consideration the information shared. You are illegally putting up a landfill in Caldwell county and ignoring regulations. Who is suppose to fight fir us if you won't?!! This is ridiculous! The ENVIRONMENTAL QUALITY of my community will be greatly impacted by this landfill. It's your responsibility to make sure that won't happen. The soil here in my county, where the proposed landfill is going is considered SEVERE for landfill use. Meaning it won't filter out toxins, it will immediately contaminate

our water wells. You must stop this!! I added a link to our soil survey in the area.
https://lookaside.fbsbx.com/file/Polk.pdf?token=AWyFifaW61heo-Zn6Yx73r0YDpC5sDYi-HdVwvORHvx385mRsYSLdAMiC-eqc5P8ujdHZnb0TMIsrWtezmi9bvuLrDNtyLmQbOBPoLIYZiUGNtUI3J5SginQvRjEzJNCYWxozYVXbHLDwYKJLf90rGDnLs4kHj2zvy_eh_2-46gMxM2ssZtwyM2qaDNPENLjCIVV95yM6yWHuVQgkWjhhLGAsem39nQSgWR5a5YCBKMT0g

Deornette Monteleone

From: PUBCOMMENT-OCC
Sent: Thursday, May 13, 2021 8:47 AM
To: jrdn_branch@yahoo.com
Subject: Public comment on Permit Number 2406

Thank you for your comments.

A copy of your email will be forwarded to the Texas Commission on Environmental Quality (TCEQ) staff responsible for reviewing the application. All timely filed comments will be considered by the staff prior to the final decision on the application. You will be added to the mailing list for this application. After the opportunity to submit comments ends, a copy of the formal written response to all timely filed comments will be mailed to you.

The TCEQ appreciates your interest in environmental issues. You may track the status of matters pending before the Commission for approval or view comments and requests by visiting the following website: https://www14.tceq.texas.gov/epic/eCID/. If you have any further questions, please feel free to contact the Public Education Program staff at 800-687-4040.

Sincerely,
Office of the Chief Clerk

NOTE: Please do not respond to this email; it will not be answered. If you would like to submit additional comments, please use the online eComments system at: https://www.tceq.texas.gov/agency/decisions/cc/comments.html

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Jordan Combs

E-MAIL: jrdn_branch@yahoo.com

COMPANY:

ADDRESS: 341 WARE RD
CLEVELAND TX 77328-4575

PHONE: 9727415108

FAX:

COMMENTS: Under Texas Health and Safety Code section 361.083 people affected by municipal solid waste must be notified by MAIL. The investors of the landfill DID NOT notify the people in this area. They put the notice in a newspaper that DOES NOT circulate in this area. So we, in fact,were not notified. The investors are already not following state regulations. How can we trust that they will follow regulations when it comes to managing waste?! My families well being is at stake!! TCEQ is liable to make sure my water, land, and health is not affected by their negligence. They are already lying and being negligent. In Section 361.089, you are able to deny their permit for falsifying and putting misleading information in their application (by saying they notified those that will be affected by the landfill). I am holding TCEQ responsible in making sure my families safety will be upheld and that you deny permit #2406.

Deornette Monteleone

From: PUBCOMMENT-OCC
Sent: Thursday, May 13, 2021 8:47 AM
To: jrdn_branch@yahoo.com
Subject: Public comment on Permit Number 2406

Thank you for your comments.

A copy of your email will be forwarded to the Texas Commission on Environmental Quality (TCEQ) staff responsible for reviewing the application. All timely filed comments will be considered by the staff prior to the final decision on the application. You will be added to the mailing list for this application. After the opportunity to submit comments ends, a copy of the formal written response to all timely filed comments will be mailed to you.

The TCEQ appreciates your interest in environmental issues. You may track the status of matters pending before the Commission for approval or view comments and requests by visiting the following website: https://www14.tceq.texas.gov/epic/eCID/. If you have any further questions, please feel free to contact the Public Education Program staff at 800-687-4040.

Sincerely,
Office of the Chief Clerk

NOTE: Please do not respond to this email; it will not be answered. If you would like to submit additional comments, please use the online eComments system at: https://www.tceq.texas.gov/agency/decisions/cc/comments.html

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Jordan Combs

E-MAIL: jrdn_branch@yahoo.com

COMPANY:

ADDRESS: 341 WARE RD
CLEVELAND TX 77328-4575

PHONE: 9727415108

FAX:

COMMENTS: I was told over the phone by someone at TECQ that you read the comments and take into consideration the information shared. You are illegally putting up a landfill in Caldwell county and ignoring regulations. Who is suppose to fight fir us if you won't?!! This is ridiculous! The ENVIRONMENTAL QUALITY of my community will be greatly impacted by this landfill. It's your responsibility to make sure that won't happen. The soil here in my county, where the proposed landfill is going is considered SEVERE for landfill use. Meaning it won't filter out toxins, it will immediately contaminate our water wells. You must stop this!! I added a link to our soil survey in the area.
https://lookaside.fbsbx.com/file/Polk.pdf?token=AWyFifaW61heo-Zn6Yx73r0YDpC5sDYi-HdVwvORHvx385mRsYSLdAMiC-eqc5P8ujdHZnb0TMIsrWtezmi9bvuLrDNtyLmQbOBPoLIYZiUGNtUI3J5SginQvRjEzJNCYWxozYVXbHLDwYKJLf90rGDnLs4kHj2zvy_eh_2-46gMxM2ssZtwyM2qaDNPENLjCIVV95yM6yWHuVQgkWjhhLGAsem39nQSgWR5a5YCBKMT0g

Melissa Schmidt

From: PUBCOMMENT-OCC
Sent: Monday, May 3, 2021 1:32 PM
To: PUBCOMMENT-WPD; PUBCOMMENT-ELD; PUBCOMMENT-OCC2; PUBCOMMENT-OPIC
Subject: FW: Public comment on Permit Number 2406

From: jrdn_branch@yahoo.com <jrdn_branch@yahoo.com>
Sent: Friday, April 30, 2021 11:41 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Jordan Combs

E-MAIL: jrdn_branch@yahoo.com

COMPANY:

ADDRESS: 341 WARE RD
CLEVELAND TX 77328-4575

PHONE: 9727415108

FAX:

COMMENTS: Under Texas Health and Safety Code section 361.083 people affected by municipal solid waste must be notified by MAIL. The investors of the landfill DID NOT notify the people in this area. They put the notice in a newspaper that DOES NOT circulate in this area. So we, in fact,were not notified. The investors are already not following state regulations. How can we trust that they will follow regulations when it comes to managing waste?! My families well being is at stake!! TCEQ is liable to make sure my water, land, and health is not affected by their negligence. They are

already lying and being negligent. In Section 361.089, you are able to deny their permit for falsifying and putting misleading information in their application (by saying they notified those that will be affected by the landfill). I am holding TCEQ responsible in making sure my families safety will be upheld and that you deny permit #2406.

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Thursday, March 10, 2022 7:56 PM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406
Attachments: Cook Comment 2 PDF-combined.pdf

eComment = H
Attachment = Comment

From: mcook14@lamar.edu <mcook14@lamar.edu>
Sent: Wednesday, March 9, 2022 2:46 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: MRS Mandy Cook

E-MAIL: mcook14@lamar.edu

COMPANY:

ADDRESS: 361 JAYHAWKER RD
CLEVELAND TX 77328-7971

PHONE: 2818832839

FAX:

COMMENTS: Please see the attached PDF document that has my entire comment, request for contested hearing when/if applicable, references, and documents to review, publish in comments, and put into consideration to support the denial of application 2406.

Dear Office of Chief Clerk:
I am requesting for the following information to be added to the comments filed in conjunction to proposed landfill 2406.

Based on the current projection location of this proposed landfill, it reflects to be less than 2 miles from our home off Jayhawker Rd. Our small homestead would be adversely affected by the proposed landfill if the application is granted. A list of disputed issues has already been commented in past dates, and below I am providing additional documentation related to the false location information that has been provided on all documentation. I am referencing FEMA dynamic maps and using the latitude and longitude provided in Peach Creek documentation in addition to an approximate latitude and longitude pin point based on the information Peach Creek has provided.

1. Facility Physical Location vs. Facility Permanent Benchmark
   Per Part I, Section A and B of the Application, The Facility Permanent Benchmark site location coordinates at are located at:
   Site Coordinates:
   Latitude: 30o 23' 20" N
   Longitude: 95o 11' 25" W
   These coordinates are not only in a different city, but a different county and terrain than the proposed physical location of the landfill over 11 miles away (with the proposed site NNW of the benchmark).

   While there are no coordinates provided for the physical location (which should be updated on all documentation prior to any other proceedings), Peach Creek documentation states that the entrance will be "Rajak Road, north 0.3 mile to facility entrance road" which is provided in the attached screenshot/pdf using the following coordinates:
   Latitude: 30.389010
   Longitude: -95.192621
   In addition to the GPS coordinates provided, I am also providing FEMA maps that prove the site location and the permanent benchmark locations are clearly different in terrain and sea level elevation

Thank you for your time and attention to these comments. I have confidence that you will review the documents provided and attached for your research.

Sincerely,

Mandy Cook

National Flood Hazard Layer FIRMette

FEMA

95°11'6"W 30°22'54"N

95°10'28"W 30°22'23"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

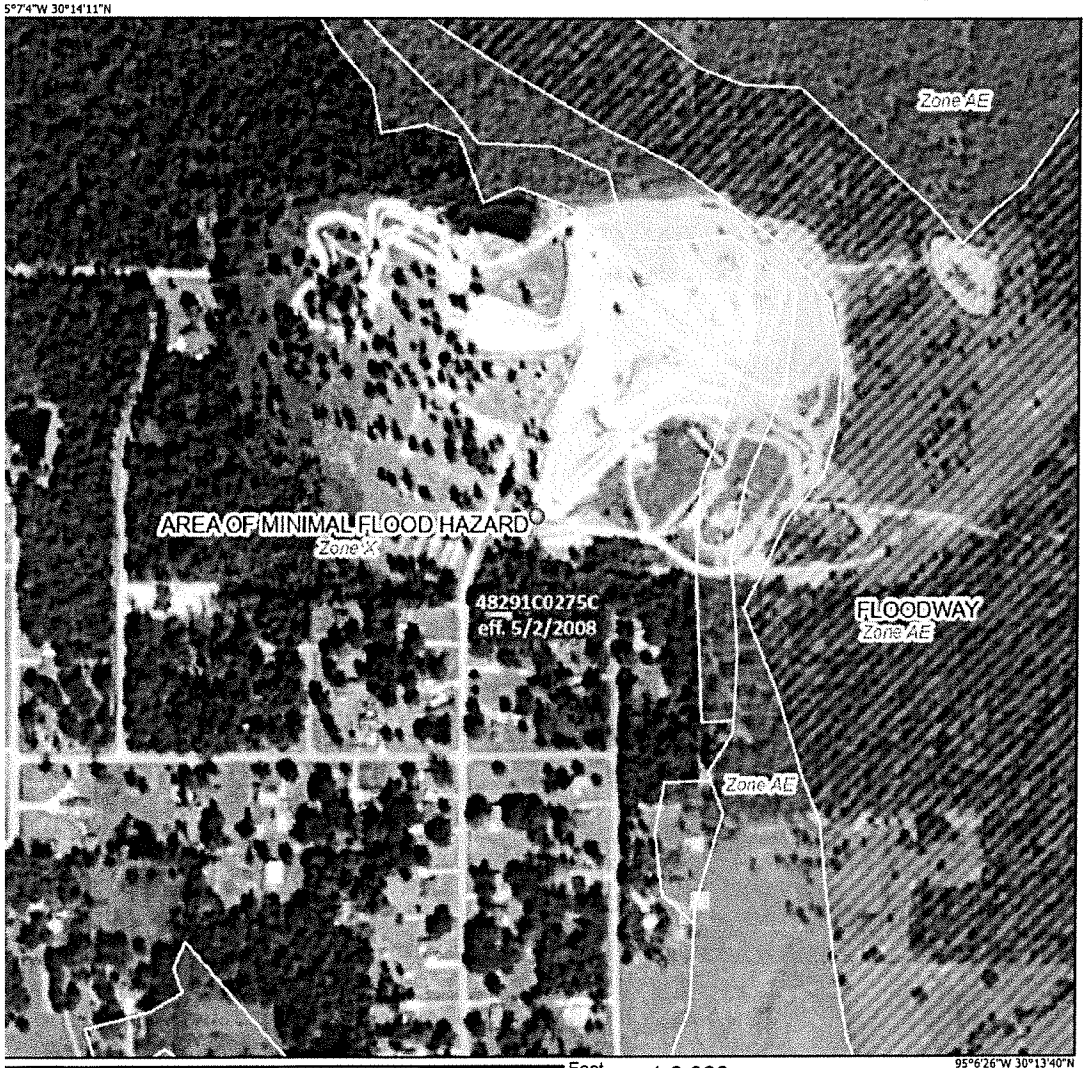
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/9/2022 at 3:01 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

National Flood Hazard Layer FIRMette

FEMA

95°7'4"W 30°14'11"N



95°6'26"W 30°13'40"N

250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/9/2022 at 2:57 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

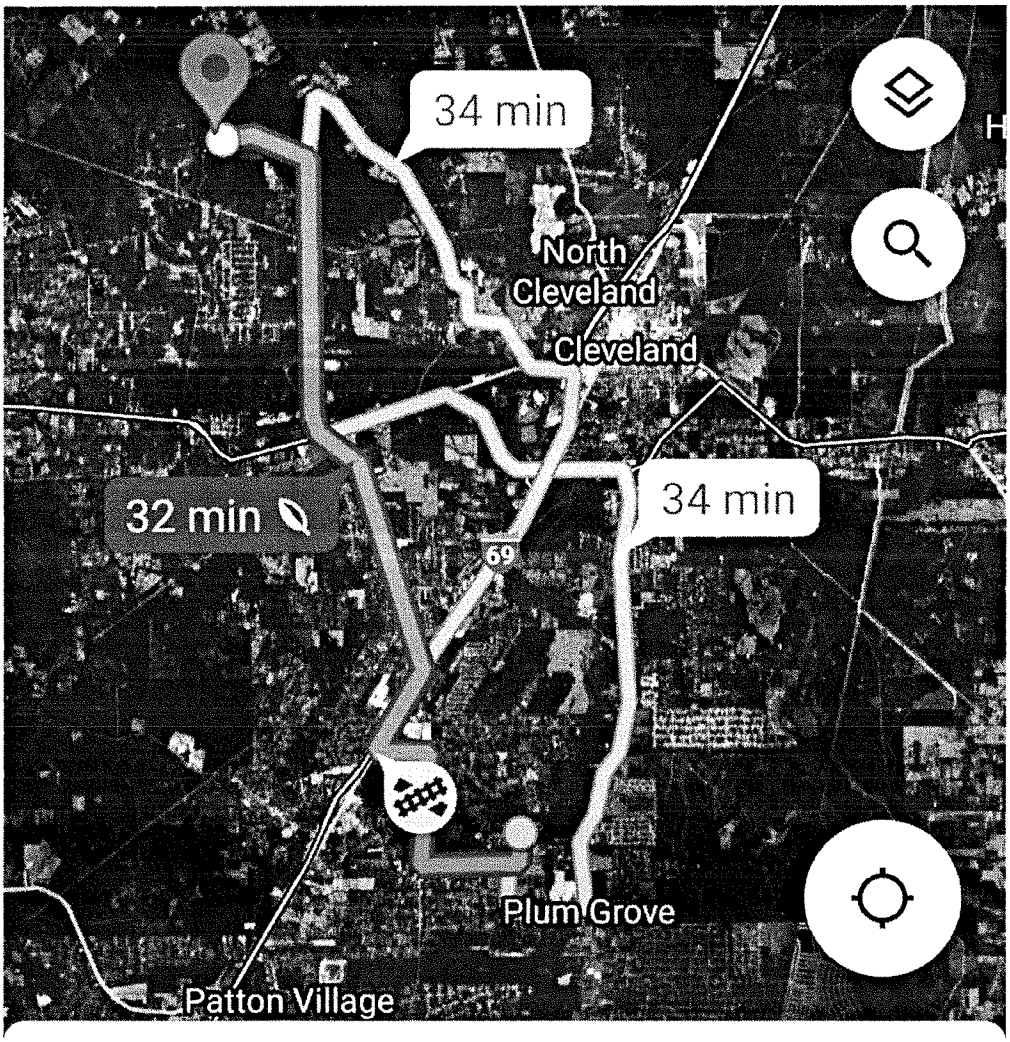
This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

30.232000,-95.112500

30°23'20.4"N 95°11'33.4"W

32 min — 5 hr 1 hr 17

Options



32 min (16 mi)

Most fuel-efficient

Fastest route now due to traffic conditions

Preview Steps Pin

Measure distance

Tap Add point to trace path

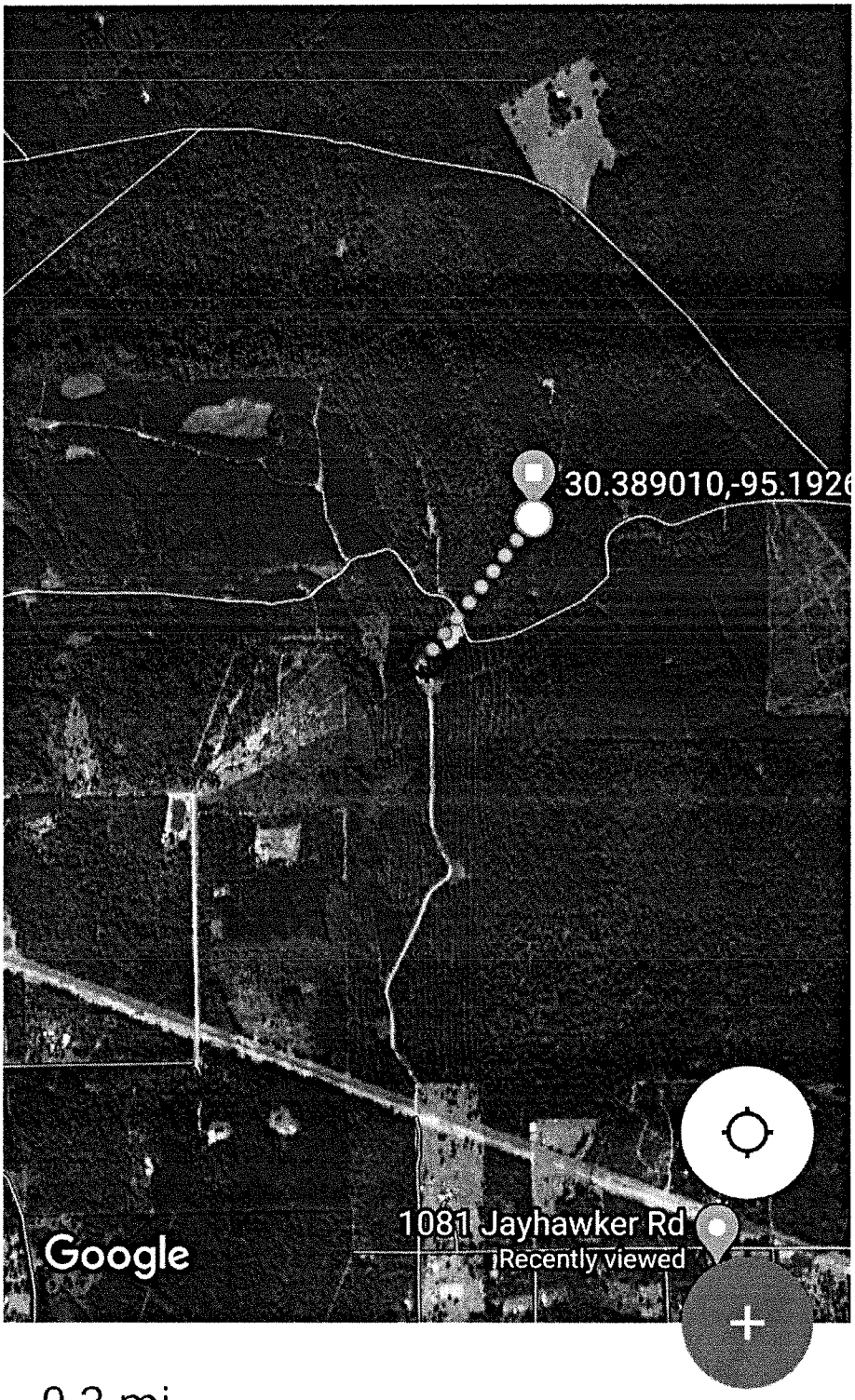
11 mi

Add point

2:31 • 5G 50%

Measure distance

Tap Add point to trace path



0.3 mi

Add point

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Friday, March 4, 2022 4:36 PM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406
Attachments: Cook Comment PDF w. Articles.pdf

H

From: mcook4112@gmail.com <mcook4112@gmail.com>
Sent: Friday, March 4, 2022 4:32 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: MRS Mandy Cook

E-MAIL: mcook4112@gmail.com

COMPANY:

ADDRESS: 361 JAYHAWKER RD
CLEVELAND TX 77328-7971

PHONE: 2818832839

FAX:

COMMENTS: Please see the attached PDF document that has my entire comment, request for contested hearing when/if applicable, references, and documents to review, publish in comments, and put into consideration to support the denial of application 2406.

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Friday, January 14, 2022 8:40 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

H

From: Mjb_0619@yahoo.com <Mjb_0619@yahoo.com>
Sent: Thursday, January 13, 2022 2:41 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: MRS Mandy J Cook

E-MAIL: Mjb_0619@yahoo.com

COMPANY:

ADDRESS: 361 JAYHAWKER RD
CLEVELAND TX 77328-7971

PHONE: 2818832839

FAX:

COMMENTS: I, Mandy Cook, at 361 Jayhawker Rd Cleveland Tx 77328, phone number 281-883-2839 located less than 2 mimes from the propsed sight, wish to express my disappointment in seeing this proposal for a landfill #2406. I have written repeatedly about several issues that have not been replied about, such as the access road that does not exist and therefore is not counted toward possible flooding issues on the proposed application, leachage from an outdated system that has been proven to fail without notice, water Contamination to wells for local family members, water

contamination to local farms and homesteads like myself, location to endangered species, and so many more that can be found in previous Comments. I am requested a contested case hearing.

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Monday, November 15, 2021 2:27 PM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: TCEQ permit #2406 Comment
Attachments: per-and_polyfluoroalkyl_substances.memo_.signed.pdf; pfas-roadmap_final-508 (1).pdf

PM
H

From: CHIEFCLK <chiefclk@tceq.texas.gov>
Sent: Monday, November 15, 2021 1:00 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: FW: TCEQ permit #2406 Comment

From: Mandy Cook <mcook4112@gmail.com>
Sent: Monday, November 15, 2021 12:09 PM
To: CHIEFCLK <chiefclk@tceq.texas.gov>; jason.roesner@usda.gov; Randy.Moore@usda.gov; ken.arney@usda.gov; William.Taylor@usda.gov; frank.stranimier@usda.gov; brandt_mannchen@comcast.net; woodduckfarm@yahoo.com
Subject: TCEQ permit #2406 Comment

To: TCEQ Staff and all concerned

Please review upcoming EPA actions and regulations.

I ask for denial of permit #2406 based on new and incoming data and legislation. I strongly urge all at the TCEQ to read and research

https://www.trihydro.com/webinars/news-test/2021/11/03/pfas-federal-regulations-part-3-recent-actions-affecting-industry-now-next-year-and-beyond

regarding PFAS as well as view the two attached documents. I also ask that the TCEQ follow the EPA's lead and hold permitting solid waste landfills until safer regulations can be implemented to ensure disposal of harmful chemicals can be handled properly.

Attached are PDFs of the above referenced information regarding new regulations concerning PFAS. Waste disposal is a big concern to the EPA and strides are being made toward more regulation of these chemicals due to the toxic effects on human, animal, and the environment.

With this new information and forthcoming regulation, I insist that the TCEQ deny permit #2406 based on scientific evidence that PFAS do and will cause harm. The EPA is considering placing a hazardous material rating on PFAS and I do NOT want my family, my community, neighboring communities, local farmers, the natural forest, local waterways, and aquifers to be affected for YEARS to come.

Please deny this permit based on impending regulation that will drastically affect the lives of everyone locally and downstream of this proposed site in a life-threatening way.

The TCEQ cannot turn a blind eye to evidence that exists but has not yet been legislated. It is unkind, cruel, and irresponsible to knowingly subject the environment to hazardous chemicals.

The future of waste disposal is changing, and I urge the Executive Director, Commissioners, and all TCEQ staff to consider the potential harm that will devastate communities and natural ecosystems.

Please deny permit #2406.

I request another public meeting where individuals who have no internet access can hear more information on this application and understand the life altering effects it will have if permitted.

I also request a contested case hearing.

To knowingly subject individuals, communities, and drinking water sources to KNOWN harmful substances is negligent!

With all due respect, this permit #2406 is wrought with flaws. The burden has been placed upon an economically challenged county and the local residents to prove the deficiencies while the TCEQ allows for unlimited revisions! This is NOT EQUITABLE!

Sincerely,

Mandy Cook and Family

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

WASHINGTON, D.C. 20460

April 27, 2021

THE ADMINISTRATOR

MEMORANDUM

SUBJECT: Memorandum Regarding Per- and Polyfluoroalkyl Substances

FROM: Michael S. Regan

TO: General Counsel
Assistant Administrators
Inspector General
Chief Financial Officer
Chief of Staff
Associate Administrators
Regional Administrators
Deputy Assistant Administrators
Deputy Regional Administrators

As Secretary of the North Carolina Department of Environmental Quality, I saw firsthand how devastating per- and polyfluoroalkyl substances pollution can be for communities. Many PFAS persist in the environment and accumulate in the body, putting those exposed at risk of severe health effects. The scope of PFAS contamination in the United States and the potential public health threat makes our task to address these chemicals particularly challenging and urgent.

In North Carolina, I also wanted strong federal leadership. Now, as the EPA's Administrator, tackling this problem will be one of my top priorities. We will take meaningful action, following the science and following the law, to better understand and ultimately reduce the potential risks caused by these chemicals. I am committed to listening to the public and working collaboratively with states, tribes, local governments, industry, water systems and impacted communities to identify pragmatic approaches that will deliver critical protections across the country.

In the early days of this administration, we took some important steps. We pulled down a PFBS toxicity assessment that had been politically compromised and issued a new assessment backed by career scientists. We have taken swift action to begin to develop a national primary drinking water regulation, to collect new data critically needed to improve the EPA's understanding of 29 PFAS and to solicit data on the presence and treatment of PFAS in wastewater discharges. We have also voiced our strong support for President Biden's American Jobs Plan, which calls for investing billions of dollars to monitor and treat PFAS in drinking water.

But we still have more work to do. To build on this progress, I have asked Radhika Fox, Principal Deputy Assistant Administrator, Office of Water, and Deb Szaro, Acting Regional Administrator, Region 1, to convene and lead a council of senior EPA career officials from across the agency to strategize the best way to use the EPA's authorities, expertise and partnerships to mitigate and reduce PFAS pollution and protect public health and the environment. This newly established EPA Council on PFAS will collaborate on cross-cutting strategies; advance new science; develop coordinated policies, regulations and communications; and engage with affected states, tribes, communities and stakeholders. The work of the ECP is not a substitute for the ongoing efforts by our national programs and regions to meaningfully address PFAS pollution and its impacts on public health and communities. The ECP will strive to build on and significantly enhance our capabilities through comprehensive, coordinated and results-driven multi-media actions.

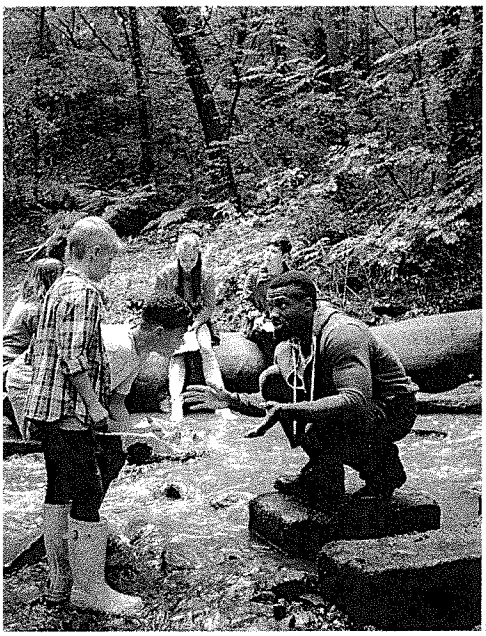
The agency's ongoing work on PFAS is based on the 2019 EPA PFAS Action Plan. Developed by EPA career staff, the plan identifies an agenda and actions that have yet to be realized. During the past few years, science has progressed rapidly, including through the hard work of our own scientists in the Office of Research and Development and throughout the agency. We must move forward with actions based on new science and a better understanding of the complex challenges so many of our communities are facing. To address these challenges and meet the needs of our partners and communities across the United States, I am directing the ECP to:

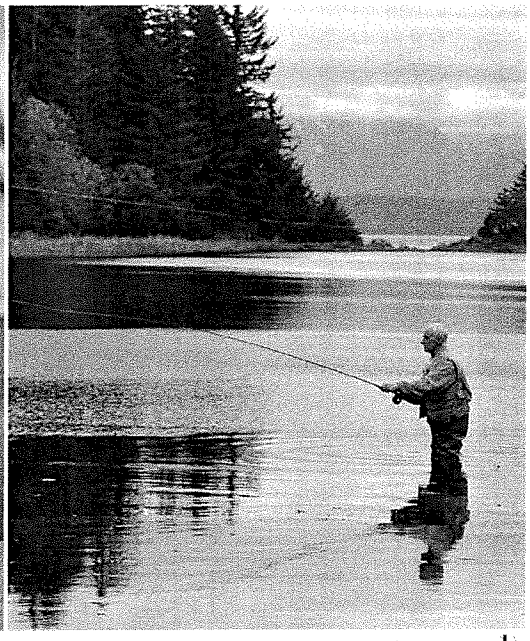
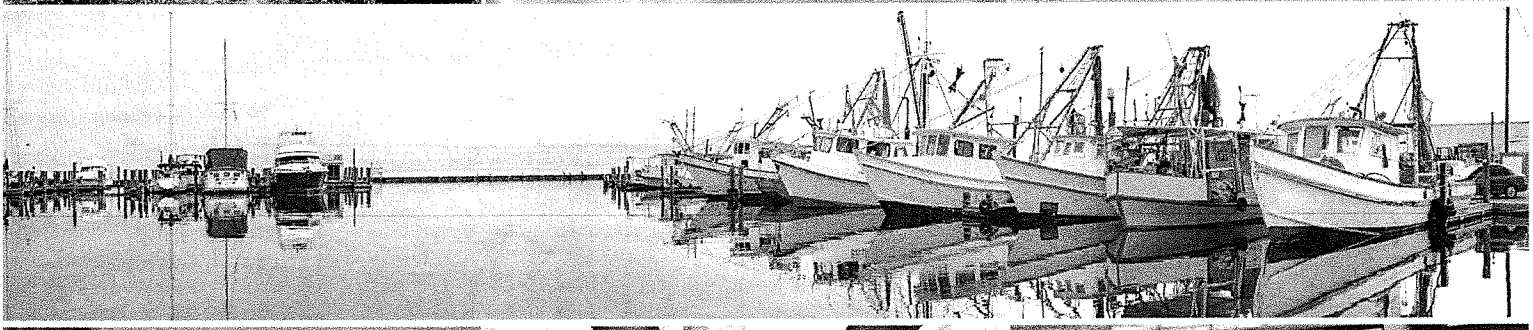
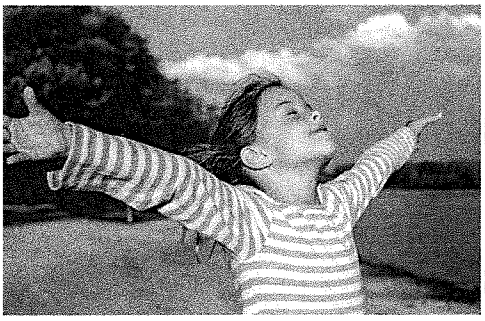
- Develop "PFAS 2021-2025 – Safeguarding America's Waters, Air and Land," a multi-year strategy to deliver critical public health protections to the American public. To develop the strategy, the ECP will review all ongoing actions, propose any necessary modifications and identify new strategies and priorities. The ECP shall make initial recommendations to me within 100 days of its establishment.
- Continue close interagency coordination on regional specific and cross-media issues to assist states, tribes and local communities faced with significant and complex PFAS challenges.
- Work with all national program offices and regions to maximize the impact of the EPA's funding and financing programs to support cleanup of PFAS pollution, particularly in underserved communities.
- Expand engagement opportunities with federal, state and tribal partners to ensure consistent communications, exchange information and identify collaborative solutions.

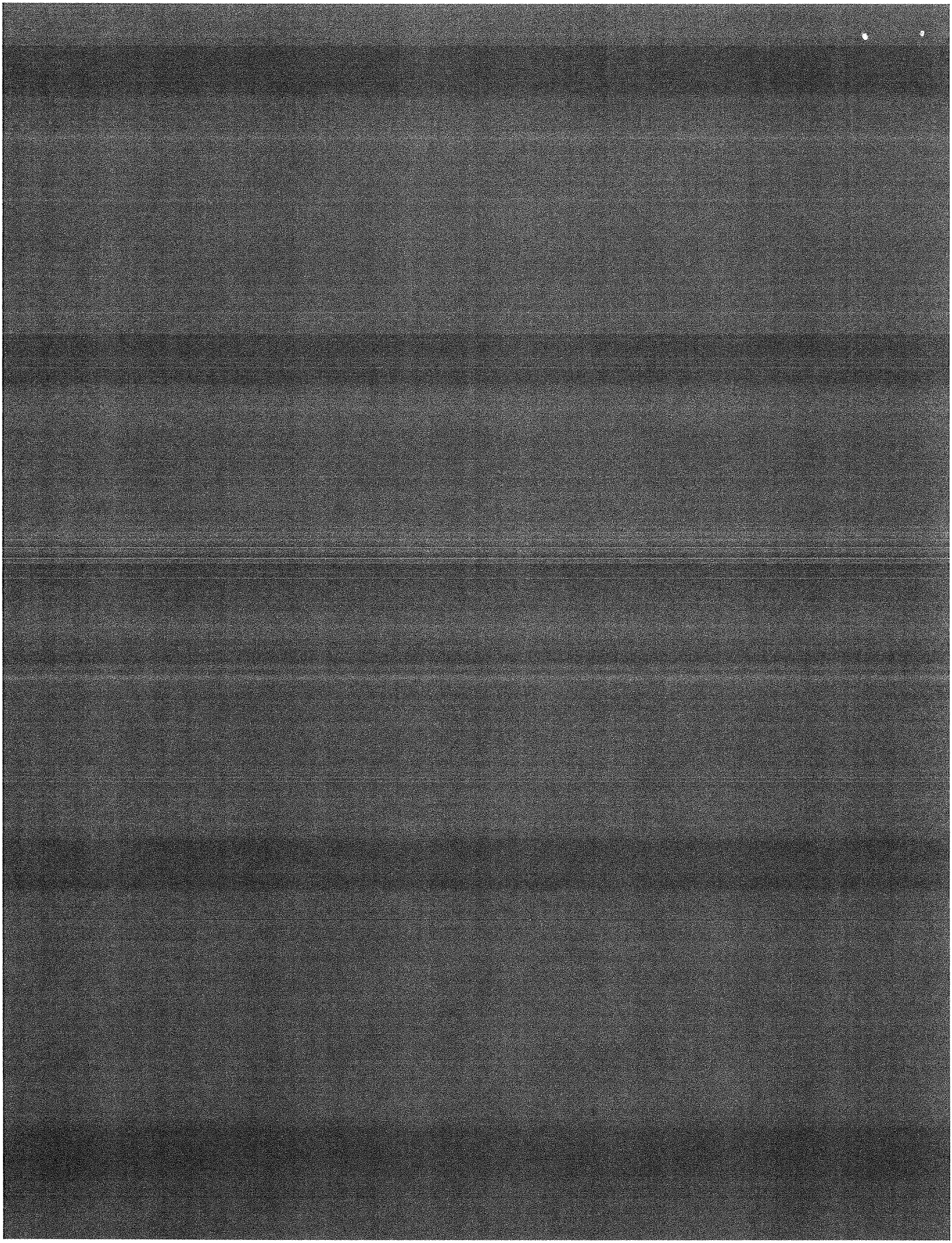
There is a lot of work ahead of us on this front. I have seen this problem firsthand, and I am committed to pursuing all options to address PFAS pollution with our mission to protect human health and the environment at the forefront. I appreciate your leadership as we roll up our sleeves on this issue and look forward to working with you on these next steps.

EPA
United States
Environmental Protection
Agency

PFAS Strategic Roadmap: EPA's Commitments to Action 2021–2024





A Note from EPA Administrator Michael S. Regan

For far too long, communities across the United States have been suffering from exposure to PFAS pollution. As the science has continued to develop, we know more now than ever about how PFAS build up in our bodies over long periods of time, and how they can cause adverse health effects that can devastate families. As Secretary of the North Carolina Department of Environmental Quality, I saw this devastation firsthand. For years, the Cape Fear River had been contaminated by these persistent "forever" chemicals. As I spoke with families and concerned citizens, I could feel their suffering and frustration with inaction. I knew my job was going to be trying and complex. But we were able to begin to address this pervasive problem by following the science, following the law, and bringing all stakeholders to the table.

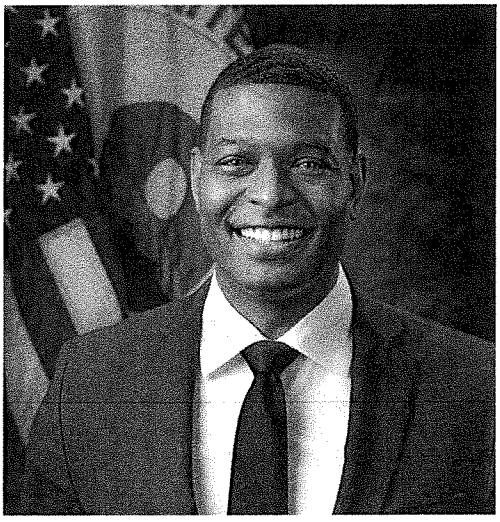
As one of my earliest actions as EPA Administrator, I established the EPA Council on PFAS and charged it with developing an ambitious plan of action to further the science and research, to restrict these dangerous chemicals from getting into the environment, and to immediately move to remediate the problem in communities across the country. EPA's PFAS strategic roadmap is our plan to deliver tangible public health benefits to all people who are impacted by these chemicals—regardless of their zip code or the color of their skin.

Since I've been EPA Administrator, I have become acutely aware of the invaluable and central role EPA has in protecting public health in America. For more than 50 years, EPA has implemented and enforced laws that protect people from dangerous pollution in the air they breathe, the water they drink, and the land that forms the foundation of their communities. At the same time, my experience in North Carolina reinforced that EPA cannot solve these challenges alone. We can only make progress if we work in close collaboration with Tribes, states, localities, and stakeholders to enact solutions that follow the science and stand the test of time. To affect meaningful change, engagement, transparency, and accountability will be critical as we move forward.

This roadmap will not solve our PFAS challenges overnight. But it will turn the tide by harnessing the collective resources and authority across federal, Tribal, state, and local governments to empower meaningful action now.

I want to thank the co-chairs of the EPA Council on PFAS—Radhika Fox, Assistant Administrator for Water, and Deb Szaro, Acting Regional Administrator in Region 1—for their leadership in guiding the development of this strategy.

Let's get to work.



Administrator Michael S. Regan

PFAS Council Members

The following policy and technical leaders serve as members of the EPA Council on PFAS. They have been instrumental in working with their respective offices to develop the Agency's strategy. The Council will continue to coordinate across all EPA offices and Regions to accelerate progress on PFAS.

Co-Chairs

Radhika Fox, Assistant Administrator for Water

Deb Szaro, Acting Regional Administrator, Region 1

Office of the Administrator

John Lucey, Special Assistant to the Administrator

Andrea Drinkard, Senior Advisor to the Deputy Administrator

Office of Air and Radiation

John Shoaff, Director, Air Policy and Program Support

Office of Chemical Safety and Pollution Prevention

Jeffrey Dawson, Science Advisor

Tala Henry, Deputy Director, Pollution Prevention and Toxics

Office of Enforcement and Compliance Assurance

Cyndy Mackey, Director, Site Remediation Enforcement

Karin Leff, Director, Federal Facilities Enforcement

Office of General Counsel

Dawn Messier, Deputy Associate General Counsel, Water

Jen Lewis, Deputy Associate General Counsel, Solid Waste and Emergency Response

Office of Land and Emergency Management

Dana Stalcup, Deputy Director, Superfund Remediation and Technology Innovation

Dawn Banks, Director, Policy Analysis and Regulatory Management

Office of Research and Development

Tim Watkins, Acting Director, Center for Public Health and Environmental Assessment

Susan Burden, PFAS Executive Lead

Office of Water

Jennifer McLain, Director, Ground Water and Drinking Water

Deborah Nagle, Director, Science and Technology

Zachary Schafer, Senior Advisor to the Assistant Administrator

EPA Regions

John Blevins, Acting Regional Administrator, Region 4

Tera Fong, Water Division Director, Region 5

Contents

Introduction 5

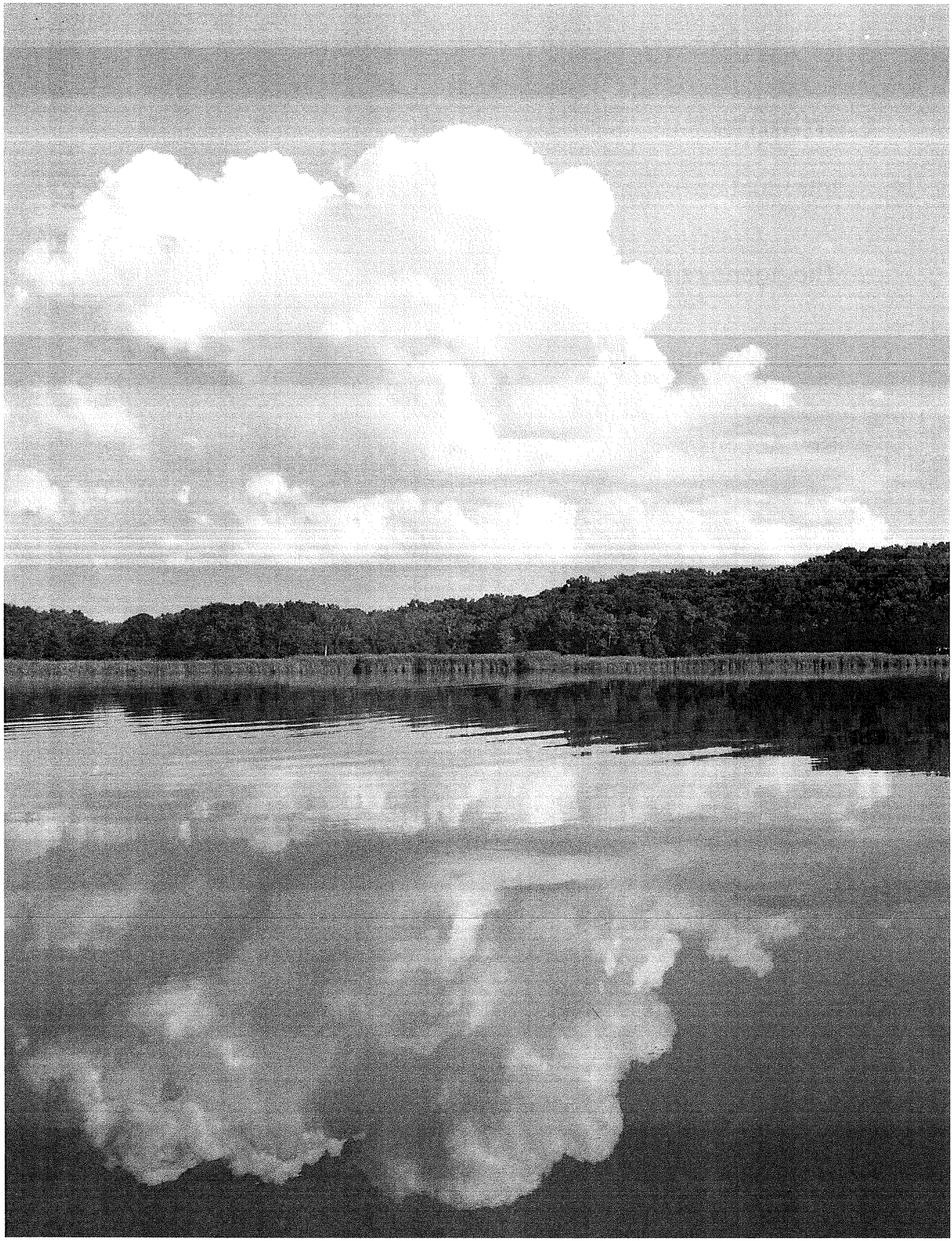
The Agency's Approach 6

Goals and Objectives 9

Key Actions 10

Conclusion 22

Endnotes 23



Introduction

Harmful per- and poly-fluoroalkyl substances (PFAS) are an urgent public health and environmental issue facing communities across the United States. PFAS have been manufactured and used in a variety of industries in the United States and around the globe since the 1940s, and they are still being used today. Because of the duration and breadth of use, PFAS can be found in surface water, groundwater, soil, and air—from remote rural areas to densely-populated urban centers. A growing body of scientific evidence shows that exposure at certain levels to specific PFAS can adversely impact human health and other living things. Despite these concerns, PFAS are still used in a wide range of consumer products and industrial applications.

Every level of government—federal, Tribal, state, and local—needs to exercise increased and sustained leadership to accelerate progress to clean up PFAS contamination, prevent new contamination, and make game-changing breakthroughs in the scientific understanding of PFAS. The EPA Council on PFAS developed this strategic roadmap to lay out EPA's whole-of-agency approach to addressing PFAS. To deliver needed protections for the American people, the roadmap sets timelines by which the Agency plans to take specific actions during the first term of the Biden-Harris Administration. The strategic roadmap builds on and accelerates implementation of policy actions identified in the Agency's 2019 action plan and commits to bolder new policies to safeguard public health, protect the environment, and hold polluters accountable.

The risks posed by PFAS demand that the Agency attack the problem on multiple fronts at the same time. EPA must leverage the full range of statutory authorities to confront the human health and ecological risks of PFAS. The actions described in this document each represent important and meaningful steps to safeguard communities from PFAS contamination. Cumulatively, these actions will build upon one another and lead to more enduring and protective solutions.

EPA's integrated approach to PFAS is focused on three central directives:

- **Research.** Invest in research, development, and innovation to increase understanding of PFAS exposures and toxicities, human health and ecological effects, and effective interventions that incorporate the best available science.
- **Restrict.** Pursue a comprehensive approach to proactively prevent PFAS from entering air, land, and water at levels that can adversely impact human health and the environment.
- **Remediate.** Broaden and accelerate the cleanup of PFAS contamination to protect human health and ecological systems.

The Agency's Approach

EPA's approach is shaped by the unique challenges to addressing PFAS contamination. EPA cannot solve the problem of "forever chemicals" by tackling one route of exposure or one use at a time. Rather, EPA needs to take a lifecycle approach to PFAS in order to make meaningful progress. PFAS pollution is not a legacy issue—these chemicals remain in use in U.S. commerce. As such, EPA cannot focus solely on cleaning up the downstream impacts of PFAS pollution. The Agency needs to also look upstream to prevent new PFAS contamination from entering air, land, and water and exposing communities. As the Agency takes tangible actions both upstream and downstream, EPA will continue to pursue a rigorous scientific agenda to better characterize toxicities, understand exposure pathways, and identify new methods to avert and remediate PFAS pollution. As EPA learns more about the family of PFAS chemicals, the Agency can do more to protect public health and the environment. In all this work, EPA will seek to hold polluters accountable for the contamination they cause and ensure disadvantaged communities equitably benefit from solutions.

Consider the Lifecycle of PFAS

EPA will account for the full lifecycle of PFAS, their unique properties, the ubiquity of their uses, and the multiple pathways for exposure.

PFAS are a group of synthetic chemicals that continue to be released into the environment throughout the lifecycle of manufacturing, processing, distribution in commerce, use, and disposal. Each action in this cycle creates environmental contamination and human and ecological exposure. Exacerbating this challenge is that some PFAS persist in the environment. PFAS are synthesized for many different uses, ranging from firefighting foams, to coatings for clothes and furniture, to food contact substances. Many PFAS are also used in industrial processes and applications, such as in the manufacturing of other chemicals and products. PFAS can be released into the environment during manufacturing and processing as well as during industrial and commercial use. Products known to contain PFAS are regularly disposed of in landfills and by incineration, which can also lead to the release of PFAS. Many PFAS have unique properties that prevent their complete breakdown in the environment, which means that even removing PFAS from contaminated areas can create PFAS-contaminated waste. This is currently unregulated in most cases.

Get Upstream of the Problem

EPA will bring deeper focus to preventing PFAS from entering the environment in the first place—a foundational step to reducing the exposure and potential risks of future PFAS contamination.

Intervening at the beginning of the PFAS lifecycle—before they have entered the environment—is a foundational element of EPA's whole-of-agency approach. While hundreds of individual PFAS compounds are in production and use,[i] a relatively

modest number of industrial facilities produce PFAS feedstock,[ii] and a relatively narrow set of industries directly discharge PFAS into water or soil or generate air emissions in large quantities.[iii] This context helps to pinpoint clear opportunities to restrict releases into the environment. EPA will use its authorities to impose appropriate limitations on the introduction of new unsafe PFAS into commerce and will, as appropriate, use all available regulatory and permitting authorities to limit emissions and discharges from industrial facilities. This approach does not eliminate the need for remediation where releases and exposures have already occurred, but it is a critical step to preventing ongoing concentrated contamination of soil and surface and groundwaters.

Hold Polluters Accountable

EPA will seek to hold polluters and other responsible parties accountable for their actions and for PFAS remediation efforts.

Many communities and ecosystems are continuously exposed to PFAS in soil, surface water, groundwater, and air. Areas can be exposed due to their proximity to industrial sites, airports, military bases, land where biosolids containing PFAS have been applied, and other sites where PFAS have been produced or used and disposed of for specific and repeated purposes. When EPA becomes aware of a situation that poses a serious threat to human health or the environment, the Agency will take appropriate action. For other sites where contamination may have occurred, the presence of certain PFAS in these environments necessitates coordinated action to understand what specific PFAS have been released, locations where they are found, where they may be transported through air, soil, and water in the future, and what remediation is necessary. EPA will seek to hold polluters and other responsible parties accountable for their actions, ensuring that they assume responsibility for remediation efforts and prevent any future releases.

Ensure Science-Based Decision-Making

EPA will invest in scientific research to fill gaps ***in understanding of PFAS, to identify which additional PFAS may pose human health and ecological risks at which exposure levels, and to develop methods to test, measure, remove, and destroy them.***

EPA's decisions regarding PFAS will be grounded in scientific evidence and analysis. The current body of scientific evidence clearly indicates that there are real, present, and significant hazards associated with specific PFAS, but significant gaps remain related to the impacts of other PFAS on human health and in the environment. Regulatory development, either at the state or federal level, would greatly benefit from a deeper scientific understanding of the exposure pathways, toxicities, and potential health impacts of less-studied PFAS. The federal government, states, industry, academia, and nonprofit organizations—with appropriate coordination and resources—have the capability to conduct this necessary research.

EPA is conducting new research to better understand the similar and different characteristics of specific PFAS and whether and how to address groups and categories of PFAS. The Agency is focused on improving its ability to address multiple chemicals at once, thereby accelerating the effectiveness of regulations, enforcement actions, and the tools and technologies needed to remove PFAS from air, land, and water.

To break the cycle of contamination and exposure from PFAS, additional research is needed to identify and/or develop techniques to permanently dispose of or destroy these durable compounds. Government agencies, industry, and private laboratories need tools and validated methods to measure PFAS in air, land, and water to identify pollution sources, demonstrate facility compliance, hold polluters accountable, and support communities during and after cleanups.

Prioritize Protection of Disadvantaged Communities

When taking action on PFAS, EPA will ensure that disadvantaged communities have equitable access to solutions.

Many known and potential sources of PFAS contamination (including military bases, airports, industrial facilities, and waste management and disposal sites) are near low-income communities and communities of color. EPA needs to ensure these affected populations have an opportunity to participate in and influence the Agency's decision-making. This may call for the Agency to seek out and facilitate the communities' engagement by providing culturally appropriate information and accommodations for people with Limited English Proficiency, facilitating community access to public meetings and comment periods, and offering technical assistance to build community-based capacity for participation. EPA's actions need to consider the unique on-the-ground conditions in these communities, such as outdated infrastructure, to help ensure they benefit equitably from policy solutions.

EPA will also collect more data and develop new methodologies to understand PFAS exposure pathways in disadvantaged communities; to what extent PFAS pollution contributes to the cumulative burden of exposures from multiple sources in these communities; and how non-environmental stressors, such as systemic socioeconomic disparities, can exacerbate the impacts of pollution exposure and vice versa.

Goals and Objectives

EPA's comprehensive approach to addressing PFAS is guided by the following goals and objectives.

RESEARCH

Invest in research, development, and innovation to increase understanding of PFAS exposures and toxicities, human health and ecological effects, and effective interventions that incorporate the best available science.

Objectives

- Build the evidence base on individual PFAS and define categories of PFAS to establish toxicity values and methods.
- Increase scientific understanding on the universe of PFAS, sources of environmental contamination, exposure pathways, and human health and ecological effects.
- Expand research on current and emerging PFAS treatment, remediation, destruction, disposal, and control technologies.
- Conduct research to understand how PFAS contribute to the cumulative burden of pollution in communities with environmental justice concerns.

RESTRICT

Pursue a comprehensive approach to proactively prevent PFAS from entering air, land, and water at levels that can adversely impact human health and the environment.

Objectives

- Use and harmonize actions under all available statutory authorities to control and prevent PFAS contamination and minimize exposure to PFAS during consumer and industrial uses.
- Place responsibility for limiting exposures and addressing hazards of PFAS on manufacturers, processors, distributors, importers, industrial and other significant users, dischargers, and treatment and disposal facilities.
- Establish voluntary programs to reduce PFAS use and release.
- Prevent or minimize PFAS discharges and emissions in all communities, regardless of income, race, or language barriers.

REMEDIATE

Broaden and accelerate the cleanup of PFAS contamination to protect human health and ecological systems.

Objectives

- Harmonize actions under all available statutory authorities to address PFAS contamination to protect people, communities, and the environment.
- Maximize responsible party performance and funding for investigations and cleanup of PFAS contamination.
- Help ensure that communities impacted by PFAS receive resources and assistance to address contamination, regardless of income, race, or language barriers.
- Accelerate the deployment of treatment, remediation, destruction, disposal, and mitigation technologies for PFAS, and ensure that disposal and destruction activities do not create new pollution problems in communities with environmental justice concerns.

Key Actions

This section summarizes the bold actions that EPA plans to take from 2021 through 2024 on PFAS, as well as some ongoing efforts thereafter. The actions described in this roadmap are subject to the availability of appropriations and other resources. Each of these actions—led by EPA's program offices—are significant building blocks in the Agency's comprehensive strategy to protect public health and ecosystems by researching, restricting, and remediating PFAS contamination. As EPA takes each of these actions, it also commits to transparent, equitable, and inclusive engagement with all stakeholders to inform the Agency's work.

These are not the only actions underway at EPA, nor will they be the last. As the Agency does more, it will learn more. And as EPA learns more, it will do more. As EPA continues to build the evidence base, as regulatory work matures, and as EPA learns more from its partnerships across the country, the Agency will deliver additional actions commensurate with the urgency and scale of response that the PFAS problem demands.

Office of Chemical Safety and Pollution Prevention

Publish national PFAS testing strategy

Expected Fall 2021

EPA needs to evaluate a large number of PFAS for potential human health and ecological effects. Most PFAS have limited or no toxicity data. To address this data gap, EPA is developing a national PFAS testing strategy to deepen understanding of the impacts of categories of PFAS, including potential hazards to human health and the environment. This will help EPA identify and select PFAS for which the Agency will require testing using Toxic Substances Control Act (TSCA) authorities. In the 2020 National Defense Authorization Act (NDAA), Congress directed EPA to develop a process for prioritizing which PFAS or classes of PFAS should be subject to additional research efforts based on potential for human exposure to, toxicity of, and other available information. EPA will also identify existing test data for PFAS (both publicly available and submitted to EPA under TSCA) that will be considered prior to requiring further testing to ensure adherence to the TSCA goal of reducing animal testing. EPA will use the testing strategy to identify important gaps in existing data and to select representative chemical(s) within identified categories as priorities for additional studies. EPA expects to exercise its TSCA Section 4 order authority to require PFAS manufacturers to conduct and fund the studies. EPA plans to issue the first round of test orders on the selected PFAS by the end of 2021.

Ensure a robust review process for new PFAS

Efforts Ongoing

EPA's TSCA New Chemicals program plays an important gatekeeper role in ensuring the safety of new chemicals, including new PFAS, prior to their entry in U.S. commerce. Where unreasonable

risks are identified as part of the review process, EPA must mitigate those risks before any manufacturing activity can commence. The 2016 TSCA amendments require EPA to review and make a determination regarding the potential risks for each new chemical submission. Since early 2021, EPA has taken steps to ensure that new PFAS are subject to rigorous reviews and appropriate safeguards, including making changes to the policies and processes underpinning reviews and determinations on new chemicals to better align with the 2016 amendments. In addition, EPA has previously allowed some new PFAS to enter the market through low-volume exemptions (LVEs), following an expedited, 30-day review process. In April 2021, the Agency announced that it would generally expect to deny pending and future LVE submissions for PFAS based on the complexity of PFAS chemistry, potential health effects, and their longevity and persistence in the environment. Moving forward, EPA will apply a rigorous premanufacture notice review process for new PFAS to ensure these substances are safe before they enter commerce.

Review previous decisions on PFAS

Efforts Ongoing

EPA is also looking at PFAS that it has previously reviewed through the TSCA New Chemicals program, including those that it reviewed prior to the 2016 TSCA amendments. For example, EPA recently launched a stewardship program to encourage companies to voluntarily withdraw previously granted PFAS LVEs. EPA also plans to revisit past PFAS regulatory decisions and address those that are insufficiently protective. As part of this effort, the Agency could impose additional notice requirements to ensure it can review PFAS before they are used in new ways that might present concerns.

In addition, EPA plans to issue TSCA Section 5(e) orders for existing PFAS for which significant new use notices (e.g., a new manufacturing process for an existing PFAS, or a new use or user) have recently been filed with EPA. The orders would impose rigorous safety requirements as a condition of allowing the significant new use to commence.

More broadly, EPA is planning to improve approaches for overall tracking and enforcement of requirements in new chemical consent orders and significant new use rules (SNURs) to ensure that companies are complying with the terms of those agreements and regulatory notice requirements.

Close the door on abandoned PFAS and uses

Expected Summer 2022

Many existing chemicals (i.e., those that are already in commerce and listed on the TSCA Inventory of chemicals), including PFAS, are currently not subject to any type of restriction under TSCA. In some instances, the chemicals themselves have not been actively manufactured for many years. In others, chemicals may have certain past uses that have been abandoned. Absent restriction, manufacturers are free to begin using those abandoned chemicals or resume those abandoned uses at any time. Under TSCA, by rule, EPA can designate uses of a chemical that are not currently ongoing—and potentially *all* uses associated with an inactive chemical—as "significant new uses." Doing so ensures that an entity must first submit a notice and certain information to EPA before it can resume use of that chemical or use. TSCA then requires EPA to review and make an affirmative determination on the potential risks to health and the environment and to require safety measures to address unreasonable risks before allowing the PFAS use to resume. EPA is considering how it can apply this authority to help address abandoned uses of PFAS as well as future uses of PFAS on the inactive portion of the TSCA Inventory.

Enhance PFAS reporting under the Toxics Release Inventory

Expected Spring 2022

The Toxics Release Inventory (TRI) helps EPA compile data and information on releases of certain chemicals and supports informed decision-making by companies, government agencies, non-governmental organizations, and the public. Pursuant to the 2020 NDAA, certain industry sectors must report certain PFAS releases to TRI. However, certain

exemptions and exclusions remain for those PFAS reporters, which significantly limited the amount of data that EPA received for these chemicals in the first year of reporting.[iv] To enhance the quality and quantity of PFAS information collected through TRI, EPA intends to propose a rulemaking in 2022 to categorize the PFAS on the TRI list as "Chemicals of Special Concern" and to remove the de minimis eligibility from supplier notification requirements for all "Chemicals of Special Concern." EPA will also continue to update the list of PFAS subject to TRI and expects to announce an additional rulemaking to add more PFAS to TRI in 2022, as required by the 2020 NDAA.

Finalize new PFAS reporting under TSCA Section 8

Expected Winter 2022

TSCA Section 8(a)(7) provides authority for EPA to collect existing information on PFAS. In June 2021, EPA published a proposed data-gathering rule that would collect certain information on any PFAS manufactured since 2011, including information on uses, production volumes, disposal, exposures, and hazards. EPA will consider public comments on the proposal and finalize it before January 1, 2023. Ultimately, information received under this rule will enable EPA to better characterize the sources and quantities of manufactured PFAS in the United States and will assist the Agency in its future research, monitoring, and regulatory efforts.

Office of Water

Undertake nationwide monitoring for PFAS in drinking water

Final Rule Expected Fall 2021

The Safe Drinking Water Act (SDWA) establishes a data-driven and risk-based process to assess drinking water contaminants of emerging concern. Under SDWA, EPA requires water systems to conduct sampling for unregulated contaminants every five years. EPA published the proposed Fifth Unregulated Contaminant Monitoring Rule (UCMR 5) in March 2021. As proposed, UCMR 5 would provide new data that is critically needed to improve EPA's understanding of the frequency that 29 PFAS are found in the nation's drinking water systems and at what levels. The proposed UCMR 5 would significantly expand the number of drinking water systems participating in the program, pending sufficient appropriations by Congress. The data gathered from an expanded set of drinking water systems would improve EPA's ability to conduct state and local assessments of contamination, including analyses of potential environmental justice impacts. As proposed, and if funds are appropriated by Congress, all public water systems serving 3,300 or more people and 800 representative public water systems serving fewer than 3,300 would collect samples during a 12-month period from January 2023 through December 2025. EPA is considering comments on the proposed UCMR 5 and preparing a final rule. Going forward, EPA will continue to prioritize additional PFAS for inclusion in UCMR 6 and beyond, as techniques to measure these additional substances in drinking water are developed and validated.

Establish a national primary drinking water regulation for PFOA and PFOS

Proposed Rule Expected Fall 2022, Final Rule Expected Fall 2023

Under the SDWA, EPA has the authority to set enforceable National Primary Drinking Water Regulations (NPDWRs) for drinking water contaminants and require monitoring of public water

supplies. To date, EPA has regulated more than 90 drinking water contaminants but has not established national drinking water regulations for any PFAS. In March 2021, EPA published the Fourth Regulatory Determinations, including a final determination to regulate Perfluorooctanoic acid (PFOA) and Perfluorooctane sulfonic acid (PFOS) in drinking water. The Agency is now developing a proposed NPDWR for these chemicals. As EPA undertakes this action, the Agency is also evaluating additional PFAS and considering regulatory actions to address groups of PFAS. EPA expects to issue a proposed regulation in Fall 2022 (before the Agency's statutory deadline of March 2023). The Agency anticipates issuing a final regulation in Fall 2023 after considering public comments on the proposal. Going forward, EPA will continue to analyze whether NPDWR revisions can improve public health protection as additional PFAS are found in drinking water.

Publish the final toxicity assessment for GenX and five additional PFAS

Expected Fall 2021 and Ongoing

EPA plans to publish the toxicity assessments for two PFAS, hexafluoropropylene oxide dimer acid and its ammonium salt. These two chemicals are known as "GenX chemicals." GenX chemicals have been found in surface water, groundwater, drinking water, rainwater, and air emissions. GenX chemicals are known to impact human health and ecosystems. Scientists have observed liver and kidney toxicity, immune effects, hematological effects, reproductive and developmental effects, and cancer in animals exposed to GenX chemicals. Completing a toxicity assessment for GenX is essential to better understanding its effects on people and the environment. EPA can use this information to develop health advisories that will help communities make informed decisions to better protect human health and ecological wellness. The Office of Research and Development is also currently developing toxicity assessments for five other PFAS—PFBA, PFHxA, PFHxS, PFNA, and PFDA.

Publish health advisories for GenX and PFBS

Expected Spring 2022

PFAS contamination has impacted drinking water quality across the country, including in underserved rural areas and communities of color. SDWA authorizes EPA to develop non-enforceable and non-regulatory drinking water health advisories to help Tribes, states, and local governments inform the public and determine whether local actions are needed to address public health impacts in these communities. Health advisories offer a margin of protection by defining a level of drinking water concentration at or below which lifetime exposure is not anticipated to lead to adverse health effects. They include information on health effects, analytical methodologies, and treatment technologies and are designed to protect all lifestages. EPA will publish health advisories for Perfluorobutane sulfonic acid (PFBS) and GenX chemicals based on final toxicity assessments. The Agency will develop accompanying fact sheets in different languages to facilitate access to information on GenX and other PFAS. Going forward, EPA will develop health advisories as the Agency completes toxicity assessments for additional PFAS.

Restrict PFAS discharges from industrial sources through a multi-faceted Effluent Limitations Guidelines program

Expected 2022 and Ongoing

Effluent Limitations Guidelines (ELGs) are a powerful tool to limit pollutants from entering the nation's waters. ELGs establish national technology-based regulatory limits on the level of specified pollutants in wastewater discharged into surface waters and into municipal sewage treatment facilities. EPA has been conducting a PFAS multi-industry study to inform the extent and nature of PFAS discharges. Based on this study, EPA is taking a proactive approach to restrict PFAS discharges from multiple industrial categories. EPA plans to make significant progress in its ELG regulatory work by the end of 2024. EPA has established timelines for action—whether it is data collection

or rulemaking—on the nine industrial categories in the proposed PFAS Action Act of 2021, as well as other industrial categories such as landfills. EPA's multi-faceted approach entails:

- Undertake rulemaking to restrict PFAS discharges from industrial categories where EPA has the data to do so—including the guidelines for organic chemicals, plastics and synthetic fibers (OCPSF), metal finishing, and electroplating. Proposed rule is expected in Summer 2023 for OCPSF and Summer 2024 for metal finishing and electroplating.
- Launch detailed studies on facilities where EPA has preliminary data on PFAS discharges, but the data are currently insufficient to support a potential rulemaking. These include electrical and electronic components, textile mills, and landfills. EPA expects these studies to be complete by Fall 2022 to inform decision making about a future rulemaking by the end of 2022.
- Initiate data reviews for industrial categories for which there is little known information on PFAS discharges, including leather tanning and finishing, plastics molding and forming, and paint formulating. EPA expects to complete these data reviews by Winter 2023 to inform whether there are sufficient data to initiate a potential rulemaking.
- Monitor industrial categories where the phaseout of PFAS is projected by 2024, including pulp, paper, paperboard, and airports. The results of this monitoring, and whether future regulatory action is needed, will be addressed in the Final ELG Plan 15 in Fall 2022.

Leverage NPDES permitting to reduce PFAS discharges to waterways

Expected Winter 2022

The National Pollutant Discharge Elimination System (NPDES) program interfaces with many pathways by which PFAS travel and are released into the environment and ultimately impact people and water quality. EPA will seek to proactively use existing NPDES authorities to reduce discharges of PFAS at the source and obtain more comprehensive information through monitoring on the sources of PFAS and quantity of PFAS discharged by these sources. EPA will use the effluent monitoring data to inform which industrial categories the Agency should study for future ELGs actions to restrict PFAS in wastewater discharges.

- **Leverage federally-issued NPDES permits to reduce PFAS discharges.**[v] EPA will propose monitoring requirements at facilities where PFAS are expected or suspected to be present in wastewater and stormwater discharges, using EPA's recently published analytical method 1633, which covers 40 unique PFAS. In addition, EPA will propose, as appropriate, that NPDES permits: 1) contain conditions based on product elimination and substitution when a reasonable alternative to using PFAS is available in the industrial process; 2) require best management practices to address PFAS-containing firefighting foams for stormwater permits; 3) require enhanced public notification and engagement with downstream communities and public water systems; and 4) require pretreatment programs to include source control and best management practices to protect wastewater treatment plant discharges and biosolid applications.
- **Issue new guidance to state permitting authorities to address PFAS in NPDES permits.** EPA will issue new guidance recommending that state-issued permits that do not already include monitoring requirements for PFAS use EPA's recently published analytical method 1633, which covers 40 unique PFAS, at facilities where PFAS is expected or suspected to be present in wastewater and stormwater discharges. In addition, the new guidance will recommend the full suite of permitting approaches that EPA will use in federally-issued permits. The guidance will enable communities to work closely with their state permitting authorities to suggest monitoring at facilities suspected of containing PFAS.

Publish multi-laboratory validated analytical method for 40 PFAS

Expected Fall 2022

In September 2021, EPA (in collaboration with the Department of Defense) published a single-laboratory validated method to detect PFAS. The method can measure up to 40 specific PFAS compounds in eight environmental matrices (including wastewater, surface water and biosolids) and has numerous applications, including NPDES compliance monitoring. EPA and DOD are continuing this collaboration to complete a multi-laboratory validation of the method. EPA expects to publish the multi-lab validated method online by Fall 2022. Following the publication of the method, EPA will initiate a rulemaking to propose the promulgation of this method under the Clean Water Act (CWA).

Publish updates to PFAS analytical methods to monitor drinking water

Expected Fall 2024

SDWA requires EPA to use scientifically robust and validated analytical methods to assess the occurrence of contaminants of emerging concern, such as an unidentified or newly detected PFAS chemical. EPA will update and validate analytical methods to monitor additional PFAS. First, EPA will review reports of PFAS of concern and seek to procure certified reference standards that are essential for accurate and selective quantitation of emerging PFAS of concern in drinking water samples. EPA will evaluate analytical methods previously published for monitoring PFAS in drinking water (EPA Methods 533 and 537.1) to determine the efficacy of expanding the established target PFAS analyte list to include any emerging PFAS. Upon conclusion of this evaluation, EPA will complete multi-laboratory validation studies and peer review and publish updated EPA PFAS analytical methods for drinking water, making them available to support future drinking water monitoring programs.

Publish final recommended ambient water quality criteria for PFAS

Expected Winter 2022 and Fall 2024

EPA will develop national recommended ambient water quality criteria for PFAS to protect aquatic life and human health. Tribes and states use EPA-recommended water quality criteria to develop water quality standards to protect and restore waters, issue permits to control PFAS discharges, and assess the cumulative impact of PFAS pollution on local communities. EPA will publish recommended aquatic life criteria for PFOA and PFOS and benchmarks for other PFAS that do not have sufficient data to define a recommended aquatic life criteria value. EPA will first develop human health criteria for PFOA and PFOS, taking into account drinking water and fish consumption. This initiative will consider the latest scientific information and will develop human health criteria for additional PFAS when final toxicity assessments are available. Additionally, EPA will support Tribes in developing water quality standards that will protect waters under Tribal jurisdiction under the same framework as waters in adjacent states. Aquatic life criteria are expected in Winter 2022, and human health criteria are expected Fall 2024.

Monitor fish tissue for PFAS from the nation's lakes and evaluate human biomarkers for PFAS

Expected Summer 2022

States and Tribes have highlighted fish tissue data in lakes as a critical information need. Food and water consumption are important pathways of PFAS exposure, and PFAS can accumulate in fish tissue. In fact, EPA monitoring to date shows the presence of PFAS, at varying levels, in approximately 100 percent of fish tested in the Great Lakes and large rivers. In Summer 2022, EPA will collect fish tissue in the National Lakes Assessment for the first national study of PFAS in fish tissue in U.S. lakes. This will provide a better understanding of where PFAS fish tissue contamination is occurring, which

PFAS are involved, and the severity of the problem. The new data will complement EPA's analyses of PFAS in fish tissue and allow EPA to better understand unique impacts on subsistence fishers, who may eat fish from contaminated waterbodies in higher quantities. EPA's preliminary analysis on whether concentrations of certain PFAS compounds in human blood could be associated with eating fish using the Centers for Disease Control and Prevention's National Health and Nutrition Examination Survey (NHANES) data found a positive correlation. Completing this analysis will help make clear the importance of the fish consumption pathway for protecting communities. EPA will continue to pursue collaboration with Tribal and federal partners to investigate this issue of mutual interest.

Finalize list of PFAS for use in fish advisory programs

Expected Spring 2023

EPA will publish a list of PFAS for state and Tribal fish advisory programs that are either known or thought to be in samples of edible freshwater fish in high occurrence nationwide. This list will serve as guidance to state and Tribal fish tissue monitoring and advisory programs so that they know which PFAS to monitor and how to set fish advisories for PFAS that have human health impacts via fish consumption. This information will encourage more robust data collection from fish advisory programs and promote consistency of fish tissue PFAS monitoring results in EPA's publicly accessible Water Quality Portal. By issuing advisories for PFAS, state and Tribal programs can provide high-risk populations, including communities and individuals who depend on subsistence fishing, with more information about how to protect their health.

Finalize risk assessment for PFOA and PFOS in biosolids

Expected Winter 2024

Biosolids, or sewage sludge, from wastewater treatment facilities can sometimes contain PFAS. When spread on agricultural fields, the PFAS can contaminate crops and livestock. The CWA authorizes EPA to set pollutant limits and monitoring and reporting requirements for contaminants in biosolids if sufficient scientific evidence shows that there is potential harm to human health or the environment. A risk assessment is key to determining the potential harm associated with human exposure to chemicals. EPA will complete the risk assessment for PFOA and PFOS in biosolids by Winter 2024. The risk assessment will serve as the basis for determining whether regulation of PFOA and PFOS in biosolids is appropriate. If EPA determines that a regulation is appropriate, biosolids standards would improve the protection of public health and wildlife health from health effects resulting from exposure to biosolids containing PFOA and PFOS.

Office of Land and Emergency Management

Propose to designate certain PFAS as CERCLA hazardous substances

Proposed rule expected Spring 2022; Final rule expected Summer 2023

EPA is developing a Notice of Proposed Rulemaking to designate PFOA and PFOS as Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) hazardous substances. Such designations would require facilities across the country to report on PFOA and PFOS releases that meet or exceed the reportable quantity assigned to these substances. The hazardous substance designations would also enhance the ability of federal, Tribal, state, and local authorities to obtain information regarding the location and extent of releases. EPA or other agencies could also seek cost recovery or contributions for costs incurred for the cleanup. The proposed rulemaking will be available for public comment in Spring 2022. The Agency commits to conducting robust stakeholder engagement with communities near PFAS-contaminated sites.

Issue advance notice of proposed rulemaking on various PFAS under CERCLA

Expected Spring 2022

In addition to developing a Notice of Proposed Rulemaking designating PFOA and PFOS as hazardous substances under CERCLA, EPA is developing an Advance Notice of Proposed Rulemaking to seek public input on whether to similarly designate other PFAS. The Agency may request input regarding the potential hazardous substance designation for precursors to PFAS, additional PFAS, and groups or subgroups of PFAS. The Agency will engage robustly with communities near PFAS-contaminated sites to seek their input and learn about their lived experiences. Going forward, EPA will consider designating additional PFAS as hazardous substances under CERCLA as more specific information related to the health effects of those PFAS and methods to measure them in groundwater are developed.

Issue updated guidance on destroying and disposing of certain PFAS and PFAS-containing materials

Expected by Fall 2023

The 2020 NDAA requires that EPA publish interim guidance on destroying and disposing of PFAS and certain identified non-consumer PFAS-containing materials. It also requires that EPA revise that guidance at least every three years, as appropriate. EPA published the first interim guidance in December 2020 for public comment. It identifies three technologies that are commercially available to either destroy or dispose of PFAS and PFAS-containing materials and outlines the significant uncertainties and information gaps that exist concerning the technologies' ability to destroy or dispose of PFAS while minimizing the migration of PFAS to the environment. The guidance also highlights research that is underway and planned to address some of these information gaps. Furthermore, the interim guidance identifies existing EPA tools, methods, and approaches to characterize and assess the risks to disproportionately impacted people of color and low-income communities living near likely PFAS destruction or disposal sites. EPA's updated guidance will address the public comments and reflect newly published research results. Since the publication of the interim guidance, EPA and other agencies have been conducting relevant research on destruction and disposal technologies. EPA anticipates that additional research data will become available starting in 2022. EPA will update the guidance when sufficient useful information is available and no later than the statutory deadline of December 2023.

Office of Air and Radiation

Build the technical foundation to address PFAS air emissions

Expected Fall 2022 and Ongoing

The Clean Air Act requires EPA to regulate emissions of hazardous air pollutants (HAPs), which are pollutants that are known or suspected to cause cancer or other serious health effects. At present, EPA actively works with Tribal, state, and local governments to reduce air emissions of 187 HAPs to the environment. While PFAS are not currently listed as HAPs under the Clean Air Act, EPA is building the technical foundation on PFAS air emissions to inform future decisions. EPA is conducting ongoing work to:

- Identify sources of PFAS air emissions;
- Develop and finalize monitoring approaches for measuring stack emissions and ambient concentrations of PFAS;
- Develop information on cost-effective mitigation technologies; and
- Increase understanding of the fate and transport of PFAS air emissions to assess their potential for impacting human health via contaminated groundwater and other media pathways.

EPA will use a range of tools, such as EJSCREEN, to determine if PFAS air pollution disproportionately affects communities with environmental justice concerns. Data from other ongoing EPA activities, such as field tests, TRI submissions, and new TSCA reporting and recordkeeping requirements, will help EPA collect additional information on sources and releases. By Fall 2022, EPA will evaluate mitigation options, including listing certain PFAS as hazardous air pollutants and/or pursuing other regulatory and non-regulatory approaches. The Agency will continue to collect necessary supporting technical information on an ongoing basis.

Office of Research and Development

Develop and validate methods to detect and measure PFAS in the environment

Ongoing Actions

Robust, accurate methods for detecting and measuring PFAS in air, land, and water are essential for understanding which PFAS are in the environment and how much are present. These methods are also essential for evaluating the effectiveness of different technologies for removing PFAS from air, land, and water and for implementing future regulations. To date, EPA has developed validated methods to measure 29 PFAS in drinking water and 24 PFAS in groundwater, surface water, and wastewater. EPA has also developed a method for measuring selected PFAS in air emissions. EPA will build on this work by developing additional targeted methods for detecting and measuring specific PFAS and non-targeted methods for identifying unknown PFAS in the environment. EPA also recognizes the need for "total PFAS" methods that can measure the amount of PFAS in environmental samples without identifying specific PFAS. EPA will increase its efforts to develop and, if appropriate, validate "total PFAS" methods, focusing on air emissions, wastewater, and drinking water. Near-term deliverables include:

- Draft total adsorbable fluorine method for wastewater for potential laboratory validation (Fall 2021);
- Draft method for measuring additional PFAS in air emissions (Fall 2022); and
- Draft methods and approaches for evaluating PFAS leaching from solid materials (Fall 2022).

Advance the science to assess human health and environmental risks from PFAS

Ongoing Actions

EPA will expand understanding of the toxicity of PFAS through several ongoing research activities. First, EPA will continue to develop human health toxicity assessments for individual PFAS under EPA's Integrated Risk Information System (IRIS) Program,

and if needed, other fit-for-purpose toxicity values. When combined with exposure information and other important considerations, EPA can use these toxicity assessments to assess potential human health risks to determine if, and when, it is appropriate to address these chemicals. Most PFAS, however, have limited or no toxicity data to inform human health or ecological toxicity assessments. To better understand human health and ecological toxicity across a wider variety of PFAS, EPA will continue to compile and summarize available and relevant scientific information on PFAS and conduct toxicity testing on individual PFAS and PFAS mixtures. This will inform the development and refinement of PFAS categories for hazard assessment. EPA will also conduct research to identify PFAS sources in the outdoor and indoor environment, to characterize PFAS movement through the environment, and to identify the relative importance of different human exposure pathways to PFAS (e.g., ingestion of contaminated food or water, interaction with household articles or consumer products, and inhalation of indoor or outdoor air containing PFAS). EPA also will work to characterize how exposure to PFAS may contribute to cumulative impacts on communities, particularly communities with environmental justice concerns. Near-term deliverables include:

- Identify initial PFAS categories to inform TSCA test orders as part of the PFAS National Testing Strategy (Fall 2021)
- Consolidate and update data on chemical/physical properties, human health toxicity and toxicokinetics, and ecotoxicity (Spring 2022 – Fall 2024)
- Complete draft PFHxS, PFHxA, PFNA, and PFDA IRIS assessments for public comment and peer review (Spring – Fall 2022)
- Complete and publish the final PFBA IRIS assessment (Fall 2022)

Evaluate and develop technologies for reducing PFAS in the environment

Ongoing Actions

EPA needs new data and information on the effectiveness of different technologies and approaches for removing PFAS from the environment and managing PFAS and PFAS-containing materials to inform decisions on drinking water and wastewater treatment, contaminated site cleanup and remediation, air emission controls, and end-of-life materials management. This information is also needed to better ensure that particular treatment and waste management technologies and approaches do not themselves lead to additional PFAS exposures, particularly in overburdened communities where treatment and waste management facilities are often located. Toward that end, EPA will continue efforts to develop approaches for characterizing PFAS in source waters, at contaminated sites, and near PFAS production and treatment/disposal facilities. EPA will also continue to evaluate and develop technologies for drinking water and wastewater treatment, contaminated site remediation, air emission controls, and destruction and disposal of PFAS-containing materials and waste streams. These efforts include conducting laboratory- and pilot-scale studies, which will inform the design of full-scale field studies done in partnership with facilities and states to evaluate real-world applications of different PFAS removal technologies and management approaches.

EPA will prioritize efforts to evaluate conventional thermal treatment of PFAS-containing wastes and air emissions and assess the effectiveness of conventional drinking water and wastewater treatment processes. EPA will also continue to evaluate and advance the application of innovative, non-thermal technologies to treat PFAS waste and PFAS-contaminated materials. Building upon these evaluations, EPA will document the performance of PFAS removal technologies and establish technology-based PFAS categories that identify the list of PFAS that are effectively removed through the application of the associated technology. Near-term deliverables include:

- Collect data to inform the 2023 guidance on destroying and disposing of certain PFAS and PFAS-containing materials (Spring 2022 – Fall 2023);
- Identify initial PFAS categories for removal technologies (Summer 2022); and
- Develop effective PFAS treatment technologies for drinking water systems (Fall 2022).

Cross-Program

Engage directly with affected communities in every EPA Region

Expected Fall 2021 and Ongoing

EPA must fully understand the challenges facing individuals and communities grappling with PFAS contamination to understand their lived experiences and determine the most effective interventions. As recommended by the National Environmental Justice Advisory Council (NEJAC), EPA will meet with affected communities in each EPA Region to hear how PFAS contamination impacts their lives and livelihoods. EPA will use the knowledge from these engagements to inform the implementation of the actions described in this roadmap. EPA will also use the input to develop and share information to reduce potential health risks in the near term and help communities on the path to remediation and recovery from PFAS contamination.

Use enforcement tools to better identify and address PFAS releases at facilities

Ongoing Actions

EPA is initiating actions under multiple environmental authorities—RCRA, TSCA, CWA, SDWA and CERCLA—to identify past and ongoing releases of PFAS into the environment at facilities where PFAS has been used, manufactured, discharged, disposed of, released, and/or spilled. EPA is conducting inspections, issuing information requests, and collecting data to understand the level of contamination and current risks posed by PFAS to surrounding communities and will seek to address threats to human health with all its available tools. For example, EPA's enforcement authorities allow the Agency, under certain circumstances, to require parties responsible for PFAS contamination to characterize the nature and extent of PFAS contamination, to put controls in place to expeditiously limit future releases, and to address contaminated drinking water, soils, and other contaminated media. When EPA becomes aware of a potential imminent and substantial endangerment situation where PFAS poses a threat to human health, the Agency will swiftly employ its expertise to assess the situation and take appropriate action, including using statutorily authorized powers.

Accelerate public health protections by identifying PFAS categories

Expected Winter 2021 and Ongoing

To accelerate EPA's ability to address PFAS and deliver public health protections sooner, EPA is working to break the large, diverse class of PFAS into smaller categories based on similarities across defined parameters (such as chemical structure, physical and chemical properties, and toxicological properties). EPA plans to initially categorize PFAS using two approaches. In the first approach, EPA plans to use toxicity and toxicokinetic data to develop PFAS categories for further hazard assessment and to inform hazard- or risk-based decisions. In the second approach, EPA plans to develop PFAS categories based on removal technologies using existing understanding of treatment, remediation, destruction, disposal, control, and mitigation principles.

EPA plans to use the PFAS categories developed from these two approaches to identify gaps in coverage from either a hazard assessment or removal technology perspective, which will help EPA prioritize future actions to research, restrict, and remediate PFAS. For example, EPA may choose to prioritize research to characterize the toxicity of PFAS that are not being addressed by regulations that require the implementation of removal technologies. Conversely, EPA may prioritize research to evaluate the efficacy of technologies designed to remove PFAS that are included in a hazard-based category with relatively higher toxicities. To support coordination and integration of information across PFAS categories, EPA plans to develop a PFAS categorization database that will capture key characteristics of individual PFAS, including category assignments.

Establish a PFAS Voluntary Stewardship Program

Expected Spring 2022

Reduction of PFAS exposure through regulatory means can take time to develop, finalize, and implement. Moreover, current PFAS regulatory efforts do not extend to all of the approximately 600 PFAS currently in commerce. As a companion to other efforts described in this roadmap, EPA will establish a voluntary stewardship program challenging industry to reduce overall releases of PFAS into the environment. The program, which will not supplant industry's regulatory or compliance requirements, will call on industry to go beyond those requirements by reporting all PFAS releases in order to establish a baseline and then continuing to report to measure progress in reducing releases over time. EPA will validate industry efforts to meet reduction targets and timelines.

Educate the public about the risks of PFAS

Expected Fall 2021 and Ongoing

Addressing PFAS contamination is a critical part of EPA's mission to protect human health and the environment. This important mission cannot be achieved without effectively communicating with communities, individuals, businesses, the media, and Tribal, state, and local partners about the known and potential health risks associated with these chemicals. When EPA communicates risk, it is the Agency's goal to provide meaningful, understandable, and actionable information to many audiences. To accomplish this goal, EPA will make available key explainers that help the public understand what PFAS are, how they are used, and how PFAS can impact their health and their lives. These explainers and other educational materials will be published in multiple languages, and the Agency will work to ensure information reaches targeted communities (including those with limited access to technology and resources).

Issue an annual public report on progress towards PFAS commitments

Winter 2022 and Ongoing

EPA is committed to acting on PFAS with transparency and accountability. On an annual basis, EPA will report to the public on the status of the actions outlined in this roadmap, as well as future actions the Agency may take. EPA will also engage regularly with communities experiencing PFAS contamination, co-regulators, industry, environmental groups, community leaders, and other stakeholders to clearly communicate its actions and to stay abreast of evolving needs.

Conclusion

Every level of government—federal, Tribal, state, and local—needs to exercise increased and sustained leadership to accelerate progress to clean up PFAS contamination, prevent new contamination, and make game-changing breakthroughs in the scientific understanding of PFAS. This strategic roadmap represents the Agency's commitment to the American people on what EPA seeks to deliver from 2021 to 2024.

The risks posed by PFAS demand that the Agency take a whole-of-agency approach to attack the problem from multiple directions. Focusing only on remediating legacy contamination, for example, does nothing to prevent new contamination from occurring. Focusing only on preventing future contamination fails to minimize risks to human health that exist today. To build more enduring, comprehensive, and protective solutions, EPA seeks to leverage its full range of statutory authorities and work with its partners—including other federal agencies, state and Tribal regulators, scientists, industry, public health officials, and communities living with PFAS contamination—to implement this multi-media approach and achieve tangible benefits for human health and the environment.[vi]

Endnotes

[i] Approximately 650 PFAS are currently in commerce under TSCA, roughly half of which were grandfathered into the TSCA inventory.

[ii] EPA has identified 6-8 facilities that produce PFAS feedstock.

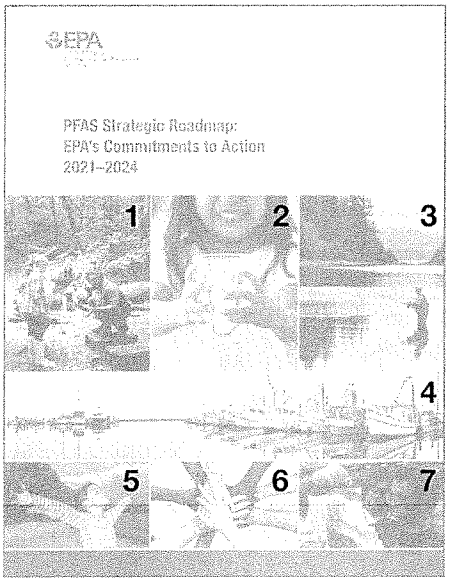
[iii] Key industries with significant documented discharges include PFAS production and processing, metal finishing, airports, pulp and paper, landfills, and textile and carpet manufacturing.

[iv] Examples include de minimis exemption, supplier notification requirements, and applicability of those requirements to wastes.

[v] Federally-issued permits are those that EPA issues in MA, NH, NM, DC, territories, federal waters, and Indian Country (and federal facilities in DE, CO, VT, WA).

[vi] This document provides information to the public on how EPA intends to exercise its discretion in implementing statutory and regulatory provisions that apply to PFAS. Those provisions contain legally binding requirements, and this document does not substitute for those statutory and regulatory provisions or regulations, nor is it a regulation itself.

Photo Credits



On the cover:

1. © istock.com
2. https://photostockeditor.com/free-images/girl-glass/page/2
3. Fly fishing, https://www.flickr.com/photos/umnak/, Joseph CC BY-SA 2.0
4. © istock.com
5. © istock.com
6. © Adobestock.com
7. High school students help with water monitoring and river cleanup, https://www.flickr.com/photos/usepagov/6237611883

page 4: Chesapeake Bay, Maryland, https://www.maxpixel.net/Sky-Maryland-Reflection-Chesapeake-Bay-Water-1310538

United States
Environmental Protection
Agency

EPA-100-K-21-002
October 2021

Melissa Schmidt

From: PUBCOMMENT-OCC
Sent: Monday, May 3, 2021 1:14 PM
To: PUBCOMMENT-WPD; PUBCOMMENT-ELD; PUBCOMMENT-OCC2; PUBCOMMENT-OPIC
Subject: FW: Public comment on Permit Number 2406
Attachments: Screenshot_20210501-085145_Facebook.PDF

H

From: mjb_0619@yahoo.com <mjb_0619@yahoo.com>
Sent: Saturday, May 1, 2021 9:06 AM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: MRS Mandy Cook

E-MAIL: mjb_0619@yahoo.com

COMPANY:

ADDRESS: 361 JAYHAWKER RD
CLEVELAND TX 77328-7971

PHONE: 2818832839

FAX:

COMMENTS: I am writing today with the extreme fear for the safety of myself, family, and all people in my area and south of the proposed landfill site. We have had only light rain for the last day and the roads that connect the landfill to access roads, and all surrounding areas are flooded! The screenshot captured from our local Commissioner admits that these access roads have officially been closed due to rain flooding and are not passable. The landfill will be in the direct

path of this runoff and will cause landfill runoff into the rivers that run through the property and in turn run into San Jacinto River and all waterways south effecting MILLIONS of people. I request a public hearing to discuss the threat this landfill causes for millions of people.

8:51 97%

Search

Like Comment Share

Commissioner David Brandon

36m ·

Fostoria at FM 1725 is closed, Tony Tap is closed FM 945 N at the bridge between Pct. 3 and 4 is closed. All that were closed yesterday still remain closed.

Current Rain Projections have this rond out by noon with lighter rains returning late tonight. All forcast are subject to change so please stay tuned to your local weather stations for updates.

Travel for today has been discouraged in all affected rain areas.

Be safe

5 6 Comments · 7 Shares

Like Comment Share

Commissioner David Brandon

11h ·

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Wednesday, April 28, 2021 9:44 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406
Attachments: Floodmap for Landfill.pdf

PM
H

From: mjb_0619@yahoo.com <mjb_0619@yahoo.com>
Sent: Wednesday, April 28, 2021 8:46 AM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: MRS Mandy Jo Cook

E-MAIL: mjb_0619@yahoo.com

COMPANY:

ADDRESS: 361 JAYHAWKER RD
CLEVELAND TX 77328-7971

PHONE: 2818832839

FAX:

COMMENTS: I, Mandy Cook, at 361 Jayhawker Road, phone # 281-883-2839, am in opposition of Peach Creek Environmental Park permit # 2406 application. The proposed landfill location is approximately 1 mile to 1.5 miles of my home and within 1 mile of land that I own. It is my understanding, according to the coordinates listed on the application,

that there is either an error on the application, and/or the proposed landfill is located in a flood plain. Per the application coordinates which are found in section 12 on page 5 (a screenshot has been attached), show that the landfill is located in Liberty County. The coordinates do not match the description of the proposed site, as no part of the proposed site is located in Liberty County. In addition to the incorrect coordinates, there is no listing of a city, zip code, or address for this specific site. If the coordinates are correct on the application, then 1. it is not located using the access roads mentioned below the coordinates and 2. it is not outside of a flood plain, but indeed located within a 100 year flood plain, also known as Zone A. This is an extreme error by not only Peach Creek Environmental, but also TCEQ for not realizing the error in the coordinates. If this was an error in coordinates, then Peach Creek Environmental has been falsifying documents in this application process and this application should be stopped immediately. I have attached FEMA maps that show the coordinates listed on the application are being shown in Liberty County, and not at the proposed site. In addition to this extreme error, I will continue to express my complaint that Peach Creek Environmental broke the communication portion of this application at the very beginning. It is clearly stated in the commissioners letter that I have found online, and was then mailed to me and postmarked on November 4th 2020, that this "Notice of Application and Preliminary Decision [by the TCEQ] will be published AND MAILED to those who are on the county-wide mailing list and to those who are on the mailing list for this application. That notice will contain the deadline for submitting public comments." This notice of application was NEVER sent to me, or any of my family members, neither was the preliminary Decisions made by TCEQ. As I have stated in previous comments, that is a violation of this process and no explanation has been given to this violation. I am requesting a public meeting and hearing to be informed on how this application is allowed to continue when it violated the public notice at the very beginning, in addition, to the other errors that have now been found on this application. I have commented several other life threatening concerns in my previous comments, and I have received no reply or clarification from any party (Peach Creek or TCEQ). As stated above, I have commented my concerns on several other issues with this proposed landfill, therefore I will not comment them again here. However, for the record, all my previous concerns are still true and marked for the record. I would like to request a hearing to discuss not only the previous issues mentioned in other comment forms, but to also discuss the errors of this application that I have listed in this comment form.

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Tuesday, April 27, 2021 12:19 PM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

PM
H

From: mjb_0619@yahoo.com <mjb_0619@yahoo.com>
Sent: Friday, April 23, 2021 7:13 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Mandy Cook

E-MAIL: mjb_0619@yahoo.com

COMPANY:

ADDRESS: 361 JAYHAWKER RD
CLEVELAND TX 77328-7971

PHONE: 2818832839

FAX:

COMMENTS: I, Mandy Cook, at 361 Jayhawker Road, phone # 281-883-2839, am in opposition of Peach Creek Environmental Park permit # 2406 application. The proposed landfill location is approximately 1 mile to 1.5 miles of my home and within 1 mile of land that I own. It is my understanding, according to the commissioners letter that I have found online, and was then mailed to me and postmarked on November 4th 2020, that this "Notice of Application and

Preliminary Decision [by the TCEQ] will be published AND MAILED to those who are on the county-wide mailing list and to those who are on the mailing list for this application. That notice will contain the deadline for submitting public comments." This notice of application was NEVER sent to me, neither was the preliminary Decisions made by TCEQ. As I have stated in previous comments, this entire application process should be stopped as the initial letters informing myself and my fellow community members were NEVER MAILED a notice of application when this process was started. That is a violation of this process and no explanation has been given to this violation. I am requesting a public meeting and hearing to be informed on how this application is allowed to continue when it violated the public notice at the very beginning. In addition, there are serious concerns about this landfill and it's negative impact on my health, my families health, our wellbeing, and our communities overall wellbeing. As I have stated in multiple comments already, there are over 57 endangered species on the San Jacinto County endangered species list, some of them living within a 1 mile radius of this proposed landfill, and inside the landfill's potential perimeter. Upon further reading of this application process, in regards to C1.7, it shows that all water flow will be diverted into Jayhawker Creek, which will go outside of the proposed site however, there is no discussion of how this landfill will stop flooding outside of this area. The site itself may not flood, but the areas outside of this will be effected. The access roads are not even paved and flood on even regular thunderstorms, let alone during hurricane season. It states that you will only "be controlled to MINIMIZE surface water running onto, into, and off the landfill disposal and treatment areas," but you cannot STOP it. This is already a significantly "low lying" area that already holds standing water, this is going to add to that standing water causing potentially devastating additional mosquitos and the life threatening diseases they carry to drastically increase. This landfill is a threat to multiple families health, but also to our community when we lose the small businesses here due to the potential water flow that is only "MINIMIZED," but also due to the risk of water contamination, odor, lowered property values, threat to endangered species, and destruction to the natural habitat for several non endangered species that help make this area an attraction during hunting and outdoor seasonal times. In addition to my concerns regarding C1.7, the threat of this landfill only continues with the conclusions found in C3-10, "Erosion control is an ONGOING prevention and maintenance ISSUE" while also stating that "new methods introduced in the future will be REQUIRED to comply." This is threatening our safety, as well as our health and future. To state that the erosion will always be an issue, how is that going to be corrected? Over the years, the erosion will continue; I request stipulations to be made in regards to how often this will investigated, enforced, check for compliance and how often? Section C4-1 posses additional dangers of having this landfill in our area. While the "waste disposal footprint and processing facilities will be located entirely outside the limits of the 100 year flood plain" both phase 1 and 2 surround the flood plain and there is NO data being discussed about how BOTH TOGETHER, in addition to the erosion mentioned above, will effect not only water flow and standing water, but the ecosystem. These seem to be a violation of the clear air and water act and are yet another reason a public hearing needs to be held with all community members. According to C4.2 there are areas that are less than 200 feet from the 100 year flood plain, and no area is more than 800 feet from the 100 year flood plain. This is SURROUNDING the flood plain on both sides. When it does flood, as that is a regular occurrence, how will this damage our area? The damage this could potentially cause is NOT worth risking our lives. In addition to the concerns listed above, I would like to discuss the access points to this potential landfill and the threats they will add to our community. According to all of the maps that I have found with this application, it is my understanding that the only access point to this property is through the use of Fostoria Tram onto Jayhawker Road. These two roads are in significantly poor condition on a regular basis, and the county has repeatedly denied the requests and funds to properly pave these roads. There are already weight limits and signs restricting large loads from using these roads as through traffic because of their inability to hold the weight. With the addition of HUNDREDS of trucks holding large weight loads, the road conditions will be severely impacted to even more negative conditions that will potentially harm our vehicles, and again, stop people from visiting our small businesses making another reason on how this landfill will impact our community as a whole. It is my understanding that speed bumps are proposed to ensure slow speeds by the trucks, however, not all of the roads are even paved. It was stated that any dust or mud that was tracked onto the roads would be sprayed off daily, however, adding this water will only add to the flooding conditions previously mentioned. In addition to the poor road conditions we already struggle with, both roads, especially Jayhawker and specifically Fostoria on the San Jacinto County side, are extremely narrow. A rough measurement shows that Jayhawker Road itself is only 20 feet wide, clearly not wide enough for large vehicles to constantly pass residential motorists, let alone school busses that are travelling on a daily basis to drop off our children. In addition, the easement access forces these trucks to go by every side road that connects to Jayhawker which leads to multiple residential areas and side communities. The life threatening risks of our children's safety is a risk that this landfill is willing to take? What precautions are going to be

used to ensure the safety of our children when your trucks travel up and down our roads multiple times a day/week? What are you going to do about the damage to our vehicles when these trucks ruin our roads, and throw up more debris as they are driving? What requirements are going to be made to ensure that our community members who are visiting our small businesses will be safe while driving next to these trucks on roads that are not made to handle their loads nor that size of vehicle? What regulations will be placed to ensure these trucks are driving safe at a speed that is appropriate for a back road community? The San Jacinto County already ignores these warnings and life threatening danger, and they will clearly not make any changes based on this landfill when they already push this matter aside and state that everything is up to TCEQ. In addition to the dangers of the roadway, the permits of the type of waste that are being applied for are an imminent threat to our health and the well-being if our animals in addition to our own. It is being proposed that asbestos and animal carcasses, to name only a few, would be permitted at this location. As I have stated multiple times, the majority of the homes are on private well water and those of us on city water are actually well water as the city uses a well just a few miles down the road from the proposed landfill site. What precautions are being made for the contaminants, as it has been proved by numerous studies that landfil liner requirements in Texas are the lowest required in the entire US. This is another issue that MUST be addressed in a public hearing that has yet to be granted. Again, this landfill is an extreme and imminent threat to not only myself and my family, but to this community, to endangered animals, to the ecosystem, and will create a rippling effect of destruction down to Houston and the Gulf. I again request my right to a public meeting and hearing being held for all community members to attend, and continue to point out that this application should have been forced to cease at the beginning when Peach Creek and TCEQ failed to MAIL notice of the application and preliminary decisions to myself and every resident this affects, in addition to every resident on the county-wide mailing list. I am reiterating that I am opposed to application #2406 for all of the above mentioned reasons, and requesting a public meeting.

lisa Guerra

'om: PUBCOMMENT-OCC
ent: Thursday, November 5, 2020 8:08 AM
o: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
ubject: FW: Public comment on Permit Number 2406
ttachments: G__jboss7_www14ext2_tmp_cfusion.ear.cfusion.war_2406 .NORI.pdfpdf (2).pdf

om: mjb_0619@yahoo.com <mjb_0619@yahoo.com>
ent: Wednesday, November 4, 2020 6:29 PM
o: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
ubject: Public comment on Permit Number 2406

EGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

N NUMBER: RN110843042

ERMIT NUMBER: 2406

OCKET NUMBER:

OUNTY: SAN JACINTO

INCIPAL NAME: PC-II LLC

I NUMBER: CN605694611

OM

AME: MRS Mandy Cook

MAIL: mjb_0619@yahoo.com

OMPANY:

DRESS: 361 JAYHAWKER RD
EVELAND TX 77328-7971

ONE: 2818832839

X:

MMENTS: I, Mandy Cook, at 361 Jayhawker Road, phone number 281-883-2839, am in opposition of Peach Creek vironmental Park permit number 2406 application; the location is approximately 1 to 1.5 miles of my home. I, Mandy ok, request a contested hearing about this application 2406. While this is an unrestricted area, this is a rural idential location with homes, farms, and national forest surrounding this potential landfill. This permit is requesting right to dump potentially hazardous materials into our streams that contain over 50 endangered and/or threatened

animals. In addition, this location is located in a flood plain and has two streams that flow through the property increasing the risk of flooding and contamination. While there are stipulations to the type of pollutants that can be discharged from the site, as well as checks that will be required, it is not a 100% guarantee that other extremely hazardous materials will not be mixed in, especially with the potential for flooding. According to San Jacinto County Development plans, any commercial or private developmenr that is being built in a potential flood area is required to have their first floor raised above ground level, which can clearly not be done when building a landfill. This area flooded without a hurricane, with our recent tropic storm Imelda, and can clearly not be a location for a landfill, especially one with a 5 year permit. Additionally, upon reading the application process, Peach Creek Environmental Park was required to send letters to every person on the county mailing this. This did not happen, which is a direct violation of this application's process and should therefore void this application. The majority of families and farms in this area, especially within 1 mile of the proposed site, have well water which could be contaminated and then can potentially harm not only humans but the livestock which in turn contaminates the food chain to spread beyond our local community as many businesses in the area sell local produce and livestock products. Many families and farms rely solely on their own animals and farms for their food, which is why the majority of us moved to this location. As a small homestead with the plans to potentially earn an income through selling organic produce and animals, this landfill would destroy and eliminate any possibility of that due to the potential hazards and contaminants that would arise. This landfill is an imminent and long term threat to the people in this area, as well as all whom visit or purchase products produced by these farms, live down river, and down stream from this location. Thank you in advance for your time in reading this comment, and know that I, Mandy Cook, request a contested hearing. I look forward to receiving all updates that involve the imminent threat this landfill hold on myself, my family, and my community, as well as the confirmation of this application being denied due to the violations if the notices, county building requirements, threat to human health and livelihood, and destruction to critical endangered animals and species.

Texas Commission on Environmental Quality

Notice of Receipt of Application for Land Use Compatibility Determination for a Municipal Solid Waste Permit

Proposed Permit No. 2406

Application. PC-II, LLC, 300 Concourse Blvd., Suite 101, Ridgeland, Madison County, Mississippi 39157, a Mississippi limited liability company, has applied to the Texas Commission on Environmental Quality (TCEQ) for a separate land use compatibility determination on a permit to authorize a new Municipal Solid Waste Type I Landfill. The facility is located approximately seven miles northwest of the intersection of US 59 and SH 105, San Jacinto County, Texas. The TCEQ received the land use compatibility portion of the application on August 28, 2019. This application is available for viewing and copying at the Shepherd Public Library, 30 North Liberty Street, Shepherd, San Jacinto County, Texas 77371, and may be viewed online at https://peachcreekep.com. The following link to an electronic map of the site or facility's general location is provided as a public courtesy and is not part of the application or notice: https://tceq.maps.arcgis.com/apps/webappviewer/index.html?id=db5bac44afbc468bbddd360f8168250f&marker=-95.189444%2C30.390833&level=12. For exact location, refer to application.

Additional Notice. The TCEQ Executive Director has determined that the land use compatibility portion of the application is administratively complete and will conduct a substantive review of this portion of the application. Following completion of that review, the TCEQ will make a separate determination on the question of land use compatibility. If the site is determined to be compatible with the surrounding land uses, the TCEQ may at another time consider conformity with other regulatory requirements. After completing the land use compatibility review, the TCEQ will issue a Notice of Application and Preliminary Decision. **Notice of the Application and Preliminary Decision will be published and mailed to those who are on the county-wide mailing list and to those who are on the mailing list for this application. That notice will contain the deadline for submitting public comments.**

Public Comment/Public Meeting. You may submit public comments or request a public meeting on this application. The purpose of a public meeting is to provide the opportunity to submit comments or to ask questions about the application. TCEQ will hold a public meeting if the Executive Director determines that there is a significant degree of public interest in the application or if requested by a local legislator. A public meeting is not a contested case hearing.

Opportunity for a Contested Case Hearing. After the deadline for submitting public comments, the Executive Director will consider all timely comments and prepare a response to all relevant and material, or significant public comments. **Unless the application is directly referred for a contested case hearing, the response to comments, and the Executive Director's decision on the application, will be mailed to everyone who submitted public comments and to those persons who are on the mailing list for this application. If comments are received, the mailing will also provide instructions for requesting reconsideration of the Executive Director's decision and for requesting a contested case hearing. A person who may be affected by the facility is entitled to request a contested case hearing from the commission.** A contested case hearing is a legal proceeding similar to a civil trial in state district court.

To Request a Contested Case Hearing, You Must Include The Following Items in Your Request: your name, address, phone number; applicant's name and permit number; the location and distance of your property/activities relative to the facility; a specific description of how you would be adversely affected by the facility in a way not common to the general public; a list of all disputed issues of fact that you submit during the comment period, and the statement "[I/we] request a contested case hearing." If the request for contested case hearing is filed on behalf of a group or association, the request must designate the group's representative for receiving future correspondence; identify by name and physical address an individual member of the group who would be adversely affected by the facility or activity; provide the information discussed above regarding the affected member's location and distance from the facility or activity; explain how and why the member would be affected; and explain how the interests the group seeks to protect are relevant to the group's purpose.

Following the close of all applicable comment and request periods, the Executive Director will forward the application and any requests for reconsideration or for a contested case hearing to the TCEQ Commissioners for their consideration at a scheduled Commission meeting. The Commission may only grant a request for a contested case hearing on issues the requestor submitted in their timely comments that were not subsequently withdrawn.

If a hearing is granted, the subject of a hearing will be limited to disputed issues of fact or mixed questions of fact and law that are relevant and material to the Commission's decision on the application submitted during the comment period.

Mailing List. If you submit public comments, a request for a contested case hearing or a reconsideration of the Executive Director's decision, you will be added to the mailing list for this application to receive future public notices mailed by the Office of the Chief Clerk. In addition, you may request to be placed on: (1) the permanent mailing list for a specific applicant name and permit number; and/or (2) the mailing list for a specific county. To be placed on the permanent and/or the county mailing list, clearly specify which list(s) and send your request to TCEQ Office of the Chief Clerk at the address below.

Information Available Online. For details about the status of the application, visit the Commissioners' Integrated Database (CID) at <www.tceq.texas.gov/goto/cid>. Once you have access to the CID using the above link, enter the permit number for this application, which is provided at the top of this notice.

Agency Contacts and Information. All public comments and requests must be submitted either electronically at <www14.tceq.texas.gov/epic/eComment/> or in writing to the Texas Commission on Environmental Quality, Office of the Chief Clerk, MC-105, P.O. Box 13087, Austin, Texas 78711-3087. Please be aware that any contact information you provide, including your name, phone number, email address and physical address will become part of the agency's public record. For more information about this permit application or the permitting process, please call the TCEQ's Public Education Program, Toll Free, at 800-687-4040 or visit their website at <www.tceq.texas.gov/goto/pep>. Si desea información en español, puede llamar al 800-687-4040.

Further information may also be obtained from PC-II, LLC at the address stated above or by calling Mr. Jeffery Hobby, Project Manager at (601) 362-3333.

Issued Date: October 28, 2019

TCEQ Office of the Chief Clerk, MC-105
P.O. Box 13087
Austin, Texas 78711-3087

RECEIVED
NOV 05 2021
TCEQ

CHIEF CLERKS OFFICE
2021 NOV -4 AM 9:41
TCEQ

Date: 10/31/2021

Name: Mandy Cook

Address: 361 Jayhawker Rd

City, ST, Zip: Cleveland TX 77328

Email Address: mcook4112@gmail.com

Re: Peach Creek Environmental Park (PCEP) Proposed Landfill Permit Application No. Permit #2406

I am writing to request that the permit for Peach Creek EP Landfill MSW No 2406 be denied. There are four main concerns that form the basis for my comments.

1. MSW liner systems do not protect groundwater from volatile organic compounds (VOCs). These vapors can penetrate and permeate through the required subtitle D liner of MSW landfills. The proof of which is in the groundwater contamination reports authored by the TCEQ. I ask the Executive Director, Commissioners, TCEQ staff, and the US Forest Service consider the impacts of up-gradient VOCs migrating into the Sam Houston National Forest (SHNF), commercial and family farms, as well as primary drinking water sources from shallow aquifers in the region. There are many studies that prove gas migration within MSW landfills have caused and will cause groundwater contamination. https://www.usgs.gov/mission-areas/water-resources/science/volatile-organic-compounds-vocs?qt-science_center_objects=0#qt-science_center_objects

2. The SHNF sits on the east and north side of the proposed landfill. The USFS was started to help provide clean water to our country. When it rains, the SHNF acts as a filter to cleanse water going downstream to Lake Houston. The leachate tanks are to sit on the north side of the LF, within a few feet of the FEMA 100-year floodplain. Storm water overflow, leachate, and VOCs will make the Jayhawker Creek floodplain a conduit for contamination which will impact drinking water downstream.

3. Dr. HC Clark wrote a geological assessment to the TCEQ back in August, to quote him "The application implicitly recognizes the gravel location restriction insofar as Class I nonhazardous is not listed as waste to be accepted. Will the permit explicitly state that Class I waste may not be and never will be accepted here because of this hydrogeologic limitation?" ..... "The sink created by pumping will draw water into the landfill rather than allowing it to pass beneath the liner and detect a leak as that groundwater moves through the point of compliance. Water will move inward rather than out."...."How will this problem be addressed?"

4. It is a fact that millions of seagulls feast at LF across North America. South Wake MSW landfill in NC is comprised of approximately 179 acres and has an estimated seagull population of 50,000. Phase 1 of this 2406 LF will be about 124 acres, or almost 37% smaller which equates to almost 31,500 seagulls as an estimated flock number. Studies from Duke Univ School for the Environment determined that these seagulls dropped over a ton of droppings each year. A year-round fruit and vegetable operation, Wood Duck Farm is located bordering the 2406 LF from the east. What are the plans to keep seagull droppings off farm produce growing in the field? What are the plans to keep seagulls from eating the crops? What type of disease vector plan might be implemented? How will the applicant mitigate wild animal scavenging? How will the extra nitrogen and phosphorus impact the SHNF?
http://www.newsobserver.com/news/local/counties/wake-county/article158475619.html

I strongly request that you take the next logical step and reject this current Application No. MSW-2406. Thank you for your consideration.

Sincerely,

Mandy Cook

TCEQ Office of the Chief Clerk, MC-105
P.O. Box 13087
Austin, Texas 78711-3087

RECEIVED
NOV 05 2021
GW

Date: 10/30/2021

Name: Mandy Cook
Address: 361 Jayhawker Rd
City, ST, Zip: Cleveland TX 77328
Email Address: mcook4112@gmail.com

Re: Peach Creek Environmental Park (PCEP) Proposed Landfill Permit Application No. Permit #2406

I am writing to request that the permit for Peach Creek EP Landfill MSW No 2406 be denied. There are four main concerns that form the basis for my comments.

1. MSW liner systems do not protect groundwater from volatile organic compounds (VOCs). These vapors can penetrate and permeate through the required subtitle D liner of MSW landfills. The proof of which is in the groundwater contamination reports authored by the TCEQ. I ask the Executive Director, Commissioners, TCEQ staff, and the US Forest Service consider the impacts of up-gradient VOCs migrating into the Sam Houston National Forest (SHNF), commercial and family farms, as well as primary drinking water sources from shallow aquifers in the region. There are many studies that prove gas migration within MSW landfills have caused and will cause groundwater contamination. https://www.usgs.gov/mission-areas/water-resources/science/volatile-organic-compounds-vocs?qt-science_center_objects=0#qt-science_center_objects

2. The SHNF sits on the east and north side of the proposed landfill. The USFS was started to help provide clean water to our country. When it rains, the SHNF acts as a filter to cleanse water going downstream to Lake Houston. The leachate tanks are to sit on the north side of the LF, within a few feet of the FEMA 100-year floodplain. Storm water overflow, leachate, and VOCs will make the Jayhawker Creek floodplain a conduit for contamination which will impact drinking water downstream.

3. Dr. HC Clark wrote a geological assessment to the TCEQ back in August, to quote him "The application implicitly recognizes the gravel location restriction insofar as Class I nonhazardous is not listed as waste to be accepted. Will the permit explicitly state that Class I waste may not be and never will be accepted here because of this hydrogeologic limitation?" ..... "The sink created by pumping will draw water into the landfill rather than allowing it to pass beneath the liner and detect a leak as that groundwater moves through the point of compliance. Water will move inward rather than out."...."How will this problem be addressed?"

4. It is a fact that millions of seagulls feast at LF across North America. South Wake MSW landfill in NC is comprised of approximately 179 acres and has an estimated seagull population of 50,000. Phase 1 of this 2406 LF will be about 124 acres, or almost 37% smaller which equates to almost 31,500 seagulls as an estimated flock number. Studies from Duke Univ School for the Environment determined that these seagulls dropped over a ton of droppings each year. A year-round fruit and vegetable operation, Wood Duck Farm is located bordering the 2406 LF from the east. What are the plans to keep seagull droppings off farm produce growing in the field? What are the plans to keep seagulls from eating the crops? What type of disease vector plan might be implemented? How will the applicant mitigate wild animal scavenging? How will the extra nitrogen and phosphorus impact the SHNF?
http://www.newsobserver.com/news/local/counties/wake-county/article158475619.html

I strongly request that you take the next logical step and reject this current Application No. MSW-2406. Thank you for your consideration.

Sincerely,

Mandy Cook

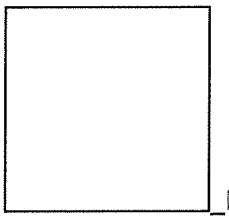
Lori Rowe

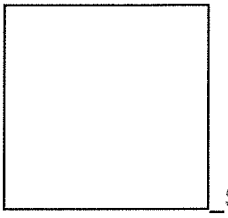
From: PUBCOMMENT-OCC
Sent: Thursday, September 30, 2021 8:13 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: TCEQ Comments on Proposed Landfill 2406

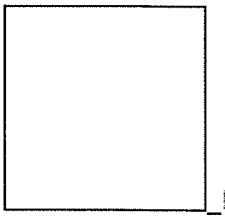
From: CHIEFCLK <chiefclk@tceq.texas.gov>
Sent: Wednesday, September 29, 2021 3:51 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: FW: TCEQ Comments on Proposed Landfill 2406

From: Mandy Cook <mcook4112@gmail.com>
Sent: Wednesday, September 29, 2021 3:31 PM
To: CHIEFCLK <chiefclk@tceq.texas.gov>
Subject: TCEQ Comments on Proposed Landfill 2406

Executive Director, Commissioners, and TCEQ staff,
In response to the TCEQ's comments regarding Subtitle D landfills at the public meeting held on September 28, 2021, for application 2406, I would like to furnish addition information to be reviewed by the Exective Director, Commissioners, and TCEQ staff. I look forward to your response.
Sincerely,
Mandy Cook


_Deficiencies in Subtitle D Landfill Liner Failure and Groundwater Pollution Monitoring.PDF


_SubtitleDFlawedTechnPap (1).pdf



_landfill leak3.pdf

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Monday, September 27, 2021 11:14 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: TCEQ MSW permit #2406

From: Mandy Cook <mcook4112@gmail.com>
Sent: Friday, September 24, 2021 4:32 PM
To: CHIEFCLK <chiefclk@tceq.texas.gov>
Subject: TCEQ MSW permit #2406

I just recently heard about the Landfill application proposed to be built next to the Sam Houston National Forest, FEMA 100 yr. floodplain, and small family farms. I am concerned that the proposed landfill will contaminate both surface and groundwater. The county roads are dilapidated, flood, and are very narrow; they will not hold up to heavy truck traffic. Endangering the lives of school children with 400+ proposed garbage trucks traveling daily through the neighborhood? This is where kids wait for their school busses. This LF permit application idea is totally irresponsible to our future generations. I urge the TCEQ to deny this #2406 Landfill application.

Sincerely,

Mandy Cook

Melissa Schmidt

From: PUBCOMMENT-OCC
Sent: Monday, June 14, 2021 8:15 AM
To: PUBCOMMENT-WPD; PUBCOMMENT-ELD; PUBCOMMENT-OCC2; PUBCOMMENT-OPIC
Subject: FW: Public comment on Permit Number 2406

From: mjb_0619@yahoo.com <mjb_0619@yahoo.com>
Sent: Friday, June 11, 2021 6:55 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: MRS Mandy Cook

E-MAIL: mjb_0619@yahoo.com

COMPANY:

ADDRESS: 361 JAYHAWKER RD
CLEVELAND TX 77328-7971

PHONE: 2818832839

FAX:

COMMENTS: I am writing in opposition to the landfill with permit number 2406. It states that the proposed landfill will access its property off Rayjack Road, however there is no access road. That means Peach Creek will need to build a road, which is not currently in the plans or anywhere on the application. PC-II, LLC also owns 3.6724 acres south of the permit site that will connect the proposed MSW facility to the county maintained Rajack road. The TCEQ should include this within the permit boundary as that property is in a floodplain, it may also have wetlands within those 3.6724 acres, and

could potentially harm drainage of nearby properties. Basically, this property should go through the rigorous permitting process since it is pertinent to the accessibility of the proposed MSW facility. The access road design and construction should be a concern to the TCEQ in the event of an emergency as well as for the safety of all nearby residents. Because this road will effect drainage and flooding, these need to be considered. There should then be tests and all other processes done as mentioned above.

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Wednesday, November 18, 2020 3:45 PM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

PM

From: mjb_0619@yahoo.com <mjb_0619@yahoo.com>
Sent: Wednesday, November 18, 2020 2:23 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: MRS Mandy Jo Cook

E-MAIL: mjb_0619@yahoo.com

COMPANY:

ADDRESS: 361 JAYHAWKER RD
CLEVELAND TX 77328-7971

PHONE: 2818832839

FAX:

COMMENTS: I, Mandy Cook, at 361 Jayhawker Road, phone # 281-883-2839, am in opposition of Peach Creek Environmental Park permit # 2406 application. The proposed landfill location is approximately 1 mile to 1.5 miles of my home and within 1 mile of land that I own. It is my understanding, according to the commissioners letter that I have found online, and was then mailed to me and postmarked on November 4th 2020, that this "Notice of Application and Preliminary Decision [by the TCEQ] will be published AND MAILED to those who are on the county-wide mailing list and to those who are on the mailing list for this application. That notice will contain the deadline for submitting public

comments." This notice of application was NEVER sent to me, neither was the preliminary Decisions made by TCEQ. It is now in phase 3 of the application process. This entire application process should be stopped and should have to start over as the initial letters informing myself and my fellow community members were NEVER MAILED a notice of application when this process was started. That is a violation of this process and no explanation has been given to this violation. If I am not going to receive a reply by mail, I am requesting a public meeting to be informed on how this application is allowed to continue when it violated the public notice at the very beginning. I understand that it was posted in a newspaper, but the TCEQ wording specifically states it will be "MAILED to those who are on the county-wide mailing list" and this was not done until November 4th which is when my letter is postmarked. In addition to the above notice, there are serious concerns about this landfill and it's negative impact on my health, my families health, our wellbeing, and our communities overall wellbeing. As I have stated in multiple comments already, there are over 57 endangered species on the San Jacinto County endangered species list, some of them living within a 1 mile radius of this proposed landfill, and possibly inside the landfill's potential perimeter. Upon further reading of this application process, in regards to C1.7, it shows that all water flow will be diverted into Jayhawker Creek, which will go outside of the proposed site however, there is no discussion of how this landfill will stop flooding outside of this area. The site itself may not flood (which is hard to believe in notes below), but the areas outside of this will be effected. It states that you will only "be controlled to MINIMIZE surface water running onto, into, and off the landfill disposal and treatment areas," but you cannot STOP it. This is already a significantly "low lying" area that already hold standing water, this is going to add to that standing water causing potentially devastating additional mosquitos and the life threatening diseases they carry to drastically increase. This is a mainly residential area with a few small business and this landfill will not only put our health in extreme danger, it will also put these small business out of business. This landfill is a threat to multiple families health, but also to our community when we lose these small businesses due to the potential water flow that is only "MINIMIZED," but also due to the risk of water contamination, odor, lowered property values, threat to endangered species, and destruction to the natural habitat for several non endangered species that help make this area an attraction during hunting and outdoor seasonal times. In addition to my concerns regarding C1.7, the threat of this landfill only continues with the conclusions found in C3-10, "Erosion control is an ONGOING prevention and maintenance ISSUE" while also stating that "new methods introduced in the future will be REQUIRED to comply." This is threatening our safety, as well as our health and future. To state that the erosion will always be an issue, how is that going to be corrected? Over the years, the erosion will continue and while the initial findings may prove that there is little impact to our area, it will certainly increase significantly over time. I request stipulations to be made in regards to how often will this be looked at? How will this be enforced and how often? How will it be controlled? How often will this facility be checked for compliance? Section C4-1 posses additional dangers of having this landfill in our area. While the "waste disposal footprint and processing facilities will be located entirely outside the limits of the 100 year flood plain" both phase 1 and 2 surround the flood plain and there is NO data being discussed about how BOTH TOGETHER, in addition to the erosion mentioned above, will effect not only water flow and standing water, but the ecosystem. According to C4.2 there are areas that are less than 200 feet from the 100 year flood plain, and no area is more than 800 feet from the 100 year flood plain. This is SURROUNDING the flood plain on both sides, so when all elements are added together, where is that data? How will this be monitored? When it does flood, as that is a possibility, how will this damage our area? This not simply a construction site or a regular building that is flooded and then the materials are washed into our community, this is WASTE and potentially hazardous materials that CAN be pushed into our community and ecosystem as, I stated, it SURROUNDS a flood plain. The damage this could potentially cause is NOT worth the risks. In addition to the concerns listed above, I would like to discuss the access points to this potential landfill and the threats they will add to our community. According to all of the maps that I have found with this application, it is my understanding that the only access point to this property is through the use of Fostoria Tram onto Jayhawker Road. These two roads are in significantly poor condition on a regular basis, and the county has repeatedly denied the requests and funds to properly pave these roads. There are already weight limits and signs restricting large loads form using these roads as through traffic because of their inability to hold the weight. With the addition of multiple trucks holding large weight loads, the road conditions will be severely impacted to even more negative conditions that will potentially harm our vehicles, and again, stop people from visiting our small businesses making another reason on how this landfill will impact our community as a whole. In addition to the poor road conditions we already struggle with, both roads, especially Jayhawker and specifically Fostoria on the San Jacinto County side, are extremely narrow. A rough measurement shows that Jayhawker Road itself is only 20 feet wide, clearly not wide enough for large vehicles to constantly pass residential motorists, let alone school busses that are travelling on a daily basis to drop off our children.

In addition, the easement access forces these trucks to go by every side road that connects to Jayhawker which leads to multiple residential areas and side communities. The life threatening risks of our children's safety is a risk that this landfill is willing to take? What precautions are going to be used to ensure the safety of our children when your trucks travel up and down our roads multiple times a day/week? What are you going to do about the damage to our vehicles when these trucks ruin our roads, and throw up more debris as they are driving? What requirements are going to be made to ensure that our community members who are visiting our small businesses will be safe while driving next to these trucks on roads that are not made to handle their loads nor that size of vehicle? What regulations will be placed to ensure these trucks are driving safe at a speed that is appropriate for a back road community? The San Jacinto County already ignores these warnings and life threatening danger, and they will clearly not make any changes based on this landfill when they already push this matter aside and state that everything is up to TCEQ. If you propose to widen our roads, how will you do that when we have our entire electrical systems running down the road within the Right Of Way limits? The electrical poles will all need to be moved, replaced, and then put on private property. How is that going to be achieved? As I have stated multiple times, this landfill is an extreme and imminent threat to not only myself and my family, but to this community, to endangered animals, to the ecosystem, and will create a rippling effect of destruction down to Houston and the Gulf. I again request a public meeting and continue to point out that this application should have been forced to cease a the beginning when Peach Creek and TCEQ failed to MAIL notice of the application and preliminary decisions to myself and every resident this affects, in addition to every resident on the county-wide mailing list. I am reiterating that I am opposed to application #2406 for all of the above mentioned reasons, and requesting a public meeting.

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Monday, November 23, 2020 4:16 PM
To: mjb_0619@yahoo.com
Subject: Public comment on Permit Number 2406

Thank you for your comments.

A copy of your email will be forwarded to the Texas Commission on Environmental Quality (TCEQ) staff responsible for reviewing the application. All timely filed comments will be considered by the staff prior to the final decision on the application. You will be added to the mailing list for this application. After the opportunity to submit comments ends, a copy of the formal written response to all timely filed comments will be mailed to you. If a decision is made to hold a public meeting, you will receive a hard copy of the public meeting notice in the mail.

The TCEQ appreciates your interest in environmental issues. If you have any further questions, please feel free to contact the Public Education Program staff at 800-687-4040.

Sincerely,
Office of the Chief Clerk

NOTE: Please do not respond to this email; it will not be answered. If you would like to submit additional comments, please use the online eComments system at: https://www.tceq.texas.gov/agency/decisions/cc/comments.html

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: MRS Mandy Jo Cook

E-MAIL: mjb_0619@yahoo.com

COMPANY:

ADDRESS: 361 JAYHAWKER RD
CLEVELAND TX 77328-7971

PHONE: 2818832839

FAX:

COMMENTS: I, Mandy Cook, at 361 Jayhawker Road, phone # 281-883-2839, am in opposition of Peach Creek Environmental Park permit # 2406 application. The proposed landfill location is approximately 1 mile to 1.5 miles of my home and within 1 mile of land that I own. It is my understanding, according to the commissioners letter that I have found online, and was then mailed to me and postmarked on November 4th 2020, that this "Notice of Application and Preliminary Decision [by the TCEQ] will be published AND MAILED to those who are on the county-wide mailing list and to those who are on the mailing list for this application. That notice will contain the deadline for submitting public comments." This notice of application was NEVER sent to me, neither was the preliminary Decisions made by TCEQ. It is now in phase 3 of the application process. This entire application process should be stopped and should have to start over as the initial letters informing myself and my fellow community members were NEVER MAILED a notice of application when this process was started. That is a violation of this process and no explanation has been given to this violation. If I am not going to receive a reply by mail, I am requesting a public meeting to be informed on how this application is allowed to continue when it violated the public notice at the very beginning. I understand that it was posted in a newspaper, but the TCEQ wording specifically states it will be "MAILED to those who are on the county-wide mailing list" and this was not done until November 4th which is when my letter is postmarked. In addition to the above notice, there are serious concerns about this landfill and it's negative impact on my health, my families health, our wellbeing, and our communities overall wellbeing. As I have stated in multiple comments already, there are over 57 endangered species on the San Jacinto County endangered species list, some of them living within a 1 mile radius of this proposed landfill, and possibly inside the landfill's potential perimeter. Upon further reading of this application process, in regards to C1.7, it shows that all water flow will be diverted into Jayhawker Creek, which will go outside of the proposed site however, there is no discussion of how this landfill will stop flooding outside of this area. The site itself may not flood (which is hard to believe in notes below), but the areas outside of this will be effected. It states that you will only "be controlled to MINIMIZE surface water running onto, into, and off the landfill disposal and treatment areas," but you cannot STOP it. This is already a significantly "low lying" area that already hold standing water, this is going to add to that standing water causing potentially devastating additional mosquitos and the life threatening diseases they carry to drastically increase. This is a mainly residential area with a few small business and this landfill will not only put our health in extreme danger, it will also put these small business out of business. This landfill is a threat to multiple families health, but also to our community when we lose these small businesses due to the potential water flow that is only "MINIMIZED," but also due to the risk of water contamination, odor, lowered property values, threat to endangered species, and destruction to the natural habitat for several non endangered species that help make this area an attraction during hunting and outdoor seasonal times. In addition to my concerns regarding C1.7, the threat of this landfill only continues with the conclusions found in C3-10, "Erosion control is an ONGOING prevention and maintenance ISSUE" while also stating that "new methods introduced in the future will be REQUIRED to comply." This is threatening our safety, as well as our health and future. To state that the erosion will always be an issue, how is that going to be corrected? Over the years, the erosion will continue and while the initial findings may prove that there is little impact to our area, it will certainly increase significantly over time. I request stipulations to be made in regards to how often will this be looked at? How will this be enforced and how often? How will it be controlled? How often will this facility be checked for compliance? Section C4-1 posses additional dangers of having this landfill in our area. While the "waste disposal footprint and processing facilities will be located entirely outside the limits of the 100 year flood plain" both phase 1 and 2 surround the flood plain and there is NO data being discussed about how BOTH TOGETHER, in addition to the erosion mentioned above, will effect not only water flow and standing water, but the ecosystem. According to C4.2 there are areas that are less than 200 feet from the 100 year flood plain, and no area is more than 800 feet from the 100 year flood plain. This is SURROUNDING the flood plain on both sides, so when all elements are added together, where is that data? How will this be monitored? When it does flood, as that is a possibility, how will this damage our area? This not simply a construction site or a regular building that is flooded and then the materials are washed into our community, this is WASTE and potentially hazardous materials that CAN be pushed into our community

and ecosystem as, I stated, it SURROUNDS a flood plain. The damage this could potentially cause is NOT worth the risks. In addition to the concerns listed above, I would like to discuss the access points to this potential landfill and the threats they will add to our community. According to all of the maps that I have found with this application, it is my understanding that the only access point to this property is through the use of Fostoria Tram onto Jayhawker Road. These two roads are in significantly poor condition on a regular basis, and the county has repeatedly denied the requests and funds to properly pave these roads. There are already weight limits and signs restricting large loads form using these roads as through traffic because of their inability to hold the weight. With the addition of multiple trucks holding large weight loads, the road conditions will be severely impacted to even more negative conditions that will potentially harm our vehicles, and again, stop people from visiting our small businesses making another reason on how this landfill will impact our community as a whole. In addition to the poor road conditions we already struggle with, both roads, especially Jayhawker and specifically Fostoria on the San Jacinto County side, are extremely narrow. A rough measurement shows that Jayhawker Road itself is only 20 feet wide, clearly not wide enough for large vehicles to constantly pass residential motorists, let alone school busses that are travelling on a daily basis to drop off our children. In addition, the easement access forces these trucks to go by every side road that connects to Jayhawker which leads to multiple residential areas and side communities. The life threatening risks of our children's safety is a risk that this landfill is willing to take? What precautions are going to be used to ensure the safety of our children when your trucks travel up and down our roads multiple times a day/week? What are you going to do about the damage to our vehicles when these trucks ruin our roads, and throw up more debris as they are driving? What requirements are going to be made to ensure that our community members who are visiting our small businesses will be safe while driving next to these trucks on roads that are not made to handle their loads nor that size of vehicle? What regulations will be placed to ensure these trucks are driving safe at a speed that is appropriate for a back road community? The San Jacinto County already ignores these warnings and life threatening danger, and they will clearly not make any changes based on this landfill when they already push this matter aside and state that everything is up to TCEQ. If you propose to widen our roads, how will you do that when we have our entire electrical systems running down the road within the Right Of Way limits? The electrical poles will all need to be moved, replaced, and then put on private property. How is that going to be achieved? As I have stated multiple times, this landfill is an extreme and imminent threat to not only myself and my family, but to this community, to endangered animals, to the ecosystem, and will create a rippling effect of destruction down to Houston and the Gulf. I again request a public meeting and continue to point out that this application should have been forced to cease a the beginning when Peach Creek and TCEQ failed to MAIL notice of the application and preliminary decisions to myself and every resident this affects, in addition to every resident on the county-wide mailing list. I am reiterating that I am opposed to application #2406 for all of the above mentioned reasons, and requesting a public meeting.

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Monday, November 16, 2020 9:00 AM
To: mjb_0619@yahoo.com
Subject: Public comment on Permit Number 2406
Attachments: G__jboss7_www14ext2_tmp_cfusion.ear.cfusion.war_2406 .NORI.pdfpdf (2).pdf

Thank you for your comments.

A copy of your email will be forwarded to the Texas Commission on Environmental Quality (TCEQ) staff responsible for reviewing the application. All timely filed comments will be considered by the staff prior to the final decision on the application. You will be added to the mailing list for this application. After the opportunity to submit comments ends, a copy of the formal written response to all timely filed comments will be mailed to you.

All requests for hearings, if timely filed and authorized by statute or rule, are considered by the Commissioners. The Commissioners will consider your request during a regularly scheduled Commission meeting that is open to the public, and a determination will be made as to whether or not the request will be granted. You will be notified in writing when your request is scheduled for consideration. If your request is granted, the matter will be referred to the State Office of Administrative Hearings (SOAH). The SOAH hearing will be a formal, legal proceeding, conducted in a manner similar to civil trials in state district court. While not required, parties are usually represented by legal counsel. In order for an issue to be considered at a contested case hearing, it must have been first raised in a comment or in a request for a contested case hearing during the public comment period by the affected person or group requesting the hearing.

The TCEQ appreciates your interest in environmental issues. If you have any further questions, please feel free to contact the Public Education Program staff at 800-687-4040.

Sincerely,
Office of the Chief Clerk

NOTE: Please do not respond to this email; it will not be answered. If you would like to submit additional comments, please use the online eComments system at: https://www.tceq.texas.gov/agency/decisions/cc/comments.html

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: MRS Mandy Cook

E-MAIL: mjb_0619@yahoo.com

COMPANY:

ADDRESS: 361 JAYHAWKER RD
CLEVELAND TX 77328-7971

PHONE: 2818832839

FAX:

COMMENTS: I, Mandy Cook, at 361 Jayhawker Road, phone number 281-883-2839, am in opposition of Peach Creek Environmental Park permit number 2406 application; the location is approximately 1 to 1.5 miles of my home. I, Mandy Cook, request a contested hearing about this application 2406. While this is an unrestricted area, this is a rural residential location with homes, farms, and national forest surrounding this potential landfill. This permit is requesting the right to dump potentially hazardous materials into our streams that contain over 50 endangered and/or threatened animals. In addition, this location is located in a flood plain and has two streams that flow through the property increasing the risk of flooding and contamination. While there are stipulations to the type of pollutants that can be discharged from the site, as well as checks that will be required, it is not a 100% guarantee that other extremely hazardous materials will not be mixed in, especially with the potential for flooding. According to San Jacinto County Development plans, any commercial or private developmenr that is being built in a potential flood area is required to have their first floor raised above ground level, which can clearly not be done when building a landfill. This area flooded without a hurricane, with our recent tropic storm Imelda, and can clearly not be a location for a landfill, especially one with a 5 year permit. Additionally, upon reading the application process, Peach Creek Environmental Park was required to send letters to every person on the county mailing this. This did not happen, which is a direct violation of this application's process and should therefore void this application. The majority of families and farms in this area, especially within 1 mile of the proposed site, have well water which could be contaminated and then can potentially harm not only humans but the livestock which in turn contaminates the food chain to spread beyond our local community as many businesses in the area sell local produce and livestock products. Many families and farms rely solely on their own animals and farms for their food, which is why the majority of us moved to this location. As a small homestead with the plans to potentially earn an income through selling organic produce and animals, this landfill would destroy and eliminate any possibility of that due to the potential hazards and contaminants that would arise. This landfill is an imminent and long term threat to the people in this area, as well as all whom visit or purchase products produced by these farms, live down river, and down stream from this location. Thank you in advance for your time in reading this comment, and know that I, Mandy Cook, request a contested hearing. I look forward to receiving all updates that involve the imminent threat this landfill hold on myself, my family, and my community, as well as the confirmation of this application being denied due to the violations if the notices, county building requirements, threat to human health and livelihood, and destruction to critical endangered animals and species.

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Thursday, November 5, 2020 9:18 AM
To: mjb_0619@yahoo.com
Subject: Public comment on Permit Number 2406
Attachments: G__jboss7_www14ext2_tmp_cfusion.ear.cfusion.war_2406 .NORI.pdfpdf (2).pdf

Thank you for your comments.

A copy of your email will be forwarded to the Texas Commission on Environmental Quality (TCEQ) staff responsible for reviewing the application. All timely filed comments will be considered by the staff prior to the final decision on the application. You will be added to the mailing list for this application. After the opportunity to submit comments ends, a copy of the formal written response to all timely filed comments will be mailed to you.

The TCEQ appreciates your interest in environmental issues. If you have any further questions, please feel free to contact the Public Education Program staff at 800-687-4040.

Sincerely,
Office of the Chief Clerk

NOTE: Please do not respond to this email; it will not be answered. If you would like to submit additional comments, please use the online eComments system at: https://www.tceq.texas.gov/agency/decisions/cc/comments.html

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: MRS Mandy Cook

E-MAIL: mjb_0619@yahoo.com

COMPANY:

ADDRESS: 361 JAYHAWKER RD
CLEVELAND TX 77328-7971

PHONE: 2818832839

FAX:

COMMENTS: According to the attached screenshot, we as residents were required to have received, "Notice of the Application and Preliminary Decision" which were to be "published and mailed to those who are on the county-wide mailing list and to those who are on the mailing list for this application." No such notice was ever sent to myself or any member in my household. In addition, the TCEQ website just recently updated that on 3/16 they received a newspaper tearsheet, however, when I had commented on this application last month, that was NOT on the TCEQ application update. Why was the newspaper tearsheet, which was apparently received on 3/16, not updated on the application process along with the update of the bilingual verification?

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Tuesday, November 3, 2020 7:49 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406
Attachments: G__jboss7_www14ext2_tmp_cfusion.ear.cfusion.war_2406 .NORI.pdfpdf (2).pdf

From: mjb_0619@yahoo.com <mjb_0619@yahoo.com>
Sent: Monday, November 2, 2020 7:03 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: MRS Mandy Cook

E-MAIL: mjb_0619@yahoo.com

COMPANY:

ADDRESS: 361 JAYHAWKER RD
CLEVELAND TX 77328-7971

PHONE: 2818832839

FAX:

COMMENTS: According to the attached screenshot, we as residents were required to have received, "Notice of the Application and Preliminary Decision" which were to be "published and mailed to those who are on the county-wide mailing list and to those who are on the mailing list for this application." No such notice was ever sent to myself or any member in my household. In addition, the TCEQ website just recently updated that on 3/16 they received a newspaper tearsheet, however, when I had commented on this application last month, that was NOT on the TCEQ application

update. Why was the newspaper tearsheet, which was apparently received on 3/16, not updated on the application process along with the update of the bilingual verification?

Texas Commission on Environmental Quality

Notice of Receipt of Application for Land Use Compatibility Determination for a Municipal Solid Waste Permit

Proposed Permit No. 2406

Application. PC-II, LLC, 300 Concourse Blvd., Suite 101, Ridgeland, Madison County, Mississippi 39157, a Mississippi limited liability company, has applied to the Texas Commission on Environmental Quality (TCEQ) for a separate land use compatibility determination on a permit to authorize a new Municipal Solid Waste Type I Landfill. The facility is located approximately seven miles northwest of the intersection of US 59 and SH 105, San Jacinto County, Texas. The TCEQ received the land use compatibility portion of the application on August 28, 2019. This application is available for viewing and copying at the Shepherd Public Library, 30 North Liberty Street, Shepherd, San Jacinto County, Texas 77371, and may be viewed online at https://peachcreekep.com. The following link to an electronic map of the site or facility's general location is provided as a public courtesy and is not part of the application or notice: https://tceq.maps.arcgis.com/apps/webappviewer/index.html?id=db5bac44afbc468bbddd360f8168250f&marker=-95.189444%2C30.390833&level=12. For exact location, refer to application.

Additional Notice. The TCEQ Executive Director has determined that the land use compatibility portion of the application is administratively complete and will conduct a substantive review of this portion of the application. Following completion of that review, the TCEQ will make a separate determination on the question of land use compatibility. If the site is determined to be compatible with the surrounding land uses, the TCEQ may at another time consider conformity with other regulatory requirements. After completing the land use compatibility review, the TCEQ will issue a Notice of Application and Preliminary Decision. **Notice of the Application and Preliminary Decision will be published and mailed to those who are on the county-wide mailing list and to those who are on the mailing list for this application. That notice will contain the deadline for submitting public comments.**

Public Comment/Public Meeting. You may submit public comments or request a public meeting on this application. The purpose of a public meeting is to provide the opportunity to submit comments or to ask questions about the application. TCEQ will hold a public meeting if the Executive Director determines that there is a significant degree of public interest in the application or if requested by a local legislator. A public meeting is not a contested case hearing.

Opportunity for a Contested Case Hearing. After the deadline for submitting public comments, the Executive Director will consider all timely comments and prepare a response to all relevant and material, or significant public comments. **Unless the application is directly referred for a contested case hearing, the response to comments, and the Executive Director's decision on the application, will be mailed to everyone who submitted public comments and to those persons who are on the mailing list for this application. If comments are received, the mailing will also provide instructions for requesting reconsideration of the Executive Director's decision and for requesting a contested case hearing. A person who may be affected by the facility is entitled to request a contested case hearing from the commission.** A contested case hearing is a legal proceeding similar to a civil trial in state district court.

To Request a Contested Case Hearing, You Must Include The Following Items in Your Request: your name, address, phone number; applicant's name and permit number; the location and distance of your property/activities relative to the facility; a specific description of how you would be adversely affected by the facility in a way not common to the general public; a list of all disputed issues of fact that you submit during the comment period, and the statement "[I/we] request a contested case hearing." If the request for contested case hearing is filed on behalf of a group or association, the request must designate the group's representative for receiving future correspondence; identify by name and physical address an individual member of the group who would be adversely affected by the facility or activity; provide the information discussed above regarding the affected member's location and distance from the facility or activity; explain how and why the member would be affected; and explain how the interests the group seeks to protect are relevant to the group's purpose.

Following the close of all applicable comment and request periods, the Executive Director will forward the application and any requests for reconsideration or for a contested case hearing to the TCEQ Commissioners for their consideration at a scheduled Commission meeting. The Commission may only grant a request for a contested case hearing on issues the requestor submitted in their timely comments that were not subsequently withdrawn.

If a hearing is granted, the subject of a hearing will be limited to disputed issues of fact or mixed questions of fact and law that are relevant and material to the Commission's decision on the application submitted during the comment period.

Mailing List. If you submit public comments, a request for a contested case hearing or a reconsideration of the Executive Director's decision, you will be added to the mailing list for this application to receive future public notices mailed by the Office of the Chief Clerk. In addition, you may request to be placed on: (1) the permanent mailing list for a specific applicant name and permit number; and/or (2) the mailing list for a specific county. To be placed on the permanent and/or the county mailing list, clearly specify which list(s) and send your request to TCEQ Office of the Chief Clerk at the address below.

Information Available Online. For details about the status of the application, visit the Commissioners' Integrated Database (CID) at <www.tceq.texas.gov/goto/cid>. Once you have access to the CID using the above link, enter the permit number for this application, which is provided at the top of this notice.

Agency Contacts and Information. All public comments and requests must be submitted either electronically at <www14.tceq.texas.gov/epic/eComment/> or in writing to the Texas Commission on Environmental Quality, Office of the Chief Clerk, MC-105, P.O. Box 13087, Austin, Texas 78711-3087. Please be aware that any contact information you provide, including your name, phone number, email address and physical address will become part of the agency's public record. For more information about this permit application or the permitting process, please call the TCEQ's Public Education Program, Toll Free, at 800-687-4040 or visit their website at <www.tceq.texas.gov/goto/pep>. Si desea información en español, puede llamar al 800-687-4040.

Further information may also be obtained from PC-II, LLC at the address stated above or by calling Mr. Jeffery Hobby, Project Manager at (601) 362-3333.

Issued Date: October 28, 2019

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Friday, October 30, 2020 1:52 PM
To: mjb_0619@yahoo.com
Subject: Public comment on Permit Number 2406

Thank you for your comments.

A copy of your email will be forwarded to the Texas Commission on Environmental Quality (TCEQ) staff responsible for reviewing the application. All timely filed comments will be considered by the staff prior to the final decision on the application. You will be added to the mailing list for this application. After the opportunity to submit comments ends, a copy of the formal written response to all timely filed comments will be mailed to you.

The TCEQ appreciates your interest in environmental issues. If you have any further questions, please feel free to contact the Public Education Program staff at 800-687-4040.

Sincerely,
Office of the Chief Clerk

NOTE: Please do not respond to this email; it will not be answered. If you would like to submit additional comments, please use the online eComments system at: https://www.tceq.texas.gov/agency/decisions/cc/comments.html

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: MRS Mandy Cook

E-MAIL: mjb_0619@yahoo.com

COMPANY:

ADDRESS: 361 JAYHAWKER RD
CLEVELAND TX 77328-7971

PHONE: 2818832839

FAX:

COMMENTS: I, Mandy Cook, am in opposition of Peach Creek Environmental Park and the permit related to #2406. I live approximately 1 mile away from the proposed site of this landfill. While this is an unrestricted area, this is a rural residential location with homes, farms, and national forest surrounding this potential landfill. This permit is requesting the right to dump potentially hazardous materials into our streams that contain over 50 endangered and/or threatened animals. In addition, this location is located in a flood plain and has two streams that flow through the property increasing the risk of flooding and contamination. While there are stipulations to the type of pollutants that can be discharged from the site, as well as checks that will be required, it is not a 100% guarantee that other extremely hazardous materials will not be mixed in, especially with the potential for flooding. This area flooded without a hurricane, with our recent tropic storm Imelda, and can clearly not be a location for a landfill, especially one with a 5 year permit. Additionally, upon reading the application process, Peach Creek Environmental Park was required to send letters to every person on the county mailing this. This did not happen, which I believe, is a violation of this application's process. While we do not have a well, the majority of families and farms do have well water that can potentially harm not only humans but the livestock which in turn contaminates the food chain to spread beyond our local community. Many families and farms rely solely on their own animals, which is why the majority of us moved to this location. As a small Homestead with the plans to potentially earn an income through selling organic produce and animals, this landfill would destroy and eliminate any possibility of that due to the potential hazards and contaminants that would arise. This landfill is an imminent and long term threat to the people in this area, as well as all whom visit or purchase products produced by these farms. Thank you in advance for your time in reading this comment, and I look forward to receiving all updates that involve the imminent threat this landfill hold on myself, my family, and my community.

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Friday, October 23, 2020 10:00 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

From: mjb_0619@yahoo.com <mjb_0619@yahoo.com>
Sent: Thursday, October 22, 2020 2:42 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: MRS Mandy Cook

E-MAIL: mjb_0619@yahoo.com

COMPANY:

ADDRESS: 361 JAYHAWKER RD
CLEVELAND TX 77328-7971

PHONE: 2818832839

FAX:

COMMENTS: I, Mandy Cook, am in opposition of Peach Creek Environmental Park and the permit related to #2406. I live approximately 1 mile away from the proposed site of this landfill. While this is an unrestricted area, this is a rural residential location with homes, farms, and national forest surrounding this potential landfill. This permit is requesting the right to dump potentially hazardous materials into our streams that contain over 50 endangered and/or threatened animals. In addition, this location is located in a flood plain and has two streams that flow through the property increasing the risk of flooding and contamination. While there are stipulations to the type of pollutants that can be

discharged from the site, as well as checks that will be required, it is not a 100% guarantee that other extremely hazardous materials will not be mixed in, especially with the potential for flooding. This area flooded without a hurricane, with our recent tropic storm Imelda, and can clearly not be a location for a landfill, especially one with a 5 year permit. Additionally, upon reading the application process, Peach Creek Environmental Park was required to send letters to every person on the county mailing this. This did not happen, which I believe, is a violation of this application's process. While we do not have a well, the majority of families and farms do have well water that can potentially harm not only humans but the livestock which in turn contaminates the food chain to spread beyond our local community. Many families and farms rely solely on their own animals, which is why the majority of us moved to this location. As a small Homestead with the plans to potentially earn an income through selling organic produce and animals, this landfill would destroy and eliminate any possibility of that due to the potential hazards and contaminants that would arise. This landfill is an imminent and long term threat to the people in this area, as well as all whom visit or purchase products produced by these farms. Thank you in advance for your time in reading this comment, and I look forward to receiving all updates that involve the imminent threat this landfill hold on myself, my family, and my community.

COOK

Dear Office of Chief Clerk:
I am requesting a contested case hearing and for the following information to be added to the comments filed in conjunction to proposed landfill 2406.

Based on the current projection location of this proposed landfill, it reflects to be less than 2 miles from our home off Jayhawker Rd. Our small homestead would be adversely affected by the proposed landfill if the application is granted. A list of disputed issues has already been commented in past dates, and below I am providing additional research studies and documentation related to the health risks posed by landfills near flood plains. I am referencing several concerns made by Jennifer Lee from Houston San Jacinto Ranch, LLC whose comments were submitted on January 17, 2022 in addition to other comments posted from various concerned members, while also adding several references attached from periodical journals, academic journals, and newspaper articles for your review.

1. General Health, Public Safety, and Environmental Concerns
   Per Part II, Section 7 of the Application, and supporting documentation, the Application Materials demonstrate that the landfill will cause landowners and members of the surrounding community to suffer adverse health and environmental effects due to contaminants or pollutants from the landfill. The first attached document is a study found in the *Journal of Environmental Health* examines the health effects suffered by working at a landfill site. While the study focuses on employees at a landfill site, it is also documented in the study how may of the respiratory and dermatological issues were airborne, "The hygienic survey conducted for this study revealed that the concentration of dust was significantly higher at the landfill than at the university. Moreover, a higher number of filamentous fungi and higher bacterial concentrations were observed in samples taken from the landfill area than in samples collected from the university building," (Richards 2000). Notice that the study shows it not strictly on the landfill itself, but in the area, and considering this landfill will be boarding a national forest, small farms and homesteads, and individual homes, it is extremely alarming that the suggested precautions of living and working around a landfill be that we should "wear surgical masks or respirators, if necessary, to prevent the onset of respiratory problems associated with hazardous materials," (Richards 2000).

2. Inadequate Stormwater Controls, Drainage Controls, Floodplains and Surface Water Quality
   Per Part III, Attachment B of the Application. While the application does not address the stormwater or surface water during all phases of landfill, it also does not take into consideration the possibility of water seeping into the landfill during operation or after operation. The second attached document is a news article from *Austin American Statesman* describing the leachate from a landfill in Northeast Austin Texas. The article explains how water seeping into the landfill "mixes with decaying garbage, the tainted water needs to be pumped out and treated by the city's water utility -- at an ongoing cost to taxpayers," (Mashhood 2013). It is presumed that the landfill leachate is caused from "nearby groundwater leaking into the landfill" which has caused the county to pay "at least $110,000 a year to maintain the facility" in addition to "$1.7 million in 1995 for a system to pump out leachate and another $1.2 million last year to fix sinking areas of the landfill" (Mashhood 2013). January 25, 2021, San Jacinto County Commissioner David Brandon write to TCEQ commenting that San Jacinto County is a small rural county composed of nearly 60% National Forest, and does not have the tax paying revenue to uphold the road repairs and expansions that would need to be done; how would our county be able to endure this unexpected additional expense when Jayhawker Creek, which runs through the proposed site, overflows and then, as noted by Texas Parks & Wildlife, drains into Peach Creek, which drains into Caney Creek, which discharges into Lake Houston 17 miles south of the proposed site.

3. Inadequate Hydrogeology, Groundwater Monitoring, and Soils
   Per Part III, Attachment D2 of the Application, and supporting documentation, the Application Materials indicate that Class 1 wastes with asbestos content will be accepted. Information submitted to TCEQ on August 13, 2021 from H.C. Clark highlights the problems with the hydrogeology due to the presence of gravel at the proposed site and the problems with assumptions utilized in groundwater monitoring. The

third attachment that I have provided is from *BioCycle* which is a report discussing how "liners deteriorate over time and ultimately fail to prevent moisture, which generates leachate, from entering the landfill" (Landfills offer false sense of security, 1996). The documentation of leachate from numerous landfills around the country proves that the liners being used are inadequate and that they at most only offer "postponement of groundwater pollution by at least a few years, and at most a century" (Landfills offer false sense of security, 1996). The monitoring systems are out of date and have been recorded in numerous studies to be faulty and not alert of leachate until after contamination has occurred for years. This puts all residents, landowners, farm animals, and crops at risk of poisonous contaminations that can then be dispersed through sale or trade of animals and goods that many of these landowners and residents rely upon for survival.

4. Endangered Species
   Per Part II, Section 12 of the Application, and supporting documentation, Application Materials do not adequately identify potential state or federal threatened or endangered species, especially given the proximate location of the Sam Houston National Forest. In the attached document titled "THE ENVIRONMENTAL IMPACT ASSESSMENT OF A MUNICIPAL LANDFILL - A STUDY ON THE LEACHATE" there is detailed research that concluded from its study that landfills "can be endangered [to endangered species] because once the work starts, their habitat can be removed, fragmented or separated. During operation, the landfill might become a favorable habitat for different birds and animal species, considered harmful and dangerous to the community near the deposit" (ALEXANDRU AG, PÎRVU MG, BODOR M, 2018). Additionally, Texas Parks Part II& Wildlife submitted a comment letter to TCEQ on January 12, stating no Biological Assessment or species protection plan was included with the Application Materials.

5. Inadequate Consideration of Groundwater Impacts
   Per Part III, Attachment E of the Application, and supporting documentation, the Application Materials fail to adequately address the presence of groundwater and to address how groundwater that is present will be protected. In the attached document titled "THE ENVIRONMENTAL IMPACT ASSESSMENT OF A MUNICIPAL LANDFILL - A STUDY ON THE LEACHATE" multiple studies were done on leachate and the detection of leachate at landfills. The study concluded that "landfills appear to be the cheapest and easiest option to solve the municipal waste problem, but in the long run they are a huge financial burden" further supporting point #2 I mentioned above in regards to San Jacinto County's ability to pay for these needs (ALEXANDRU AG, PÎRVU MG, BODOR M, 2018). The study also concluded that the financial burden, "is due to the need to monitor gas from the storage site and the potential for contamination of nearby land, watercourses and groundwater for several decades after the landfill being disposed of. Taking these drawbacks into consideration, the diminishing utilization of landfills must be seriously taken into consideration in the near future and if used, landfilling should always function in parallel with a recycling program" which, a recycling program is not in the application process nor mentioned in any documentation by Peach Creek ((ALEXANDRU AG, PÎRVU MG, BODOR M, 2018). After reviewing these studies, it is clear that for a rural community that uses mostly personal wells, with the only alternative being a well located near the proposed landfill site, the groundwater will affect the drinking water as well.

Thank you for your time and attention to these comments. I have confidence that you will review the documents provided and attached for your research.

Sincerely,

Mandy Cook

References:

Andrada Gabriela ALEXANDRU, Mădălina Gabriela PÎRVU, & Marius BODOR. (2018). The Environmental Impact Assessment of a Municipal Landfill - A Study on the Leachate. *The Annals of "Dunarea de Jos" University of Galati. Fascicle IX, Metallurgy and Materials Science*, *41*(3).

Landfills offer false sense of security. (1996). BioCycle, 37(9), 8.

Mashhood, F. (2013, July 17). Travis County pouring more money into closed landfill. Austin American Statesman (TX).

Panagiota Kitsantas, Anastasia Kitsantas, & H. Richard Travis. (2000). Occupational exposures and associated health effects among sanitation landfill employees. *Journal of Environmental Health*, *63*(5), 17–24.

Occupational Exposures and Associated Health Effects Among Sanitation Landfill Employees.

Print

Author: *Travis, H. Richard*
Geographic Code: *1USA*
Date: *Dec 1, 2000*
Words: *4131*
Publication: *Journal of Environmental Health*
ISSN: *0022-0892*

Abstract

The study reported in this paper examined whether employees working at landfills in the state of Virginia experience more work-related health effects and injuries than non-landfill workers. The purpose was twofold: 1) to determine if certain occupational factors could increase the prevalence of symptoms and 2) to conduct a hygienic evaluation of the work environment at one of the landfills. Participants included 70 male landfill workers and 60 male faculty and staff from a large university. All participants filled out a questionnaire that addressed demographics, job tasks, chemicals and materials used on the job, and symptoms experienced. The findings of this study indicated a higher prevalence of work-related dermatological, neuromuscular, respiratory, hearing, gastrointestinal symptoms and injuries among landfill workers than among the control group participants. Furthermore, specific symptoms like nasal stuffiness were positively correlated with the handling of wood products, machine oil, greases , and lubricants; job tasks that required the use of manual or power tools also were positively correlated with backaches and aching joints. Finally, the hygienic survey indicated a high amount of airborne dust, bacteria, and fungi within the breathing zone of the landfill employees. The paper concludes with recommendations for ensuring a safe, healthy environment for landfill workers.

Introduction

The impact of waste material on the environment and on the health of the landfill workers who deal with this waste has been recognized for some time (1,2). Research evidence shows that if physical, chemical, and biological hazards exceed tolerable limits, occupational diseases may develop (3,4). Landfill employees are potentially exposed to a number of harmful substances and conditions, including fungi, bacteria, diesel fumes, dust, medical wastes, heavy metals, noise, and temperature extremes present in the ambient air that may exceed tolerable levels. For example, it has been shown that in landfills concentrations of bacteria and fungi can be five to 20 times higher than background levels, particularly during the warm, humid, and windy weather of summer (5).

A handful of studies conducted among sanitation and landfill workers have shown significant correlations between landfill exposure and several health outcomes, including mood conditions (anxiety, depression, irritability, and restlessness); neurologic conditions (headaches, dizziness, lethargy, balance problems); respiratory conditions (chronic bronchitis, daily cough); and hearing, neuromuscular, cardiovascular, gastrointestinal, and dermal conditions (6-9). Gelberg found work-related dermatologic, neurologic, hearing, and respiratory symptoms, as well as sore and itching throats, to be more prevalent among landfill employees than among off-site employees (1). Similarly, Zuskin et al. indicated that acute and chronic respiratory symptoms, as well as changes in ventilatory capacity, might develop in association with the work exposure of sanitation employees; Tuomi et al. found a high prevalence of cardiovascular and musculoskeletal disorders among Finnish municipal workers in physically demanding jobs (2,7). Furthermore, a study conducted among garbage-handling men in Denmark

revealed that skin symptoms were significantly more prevalent among sanitation workers, with 23 percent experiencing itching of the skin more than once a year and 14 percent more than once a month (8). Finally, consistent with these findings, Mamtani and Cimino, in a study of closely matched relatives, found that the prevalence of heart disease, diabetes, bronchitis, backache, inguinal hernia, and arthritis were significantly higher among retired sanitation workers (10).

Determining health effects, disease patterns, and possible occupational risk factors in landfills or garbage-handling plants can be helpful in reducing illness, improving working conditions, increasing productivity, determining health care benefits, and controlling costs. It can also be useful in improving personal protective equipment and developing training programs that teach workers how to self-regulate their health safely. Only a few studies, however, have examined occupational exposures and related health risks of landfill workers, and these have relied solely on survey instruments without support of hygienic data (1,6,7). Therefore, the study discussed here has included a hygienic inspection in an attempt to determine if certain occupational tasks and chemicals could increase the prevalence of health effects and if the landfill environment is hazardous to employees' health.

Specifically, the study examined whether any overall differences exist between the types of work exposures, health-related symptoms, and on-the-job injuries incurred by an exposed "industrial" landfill population and those of an unexposed "office" control population. It was hypothesized that landfill workers would report significantly more health-related symptoms and on-the-job injuries than the control group workers. Furthermore, it was expected that there would be significant correlations both between specific job tasks and symptoms, and between materials used at work and symptoms. Finally, it was postulated that the hygienic survey inspection would reveal more harmful substances and contaminants present in the landfill than in the university office area.

Method

Participants

The experimental group consisted of 70 male landfill workers who were selected from eight landfills located in the state of Virginia. Out of the 80 landfill workers approached to participate in this study, 74 responded, yielding a 92.5 percent response rate. Four questionnaires were excluded from the study: two because female subjects responded to them (these responses were excluded because of gender differences in the reporting of symptoms) and two because the responses were incomplete. The control group comprised 60 male faculty and staff from a university. Only three individuals did not return their questionnaires, yielding a 95 percent response rate. Participants in both groups were employed for at least one continuous year prior to the study. The mean age for landfill workers was 44.3 years; for the control group it was 44.2 years. A majority of the subjects in both groups were between 30 and 50 years old. The mean length of employment was 6.2 years for landfill employees and 5.2 years for faculty and st aff. Demographic data revealed that the landfill workers' average weekly consumption of beverages containing alcohol was significantly less than that of the control participants: $t(128) = -2.45$, p [less than] .05. No attempt was made to measure how much alcohol was consumed at any one time. Significant differences were also detected between past and current smoking levels of landfill and university employees. Table 1 summarizes the demographic data for all workers.

Measures

Survey Instrument

The survey instrument employed in this study was developed from Gelberg's questionnaire (1). It consisted of four parts. Part 1 examined participants' personal and behavioral characteristics, such as age, years employed, levels of alcohol consumption, and smoking habits. Part 2 assessed the participants' involvement in each of 15 work tasks performed at landfills over the last six months. Examples of work tasks included heavy lifting, use of manual hand or power tools, direct contact with

garbage, motor vehicle operation, use of high-pressure steam-cleaning equipment, working in areas with birds, and so forth. in Part 3, landfill workers were queried about materials and chemicals they used at work (e.g., lumber and wood products, machine oils, solvents, paints, adhesives). Finally, in Part 4, all workers were asked to report health-related symptoms experienced within the last year. Examples from the list of symptoms provided to the participants are skin rashes, feeling nauseous, recurring headaches, tremors o r cramps, problems with hearing, difficulty in breathing, and injuries incurred at work. No attempt was made to validate the employees' symptoms by obtaining medical records.

Hygienic Survey Inspection

A hygienic survey was performed at only one of the landfills, located in the same city where the control participants resided. Eight hygienic work-zone samples of total dust and microbe concentration were measured during different work shifts in the months of October, November, and December, when the temperature ranged from 40[degrees]F to 80[degrees]F. Samples were taken from representative workers at each job location. Job locations, by operation, included offices, sites at which the garbage material was directed and inspected, sites at which traffic control of garbage trucks was conducted, sites at which garbage was separated for recycling, sites at which the collection of garbage by residents was controlled, and the cutting-wood area. Airborne-dust samples were collected from the worker's breathing zone with an air-sampling pump (Lamotte type). A pre-weighed glass fiber filter with a diameter of 44 millimeters (mm), and 0.8 micron ([micro]m) pore size was used. The airflow was 1.5 to 2 liters per minute (L/min), and the sampling periods lasted three to four hours. The amount of dust was determined by weighing of the filters after sampling.

In addition, eight samples of airborne bacteria and fungi (microorganisms) were collected with an air-sampling pump (Lamotte type) for approximately three hours, at 1.5 meters (m) above the ground. The airflow was calibrated at 1.5 to 2.0 L/min. To analyze microorganism samples, researchers counted the formed colonies of bacteria and fungi. The hygienic samples from the control group were collected in two university offices located in the same building. No data on chemical exposures were obtained from the hygienic survey.

Design and Procedure

All participants were assigned to an experimental or a control group (to the landfill group or the faculty and staff group), according to their occupation. Permission to conduct the study was obtained from the administrative office of each landfill. Both groups of workers were contacted personally by one of the researchers, who informed them of the study and requested that they specify a convenient time for hand delivery of the questionnaire. Hygienic samples were collected at one of the landfills located in the same town where the control participants resided. The results of the study were made available to those who requested it.

Results

Descriptive statistics were computed to identify sample characteristics. Reported symptoms were combined into seven composite variables based on previous research: dermal, gastrointestinal, neurologic, neuromuscular, hearing, respiratory, and injuries. Chi-squared tests were used to assess differences between the symptoms reported by the landfill and control groups. The odds ratios (ORs) and 95 percent confidence intervals (CIs) were calculated to compare the prevalence of specific symptoms in the two groups. Logistic regressions also were performed to assess whether any significant differences existed between the two groups after the participants' ages and smoking levels were controlled for. The researchers used t-tests to identify differences in bacterial, fungal, and dust exposures for the control group and the group of landfill workers affiliated with the landfill where the eight samples were collected for the hygienic survey. Finally, correlational analyses were conducted to examine whether the composite variables and the specific symptoms reported had significant

relationships to job tasks and exposure to chemicals used on the job.

Prevalence of Symptoms

Chi-squared analyses revealed significant variation in the frequency of specific symptoms reported by the landfill employees and the control group; this finding pertained to neuromuscular, respiratory, dermatologic, hearing, and neurologic symptoms, as well as to injuries ([c.sup.2] = 6.43; p [less than] .011).

Odds ratios calculated for each specific symptom showed that symptoms were more prevalent among the landfill group than among the office group (Table 2). Logistic regression models controlling for age and smoking revealed that age had an effect on balance problems, tremors or cramps, and flulike symptoms, whereas smoking significantly contributed to flulike symptoms only (Table 3).

Correlational Analyses

For the landfill workers, Pearson's correlations were performed among the following factors: the total number of symptoms reported, tasks performed, and chemicals or harmful materials present at the workplace. It was shown that the total number of reported symptoms correlated positively with chemicals and other harmful materials used at work (r = .351, p [less than] .01). It was also found that job tasks correlated significantly with symptoms (r = .311, p [less than] .01). That is, the more tasks the workers performed, the greater the number of symptoms reported. In addition, as landfill employees performed more job tasks during their work periods, the likelihood that they would use more chemicals or other materials also increased (r = .885, p [less than] .01). For the control group, there were no significant correlations among the total number of symptoms, chemicals/materials, and job tasks.

The results supported a priori hypotheses about specific clusters of symptoms, job tasks, and chemicals. Significant correlations emerged among specific job tasks and symptoms. It was shown, for example, that employees assigned to heavy lifting reported more injuries. Garbage handlers reported more muscle weakness problems. Use of power tools and working with cutting, grinding, or drilling machines were associated with an increased prevalence of backaches and tremors or spasms. Employees involved in digging pits or ditches with hand tools or working on the active bank at the landfill reported more unusual acne and warts, itching and bloody noses, and flulike symptoms. Workers using high-pressure steam-cleaning equipment also reported more respiratory symptoms, such as nasal stuffiness or daily phlegm or cough (Table 4).

A priori hypotheses regarding the relationship between specific symptoms and materials used at work were also supported by the data. Landfill employees required to use cleaners and degreasers experienced more respiratory problems (daily phlegm and cough, flulike symptoms, itching, bloody nose) and more gastrointestinal problems (nausea, vomiting, diarrhea). The use of lumber or wood products was highly correlated with dermatologic problems (skin rash, skin patches, warts) and respiratory problems (flulike symptoms, nasal stuffiness, bloody nose). Landfill workers using machine oils or lubricants reported more neurologic problems (recurring headaches, dizziness, daily tiredness) and more respiratory problems (tightness in the chest, etc.) (Table 5).

Subset Analysis of the Hygienic Survey

A subset analysis using t-tests revealed significant differences in the levels of bacteria [t(14) = 2.67, p [less than] .018], fungi [t(14) = 2.19, p [less than].006], and airborne dust [t(14) = 7.32, p [less than] .000] present in the university building and the landfill area where the eight hygienic samples were collected. The total dust concentration was 2.01 milligrams per cubic meter (mg/[m.sup.3]) at the landfill, and 0.28 mg/[m.sup.3] in the university building. Although no fungi were observed in the school building, significant amounts were found in the landfill area: 11.87 colony-forming units per cubic meter (CFU/[m.sup.3]). Bacterial concentrations at the landfill site were 33.38 CFU/[m.sup.3] higher than

those at the university building.

When researchers used t-tests to compare landfill and control participants who worked or lived in the area surrounding the landfill where the hygienic survey was performed (N = 34), they found differences in the number of symptoms reported for five of the composite variables: dermatologic [t(32) = -2.73, p [less than] .010], neuromuscular [t(32) = 2.19, p [less than] .009], hearing [t(32) = -2.86, p [less than].007], respiratory [t(32) = -4.53, p [less than] .000], and injuries [t(32) = -2.74, p [less than] .010]. No significant differences were found for gastrointestinal and neurologic symptoms.

Discussion

The results of this study supported all the hypotheses with which it began. Landfill employees were shown to report more health-related symptoms than did faculty and staff. With the exception of alcohol consumption, which was significantly higher for the control group, the mean values were about the same for both groups for demographic and behavioral characteristics such as age, length of employment, and smoking habits. Nevertheless, the landfill workers reported more respiratory, neuromuscular, neurologic, and dermatologic symptoms, as well as more on-the-job injuries. Specifically, 91 percent of the landfill employees reported neuromuscular problems, 84 percent reported respiratory problems, 77 percent reported neurologic problems, and 64 percent reported dermatologic problems. According to odds ratios, landfill employees were more likely to experience shortness of breath, daily phlegm or cough, tightness in the chest or difficulty in breathing, and nasal stuffiness. Landfill employees also reported a signi ficantly higher prevalence of tingling, numbness, or whiteness of fingers; problems with joints and backaches; daily tiredness, dizziness, and balance problems; and recurring headaches. In addition, injuries on the job, including broken bones, bruises, cuts, stitches, and sprains or strains were significantly higher among landfill workers than in the control group.

The findings of this study were consistent with Hertzman et al.'s observations of health effects among employees with landfill-site exposure at the Upper Ottawa Street landfill (6). The reported symptoms included chronic bronchitis; daily cough; combined respiratory complaints; skin problems; and neurologic symptoms such as headaches, dizziness, and balance and lethargy problems. In another study, examination of health problems among workers at a resource recovery plant found a higher prevalence of chest tightness, flulike symptoms, organic-dust toxic syndrome; itching eyes; itching nose; sore throat; skin symptoms; and nausea, vomiting, or diarrhea among garbage handlers (8).

Although age and smoking were potential confounders in the present study, analyses showed that differences in symptoms between the two groups were not due to these variables. Landfill workers were more likely to have smoked at some time in their lives, but when smoking was statistically controlled for, only flulike symptoms were significant. When age was controlled for, significant differences emerged only for flulike symptoms, balance problems, and tremors and cramps.

Significant relationships were also found between job tasks, chemicals and other substances, and the different categories of symptoms (dermal, respiratory, neurologic, hearing, and neuromuscular). As expected, tasks that involved heavy lifting; digging of pits or ditches; use of manual and power hand tools; maintaining and fueling of work vehicles; cutting, grinding, and drilling; handling of garbage; and working in areas with birds correlated with neuromuscular problems such as muscle weakness and problems with joints. Higher reporting of dermatological problems such as unusual acne correlated with digging of pits or ditches and handling of garbage by hand. Using high-pressure steam equipment, working in paint facilities, and working in areas with birds all correlated significantly with nasal stuffiness, shortness of breath, and daily phlegm or cough. Using manual and power tools; maintaining and fueling equipment; cutting, grinding, and drilling; and using high-pressure equipment were associated with heari ng problems.

Harmful chemicals and materials also correlated with all listed symptoms. It was found that lumber and wood products, glues and adhesives, machine oil, lubricants, and gasoline were significantly associated

with respiratory symptoms. Lumber and wood products, gasoline, and petroleum products were highly correlated with dermal, neurologic, neuromuscular, and hearing conditions. In addition, gasoline and petroleum products correlated significantly with gastrointestinal symptoms, and glues and adhesive substances were highly associated with dermal and neuromuscular problems.

The hygienic survey conducted for this study revealed that the concentration of dust was significantly higher at the landfill than at the university. Moreover, a higher number of filamentous fungi and higher bacterial concentrations were observed in samples taken from the landfill area than in samples collected from the university building. Similarly, previous research has shown high concentrations of bacteria, fungi, and dust--particularly in areas where garbage is initially dumped; in heavy equipment areas where there is no filtration of in-flowing cabin air; and in summer months (5,8).

Furthermore, this study showed that workers from the landfill where the hygienic survey was conducted reported significantly more symptoms than the faculty and staff working in a building located 10 minutes from the landfill area. The numerous respiratory problems experienced by these landfill employees could be explained by the high concentrations of dust found in that particular landfill, It should be mentioned that only three out of these 17 landfill employees smoked. The high bacterial concentrations at the landfill site (2.25 CFU/m3) also could explain the significant number of dermatological problems such as unusual acne, warts, cysts, and itching skin.

Conclusion

This study clearly demonstrated significant differences in the health symptoms of the landfill and the control workers. Although age and levels of smoking might have accounted for the apparent effect of occupational exposure, logistic regression that controlled for these variables did not support that possibility. In light of the findings--particularly the strong associations found between symptoms and job tasks, materials used at work, and high concentrations of dust and levels of bacteria--health measures should be taken to ensure a safe and healthy environment for landfill employees. Training programs and workshops should be developed to instruct landfill workers about unsafe workplace conditions; unsafe work practices; awkward postures arising from improper work methods; and physical hazards caused by noise, vibration, weather conditions, electricity, radiation, improper lifting of heavy items, and improper operation of heavy manual equipment. Employees should be required to wear surgical masks or respira tors, if necessary, to prevent the onset of respiratory problems associated with hazardous materials, while heavy equipment operators should be advised to wear earplugs. Since personal protective equipment such as gloves constituted the last line of defense, considerable effort should be expended to ensure that adequate protection is actually being provided against chemical hazards, dust, fumes, and mist. Joint occupational health and safety committees should inspect all landfills to identify safety, ergonomic, and physical hazards that can be costly both for the employees and for the employers in terms of time loss, compensation costs, and human suffering.

The conclusiveness of the findings may be limited by the self-reported nature of the data. Landfill workers may have reported more health-related symptoms than they actually experienced. No attempt was made to validate self-reported data with medical records. Recall bias is one of the major difficulties of health surveys in which respondents are asked about their symptoms. That is, subjects identified as members of a risk group may recall illnesses and exposures differently than members of the control group. In this study, however, pilot-testing that examined whether correlations of symptoms with job tasks and materials were associated with job titles within the landfill (e.g., operators, construction workers) identified no recall bias.

Other limitations may be the small sample size and the many tests conducted. The participation rate was high, however, and associations of symptoms and on-the-job injuries with job tasks and materials were consistent. The high levels of correlation between tasks and materials served to test the validity of the results. Finally, it should be mentioned that since the hygienic survey was conducted in only one of the landfills, the results cannot be generalized to the other landfills, which were used only as pools for

subjects. The hygienic survey conducted for the control group does, however, represent the majority of the control subjects tested in the study.

In short, more research, using longitudinal epidemiological studies, is needed to identify the actual agents that cause landfill workers to experience health effects. Studies also should be conducted to determine differences among landfill workers in levels of self-regulation, self-efficacy beliefs regarding usage of protective equipment, and symptoms experienced while working in hazardous areas. In other health-related areas, it has been shown that individuals who use self-regulated strategies to prevent the onset of diseases and report high self-efficacy perceptions in implementing these strategies report fewer symptoms (11, 12). Those findings may be helpful in developing appropriate training programs for landfill workers.

Corresponding Author: Anastasia Kitsantas, Ph.D., Department of Educational Research, Florida State University, 307 B Stone Building, Tallahassee FL 3206-4453.

REFERENCES

(1.) Gelberg, K.H. (1997), "Health Study of New York City Department of Sanitation Landfill Employees," Journal of Occupational and Environmental Medicine, 39(11):1103-1110.

(2.) Zuskin, E., A. Budak, J. Kern, J. Mustajbegovic, D. Pavicic, and N.E. Schachter (1996), "Airway Function and Respiratory Symptoms in Sanitation Workers," Journal of Occupational and Environmental Health, 38(5):522-527.

(3.) Cimino, J.A. (1982), "Carbon Monoxide Levels Among Sanitation Workers," Paper presented at the 42nd Annual American Medical Association Congress on Occupational Health, Tampa Florida.

(4.) Cimino, J.A., and R. Mamtani (1987), "Occupational Hazards for New York City Sanitation Workers," Journal of Environmental Health, 50(1):8-12.

(5.) Rahkonen P., M. Ettala, M. Laukkanen, and M. Salkinoja-Salonen (1990), "Airborne Microbes and Endotoxins in the Work Environment of Two Sanitary Landfills in Finland," Aerosol Science and Technology, 13(4):505-513.

(6.) Hertzman, C., M. Hayes, J. Highland, and J. Singer (1987), "Upper Ottawa Street Landfill Site Health Study," Environmental Health Perspectives, 75:173-195.

(7.) Tuomi, K., L. Eskelinen, J. Ilmarinen, E. Jarvinen, M. Kockars, and J. Toikkanen (1991), "Prevalence and Incidence Rates of Diseases and Work Ability in Different Work Categories of Municipal Occupations," Scandinavian Journal of Work Environment & Health, 17(Supplement):67-74.

(8.) Sigsgaard, T., P. Malmros, L. Nersting, and C. Petersen (1994), "Respiratory Disorders and Atopy in Danish Refuse Workers," American Journal of Respiratory Critical Care Medicine, 149(6):1407-1412.

(9.) Mamtani, R., and J.A. Cimino (1992), "Work Related Diseases Among Sanitation Workers of New York City," Journal of Environmental Health, 55(1):27-29.

(10.) Rahkonen, P., M. Ettala, and I. Loikkanen (1987), "Working Conditions and Hygiene at Sanitary Landfills in Finland," Annals of Occupational Hygiene, 31(4):505-513.

(11.) Kitsantas, A., and B.J. Zimmerman (2000), "Self-Efficacy, Activity Participation, and Physical Fitness of Asthmatic and Nonasthmatic Adolescent Girls," Journal of Asthma, 37(2):163-174.

(12.) Kitsantas, A. (2000), "The Role of Self-Regulation Strategies and Self-Efficacy Perceptions in Successful Weight Loss Maintenance," Psychology & Health, An International Journal [forthcoming].

COPYRIGHT 2000 National Environmental Health Association

Copyright 2000, Gale Group. All rights reserved. Gale Group is a Thomson Corporation Company.

EBSCO Publishing Citation Format: APA 7th Edition (American Psychological Assoc.):

NOTE: Review the instructions at http://support.ebsco.com.libproxy.lamar.edu/help/?int=eds&lang=&feature_id=APA and make any necessary corrections before using. **Pay special attention to personal names, capitalization, and dates.** Always consult your library resources for the exact formatting and punctuation guidelines.

References

Mashhood, F. (2013, July 17). Travis County pouring more money into closed landfill. *Austin American-Statesman (TX)*.

<!--Additional Information:
Persistent link to this record (Permalink): https://libproxy.lamar.edu/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=tih&AN=2W63357960437&site=eds-live
End of citation-->

Travis County pouring more money into closed landfill

~~~~~~~~

Farzad Mashhood

July 17--A closed landfill in Northeast Austin will see $99,000 worth of work in the coming months as Travis County continues to figure out how to fix the problematic facility, which closed 31 years ago.

"This has been quite a cash cow," County Judge Sam Biscoe said about the continuing costs of the county-run U.S. 290 Landfill on the northwest corner of the highway and Giles Road.

County commissioners unanimously approved the latest work Tuesday in an ongoing effort to comply with violations the state's environmental agency handed down in 2009. The work would include $50,000 to pay for a groundwater system and a study of why the landfill has unusually high amounts of trash-contaminated water, called leachate.

The problem isn't water seeping out of the landfill. It's water seeping in. Once it mixes with decaying garbage, the tainted water needs to be pumped out and treated by the city's water utility -- at an ongoing cost to taxpayers.

Leachate in closed landfills typically goes down over time, as they are covered with a liner on the bottom and a cap on top. But from 2000 to 2011, the leachate in the U.S. 290 Landfill has varied widely, according to county documents showing how much was pumped out during six-month periods. About 5.8 million gallons were pumped out from October 2002 to March 2003, the most in a period. Another 5.7 million gallons were pumped out from October 2009 to March 2010.

About 721,000 and 535,000 gallons were pumped from April to September 2008 and October 2008 to March 2009, respectively, the two lowest periods.
~~~~~~~~

Open from 1968 to 1982, the county-run facility has been maintained post-closure much longer than most landfills, said Tom Weber, the county's environmental quality program manager. Landfills are typically maintained for five to 10 years after closure, but the county has been maintaining the problematic U.S. 290 facility for 31 years, in part because of the extraordinary amount of leachate the landfill has produced, Weber said.

County and state officials have said they believe the leachate is so high because of nearby groundwater leaking into the landfill. The groundwater study would find out if water is somehow seeping into the facility; if it is, the county could then figure out how to stop it from coming in -- which would lower future maintenance costs of the landfill, though it's unclear by how much, Weber said.

"The thing that set the county off the track with this landfill is the site selection," Weber said. Built in a gully between two creeks, the landfill is close to groundwater and more susceptible to gradually sinking, Weber said.

The county pays at least $110,000 a year to maintain the facility, a cost it has borne for at least five years, officials said. That includes the city of Austin's utility costs to pump leachate into the city's sewer system, where it is treated, officials said. Among other one-time costs, the county paid $1.7 million in 1995 for a system to pump out leachate and another $1.2 million last year to fix sinking areas of the landfill.

Part of the funding approved Tuesday would pay to replace one pump, fix another pump and do other non-routine maintenance.

___ (c)2013 Austin American-Statesman, Texas Visit Austin American-Statesman, Texas at www.statesman.com Distributed by MCT Information Services

Copyright of **Austin American-Statesman (TX)** is the property of Austin American-Statesman (TX). The copyright in an individual article may be maintained by the author in certain cases. Content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.
Source: Austin American-Statesman (TX), Jul 17, 2013
Item: 2W63357960437

EBSCO Publishing Citation Format: APA 7th Edition (American Psychological Assoc.):

NOTE: Review the instructions at http://support.ebsco.com.libproxy.lamar.edu/help/?int=eds&lang=&feature_id=APA and make any necessary corrections before using. **Pay special attention to personal names, capitalization, and dates.** Always consult your library resources for the exact formatting and punctuation guidelines.

References

Landfills offer false sense of security. (1996). *BioCycle*, *37*(9), 8.

<!--Additional Information:
Persistent link to this record (Permalink): https://libproxy.lamar.edu/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=voh&AN=9609270556&site=eds-live
End of citation-->

Section:
BIOCYCLE WORLD

LANDFILLS OFFER FALSE SENSE OF SECURITY

This report on landfill regulations and leachate issues comes from Free Lee of G. Fred Lee & Associates, El Macero, California, and Bill Sheehan of the Sierra Club National Waste Committee in Athens, Georgia:

"Municipal solid waste (MSW) leachate, even with extensive waste diversion, contains a large number of hazardous and toxic chemicals that can render groundwater unusable for drinking and other basic purposes. 'Dry tomb' landfills of the type being developed today in accordance with current federal regulations attempt to isolate wastes using plastic sheeting and compacted soil/clay liners to keep the wastes dry and contain any leachate within the landfill. The major "improvement" offered by landfills of this type is postponement of groundwater pollution by at least a few years, and at most a century.

"It is widely acknowledged that such liners deteriorate over time and ultimately fail to prevent moisture, which generates leachate, from entering the landfill. Keeping garbage dry will require maintenance and periodic replacement of the cap in perpetuity, Today's landfill regulations transfer the economic and public health burdens associated with groundwater pollution to future generations. They also postpone pressure on society to develop long-term MSW management alternatives.

"Today's land filling regulations evolved from a technology that was developed in the early 1980s, and are out of date. The federal Resource Conservation and Recovery Act (RCRA) needs to be updated to develop landfills that will protect groundwater for the long term. Landfilling is the cheapest option for managing discarded resources/waste only if the costs of perpetual maintenance and the associated groundwater contamination are ignored."

Copyright of BioCycle is the property of BioCycle Connect, LLC and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission.

However, users may print, download, or email articles for individual use.

THE ANNALS OF "DUNAREA DE JOS" UNIVERSITY OF GALATI
FASCICLE IX. METALLURGY AND MATERIALS SCIENCE
N°. 3 - 2018, ISSN 2668-4748; e-ISSN 2668-4756
Article DOI: https://doi.org/10.35219/mms.2018.3.07

THE ENVIRONMENTAL IMPACT ASSESSMENT OF A MUNICIPAL LANDFILL - A STUDY ON THE LEACHATE

Andrada Gabriela ALEXANDRU, Mădălina Gabriela PÎRVU, Marius BODOR*
"Dunarea de Jos" University of Galati, Faculty of Engineering
*email: marius.bodor@ugal.ro

ABSTRACT

The increase in consumption draws the need to quickly assess the problem of the municipal solid wastes. On the short term, the easiest way to deal with this stringent problem seems to be landfilling. This method was always a controversial one. Thus, making it more environmentally friendly was the logical next step. The recovery and utilization of methane gas, the recovery and treatment of the liquid generated by the landfill and, finally, the sealing of the landfill by the end of its utilization made it possible to deal the waste problem more environmentally friendly. However, no matter how "green" a landfill might be, every time such type of site is planned, a thoroughly environmental impact assessment must be conducted to anticipate, avoid and ameliorate the impact on the environment. This paper presents some aspects regarding an environmental impact assessment of a landfill, focusing mainly on the possible impact on water, the effect of leachate treatment and, finally, the future alternatives to landfilling.

KEYWORDS: environmental impact; leachate; municipal landfill

1. Introduction

The problem with waste management keeps getting more severe due to the alarming increasing of quantity and their impact on the environment. The increase of human population induces resource consumption due to higher production creating a significant environmental impact through wastes. In Romania, final disposal of municipal waste represents the primary option. Almost 98% of this kind of wastes are disposed yearly in specially arranged places named municipal landfills [1].

Any landfill that is about to be constructed or existent must be subject to a rigorous analysis ant also has to adopt the best measures regarding the environmental protection reducing thus its impact.

Although municipal solid waste landfilling might be easier and more frequent due to low costs during construction, operation and closing, compared to recycling costs, it can impact greatly the environment in time. Badly designed or exploited landfills can create almost always more serious consequences to the environment than non-complying ones and the areas surrounding the landfill might become heavily polluted. Landfills might pollute the air, water or soil since in such a badly designed or exploited construction the dangerous chemical substances present the risk to infiltrate in the environment. Also, frequently, the fauna is attracted to landfills and can spread dangerous diseases endangering the population around the site [2].

The methane gas, the leachate and the bulk municipal waste are the three main challenges of landfilling. The methane gas is produced in a landfill through anaerobic decomposing and can be collected with the existing technology then used to generate electricity in the landfill site or elsewhere or can be purified and then used as fuel for power generators. The leachate is a thick liquid, formed during waste decomposition. In the best-case scenario, the leachate is similar to residual waters and in the worst-case scenario it can transport dangerous materials dissolved from the wastes situated in the landfill. Landfills are equipped with synthetic liners placed on a layer of clay soil that helps to prevent leachate drain in underground water, preventing contamination [3, 4].

A municipal waste landfill also comes with some advantages. The first would be the possibility to obtain energy through methane gas conversion. Landfilling all non-recycling wastes in the same, controlled and monitored place, avoiding the non-

THE ANNALS OF "DUNAREA DE JOS" UNIVERSITY OF GALATI
FASCICLE IX. METALLURGY AND MATERIALS SCIENCE
N°. 3 - 2018, ISSN 2668-4748; e-ISSN 2668-4756
Article DOI: https://doi.org/10.35219/mms.2018.3.07

complying methods would be another advantage of this procedure. Also, the construction of a landfill creates new jobs during and after its activity [5, 6].

Leachate collection from a landfill is done using a system consisting in a web of perforated pipes from the base of the landfill, situated in a layer of sand under the deposited waste [7, 8]. The purpose of the present work is to assess the environmental impact of a landfill, from the point of view of the possible transmission of pollution through leachate generation.

2. Materials and methods

The leachate is created in landfills through leaching of wastes in different putrefaction states and the precipitation water. Water is infiltrating in the waste layers, dissolving and engaging a wide range of compounds. The leachate is usually collected in a basin, treated in a treatment plant for phosphorus and heavy metals retaining then is pumped in the sewage system or in a water-body if all the norms are met. According to the actual legislation, leachate treatment can be realized using two types of systems: i) using a treatment plant owned by the landfill that will permit the leachate evacuation directly into a natural receiver in compliance with the relevant legislation; ii) using a leachate pre-treatment facility prior to discharging into a municipal waste water treatment plant, respecting the values of the effluent quality indicators. Unfortunately, presently in Romania, there are still some non-complying landfills that do not has neither of the two leachate treatment systems mentioned above. Part of the European Union legislation was assumed by Romanian national legislation. Thus, the leachate collection methods refer only on the complying landfills. There is no method describing the leachate collection for non-complying landfills [9].

To start the experiment, an untreated leachate sample and a treated leachate sample were taken to determine their chemical and physical composition. Figure 1 presents the two basins used to contain the abovementioned sample types.

a b

Fig. 1. *Leachate collection basins: a - before and b – after treatment*

The equipment used consisted of: sample collection recipients, laboratory glassware, portable multiparameter model Aquatest +MO (HACH-LANGE), for pH values determination; UV-VIZ/VIZ spectrophotometer, model: DR 5000 (HACH-LANGE), for chemical factors determinants and an incubator for CBO_5 determination.

3. Results and discussions

For the leachate to be evacuated in the nature its chemical composition must be followed some maximum values established through corresponding legislation. The most important typical limits are found in Table 1, together with values for leachate samples before and after treatment. The treatment plant is owned by the landfill and is based on the reverse osmosis principle.

In Table 1 the most dangerous concentrations of the untreated leachate can be observed. These values must be reduced through whatever methods and brought as close as possible to the admissible values before safely discharging in the environment. After the treatment process some concentrations decreased consistently, even more than the maximum admissible values. The concentrations for suspended matters, CCO-Cr, Ammoniacal nitrogen, Phosphorus and Heavy metals (Pb, Cd, Cr, Cu and Zn) suffered

THE ANNALS OF "DUNAREA DE JOS" UNIVERSITY OF GALATI
FASCICLE IX. METALLURGY AND MATERIALS SCIENCE
N°. 3 - 2018, ISSN 2668-4748; e-ISSN 2668-4756
Article DOI: https://doi.org/10.35219/mms.2018.3.07

major transformations, reaching extremely low concentrations. To further highlight the difference between the two types of samples and between the two and the maximum admissible values, several graphs were drawn for the pollutants considered the most harmful for the environment.

Table 1. *Parameters values for leachate before and after treatment compared to maximum admitted values*

Nr. crt.	Indicator	Measuring unit	Untreated leachate	Treated leachate	Maximum admissible value
1	pH	pH units	8.28	6.94	6.5
2	Suspended matter	mg/L	215	17	60
3	CBO_5	mg/L	327	20	30
4	CCO-Cr	mg/L	2102	72.7	500
5	Ammoniacal nitrogen	mg/L	58	0.6	30
6	Phosphor total	mg/L	4.95	0.3	5.0
7	Pb	mg/L	0.44	0.06	0.5
8	Cd	mg/L	0.65	0.02	0.3
9	Cr total	mg/L	1.79	0.05	1.5
10	Cu	mg/L	2.19	0.05	0.2
11	Zn	mg/L	1.73	0.09	1.0

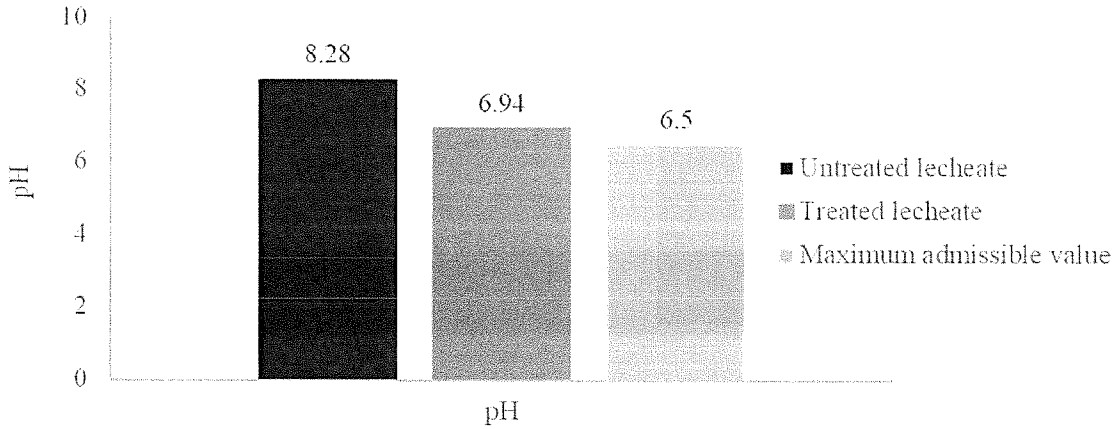


Fig. 2. *pH values of the leachate samples before and after treatment compared to the admitted value*

Figure 2 represents the modification of pH value after leachate treatment by a reduction with 1.34 pH units from the initial state. In the present case, after treatment, the leachate reaches a value close to the maximum admissible limit of 6.5 pH units, however even after treatment this limit is exceeded. In such situations, when the values after treatment do not comply with the maximum admitted values, the leachate should not be discharged directly into nature and further treated.

THE ANNALS OF "DUNAREA DE JOS" UNIVERSITY OF GALATI
FASCICLE IX. METALLURGY AND MATERIALS SCIENCE
N°. 3 - 2018, ISSN 2668-4748; e-ISSN 2668-4756
Article DOI: https://doi.org/10.35219/mms.2018.3.07

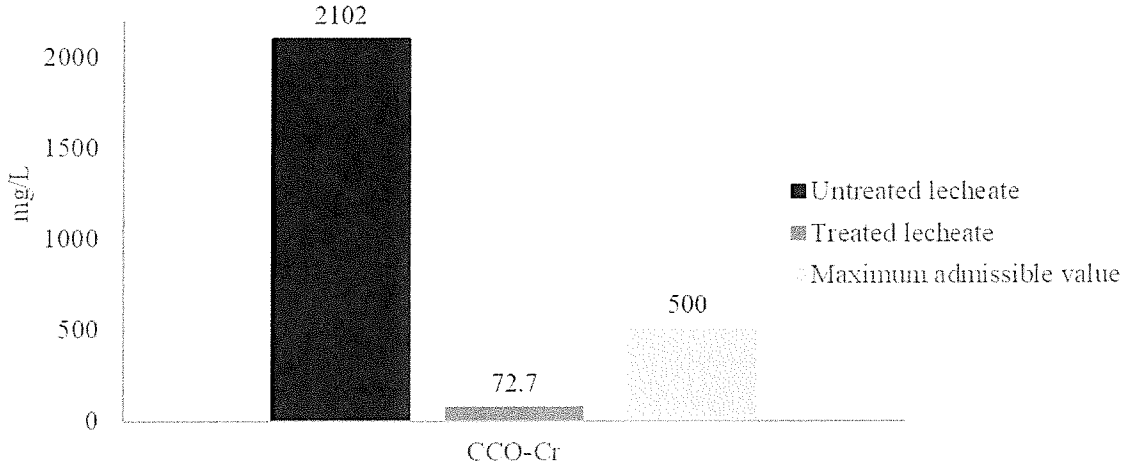


Fig. 3. *The amount of chemical oxygen demand for leachate samples before and after treatment compared to the admitted value*

The biggest difference between samples (treated and untreated) is that regarding CCO-Cr. In this case, the untreated leachate presents a value of 2102 mg/L and after treating this value falls with 2029.3 mg/L, reaching a value of 72.7 mg/L. Compared to the maximum admissible value (500 mg/L), after treatment, the CCO-Cr value for the leachate gets to decrease almost seven times. Thus, from this point of view the leachate might be discharged in nature without a major risk.

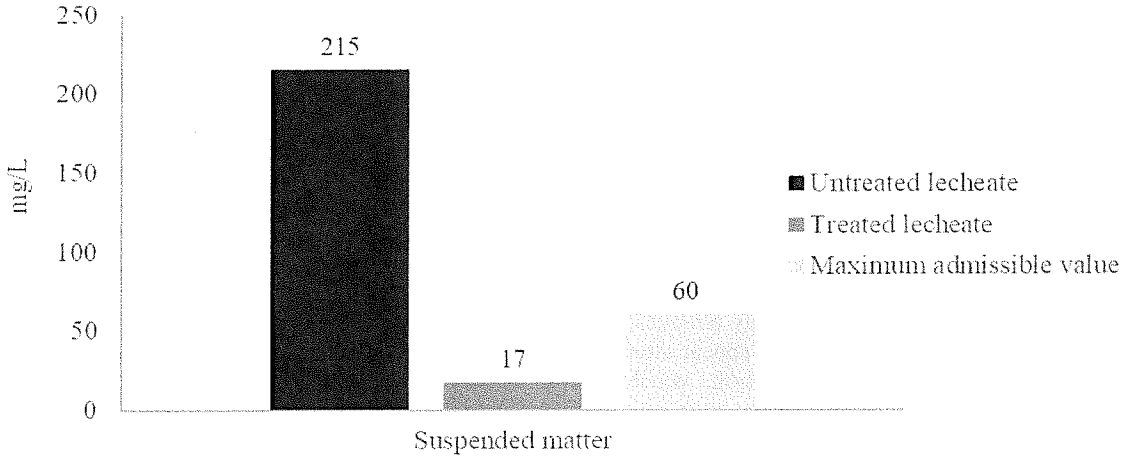


Fig. 4. *The value of suspended matter for leachate samples before and after treatment compared to the admissible value*

The suspended mater (Figure 4) represents the insoluble substances in the leachate. These are found in a very high concentration in the untreated leachate. After treatment, the suspended mater decreases considerably with 198 mg/L, which represents a big advantage for the environment.

The CBO_5 parameter (Figure 5) represents a measure of organic impurification of residual waters and is the quantity of oxygen (mg/L) needed to oxidize the organic substances through bacteria. Before leachate treatment, the CBO_5 content is significant, decreasing with 307 mg/L, reaching a value of 20 mg/L, a value smaller than the admissible one.

Regarding the heavy metals content of the leachate, from the examples abovementioned it is shown that after treatment the leachate has a lower content, compared to the admissible value. Out of the three examples, the largest content for the untreated leachate belongs to Copper, with a 2319 mg/L content. After treatment, this value decreases with 2.19 mg/L reaching the lowest value, namely 0.2

THE ANNALS OF "DUNAREA DE JOS" UNIVERSITY OF GALATI
FASCICLE IX. METALLURGY AND MATERIALS SCIENCE
N°. 3 - 2018, ISSN 2668-4748; e-ISSN 2668-4756
Article DOI: https://doi.org/10.35219/mms.2018.3.07

mg/L. The content of Zinc and Lead after treatment has also decreased considerably. Thus, the value for Lead decreased with 0.38 mg/L reaching under the admissible value and the Zinc value decreased by 1.64 mg/L.

The leachate is a liquid that cannot be discharged in nature without treatment. Its toxicity is detrimental to the health of the creatures with which it comes into contact, from the infiltration site to where it is spread through the groundwater. The leaching treatment should be based on an optimal solution, considering the actual conditions on the ground, the composition of the leachate, the climatic conditions, the available surface, and the impact of the technology on the environment [10-13].

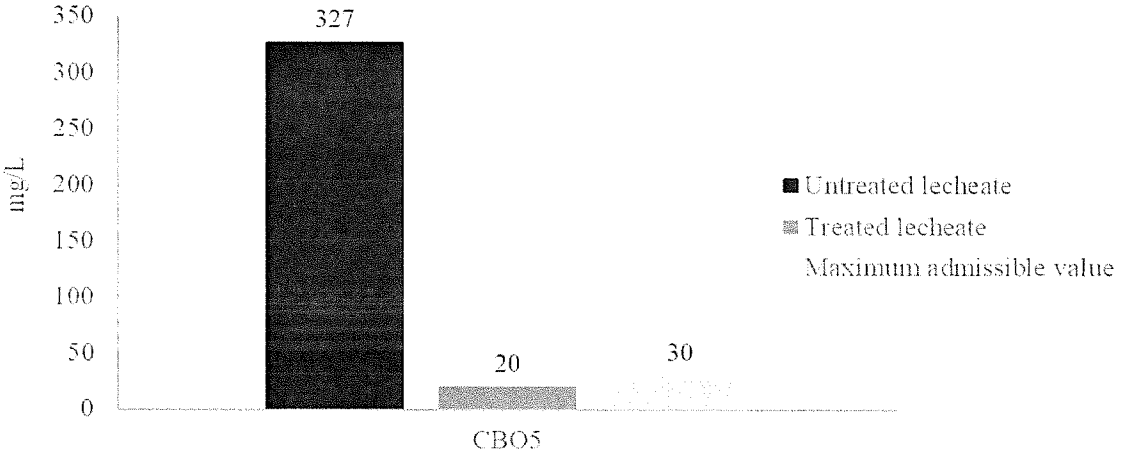


Fig. 5. *Biochemical oxygen consumption value for leachate samples before and after treatment compared to the admissible value*

Following the leachate treatment, it was found that almost all concentrations decreased considerably. For example, concentrations of CBO, total nitrogen, ammoniacal nitrogen, total Cr, Cd, Cu, decreased by over 90%. A major advantage of leachate treatment is that certain substances can be completely removed depending on the nature and quantity of the leachate. For example, Sodium, Potassium, Calcium, Magnesium and Sulphate have been totally removed. Components found in untreated leachate appear after treatment in a lower or no concentration, which proves that the eventual impact after treatment is low. Concentration decreasing rates are different for different chemicals. The readily soluble and biodegradable substances reach the highest maximum concentrations, the moment when reaching the maximum value being closer to the start of the landfill operation.

4. Conclusions

From the beginning of the construction to its closure and even after, a municipal solid waste landfill may have a negative impact on the environment. Firstly, it affects the landscape with visual discomfort and creates new forms of relief by excavation and deforestation. The equipment used for different processes during the landfill construction also has harmful effects on the environment through oil, fuel and even some construction materials. At the same time, the air might be polluted by generating dust and traffic emissions on the site. Also, flora and fauna can be endangered because once the work starts, their habitat can be removed, fragmented or separated. During operation, the landfill might become a favorable habitat for different birds and animal species, considered harmful and dangerous to the community near the deposit. The environment is disturbed by the equipment noise, the mud on the roads, and the smell characteristic of a landfill due to decomposing organic materials.

The main environmental impacts can be attributed to gas emissions and leachate resulting from the storage of waste in landfills, both of which can be managed through engineering. The leachate generated is a major environmental problem, therefore it must be collected and subjected to proper treatment before it is released into the environment or sewage. This study has shown the beneficial effect that a treatment plant can have on the resulting leachate. Excepting the pH, which has been slightly higher than the maximum admissible value, the other values for pollutants that can be found in the leachate corresponded to the norms after the treatment process and thus, it was demonstrated the possibility that this

THE ANNALS OF "DUNAREA DE JOS" UNIVERSITY OF GALATI
FASCICLE IX. METALLURGY AND MATERIALS SCIENCE
N°. 3 - 2018, ISSN 2668-4748; e-ISSN 2668-4756
Article DOI: https://doi.org/10.35219/mms.2018.3.07

liquid could be eliminated directly in nature without the need for further treatment.

On the short term, landfills appear to be the cheapest and easiest option to solve the municipal waste problem, but in the long run they are a huge financial burden. This is due to the need to monitor gas from the storage site and the potential for contamination of nearby land, watercourses and groundwater for several decades after the landfill being disposed of. Taking these drawbacks into consideration, the diminishing utilization of landfills must be seriously taken into consideration in the near future and if used, landfilling should always function in parallel with a recycling program. The declared purpose of the Romanian Ministry of Environment is to stop all landfilling until 2050 and replacing it with performant programs of recycling, the only disposal being permitted in the end only to low quantities of nonrecyclable materials.

References

[1]. ***, http://ec.europa.eu/environment/waste/landfill_index.htm, accessed in 3.03.2016.
[2]. ***, http://www.edurite.com/kbase/advantages-and-disadvantages-of-landfills, accessed in 16.01.2016.
[3]. ***, http://events.awma.org/enviro_edu/fact_sheets, accessed in 3.05.2016.
[4]. ***, http://www.ecotic.ro/wp-content/uploads/2015/11/Studiu-DEEE-Generate-2015.pdf, accessed in 30.04.2016.
[5]. Emma Rawson, *Rotherham GA Living Geography Project My Waste Story (Rotherham)*.
[6]. T.F. Fwa, *Environmental Impact Assessment of Highway Development. The Handbook of Highway Engineering*, Ed. Teylor and Francis, CRC Press, 2005.
[7]. ***, https://www.teachengineering.org/curriculum, accessed in 18.01.2016.
[8]. ***, http://livelifegreen.com/landfills-and-th-environmental-effects/, accessed in 22.04.2016.
[9]. ***, http://www.agir.ro/buletine/910.pdf, accessed in data de 26.06.2016.
[10]. ***, http://documents.tips/documents/levigatul-formare-si-tratare.html, accessed in 26.06.2016.
[11]. ***, https://www.eionet.europa.eu/, accessed in 26.06.2016.
[12]. Francesco Cherubini, Silvia Bargigli, Sergio Ulgiati, *Life cycle assessment (LCA) of waste management strategies: Landfilling, sorting plant and incineration*, Energy, vol. 34, issue 12, p. 2116-2123, 2009.
[13]. ***, http://www.galati.insse.ro/main.php?id=405, accessed in 1.05.2016.

Copyright of Annals of the University Dunarea de Jos of Galati: Fascicle IX, Metallurgy & Materials Science is the property of Dunarea de Jos University of Galati and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Friday, October 23, 2020 9:42 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

H

From: jm_corbett@yahoo.com <jm_corbett@yahoo.com>
Sent: Thursday, October 22, 2020 7:06 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: MS Jamie Michelle Corbett

E-MAIL: jm_corbett@yahoo.com

COMPANY:

ADDRESS: 161 BIG BUCK DR
CLEVELAND TX 77328-5006

PHONE: 8322054118

FAX:

COMMENTS: No one was notified of this!!! This opens everyone up to water well contaminants, air quality, loss of wildlife and more. Not to mention decrease in property values with this backing up to some very expensive homes. This area already has issues with economy and growth this is not needed or helpful. Devaluing the community and not caring about the health issues directly related to and caused by this. Please deny this permit and schedule a hearing, please I have children and already lost one we moved here to get away from polutants and refinery's

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Tuesday, November 17, 2020 9:52 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

H

From: frandamon9@aol.com <frandamon9@aol.com>
Sent: Monday, November 16, 2020 11:30 AM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Frances Damon

E-MAIL: frandamon9@aol.com

COMPANY:

ADDRESS: 9918 BOONE RD
HOUSTON TX 77099-2708

PHONE: 2819338865

FAX:

COMMENTS: I, Francs Damon, 9918 Boone Rd., Houston, Texas 77099, regarding new home on 21435 Doru, Cleveland, Texas 77328 in Peach Creek Plantation, am requesting a contested case hearing against the PC-II, LLC Peach Creek Environmental Park, TCEQ Permit #2406.The entrance to this landfill is 2.5 miles from my backyard which backs up to Peach Creek. Roughly 5 acres are in a floodplain which frequently holds stagnant water. This landfill will pollute Jayhawker Creek that flows into Peach Creek leaving carcinogenic, contaminated water and toxic waste to pool on my property virtually after every heavy rain. Additionally the close proximately will adversely affect the air quality of my

home causing cancer and other respiratory illnesses. Scientific findings prove that living within a 3 mile radius of a landfill is detrimental to one's health. In addition to the physical aspects, this landfill will also take a mental toll. We are investing all our retirement savings into this new home and now find out about this landfill which will devalue my property before the home is even completed. We can never recoup our money. This landfill will prevent us from digging our own water well as the groundwater will soon be contaminated and full of Chromium 6, just like Houston's Alief area where I now live. The public water well is only 4.5 miles from this site and will likewise soon be contaminated. We chose this rural area specifically for its clean air, clean water, and wildlife setting. Now this private, for profit company is being allowed to destroy that. I just don't understand the justification of granting this permit knowing it will devastate so many homeowners. Every large storm and this landfill waste will repeatedly flow downstream all the way to Lake Houston. Studies from the EPA and numerous scientific journals have proven the hazards of such landfill. And, to make matters worse phase 3 and 4 are being planned doubling the size of the landfill. We stand to lose our entire lifetime savings and having our retirement destroyed because of this endeavor. Again, I am respectfully requesting a contested case hearing.

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Wednesday, October 28, 2020 4:22 PM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

PM
H

From: frandamon9@aol.com <frandamon9@aol.com>
Sent: Wednesday, October 28, 2020 4:20 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Fran Elaine Damon

E-MAIL: frandamon9@aol.com

COMPANY:

ADDRESS: 9918 BOONE RD
HOUSTON TX 77099-2708

PHONE: 2819338865

FAX:

COMMENTS: I am vehemently against this landfill application and request a hearing and/or public meeting. I have halted our new home construction.

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Thursday, November 5, 2020 9:18 AM
To: frandamon9@aol.com
Subject: Public comment on Permit Number 2406

Thank you for your comments.

A copy of your email will be forwarded to the Texas Commission on Environmental Quality (TCEQ) staff responsible for reviewing the application. All timely filed comments will be considered by the staff prior to the final decision on the application. You will be added to the mailing list for this application. After the opportunity to submit comments ends, a copy of the formal written response to all timely filed comments will be mailed to you.

The TCEQ appreciates your interest in environmental issues. If you have any further questions, please feel free to contact the Public Education Program staff at 800-687-4040.

Sincerely,
Office of the Chief Clerk

NOTE: Please do not respond to this email; it will not be answered. If you would like to submit additional comments, please use the online eComments system at: https://www.tceq.texas.gov/agency/decisions/cc/comments.html

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Fran Damon

E-MAIL: frandamon9@aol.com

COMPANY:

ADDRESS: 9918 BOONE RD
HOUSTON TX 77099-2708

PHONE: 2819338865

FAX:

COMMENTS: I am building in Peach Creek Plantation. This proposed landfill is not only an environmental nightmare it endangers people's health. I have researched the risk and found that anyone living within 3.10 miles of the dump becomes a health risk, both by air and water. My backyard is 2.5 miles from this dump. The right thing to do is deny this request!

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Thursday, November 5, 2020 9:54 AM
To: frandamon9@aol.com
Subject: Public comment on Permit Number 2406

Thank you for your comments.

A copy of your email will be forwarded to the Texas Commission on Environmental Quality (TCEQ) staff responsible for reviewing the application. All timely filed comments will be considered by the staff prior to the final decision on the application. You will be added to the mailing list for this application. After the opportunity to submit comments ends, a copy of the formal written response to all timely filed comments will be mailed to you. If a decision is made to hold a public meeting, you will receive a hard copy of the public meeting notice in the mail.

All requests for hearings, if timely filed and authorized by statute or rule, are considered by the Commissioners. The Commissioners will consider your request during a regularly scheduled Commission meeting that is open to the public, and a determination will be made as to whether or not the request will be granted. You will be notified in writing when your request is scheduled for consideration. If your request is granted, the matter will be referred to the State Office of Administrative Hearings (SOAH). The SOAH hearing will be a formal, legal proceeding, conducted in a manner similar to civil trials in state district court. While not required, parties are usually represented by legal counsel. In order for an issue to be considered at a contested case hearing, it must have been first raised in a comment or in a request for a contested case hearing during the public comment period by the affected person or group requesting the hearing.

The TCEQ appreciates your interest in environmental issues. If you have any further questions, please feel free to contact the Public Education Program staff at 800-687-4040.

Sincerely,
Office of the Chief Clerk

NOTE: Please do not respond to this email; it will not be answered. If you would like to submit additional comments, please use the online eComments system at: https://www.tceq.texas.gov/agency/decisions/cc/comments.html

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Fran Elaine Damon

E-MAIL: frandamon9@aol.com

COMPANY:

ADDRESS: 9918 BOONE RD
HOUSTON TX 77099-2708

PHONE: 2819338865

FAX:

COMMENTS: I am vehemently against this landfill application and request a hearing and/or public meeting. I have halted our new home construction.

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Monday, November 2, 2020 12:03 PM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

From: frandamon9@aol.com <frandamon9@aol.com>
Sent: Monday, November 2, 2020 10:31 AM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Fran Damon

E-MAIL: frandamon9@aol.com

COMPANY:

ADDRESS: 9918 BOONE RD
HOUSTON TX 77099-2708

PHONE: 2819338865

FAX:

COMMENTS: I am building in Peach Creek Plantation. This proposed landfill is not only an environmental nightmare it endangers people's health. I have researched the risk and found that anyone living within 3.10 miles of the dump becomes a health risk, both by air and water. My backyard is 2.5 miles from this dump. The right thing to do is deny this request!

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Monday, October 26, 2020 9:14 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

From: frandamon9@aol.com <frandamon9@aol.com>
Sent: Saturday, October 24, 2020 10:44 AM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Frances Elaine Damon

E-MAIL: frandamon9@aol.com

COMPANY:

ADDRESS: 9918 BOONE RD
HOUSTON TX 77099-2708

PHONE: 2819338865

FAX:

COMMENTS: We recently purchased and started to build our home at 21435 Doru Dr. Cleveland, Tx. Now I find out that a dump is being planned at the back door. I currently live in the worst zip code in Houston for Chromium 6 in the water. All individual water wells are contaminated....because of an area dump. We purchased the Doru property for the beauty, peace and cleanliness to live out our retirement years, now it is threatened to be destroyed by some private company just for their profit. This dump will devalue our property, contaminate our water, stink and we will never recoup the cost of the home. Had we not already spent so much money, I would go elsewhere. I can't believe that we are spending out

retirement savings for our dream home in a beautiful area which is being destroyed by greed! Do the right thing and deny this application! We are the citizens that work and pay to live here and should come first, especially over a DUMP!

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Friday, October 30, 2020 1:39 PM
To: frandamon9@aol.com
Subject: Public comment on Permit Number 2406

Thank you for your comments.

A copy of your email will be forwarded to the Texas Commission on Environmental Quality (TCEQ) staff responsible for reviewing the application. All timely filed comments will be considered by the staff prior to the final decision on the application. You will be added to the mailing list for this application. After the opportunity to submit comments ends, a copy of the formal written response to all timely filed comments will be mailed to you.

The TCEQ appreciates your interest in environmental issues. If you have any further questions, please feel free to contact the Public Education Program staff at 800-687-4040.

Sincerely,
Office of the Chief Clerk

NOTE: Please do not respond to this email; it will not be answered. If you would like to submit additional comments, please use the online eComments system at: https://www.tceq.texas.gov/agency/decisions/cc/comments.html

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Frances Elaine Damon

E-MAIL: frandamon9@aol.com

COMPANY:

ADDRESS: 9918 BOONE RD
HOUSTON TX 77099-2708

PHONE: 2819338865

FAX:

COMMENTS: We recently purchased and started to build our home at 21435 Doru Dr. Cleveland, Tx. Now I find out that a dump is being planned at the back door. I currently live in the worst zip code in Houston for Chromium 6 in the water. All individual water wells are contaminated....because of an area dump. We purchased the Doru property for the beauty, peace and cleanliness to live out our retirement years, now it is threatened to be destroyed by some private company just for their profit. This dump will devalue our property, contaminate our water, stink and we will never recoup the cost of the home. Had we not already spent so much money, I would go elsewhere. I can't believe that we are spending out retirement savings for our dream home in a beautiful area which is being destroyed by greed! Do the right thing and deny this application! We are the citizens that work and pay to live here and should come first, especially over a DUMP!

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Wednesday, November 18, 2020 11:25 AM
To: frandamon9@aol.com
Subject: Public comment on Permit Number 2406

Thank you for your comments.

A copy of your email will be forwarded to the Texas Commission on Environmental Quality (TCEQ) staff responsible for reviewing the application. All timely filed comments will be considered by the staff prior to the final decision on the application. You will be added to the mailing list for this application. After the opportunity to submit comments ends, a copy of the formal written response to all timely filed comments will be mailed to you.

All requests for hearings, if timely filed and authorized by statute or rule, are considered by the Commissioners. The Commissioners will consider your request during a regularly scheduled Commission meeting that is open to the public, and a determination will be made as to whether or not the request will be granted. You will be notified in writing when your request is scheduled for consideration. If your request is granted, the matter will be referred to the State Office of Administrative Hearings (SOAH). The SOAH hearing will be a formal, legal proceeding, conducted in a manner similar to civil trials in state district court. While not required, parties are usually represented by legal counsel. In order for an issue to be considered at a contested case hearing, it must have been first raised in a comment or in a request for a contested case hearing during the public comment period by the affected person or group requesting the hearing.

The TCEQ appreciates your interest in environmental issues. If you have any further questions, please feel free to contact the Public Education Program staff at 800-687-4040.

Sincerely,
Office of the Chief Clerk

NOTE: Please do not respond to this email; it will not be answered. If you would like to submit additional comments, please use the online eComments system at: https://www.tceq.texas.gov/agency/decisions/cc/comments.html

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Frances Damon

E-MAIL: frandamon9@aol.com

COMPANY:

ADDRESS: 9918 BOONE RD
HOUSTON TX 77099-2708

PHONE: 2819338865

FAX:

COMMENTS: I, Francs Damon, 9918 Boone Rd., Houston, Texas 77099, regarding new home on 21435 Doru, Cleveland, Texas 77328 in Peach Creek Plantation, am requesting a contested case hearing against the PC-II, LLC Peach Creek Environmental Park, TCEQ Permit #2406.The entrance to this landfill is 2.5 miles from my backyard which backs up to Peach Creek. Roughly 5 acres are in a floodplain which frequently holds stagnant water. This landfill will pollute Jayhawker Creek that flows into Peach Creek leaving carcinogenic, contaminated water and toxic waste to pool on my property virtually after every heavy rain. Additionally the close proximately will adversely affect the air quality of my home causing cancer and other respiratory illnesses. Scientific findings prove that living within a 3 mile radius of a landfill is detrimental to one's health. In addition to the physical aspects, this landfill will also take a mental toll. We are investing all our retirement savings into this new home and now find out about this landfill which will devalue my property before the home is even completed. We can never recoup our money. This landfill will prevent us from digging our own water well as the groundwater will soon be contaminated and full of Chromium 6, just like Houston's Alief area where I now live. The public water well is only 4.5 miles from this site and will likewise soon be contaminated. We chose this rural area specifically for its clean air, clean water, and wildlife setting. Now this private, for profit company is being allowed to destroy that. I just don't understand the justification of granting this permit knowing it will devastate so many homeowners. Every large storm and this landfill waste will repeatedly flow downstream all the way to Lake Houston. Studies from the EPA and numerous scientific journals have proven the hazards of such landfill. And, to make matters worse phase 3 and 4 are being planned doubling the size of the landfill. We stand to lose our entire lifetime savings and having our retirement destroyed because of this endeavor. Again, I am respectfully requesting a contested case hearing.

lisa Guerra

'om: PUBCOMMENT-OCC
ent: Monday, November 9, 2020 8:31 AM
o: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
ubject: FW: Public comment on Permit Number 2406

om: gjzfausett@aol.com <gjzfausett@aol.com>
ent: Friday, November 6, 2020 4:23 PM
o: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
ubject: Public comment on Permit Number 2406

EGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

N NUMBER: RN110843042

ERMIT NUMBER: 2406

OCKET NUMBER:

OUNTY: SAN JACINTO

INCIPAL NAME: PC-II LLC

J NUMBER: CN605694611

OM

AME: MR Jeffry J Fausett

MAIL: gjzfausett@aol.com

OMPANY:

DDRESS: 4002 LEE TURNER RD
EVELAND TX 77328-5982

ONE: 7132480327

X:

OMMENTS: Jeff Fausett 4002 lee turner rd Cleveland Tx 77328 713-248-0327 RN Number Regulated Entity Name unty Location Role Details RN110843042 PEACH CREEK ENVIRONMENTAL PARK SAN JACINTO INTERSEC OF FM 1725 & STORIA TRAM RD S 1.9 MI ON FOSTORIA TRAM RD TO JAYHAWKER RD W APPROX 0.7 MI TO RAJACK RD N 0.3 MI TO CILITY ENTRANCE RD OWNER OPERATOR Affiliation Info My property is under 1 mile from this proposed site. It will versely effect my water quality for my 2 homes using ground well water. There is no alternative to a water source thin the area. It is also a managed registered Texas tree farm this facility would effect the wildlife and vegetation in

the surrounding area. The Red-cockaded Woodpecker (Picoides borealis) has been spotted in this area which is listed as endangered ref (31 TAC §65.176). Also several hawks that are threatened ref 31 TAC §65.175State-Listed Threatened Species in Texas. Assessed land values will be adversely effected due to the proximity, aromatic pollution and poor to contaminated water quality. Area roads with be adversely effected as current road conditions require extensive repair to handle increase in vehicle weight and traffic. I request a contested case hearing.

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Monday, November 16, 2020 8:59 AM
To: gjzfausett@aol.com
Subject: Public comment on Permit Number 2406

Thank you for your comments.

A copy of your email will be forwarded to the Texas Commission on Environmental Quality (TCEQ) staff responsible for reviewing the application. All timely filed comments will be considered by the staff prior to the final decision on the application. You will be added to the mailing list for this application. After the opportunity to submit comments ends, a copy of the formal written response to all timely filed comments will be mailed to you.

All requests for hearings, if timely filed and authorized by statute or rule, are considered by the Commissioners. The Commissioners will consider your request during a regularly scheduled Commission meeting that is open to the public, and a determination will be made as to whether or not the request will be granted. You will be notified in writing when your request is scheduled for consideration. If your request is granted, the matter will be referred to the State Office of Administrative Hearings (SOAH). The SOAH hearing will be a formal, legal proceeding, conducted in a manner similar to civil trials in state district court. While not required, parties are usually represented by legal counsel. In order for an issue to be considered at a contested case hearing, it must have been first raised in a comment or in a request for a contested case hearing during the public comment period by the affected person or group requesting the hearing.

The TCEQ appreciates your interest in environmental issues. If you have any further questions, please feel free to contact the Public Education Program staff at 800-687-4040.

Sincerely,
Office of the Chief Clerk

NOTE: Please do not respond to this email; it will not be answered. If you would like to submit additional comments, please use the online eComments system at: https://www.tceq.texas.gov/agency/decisions/cc/comments.html

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: MR Jeffry J Fausett

E-MAIL: gjzfausett@aol.com

COMPANY:

ADDRESS: 4002 LEE TURNER RD
CLEVELAND TX 77328-5982

PHONE: 7132480327

FAX:

COMMENTS: Jeff Fausett 4002 lee turner rd Cleveland Tx 77328 713-248-0327 RN Number Regulated Entity Name County Location Role Details RN110843042 PEACH CREEK ENVIRONMENTAL PARK SAN JACINTO INTERSEC OF FM 1725 & FOSTORIA TRAM RD S 1.9 MI ON FOSTORIA TRAM RD TO JAYHAWKER RD W APPROX 0.7 MI TO RAJACK RD N 0.3 MI TO FACILITY ENTRANCE RD OWNER OPERATOR Affiliation Info My property is under 1 mile from this proposed site. It will adversely effect my water quality for my 2 homes using ground well water. There is no alternative to a water source within the area. It is also a managed registered Texas tree farm this facility would effect the wildlife and vegetation in the surrounding area. The Red-cockaded Woodpecker (Picoides borealis) has been spotted in this area which is listed as endangered ref (31 TAC §65.176). Also several hawks that are threatened ref 31 TAC §65.175State-Listed Threatened Species in Texas. Assessed land values will be adversely effected due to the proximity, aromatic pollution and poor to contaminated water quality. Area roads with be adversely effected as current road conditions require extensive repair to handle increase in vehicle weight and traffic. I request a contested case hearing.

Law Office of Bryan French, PLLC
P.O. Box 4191 Pirates Beach
Galveston, Texas 77554
(409) 599-3234
bfrenchelcs@earthlink.net

MSW
117709

September 27, 2021

REVIEWED
OCT 08 2021
By ECW

CHIEF CLERKS OFFICE
2021 OCT -7 PM 2:44
TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Ms. Laurie Gharis
Chief Clerk
Texas Commission on Environmental Quality
Mail Code 105
P.O. Box 13087
Austin, Texas 78711-3087
By Certified U.S. Mail and Email: www14.tceq.texas.gov/epic/eComment/

Re: Comments, Objections and Request for Contested Case Hearing Regarding Peach Creek Environmental, LLC's, Proposed Municipal Solid Waste Permit Application No. 2406

Dear Ms. Gharis:

My firm respectfully submits these comments and requests a contested case hearing on behalf of Wood Duck Farms, LLC (WDF) who will be adversely affected by the proposed Peach Creek Environmental Park Type I landfill. Numerous problems with the proposed landfill's geography exist. Further, much of the material presented online is incomplete and presented in a scattershot manner that renders evaluation of the Application difficult. Because the Application is incomplete and riddled with deficiencies, Texas Municipal Solid Waste Permit No. 2406 (the Permit) for the proposed landfill located just off the intersection of Jayhawker and Rajack roads in San Jacinto County, Texas 78287 should be denied.

The materials included in these comments to TCEQ, specifically references to comments submitted by H.C. Clark to TCEQ, cited below, establish a clear causal relationship between geology and likely violations of the Teas Administrative Code (TAC). These violations include but are not limited to undetected leakages of contaminated landfill leachate into groundwater and contaminated runoff into surface waters. The Clark comments clearly identify the difficulty of monitoring groundwater for any leakage and the potential for contaminated leachates to enter the ground water via the gravel layer found in the geologic substrate, and hence into nearby wells on

adjacent properties. Here, groundwater contamination would likely render WDF defunct,[1] yet these are not the only problematic issues with this Application concerning water.

Existing drainage patters will be altered by the landfill, and an examination of the relevant topography shows that construction of the landfill access road to Rajack Road—glaringly absent from the permit application—will affect wetlands and certainly impound water on WDF causing flooding and economic loss. Additionally, any accidental or deliberate discharges of landfill leachate will flow into Jayhawker Creek then to Peach Creek and ultimately Lake Houston. Likewise, any rainfall runoff containing landfill contaminates—and worse leachates in general—will also be distributed downstream, transported by natural processes into Lake Houston, the primary water supply for the City of Houston, Texas. Contaminated runoff will degrade both water quality and aquatic life while adversely impacting the livelihood and health of those who are dependent on this watershed for income, recreational purposes and drinking water while simultaneously impairing the remarkable aesthetic quality of the area, including the adjacent National Forest. This subsequent degradation of drinking water quality surface waters will cause economic and aesthetic loss and must be avoided.

WDF's WRITTEN COMMENTS IN OPPOSITION TO PCE's PROPOSED LANDFILL AND REQUEST FOR A CONTESTED CASE HEARING

Because of these and other identified contested issues of law and fact enunciated below, WDF objects to MSW Permit No. 2406. Currently, WDF has identified a multiplicity of likely violations of 30 Texas Administrative Code §330, as well as some applicable federal laws related to this MSW Permit, the most serious of which ask if this permit compliant with:

A. TCEQ rule 330.61(h) that requires permit Applicants show that a proposed landfill be compatible with neighboring land uses, given this Application proposes to site a landfill directly nest to a National Forest, and a working produce farm.

B. TAC water pollution prohibitions found in §330.55 that require MSW facilities to not cause groundwater pollution, given the likely leakage of leachate into groundwater; the difficulty of monitoring for contaminants due to presence of a permeable gravel layer in the geologic stratum that is the uppermost aquifer boundary, and the Applications use of unlined detention ponds above the uppermost aquifer.

[1] Wood Duck Farms sells produce from the farm on site, at local farmer's markets and to area restauraunts, whose buyers visit the farm and are familiar with the owner and site where the produce is grown.

C. TAC §330.305(a), Additional Surface Water Drainage Requirements for Landfills and the requirement that existing or permitted drainage patterns must not be adversely altered, given the proposed landfill location immediately adjacent to an established floodplain, and the proposed construction of the landfill access road across wetlands that will impound water on upstream neighboring properties, as well as the landfill boundary.

D. TAC rule §330.303(a) and whether this Application is compliant with the 25-year flooding surface water drainage requirement prohibiting the off-site discharge of waste and feedstock material, given the well-documented increase in both rainfall volume and frequency, and concert with the Application's inconsistent use of rainfall data leading to erroneous flooding calculations.

E. TAC §330.153 regarding Site Access Roads, given the proposed access road location and the fact that the access road neither exists nor is included in this Application; that construction of the access road will necessarily require elevation not considered in the drainage analysis of the Application; that the existing public roads are wholly unsuitable for the heavy truck traffic proposed by this Application; as well as the mandates under §330.153(a) and (b) that the roads be "all weather roads;" and that dust from on-site roadways and other access roadways must not become a nuisance to surrounding areas.

F. 16 U. S. Code Sections 1531 thru 1544, also known as the Endangered Species Act, and whether the Application will violate prohibitions against taking, given the known presence of Red Cockaded Woodpeckers in the adjacent Sam Houston National Forest, and other assorted endangered species such as Timber Rattlesnakes, Louisiana Pine snakes and Houston Toads and the Application's plans to remove any threatened or endangered species from the project area without a required habitat conservation plan.

G. TAC rule §330.129 that requires MSW Applications provide a fire protection plan, given this Application's lack of a specific fire protection plan, and the heightened importance of such a plan at the proposed location.

H. TAC rule §330.139 mandating that MSW facilities properly manage windblown solid waste and litter, given the scant information included in the Application regarding how this important requirement will be performed.

I. TAC §330.159, regulating landfill gas control, and whether the Application is compliant with this mandate, given the absence of any triggering mechanisms regarding when such measures will be implemented and the precise means how landfill gas will be controlled.

J. TAC §330.15(a)(2), that prohibits the creation of nuisance conditions, given the Application's failure to include how nuisance behavior by vermin and other wild animals will be prevented, given that landfills remain notorious for attracting nuisance animals like seagulls, rats, and other scavengers as well as destructive insects, that stand to destroy WDF's produce.

Based upon the numerous deficiencies raised in these comments, WDF sole proprietor, Mr. Van Weldon, who may be reached at 270 Pine Valley Road, Cleveland, Texas 77328, requests that the above referenced Application be returned to the Applicant, Peach Creek Environmental Park, LLC for failure to submit a technically complete application, or in the alternative, requests a contested case hearing to resolve the disputed issues of fact and law.

I.

INTRODUCTION AND STANDING

Peach Creek Environmental, LLC (PCE) has applied to the TCEQ for a permit to operate a Type I Municipal Solid Waste facility on 636 acres of land to be accessed from Rajack Road via Jayhawker Road in San Jacinto County, Texas. Significantly the proposed landfill is immediately adjacent to WDF, as well as the Sam Houston National Forest.[2] TCEQ received PCE's initial Application on August 28, 2019 and published notice of Intent to Receive Permit (NORI) on February 10, 2021. The Commissioners have scheduled a virtual public meeting for September 28, 2021.

WDF Has Standing to Obtain a Contested Case Hearing

WDF has the requisite standing necessary to obtain a contested case hearing. Under Texas Code, standing to receive a contested case hearing for an individual is governed by Chapter 55 §55.251(a), and an affected person, when authorized by law may do so. Here, under §55.251(c), an affected person may request a contested case hearing but only if the request substantially complies with the following:

> "(1) give the name, address, and daytime telephone number of the person... who files the request.
>
> (2) identify the person's justiciable interest affected by the application, including a brief, but specific, written statement explaining in plain language the requesters location, and distance relative to the activity that is the subject of the application and how and why the requestor believes he or she will be affected by the activity in a manner not common to members of the public."[3]

---

[2] Peach Creek Environmental Park TCEQ MSW Permit No. 2406 Rev. 3, April 30, 2021, Solid Waste Permit Application Parts - I, & II, San Jacinto County, Texas, Summary of Technical Report p. 2.
[3] TAC §55.251(c).

WDF's JUSTICIABLE INTEREST AFFECTED BY THIS APPLICATION

Mr. Van Weldon, sole proprietor of Wood Duck Farms, LLC, has standing to request a contested case hearing because his economic interests affected by this application are not common to the general public. As a general proposition, to have standing a person or entity must show (1) injury in fact, (2) a causal relationship between the activity complained of and injury in fact, and (3) that the injury can be redressed by the matter pending before the court. In this case, the injury has not occurred. However, it is the potential for injury in fact and a causal relationship with the matter pending before the commission that is the basis for standing in a contested case context. Not only does WDF aver such injury in fact and causal relationship, proof of such likely injury and causal relationship is set forth in these comments. Such proof will be offered in live testimony if necessary in order to perfect a claim of standing.

As explained further below, WDF possesses standing to request a contested case hearing because of a justiciable interest in the preservation of water and air quality as well as general aesthetics relative to the proposed landfill's location immediately next to the farm. Specifically, WDF's concerns relate to the great potential for PCE to significantly degrade the groundwater quality upon which the farm is dependent, impair natural drainage patterns and as a consequence flood the farm via the impoundment the surface water caused by the construction of an access road—conspicuously absent from this permit application, degrade surface water quality via leachate runoff and drainage, impair the quality of produce by the deposition of the inevitable landfill dust carrying contaminants, attract nuisance animals that damage produce, in addition to irreparably damaging the bucolic nature of the farm with heavy truck traffic, landfill odors, as well as windblown dust and plastic debris, all under the growing shadow of what has already been dubbed "Mount Trashmore" by local children.

Background

Van Weldon purchased the first of approximately four tracts that now compose the 165 acres he transformed into WDF beginning around 1994. Shortly thereafter he relocated and restored a 1912 school house to serve as the farm's focal point. The farm's initial success led to a series of expansions around 2008 (approximately 47 acres), again around 2012 (approximately 55 acres) and finally around 2018 (approximately 19 acres). In an effort to expand the farm's business and educate the community about food and the importance of locally sourced food, WDF opened to the public on weekends during October and November of 2013, a tradition that continues today.

On these weekends, visitors learn about food and where it comes from, while enjoying hayrides, a sorghum maze, zip lines and other activities for children.[4]

Ironically, the seller accommodating the WDF expansions was none other than PC-II, the Mississippi investment group that is the parent company of Peach Creek Environmental, the Applicant. To describe Mr. Weldon as disappointed after he learned of PC-II's plans for the landfill, remains an understatement, not only because of the obvious threat posed by landfill to his investment and livelihood, but also because landfills are to rural residents what strip centers that house pawnshops, adult bookstores, and liquor stores are to suburban residents. Meanwhile, WDF, nestled deep in the verdant and unspoiled gently rolling piney woods about an hour north of Houston, remains a perfect and pastoral location for a vegetable farm. **See Figure 1 below.**

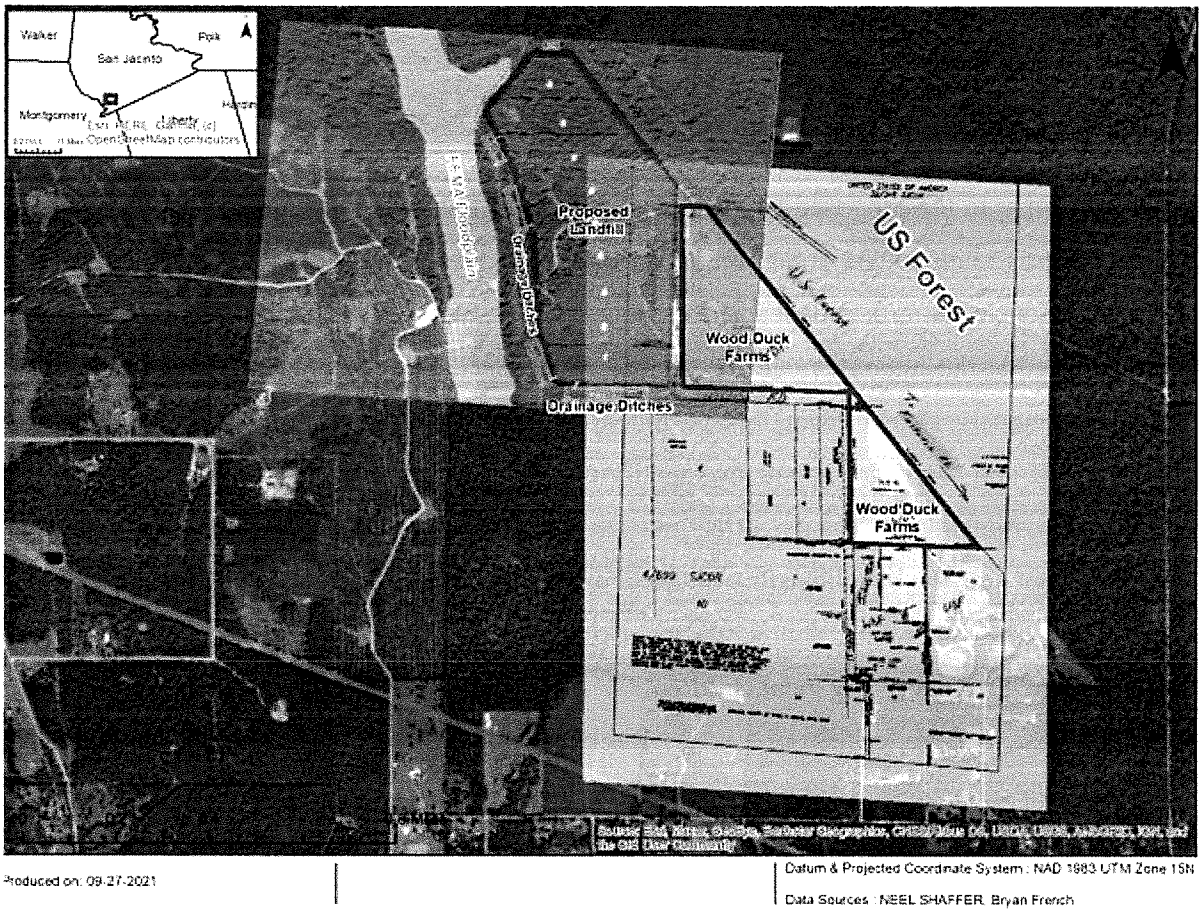


Figure 1. Survey of Wood Duck Farms shown on right as overlaid on map of PCE landfill showing proposed landfill cells between FEMA floodplain and Wood Duck Farms. Note Access road is not shown outside of Permit Boundary.

[4] Wood Duck Farm Festival, Citizens Environmental Coalition, October 19, 2013. https://cechouston.org/event/wood-duck-farm-festival-2/ Last Visited 8/17/2021.

Over the last 22 years Mr. Weldon invested his sweat equity in this property by improving and tending the land growing four seasons of fresh produce, and raising hogs, all of which are consumed in the Houston area. Currently, for instance, during the cooler fall and winter months, kale, broccoli, cauliflower, cabbage, carrots and strawberries are grown, while during the warmer spring and summer months, sweet corn, onions, arugula, tomatoes, green beans, peppers, melons and recently blueberries are produced. In addition to supplying locally sourced produce to the Whole Foods, WDF participates in farmer's markets, sells fresh produce to numerous Houston Area restaurants and raises enough food to feed about 300 Houston area families weekly.[5] Moreover, the farm has embraced an educational component for the community, while adapting to ever present changes in our world.

One such change, increased local rainfall, has complicated life for everyone in the greater Houston area and WDF is not immune to this climate change driven phenomenon. As recently as 2019, Tropical Storm Imelda deposited 22 inches of rain on the farm in 24 hours, and just earlier this year WDF received 4.5 inches of rain in two hours meaning that rapid drainage after large rain events is and will be vital to the sustainability and viability of the farm. Yet construction of the proposed access road to the landfill—only about 5 feet from WDF's western game fence—will impair natural drainage patterns. In short, PCE's proposed landfill threatens 22 years of financial investment and sweat equity in WDF and, therefore WDF satisfies the affected person requirement of TAC §55.251(c).

II.

Applicable Legal Standards

Title 30 Texas Administrative Code Chapter 330 governs TCEQ procedures to implement and regulate Municipal Solid Waste. Chapter 330 includes mandates intended to protect groundwater, and surface waters of the state of Texas as well as aquifers, in addition to prohibitions on landfill operations in certain areas as well as creating and maintaining a nuisance.

[5] Growing Awareness: Farmer opens up to the public. Kyle O'Conner, Houston Chronicle Sept. 24, 2013 https://www.houstonchronicle.com/life/columnists/oconnor/article/Growing-awareness-Farmer-opens-up-to-the-public-4840297.php Last Visited 8/17/2021.

III.

GENERAL COMMENTS AND OBJECTIONS

A. PCE's Application Violates TCEQ Rule 330.61(h) and Fails to Show that Proposed Landfill Is Compatible with Neighboring Land Uses.

1. Approval of PCE's Incomplete Application Sets a Terrible Precedent.

PCE's Application remains incomplete and virtually ignores the TCEQ requirement that the proposed facility is compatible with surrounding land use. This is readily apparent when (1) one considers the fact that the landfill is immediately next door to the Sam Houston National Forest, the virtual antithesis of a landfill, (2) no plans exist in the Application for the approximately one mile access road necessary to connect the landfill with local roads and how it will comply with TCEQ rules, (3) mitigation plans for the access road are not included in the Application, and (4) the vast number of boxes left incomplete on latest version of the TCEQ MSW Application checklist demonstrably show the Application remains woefully incomplete. The Application should be returned to the Applicant until such time as the Executive Director finds the Application technically complete for public comment. For example, no field survey for endangered species has been performed and no species protection mitigation plan has been formulated, despite the recommendation of Texas Parks and Wildlife Department.[6]

2. PCE's Application Fails to Show the Landfill is Compatible with Neighboring Land Uses.

TAC 330.61(h) requires that the Applicant demonstrate that a proposed landfill is compatible with neighboring land uses, however PCE's Application remains premised on fatally flawed assumptions and does not recognize the adverse impacts of this facility on nearby properties. Although the Application does mention the site is immediately adjacent to a working produce farm in a predominantly rural area, it fails to fully characterize current land uses within one mile of the site the affected area and worse provides no evidence that the facility is compatible

[6] Response Letter from Rachel Lange, Wildlife Habitat Assessment Program, Texas Parks and Wildlife Department to Matthew Udenenwu, MSW Permits Section TCEQ regarding TCEQ permit 2406, TPWD 45827.msg. dated January 25, 2021.

with local land use or the Sam Houston National Forest next door.[7] The dichotomy between the pastoral, almost spiritual nature of a natural forest juxtaposed against the image of a towering 160 foot tall mound of refuse, reeking of noxious odors, and inflicting plastic debris, dust, and noise, while attracting vermin to the neighborhood is startling and the obvious disparity in land use is more than noticeable, it is hard to ignore.

(a) PCE landfill incompatible next to a produce farm, National Forest and FEMA floodplain.

Location it is often said, is everything and should be afforded additional consideration in this MSW Application given the proposed landfill site is immediately adjacent to a produce farm, and a national forest, both of which will share a common border with the landfill along their southern and south-western edge of the landfill property. To the north of the project is the Sam Houston National Forest (the forest), established in 1934, one of only four National Forests in the State of Texas.[8] The forest encompasses approximately 163,037 acres of verdant wilderness interspaced with private properties that remains home to many popular game species and a sanctuary for endangered species, among them the Bald Eagle, and Red-Cockaded Woodpecker. Over 128 miles of hiking trails, open to the public, wind beside the lakes and ponds amongst the rivers, creeks and streams that meander through and around the multi-use forest.[9] This veritable green cathedral of loblolly and shortleaf pines that characterizes the forest ridges, is also home to a diverse population of deciduous hardwoods found along water bodies located in the bottomlands.[10] In fact, the Texas Health and Safety Code, contains a prohibition against landfills located in National Forest §361.123, and although this proposed landfill is not actually in the Sam Houston National Forest per se, the boundary line is an artificial property line and they are one and the same and approval of this permit would violate the intent of the statute.[11]

---

[7] Peach Creek Environmental Park TCEQ MSW Permit No. 2406 Rev. 3, April 30, 2021, Solid Waste Permit Application Parts - I, & II, San Jacinto County, Texas, Summary of Technical Report p. 8.

[8] National Forest and Grasslands in Texas Fact Sheet https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd531949.pdf Last Visited 8/17/2021.

[9] National Forests and Grass lands in Texas Sam Houston National Forest, USDA, United States Department of Agriculture. https://www.fs.usda.gov/detail/texas/about-forest/districts/?cid=fswdev3_008443 Last Visited 8/17/2021.

[10] National Forests and Grass lands in Texas Sam Houston National Forest, USDA, United States Department of Agriculture. https://www.fs.usda.gov/detail/texas/about-forest/districts/?cid=fswdev3_008443 Last Visited 8/17/2021.

[11] TAC §361.123.

(b) Significant opposition exists from municipalities, county officials, nearby property owners and residents including the Sam Houston National Forest

It is important for TCEQ to note that one barometer of compatibility with local land uses is support for—or in this case significant opposition against—this landfill. Even at this early stage in the permitting process over 1,100 comments have been submitted to TCEQ that object to this Application. Those concerned or opposed to this landfill include but are not limited to the Cities of Cleveland, Shepard, Houston, the U. S. National Park Service, US Congresswomen Sheila Jackson Lee, some San Jacinto County Commissioners, the Serra Club, and the San Jacinto County Farm Bureau among others. To date, over 3,986 individuals have signed a petition opposing this Application. It is important that TCEQ understand that those opposed to the landfill are not only concerned with the physical presence of the landfill and its adverse impact on the environment and human health but also that PCE's Type I MSW landfill Application, remains silent as to future plans except that there is a planned future expansion. This remains troublesome for those who fear that a future operator may apply for an amendment that would allow acceptance of hazardous waste, specifically highly profitable, but highly toxic coal ash, given the profit margin associated with acceptance of hazardous waste. Such an amendment remains even more problematic given site's underlying geology, in conjunction with the proposed landfill's proximity to the 100-year floodplain—one that is expected to expand once updated maps reflecting increased local rainfall become available. Of course, the Applicant could ameliorate these concerns by signing, and requiring a future operator to sign a binding statement that guarantees the Operator will not attempt to accept Class I waste in the future.

(c) PCE landfill will irreparably damage local aesthetics

PCE fails to adequately describe their proposed landfill and its impact on the surrounding area, as required by Texas Rule §330.61, which requires landfill applicants to describe the proposed landfill's "impact on surrounding area." Specifically, the Application fails to account for and describe PCE's impact as mandated under §330.61(H)(4) that the applicant include "sites with exceptional aesthetic quality, etc."[12] Here, PCE proposes to build and operate a landfill immediately next door to the Sam Houston National Forest, itself a living definition of

[12] TAC §330.61(h).

exceptionally high aesthetic values. Simply put, a landfill at this location irreparably damages the area's high aesthetic value.

This landfill if permitted, in addition to looming over the landscape, will increase and encourage unsightly litter and dumping due to the rural location and nature of the facility. In the nearby Sam Houston National Forest, illegal dumping remains a problematic issue and an adjacent landfill will only exacerbate the problem.[13] Furthermore, there is a certain amount of unsecured plastic and paper debris that will be blown from garbage trucks and other vehicles that transport waste to the facility. Finally, the landfill will operate and exist for decades towering 179 feet above the landscape—as high as a 16-story building—degrading the natural aesthetics of the area, and providing a vehicle for dust, debris and odors able to bypass any barrier erected to obscure the facility.[14]

Texans have long recognized the value and public benefit of undisturbed natural lands–as well as their associated watersheds and rivers—as valuable natural resources, increasingly utilized and enjoyed for commercial, recreational and aesthetic purposes. The Sam Houston National Forest in particular remains an impressive living treasure just north of the Houston area metropolis at the intersection of the State's famous East Piney Woods and the Coastal Plain.

(d) PCE's Landfill will diminish nearby property values

One final final issue related to PCE's proposed landfill and its compatibility with current neighboring land uses remains that of diminished property values. Without belaboring the obvious, landfills are not typically associated with an increased value of adjoining properties. Rather, research has confirmed that large landfill operations markedly diminish property values in direct proportion to the distance of the property location from the landfill.[15] In this instance, TCEQ's approval of this landfill will adversely impact nearby residential homesteads and communities through the diminution of property values. Further, it is more probable than not that

---

[13] *Illegal Dumping Called 'Epidemic' at Sam Houston National Forest*, Jose Gonzales, Houston Chronicle July 10, 2019, https://www.houstonchronicle.com/news/houston-texas/houston/article/Illegal-dumping-called-epidemic-at-Sam-14086195.php Last Visited 8/24/2021.

[14] Peach Creek Environmental Park TCEQ MSW Permit No. 2406 Rev. 0 08/27/2020 Parts III & IV, Attachment A at A2.

[15] Ready, Richard C. *Do Landfills Always Depress Nearby Property Values?* Rural Development Paper No. 7 The Northeast Regional Center for Rural Development Penn State University, (2005), at 18. http://www.cas.nercrd.psu.edu Last Visited 9/24/2021.

this landfill will adversely impact development, particularly residential development making it less likely in the surrounding area.

A study conducted by Penn State University in 2005 found that while not all landfills diminish property values, large "high volume" landfills—those accepting more than 500 tons of waste per day or more—adversely affect neighboring property values, lending credence to decades of complaints regarding landfill operations and their detrimental impact on the value of nearby properties. By this measure, PCE's proposed landfill will qualify as a high-volume landfill because the Application represents that PCE intends to receive 1,300 tons per of waste material per day.[16]

This study went further and actually calculated the diminished value of properties for both high volume and low volume landfills finding that: "On average, a high-volume landfill will depress the value of an adjacent property by 12.9%. This impact decreases with distance from the landfill at a gradient of 5.9% per mile. A low-volume landfill will depress the value of an adjacent property by only 2.5%, on average, with a gradient of 1.2% per mile."[17] Based on these metrics, and because PCE proposes to operate a high-volume landfill, local property values can be expected to decrease in direct relation to their proximity to the landfill. Of course, Van Weldon's property value as a vegetable farm will be virtually zero. Accordingly, WDF's property value will be adversely impacted the most along with other nearby neighboring properties.

Other than not being compatible with neighboring land uses, many problematic issues are raised by this Application, and the issue of the proposed site's subsurface geology remains one of critical importance. Here, the Application has not shown that the geology of the landfill contains soils that are sufficiently protective of groundwater and the underlying aquifer as required by subchapters H, J, and M of Chapter 330 TAC.

B. PCE Has Not Sufficiently Characterized and Addressed Subsurface Geology and Hydrology at the Site and Endangers Groundwater with Pollution,

The investigation and characterization of the subsurface geology performed by PCE is deficient, and the Application has not adequately characterized the hydrology of the groundwater

---

[16] Peach Creek Environmental Park TCEQ MSW Permit No. 2406, August 19, 2019, Solid Waste Permit Application Parts - I, & II, San Jacinto County, Texas, Summary of Technical Report p. 1.

[17] Ready, Richard C. *Do Landfills Always Depress Nearby Property Values?* Rural Development Paper No. 7 The Northeast Regional Center for Rural Development Penn State University, (2005), at 18.

and presence of groundwater at the site. Here, the proposed facility will pose a danger to groundwater that PCE has not adequately addressed as required under TAC §330.55(b).

1. PCE fails to account for gravel layer beneath proposed site.

Groundwater and aquifer protection remain of paramount importance to TCEQ and Texas residents as evidenced by TAC Chapter 330, Subchapters H and J, which addresses liner system design and operation as well as groundwater monitoring and corrective action respectively. In this instance, the underlying geology of the landfill raises several problematic issues specific to groundwater and monitoring, all of which arise due to the presence of a gravel layer immediately beneath the proposed landfill as identified in the permit Application Part III and IV.[18] Specifically the gravel layer raises the issue of whether this site's groundwater can ever be effectively monitored. Here, the gravel layer effectively controls the hydrology of the uppermost aquifer at the site. In turn, this is also the aquifer of concern and in this instance, the aquifer to be monitored due to its location directly beneath the proposed landfill and is the aquifer identified as the uppermost aquifer for purposes of groundwater monitoring.

The gravel layer forms the pervasive layer of Stratum II and it effectively "daylights" at Jayhawker Creek as shown on the maps and sections included in the Application. Because as Dr. H.C. Clark notes in his comments, this aquifer is "apparently unconfined," with a water table or potentiometric surface that appears to join Jayhawker Creek and hence, this aquifer serves as the creek's base flow.[19] The landfill location above this gravel layer imposes a hydrologic limitation and consequent legal limitation on the type of waste that may be accepted by PCE. The Texas Administrative Code wisely contains statutory restrictions that prohibit the acceptance of hazardous waste at such sites.[20] This Application and permit should expressly state that hazardous waste will never be acceptable at this landfill. Yet, as identified below, additional concerns present themselves due to this gravel layer.

---

[18] Peach Creek Environmental TCEQ MSW Permit No. 2406 Parts III & IV, August 8, 2020 Solid Waste Application, at E3.2; and Rev. 1 Dec. 11, 2020 at Appendix E3-5, and E3-6.
[19] Comments of Dr. H.C. Clark to TCEQ regarding MSW Permit Application Submitted August 13, 2021; and Citation from application with Map.
[20] TAC §335.204(e)(4)(5).

2. Groundwater monitoring system is inadequate because it fails to account for the permeable layer of gravel beneath the site.

As previously mentioned, a significant gravel layer lies directly below the landfill and its containment layers. This remains problematic as the upper stratum of sand and clays will be excavated for the landfill itself, leaving only a thin layer between the landfill cells, their liners and the underlying gravel. Because gravel has a higher hydraulic conductivity than sand and other materials, any leaks will literally race through the gravel layer and move downgradient.[21] Moreover, according to Dr. H.C. Clark, once the contaminated leachate reaches the gravel layer it will likely not have time to disperse, as it would in sand or other soils, but rather will quickly travel through the gravel layer.

3. Application's proposed groundwater monitoring system inadequate because it will not detect contamination in the uppermost aquifer underlying the facility.

In this instance, the gravel layer creates additional problems associated with detection because once in the uppermost aquifer and gravel layer, leachates will move quickly and migrate to the downgradient bound of the site mostly undispersed. This is precisely the situation described in a seminal ground water monitoring study conducted by J.A. Cherry.[22] Generally, leakage of leachate from landfill liners in typical groundwater pollution plumes contained in gravel, silt and sand only spread 10 to 20 feet wide by the time they reach the point of compliance. Here, this problem is compounded by the proposed 600 feet spacing between monitor wells.[23] Therefore, due to the speed of migration, contaminants will remain undetected by the monitoring system due to the monitor spacing at 600 feet intervals, too far apart for meaningful detection. **See Figure 2 below.**

---

[21] Cherry, J.A., "Groundwater Monitoring: Some Deficiencies and Opportunities," Hazardous Waste Site Investigations: Towards Better Decisions, Lewis Publishers, B.S. Berven & R.B. Gammage, Editors. Proceedings of the 10th ORNL Life Sciences Symposium, Gatlinburg, TN, GAO, "Funding of Post Closure Liabilities Remains Uncertain," GA. Last visited 9/9/2021.

[22] Cherry, J.A., "Groundwater Monitoring: Some Deficiencies and Opportunities," Hazardous Waste Site Investigations: Towards Better Decisions, Lewis Publishers, B.S. Berven & R.B. Gammage, Editors. Proceedings of the 10th ORNL Life Sciences Symposium, Gatlinburg, TN, GAO, "Funding of Post Closure Liabilities Remains Uncertain," GA. Last visited 9/9/2021.

[23] Ibid.

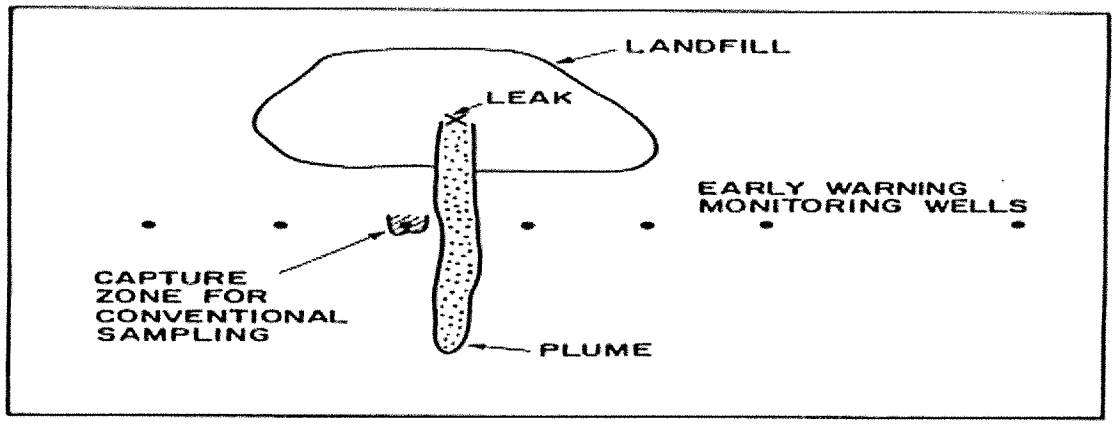


Figure 2.[24]

In short, the gravel layer will increase the speed of aquifer contamination and exponentially increase the chances of undetected groundwater contamination well beyond the bounds of the proposed landfill.

This problem may be rectified by closer spacing of the monitor wells and placement of the monitoring wells as far from landfill cells as possible but it remains especially problematic. Hypothetically, even if the wells were much closer together at 200 feet apart, due to the narrow "zone of capture," about 1 foot per well, a 10 to 20 ft. plume of contamination could easily pass undetected in the 198 feet between monitoring wells making meaningful leak detection virtually impossible to reliably monitor. Hence, leachate could travel great distances before it is ever detected.[25] Yet, for this particular landfill, meaningful contamination detection is rendered even more difficult by the landfill design, which requires long term dewatering, as discussed below.

4. Dewatering the uppermost aquifer beneath landfill creates conditions that will violate limits on contaminates under TAC §330.331(a)(1).

Because of PCE's below grade design, excavation is required. Yet, because the water table is so high at the proposed landfill location, extensive dewatering must take place in order to prevent hydrostatic pressure from raising or tearing the landfill cell liners until sufficient waste is placed in the cells to prevent this negative hydrostatic condition. It is significant that this dewatering is not for temporary construction purposes, but rather will serve as a long-term alteration of the uppermost aquifer, an alteration that effectively creates a sink beneath the landfill.

---

[24] Ibid at page 4. http://www.gfredlee.com/Groundwater/cherry_gw.pdf Last Visited 9/9/2021.
[25] Ibid.

This is important because this sink will draw water into the landfill rather than allowing it to pass under the liner and past leak detection devices as the water passes the point of compliance.[26] In short, the drawdown of the uppermost aquifer will cause water to flow into the landfill instead of out, never passing the point of compliance. Such a condition also violates the conditions set forth in TAC §330.331(a)(1) because the inflow of groundwater will predictably dilute concentrations of contaminates, thereby rendering meaningless the concentration levels established under §330.331(a)(1).[27]

5. PCE Application utilizes outdated HELP Model to evaluate future landfill performance.

The Application admits that groundwater will flow into the landfill sink in the discussion of leachate. PCE's use of the Hydrologic Evaluation of Landfill Performance (HELP) model expressly states that this model does "not predict inflow through the liner into the leachate collection system due to the exposure of the liner to a high groundwater table," although it does assume the liner will leak.[28] Significantly, todays hydrologic engineers consider the HELP and ICPR models outdated. TCEQ should require PCE to utilize the current industry standard for evaluating landfill hydraulics—the EPA's SWMM model system available at no cost.

6. Dilution of contaminates is not the solution to pollution.

As noted above, the inflow of groundwater into the sink created by landfill dewatering will dilute any leachate contaminants that have leaked from the landfill. Significantly, this condition thwarts the intent of TAC §330.331(a)(1) and any meaningful monitoring for landfill leachate contaminants, however, this is not the only dilution problem associated with this permit.

According to PCE's Application, monitoring wells 3, 4, 5, 6, 10 and 11 are slated to be located adjacent to unlined detention ponds.[29] These unlined detention ponds will recharge

---

[26] Peach Creek Environmental TCEQ MSW Permit No. 2406 Rev. 3, April 30, 2021 Solid Waste Application – Parts I and II San Jacinto County, Texas, page 65 D7-6; and Public Comments of Dr. H.C. Clark.

[27] TAC §330.331(a)(1), establishes maximum levels of known toxic contaminates, among them; arsenic, benzene, carbon tetrachloride, cadmium, chromium, lead, mercury, and vinyl chlorides, amongst others.

[28] Ibid. at D6-B-1.

[29] Peach Creek Environmental TCEQ MSW Permit No. 2406 Rev. 3, April 30, 2021 Solid Waste Application – Parts I and II San Jacinto County, Texas, at page

Stratum 1 immediately and rapidly to the uppermost aquifer following a rainfall event.[30] The practical effect here is that any contaminants passing the point of compliance will become diluted following rainfall events. Currently, this Application has no contingency plans to address this situation, and begs the question, will this dilution prevent compliance with the requirements of TAC §330.55(b) Water Pollution Control, and §330.331(a)(1), which imposes limits on leachate contaminants?

As noted previously, these problems are related to the gravel layer of the site. The current ground water monitoring system appears to be based on assumptions related to typical Texas sand, when actually, sand is not predominant in Stratum II, but rather, more highly permeable gravel predominates. In this instance, the Application improperly utilizes sand permeability when the presence of gravel is obvious. The Application uses the permeability of the aquifer as shown on the application to be 10^3, which is overly optimistic for dewatering, velocity and dispersion calculations and a more reasonable value should be used.[31] Because this permeability value is low, water will preferentially move through the gravel, at much greater velocities than this Application anticipates.

Finally, even properly constructed and operated landfills eventually experience leaks that contaminate groundwater with toxins, and even the HELP Model utilized by this Application assumes the liner will leak.[32] In such circumstances, these leaks often render the waters of the underlying aquifer unfit for human consumption or agriculture use. Any such leak would likely be catastrophic for neighboring landowners, particularly WDF, and TCEQ should consider major changes in the landfill design in addition to requiring a much more extensive groundwater monitoring system that will work as intended by Texas statute.

---

[30] Public Comments of Dr. H.C. Clark.

[31] application conductivity footnote

[32] Peach Creek Environmental TCEQ MSW Permit No. 2406 Rev. 3, April 30, 2021 Solid Waste Application – Parts I and II San Jacinto County, Texas, at D6-B-1.

C. PCE Has Not Demonstrated Compliance with TCEQ Requirements Related to Drainage, Floodplains and Pollution of Surface Waters.

1. PCE's failure to consider upstream alterations and water velocity violates TAC §330.305(a).

PCE's drainage analysis remains flawed due to the focus solely on downstream drainage impacts. Here, PCE's focus on downstream drainage ignores the significant impact the proposed facility will have on drainage upstream of the facility, is deficient, and will not meet the requirements of 30 TAC Sections §339.63 and 330.303.

Currently, TCEQ approval of this Permit without including the access road in the Permit Boundary will violate TAC §330.305 prohibiting impairment of surface water drainage. Here, the natural drainage of the area including WDF begins in the adjacent Sam Houston National Forest to the east and flows across WDF from east to west. Heavy rainwater is eventually channeled via two drain fields into the floodplain creek flowing north to south just outside the game fence on WDF's western fence and is visible on the maps included by PCE in the Application. The floodplain creek traverses about 1500-2000 feet to the south and remains undeniably located in FEMA's 2010 floodplain. Additionally, the removal of trees for the access road within the floodplain will probably increase flood water velocity. Further, the U.S. Army Corps of Engineers (USACE) analysis identified wetlands in this floodplain that appear to be located on or immediately adjacent to the proposed access road site.[33]

2. PCE has not shown compliance with TCEQ mandates related to floodplain and wetland impacts.

TAC mandates under §330.547(a) prohibit landfill operations within an established floodplain, and yet PCE's proposed MSW site will be as close to a FEMA floodplain as is physically possible. Can this proposed landfill remain compliant with prohibitions on MSW operations located in a 100-year floodway as defined by FEMA, given portions of the landfill remain on a floodplain and that the facility's proposed storm water runoff detention ponds storage cells are a mere 100 feet from an established FEMA floodplain? For this Application, TCEQ should consider the well-known increases in rainfall events and the near certain expansion of the FEMA floodplains in two years. Currently, this Application fails to adequately address the hazards

[33] U.S. Army Corps of Engineers Approved Jurisdictional Determination Form (Interim) Navigable Waters Protection Rule 11/23/2020 ORM Number SWG-2019-00646, pg. 2.

posed by potential flooding, and the impact of the facility on wetlands, even though the facility will significantly alter the area floodplain, with severe consequences likely.

Conversations with the USACE reveal the Corps agrees further study is necessary to prevent additional flooding downstream within the previously designated 2010 FEMA floodplain given the location of the proposed access road. Significantly the property PCE owns and intends to use for the access road is only about 100 feet wide, leaving little to no room for detention ponds or other actions to mitigate flooding. This is especially important because the natural drainage patterns that flow from east to west will intersect with the north to south flowing creek already within the FEMA floodplain which happens to be the location for PCE's proposed landfill access road. It is critical that a proper access roadway be designed and approved to ensure that WDF is not negatively affected by impaired drainage, and to remember that this access road will be utilized by hundreds of trucks weighing approximately 36 tons apiece each and every day.

Significantly, the USACE's determination that the identified wetlands were not waters of the US was made under the Trump administration's short-lived rule—now revoked—that restricted the designation of wetlands. This restrictive interpretation of this rule is now revoked and TCEQ should require a new determination under the current rule, which likely would result in the identified wetlands being included in the waters of the US rule and that would require a 404 permit.

3. PCE's Application lacks provisions to mitigate impoundment of surface water.

PCE's Application fails to include provisions to mitigate flooding caused by the landfill access road flooding WDF. Here, the proposed access road will be constructed approximately 600 ft. from 2010 FEMA Floodplain. The Application also lacks a sheet flow analysis to show drainage patterns across the affected area, including areas off the permit boundaries where water may be impounded by landfill activities.

The landfill requires large leachate storage tanks which must be pumped out (40,000-100,000 gal/day) into tanker trucks and hence makes them subject to leaks, accidents and spills on public roadways when the collection trucks leave the facility. The issue of roads and transportation off site is further addressed below.

4. PCE's Application Fails to Adequately Protect the Waters of the U.S. and Address Potential Pollution Caused by Rainfall Runoff and Leachate Leakage from Ponds.

Neighboring residences, and farms require both surface and groundwater water for their households, as well as livestock and irrigation water need. This is one of the purposes of Chapter 330 of TAC, yet, MSW Application No. 2406 does not provide adequate protections from contaminated discharges of leachate into Jayhawker Creek. Runoff and contaminants once in Jayhawker Creek, will flow into Peach Creek, then into the San Jacinto River before reaching Lake Houston only seventeen miles away.[34] For instance, the Application states only one foot of freeboard is planned for leachate and storm water detention ponds, when recently recorded rainfall indicates increased rainfall will over top the detention ponds causing the overflow of contaminated materials into the environment.[35]

Jayhawker Creek is considered Waters of the United States, and hence, subject to the Clean Water Act and special consideration.[36] Other leachate ponds are proposed less than 100 yards from the national forest boundary, and the nexus between the proposed facility and Jayhawker Creek raises jurisdictional issues with the USACE. TCEQ should require the Permit include testing for storm water and surface water quality in the downstream surface waters, and these should be made clear in the pending TPDES permit application. Moreover, it would be helpful if TCEQ required PCE to test for the biochemical oxygen demand imposed on the receiving waters of Jayhawker Creek. Monitoring for biochemical oxygen demand should be required to ensure a *de Minimis* effect and that current uses remain unaffected.

D. PCE's Application Utilizes Inconsistent Rainfall Data.

Under Texas rules, MSW applicants are required to provide modeling that shows the facility is designed for at a minimum 24 hr. 25-year rainfall events.[37] PCE has included the required modeling in the application, but inconsistently utilizes different rainfall amounts in the modeling calculations. For instance, the Application's Attachment C3, Erosion and sediment control for the

---

[34] Peach Creek Environmental Park San Jacinto County, Texas TCEQ Permit Application No. MSW 2406, Part III – Facility Investigation and Design, Attachment C Facility Drainage Report September 28, 2020, at C2-1.

[35] Peach Creek Environmental, TCEQ MSW Permit No. 2406 NOD Response, Parts I, II, III, IV Dec. 11, 2020. at D6-4.

[36] U.S. Army Corps of Engineers Approved Jurisdictional Determination Form (Interim) Navigable Waters Protection Rule 11/23/2020 ORM Number SWG-2019-00646, Section II C, page 5.

[37] TAC §330.63(c)(2)(C).

"Scour Calculation Side-slope reach" uses 10.5 inches of rain for the 25 year, 24-hour rainfall calculations,[38] markedly less than the 11.3 inches of maximum rainfall identified in NOAA Atlas 14 rainfall cited in Attachment C1 Appendix C1-B Existing condition hydrological calculations.[39] This inconsistent use of data is both confusing and irresponsible and lends itself to dangerous outcomes, because these calculations utilize 24 hr. rainfall calculations that do not reflect actual rainfall as established by NOAA. Further it is not clear exactly which of the two rainfall figures are utilized in the other drainage calculations. TCEQ should require PCE to: (1) utilize consistent data, and (2) recalculate all erosion and sediment control calculations that underestimate the actual rainfall expected using current up to date 25 year, 24 hr. rainfall data available from NOAA and resubmit the Application.

E. Permit Violates Rule §330. 61(i) Because Part II of the Application Fails to Adequately Address Transportation Requirements Under §330.153 Governing Site Access Roads

1. PCE's Application is misleading regarding the actual condition of local roads.

TAC §330.61(i) requires Landfill permit applicants to provide detailed transportation information including the "availability and adequacy of roads" to be utilized to access the site. PCE fails to do so, stating in part I and II of the Application that the "existing access roadways...are considered adequate to handle the existing traffic volumes associated with the proposed facility." This is not so, and the issue of access roads to PCE is especially problematic, notwithstanding the Application's glaring omission of the yet to be constructed access road to the landfill from Rajack Road, which must be included in the Application. Significantly, the Application's traffic plan is "not accurate to the actual conditions" according to David Brandon, the Commissioner for Precinct 3 of San Jacinto County, as stated in a letter to TCEQ dated January 25, 2021.[40] More troublesome to area residents is that this misrepresentation calls into question who will be responsible for the maintenance of the county roads utilized by landfill truck traffic and if local taxpayers will bear this burden.

---

[38] Peach Creek Environmental TCEQ MSW Permit No. 2406 Rev. 3, April 30, 2021 Solid Waste Application – Parts I and II San Jacinto County, Texas, Appendix C3 at C3-7 and 8.

[39] Ibid, at Attachment C1 Appendix C1-B, C1B-2. Significantly rainfall rates found on page C3-6 are lower at only 10 inches.

[40] Response Letter Regarding Roads and Traffic Routes to TCEQ's Request for Recommendations, from David Brandon, Commissioner Precinct 3, San Jacinto County, January 25, 2021 at page 1.

Here, Commissioner Brandon's letter to TCEQ expressly states that Rajack, Jayhawker and Fostoria Tram roads remain woefully inadequate for the type of heavy truck traffic envisioned by PCE, even though the application states that they are. Commissioner Brandon included the San Jacinto County Road Summary as provided by the Texas Department of Transportation to prove the point. These roads are classified by TXDOT as all-weather roads but only Fostoria Tram Road is actually paved, and at least one is prone to flooding. Importantly, San Jacinto County's all-weather roads are maintained with a motorized grader. Consider Rajack Rd, which is a TXDOT classified 32 surface (sand-ore). This road would "require extensive expansion, stabilizing and asphalting to meet the current standards to support traffic and weights for just one year of service." Further, the letter estimates that the cost to bring these roads up to "acceptable standards," will be $1.1 Million per mile, with over 5 miles of roadway requiring extensive work.[41] This cost should not burden San Jacinto County, but rather should be borne by the Applicant. Moreover, the application does not consider that these narrow rural roads—some of which are flood prone—with little to no shoulders will be shared by school buses, children delivery vehicles, first responders, postal carriers, law enforcement and residents of the area going about their daily activities.

This unanticipated and heavy use of these vulnerable rural roads, in a county deemed economically disadvantaged will deteriorate road conditions significantly due to the estimated 810 combined trips daily.[42] Not surprisingly, the Sam Houston National Forest denied access to PCE truck traffic seeking to access the landfill.

2. Landfill access road must be included in the Application.

TAC 330.153(b) governs the maintenance of landfill access roads, and includes provisions designed to prevent landfill dust from becoming a nuisance to neighboring properties.[43] Yet despite stated concerns regarding vehicular traffic and roads, this Application fails to include the entire access road in the Permit Boundary. This failure to include the access road in the Application artificially creates enforcement issues because without inclusion in the Application, it is unclear if TCEQ will have the authority enforce rules regarding dust control, fencing, and drainage etc. on the access road outside the permit boundary. Further, the Application fails to disclose how dust will be maintained and mitigated. Previous recommendations by SOAH judges reinforce the notion that

[41] Ibid, at pgs. 1 and 2.
[42] PCE Application, Appendix L, at L8.
[43] TAC 330.153(b).

the Application should include the entire access road in the permit boundary. For example, in 2017, SOAH Administrative Law Judges agreed that the entire length of a landfill access road should be included in the permit boundary.[44]

Additionally, the Application presupposes the routes for the estimated daily truck traffic to access the facility, but this is not necessarily true because PCE cannot enforce the suggested routes to the landfill and truckers are free to utilize whatever roads they deem the most efficient. Moreover, and perhaps more troublesome for county officials charged with the upkeep of county roads; the Application is unclear how maintenance and upkeep of the county roads to the facility will be achieved.

3. Application is unclear if leachate trucks are included in total trip calculations to facility.

Significantly, the application does not mention if it includes leachate transportation trucks in the daily vehicular traffic estimate. The Application makes it clear that leachates will be transported off site, which involves the movement of heavy liquid waste requiring specific trucks for the job. While the Application states that up to 500,000 gallons of contaminated leachate will be trucked off the facility for disposal, the Application neglects to identify what type of truck will be used and how many trips are expected daily.[45] For instance, will 10,000 gallon fracking trucks be used, or lighter 5,000 gallon trucks. In the case of the former, approximately 50 trips will be required and will be at least twice as heavy as the 5,000 trucks, yet the 5,000 gal. trucks while lighter will require 100 trips to dispose of the contaminated leachates. Further, the Application remains silent as to who will operate these leachate trucks, the facility or a third party, and where these heavy trucks will be marshalled on the property.

TCEQ should require the Applicant to include these trucks in the traffic summary and account for the effect of these trucks on local roads and the community. Moreover, during our more frequent "rain fall events" the Application should identify precisely what measures it will take to prevent leachate from overtopping the leachate ponds in the event that the heavy trucks are unable to transport the leachate off property. This potential inability to remove leachate due to

---

[44] State Office of Administrative Hearings Feb. 17, 2017, SOAH Docket No. 582-15-2082; TC EQ Docket No. 2015-0069-MSW; In RE: Application of 130 Environmental Park, L.L.C. for Proposed Permit No. 2383, at pg. 28. http://www.gghcorp.com/wp-content/uploads/2020/11/2017-02-17-PFD.pdf Last Visited 9/19/2021.

[45] Peach Creek Environmental Park, TCEQ MSW Permit No. 2406, April 30, 2021 Rev. 3 April 30 at D6-4.

excess rainfall, should be addressed by the Application before adverse circumstance necessitate the discharge of leachates into Jayhawker Creek. In short, TCEQ should require a more reasonably accurate traffic mitigation plan, a demonstration of the means by which local roads and taxpayers are protected from the wear and tear of heavy truck traffic and contingency plans for leachate in the event roads become impassable due to heavy rainfall.

F. PCE's Proposed Facility Will Adversely Impact Threatened and Endangered Species.

1. Endangered and threatened species are known to inhabit the area

Endangered species remain a concern under this Application, given the known presence of endangered species in the adjacent Sam Houston National Forest, and the methodology utilized to reach the Application's conclusion that they are not an issue. Moreover, the Application offers no support for the statement "that the construction and operation of the facility shall not result in the destruction or adverse modification of the critical habitat or cause or contribute to the taking of endangered or threatened species."[46] In short, PCE has no plan to avoid, minimize or mitigate impacts to wildlife, including protected species during the construction, operation or maintenance of the landfill, even though endangered and threatened species are known to be in the area. For instance, in the Sam Houston National Forest next door, as of 2016, there were 274 nesting households of Red-cockaded Woodpeckers in the forest.[47] Currently according to conversations with wildlife biologists, there are significantly more nesting households of Red-Cockaded Woodpeckers in the forest, indicating that as the population increased, the woodpecker habitat likely expanded.

2. Desktop reviews are inadequate and likely will lead to violations of ESA.

Significantly, the Biological Assessment included in the Application admits the assessment was essentially a desk top review without a field survey of the property. Absent a proper field study, the Application assumes but contains no support for the statement that "the construction and operation of the facility shall not result in the destruction or adverse modification of the critical

---

[46] Peach Creek Environmental Park, TCEQ MSW Permit No. 2406, Rev.0, 08/27/2020 Parts III & IV, at B-10.

[47] National Forest and Grasslands in Texas Fact Sheet. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd531949.pdf Last Visited 8/17/2021.

habitat or cause or contribute to the taking of endangered or threatened species."[48] Under the ESA, this is unacceptable. Simply put there is no way to know if there are any of the endangered or threatened species on the site that are known to exist in the area until a proper biological survey is performed. Additionally, the ESA requires that some form of habitat management plan exist *prior* to any take or removal of a species contrary to express statements included in PCE's dubious Species Protection/Management Plan, that proposes to simply remove any Endangered Species found during some future survey.[49] Another point, is that the Application did not include the required Texas Parks and Wildlife correspondence letter dated Oct. 21, 2019.[50]

3. Operational Plan neglects endangered and threatened species.

Under TAC §330.157 governing MSW facilities operational standards, "A facility and the operation of the facility must not result in the destruction or adverse modification of the critical habitat of endangered or threatened species. Facilities must be operated in conformance with any endangered or threatened species protection plan required by the Commission."[51] PCE's site operating plan does not contain provisions for the protection of any identified endangered species, and does not incorporate the measures requested by TPWD's wildlife specialist. These recommended actions—such as utilizing erosion control methods that do not utilize plastic mesh or micro plastics, which can entangle birds, mammals and reptiles or be ingested by wildlife to their detriment—remain absent. Neither does the Application appear to incorporate the TPWD lighting recommendations designed minimize the negative impacts of artificial nighttime lighting on migratory birds and other animals.[52] Instead, the Application proposes to move species, by an unnamed entity, if such an endangered species is located and incorporates no plan to "avoid, minimize or mitigate impacts" to wildlife. This absence of a definitive species protection and mitigation plan is unacceptable and likely will lead to violations of the ESA and Texas Parks and

---

[48] Response Letter from Rachel Lange, Wildlife Habitat Assessment Program, Texas Parks and Wildlife Department to Matthew Udenenwu, MSW Permits Section TCEQ regarding TCEQ permit 2406, TPWD 45827.msg. dated January 25, 2021.

[49] PCEP Permit Application Parts II and IV Appendix H.

[50] Response Letter from Rachel Lange, Wildlife Habitat Assessment Program, Texas Parks and Wildlife Department to Matthew Udenenwu, MSW Permits Section TCEQ regarding TCEQ permit 2406, TPWD 45827.msg. dated January 25, 2021.

[51] TAC §330.157.

[52] Response Letter from Rachel Lange, Wildlife Habitat Assessment Program, Texas Parks and Wildlife Department to Matthew Udenenwu, MSW Permits Section TCEQ regarding TCEQ permit 2406, TPWD 45827.msg. dated January 25, 2021, pgs. 2-6.

Wildlife code. Further, removal of species, while generally acceptable for vegetation, is far more complex a process for mammals, reptiles, amphibians and birds, and a detailed mitigation plan should be included in the Application as required under Texas rules.

G. PCE's Operating Plan Does Not Adequately Ensure Against the Danger of Fire for Adjoining Properties.

PCE's landfill will increase the threat of wildfire in the adjacent neighborhoods and within the Sam Houston National Forest immediately next door, and PCE's operating plan provides no explicit provisions or training for employees. TAC §330.129 mandates a fire protection plan for MSW facilities,[53] because landfills naturally generate explosive methane gas. Significantly, while the Application contains a "fire protection plan," it suffers a lack of detail and triggering mechanisms that render the plan deficient. This is important because landfills are notorious for spontaneous fires and approximately 8,300 fires occur per year at these facilities.[54] These fires remain difficult to extinguish because they burn and smolder underground like peat or coal fires.[55] One such fire in New Jersey burned for weeks, released noxious and dangerous hydrogen sulfide gas that spread into adjacent neighborhoods and ultimately cost the township of Danbury NJ over $1 million for a gas recovery system. [56]

A major contributor to landfill fires is flammable material that regularly is sent to MSW landfills. Here, landfill personal play a critical role in preventing acceptance of flammable and explosive material and reducing the chance of spontaneous fires, but no information is provided regarding landfill employee training, how flammable materials will be excluded, and how the fires will be extinguished. Risk of fire takes an increased significance given the climate change driven record number of wildfires that have scorched western states over the last two years.

Less than a decade ago, Texas experienced droughts that led to record wildfires in 2013 and 2011. Future drought conditions, in conjunction with a wildfire initiated at the landfill that spreads into the National Forest would have catastrophic consequences for Wood Duck Farms, the National Forest, neighboring residents, regional air and water quality and the wild life dependent

---

[53] TAC §330.129.

[54] Landfill Fires, U.S. Fire Administration Topical Fire Research Series Volume 1, Issue 18 March 2001, https://www.hsdl.org/?view&did=19520 Last visited 8/24/2021.

[55] Waste Today Magazine. https://www.wastetodaymagazine.com/article/preventing-landfill-fires-waste-today/ Last visited 9/22/2021.

[56] Landfill Fires, U.S. Fire Administration Topical Fire Research Series Volume 1, Issue 18 March 2001, https://www.hsdl.org/?view&did=19520 Last visited 8/24/2021.

on the forest for habitat. TCEQ should require PCE to produce a comprehensive fire protection plan to be included in PCE's Operational Plan such as a very wide fire break adjacent to the bounds of the forest.

H. PCE Application Fails to Adequately Address Windblown Debris, and Dust

TAC §330.139 requires MSW Operators to control and confine windblown waste and litter and for good reason, as landfills remain notorious for their association with windblown debris and plastics. This issue is of paramount importance to WDF due to the nature of farm produce and the marked reluctance of consumers to purchase produce grown in such close proximity to a landfill. This is especially so with WDF customers such as Whole Foods and high end restaurants who market natural and organic produce to customers concerned about the presence of toxins in the food they consume. The fact of the matter is that the mere presence of a landfill next to WDF will certainly cause a loss in customers as well as income to WDF because of the association many consumers have made between landfills and airborne contaminants.

TAC rule §330.153(b) requires that landfill access roadways control their dust generated by truck traffic.[57] Yet, it is important to note that PCE included no dust mitigation plans in their Application and TCEQ should require PCE to do. Further, PCE's Application includes no details in its Operations Plan about how landfill employees will screen incoming waste for prohibited materials. This proposed permit will already allow household, commercial, as well as some industrial and special wastes. This waste material could include garbage, ashes, street cleanings, dead animals, slaughter house offal, contaminated soils, asbestos containing material, sludge, construction and demolition waste, grit and grease trap materials, empty pesticide and herbicide containers, medical waste, electronic waste and others as well as waste generated outside of Texas. Despite the importance of screening waste material before it is accepted, the Application does not make clear how employees will be trained or how the waste material will be screened for prohibited items.

TCEQ should require that PCE demonstrate exactly how windblown dust—which may contain toxins due the nature of the landfill waste—will be mitigated. The Application must also better address the issue of windborne plastic debris, which remains particularly problematic due to the breakdown of plastics and their subsequent ingestion or entrapment by wildlife.

---

[57] TAC §330.153(b).

This issue takes on a heightened concern due to the well established presence of endangered species in the National Forest, and the written statements from Texas Parks and Wildlife Department regarding plastics and the risk they carry to all manner of wildlife. Farmers and ranchers also have cause for concern due to the risk that forage hay and farm produce may become unharvestable due to landfill trash contaminating production fields.

Finally, landfills are inherently noisy operations because of the heavy equipment utilized to move and bury the waste material as well as the heavy truck traffic necessary to bring wastes to the site. Moreover, because of the landfills proximity to the National Forest, the Application should address the effect that the back-up beepers found on operating equipment and trucks do not adversely impact wildlife. It is noteworthy that the wild blown dust, odors, waste, plastic debris and obnoxious noises produced and inflicted upon the PCE's landfill's neighbors, are not remotely compatible with the area's current land uses.

I. Application Fails to Adequately Address the Impact of Methane and Other Noxious Landfill Gasses on Adjacent Properties.

TAC §330.371 mandates landfill gas management because methane off gassing remains a reoccurring issue with landfills, particularly Type I landfills accepting putrescible waste. Here, the gasses are not only noxious, but are also dangerous because of the well-known adverse health effects of methane and hydrogen sulfide gas on humans and wildlife in addition to the explosive nature of methane gas and risk of fire discussed above.

Based on the information available in Appendix G found in the Response to a Notice of Deficiency sent by TCEQ to PCE, landfill gasses will be flared. [58] Here, PCE's proposed landfill gas management is inadequate. TAC §330.371(g) requires a timeline for the installation and monitoring of gas detection systems and control procedures.[59] Yet the Application remains vague as to when this process will be implemented, stating "as the site develops extraction wells will be installed as needed to control landfill gas and meet regulatory requirements." Such a promise to take action at some future date is not compliant with the language and intent of TAC §330.371, which is designed to prevent off gassing and reduce the risk of explosion, fire and injury. Moreover, PCE's nebulous adherence to TCEQ's statutory requirements for landfill gas

[58] PC-II No. 2406 Technical Notice of Deficiency Response 022420219, Appendix G.
[59] TAC §330.371(g).

management increases the probability that PCE will violate TAC §330.15(a)(2), which prohibits the creation and maintenance of a nuisance.

J. PCE's Operating Plan is Deficient Because It Fails to Adequately Address Landfill Vermin and the Impact of Nuisance Wildlife on Adjacent Properties

Texas MSW rules include §330.15(a)(2), TCEQ's provision that prohibits landfills from becoming a nuisance. Here, PCE's landfill will certainly attract birds and other animals including pests such as mice, and rats, all generally considered nuisance animals—especially if one operates a produce farm for a living. Raccoons, Opossums and bats as well as predators will follow, and a high probability exists the facility will attract feral hogs, well known for their highly destructive foraging habits.

Unwanted nuisance animals such as rats, raccoons and opossums pose a direct threat to the produce growing in WDF, in addition to the real threat of seagull infestations and the subsequent foraging and defecation on adjacent produce crops. Feral hogs create another well-known subset of problems associated with feces, and property destruction as well as the real danger they pose to humans who might encounter them.[60] PCE's Operating Plan does not demonstrate how landfill vermin will be addressed. Here, PCE's representations that these issues will be resolved in and of itself does not solve them, but rather calls into question the viability of PCE's Operating Plan. This Application's Operating Plan remains deficient in this respect and TCEQ should require that PCE address these issues specifically and directly.

PCE Lacks Competency to Operate a MSW Facility and Statements Regarding Future Sale to an Unknown Future Operator Create Transparency Issues.

PCE and its investors are a Mississippi based outfit with no known experience regarding the construction and operation of landfills. Currently, PCE has failed to provide information that demonstrates it has any experience owning, or operating any other solid waste facility, or that it has any direct financial interest in any other waste facilities or any management experience with organizations engaged in solid waste activities or experience earthmoving and landfilling. Specifically, who will be operating this landfill if a permit is approved by TCEQ remains unknown,

---

[60] Emily Foxhall, *Officially, an Anahuac woman was kicked in a rare feral hog attack. But some aren't convinced.* Houston Chronicle, February 21, 2020. https://www.houstonchronicle.com/news/houston-texas/houston/article/Feral-hogs-killed-a-woman-in-Anahuac-officials-15072296.php Last Visited 9/23/2021.

given Peach Creek's oral representations to WDF that they will sell the landfill to another unknown Operator once the permit is issued. Generally, landfills are only as compliant as their Operators which are critical to successfully maintaining the permit conditions required by TCEQ, and upon which the health, safety and well-being or nearby residents depend. This is precisely why TCEQ regulations consider an Operator's compliance record for certain permit applications and amendments to be a relevant factor in new or amended landfill operations.

CONCLUSION

For the aforementioned reasons, WDF objects to Peach Creek Environmental Park, LLC's Permit Application and challenges the Permit's compliance with Title 30 Texas Administrative Code, Chapter 330, 16 USC Section 1538 and the Clean Water Act. Specifically, Wood Duck Farms challenges whether or not the Application complies with the following TCEQ rules:

-Compliance with TAC §330.15(a)(2), which prohibits the creation and maintenance of a nuisance, or the endangerment of human health and welfare or the environment, given the current permit application will likely leak toxic landfill leachates into the surface and ground water, and landfill odors, wind-blown trash and debris clearly will constitute a nuisance for neighbors and a hazard for those that rely on ground water or surface waters downstream.

- Compliance with TAC §330.303 and the prohibition of off-site discharge of waste material during 25-yer rain events, given PCE's Application inconsistently utilizes 25-year rainfall data.

- Compliance with TAC §330.305(a), and the requirement that "existing or permitted drainage patterns must not be adversely altered, given that the necessary access road for the landfill is not included in the permit application and road construction to access county roads from the site will certainly alter drainage patterns as the road will transect a significant drain field that runs from the SHNF thru Wood Duck Farms.

- Compliance with TAC §330.305(c) that requires the operator or owner maintain a runoff management system to collect and control rainwater volume from a 24-hr. 25-year storm given the permit utilizes outdated 24 hr. flood projections.

- Compliance with TAC330.305(g) regarding leachate runoff, given the Application rain water detention ponds only have 1 foot of freeboard, while increased rainfall amounts indicate the near certainty of rainfall events with over 1 foot of rain, which will overtop both leachate and detention ponds.

- Compliance with TAC §330.305(g) that regulates the handling, storage, treatment and disposal of surface and groundwater that has become contaminated by contact with the working face of the landfill or the treatment of leachate, given the mandates of TAC § 330.207, and the presence of unlined storage tanks directly above a porous aquifer.

- Compliance with TAC §330.331(a)(1) governing the landfill liner system, design and operation criteria and the accompanying table that lists the maximum acceptable concentration values of common landfill contaminants, given the substantial gravel layer under the proposed site and the consequent hydrological issues that will make accurate evaluation and monitoring of these contaminants virtually impossible under the current permit application.

- Compliance with §330.331(c) which enumerates 6 factors the TCEQ may utilize in the determination of compliance with §330.331(a) above, given §330(c)(1) hydrologic characteristics of the facility and surrounding land, (c)(2) climactic factors of the area, (c)(4) the quantity, quality and direction of flow of groundwater, (c)5) the proximity and withdrawal rate of the groundwater users; and (c)(6) the availability of alternative drinking water supplies, given Wood Duck Farms sole reliance on groundwater for drinking, irrigation and all other conceivable uses of a produce farm.

- Compliance with TAC §330.371 Landfill Gas Management and if the proposed methane monitoring system is adequate to ensure that methane gas concentrations do not exceed 1.25% in facility structures and 5% by volume in monitoring points or off the property, given that such a monitoring program is mandated by TAC § 330.371(b).

- Compliance with 16 U.S.C. §1531 (1973) otherwise known as the Endangered Species Act (ESA), and whether the permit will violate the ESA's prohibition on the Taking of endangered Red Cockaded Woodpeckers and Louisiana Pine Snakes known to inhabit the area and their established critical habitat in the adjacent Sam Houston National Forest.

- Compliance with Texas Parks and Wildlife Code Section 64.002 regarding protection of nongame birds and the prohibition that provides "no person may destroy or take the nests, eggs, or young and any wild game bird, wild bird, or wild fowl..." given the Applications cursory treatment of wildlife.

- Future Compliance with regarding the prohibition on accepting hazardous waste, given the rule prohibiting such waste when the underlying geology remains incompatible with hazardous waste disposal.

These enumerated issues are likely violations of Texas law and are contested issues of fact. WDF opposes this Application because this MSW facility threatens to ruin the water quality and

habitat of an important watershed. Preservation of the state's natural resources and compliance with Texas law is of paramount importance. Therefore, TCEQ is urged to afford Wood Duck Farms and the adjoining affected neighbors—as well as those living in this watershed that remain dependent on quality drinking water—all the appropriate protection available under Texas law. Preservation of Texas's water, this unspoiled portion of the San Jacinto National Forest, and the surrounding San Jacinto watershed is important and Texas citizens depend upon TCEQ to do so.

WDF respectfully requests that the above referenced MSW Application No. 2406 be returned to the Applicant, Peach Creek Environmental Park, LLC for failure to submit a complete Application. In the alternative, WDF seeks denial of the Permit Application No. 2406 and requests a contested case hearing to evaluate these contested issues of fact and law.

Thank you and the TCEQ staff for the attention you afford Wood Duck Farm's concerns. Please contact the undersigned counsel if you have any questions or need clarification regarding the comments contained herein.

Sincerely,

/S/ Bryan French
Bryan French
Texas State Bar No. 24091372
The Law Office of Bryan French, PLLC
bfrenchelcs@earthlink.net
(409) 599-3234
ATTORNEY FOR WOOD DUCK FARMS

Law Office of Bryan French, PLLC
P.O. Box 4191 Pirates Beach
Galveston, Texas 77554
(409) 599-3234
bfrenchelcs@earthlink.net

October 2, 2021

Ms. Laurie Gharis
Chief Clerk
Texas Commission on Environmental Quality
Mail Code 105
Austin, Texas 78711-3087

Re: Comments, Objections and Request for a Contested Case Hearing Regarding Peach Creek Environmental, LLC's Proposed Municipal Solid Waste Permit Application No. 2406

Dear Ms. Gharis;

Greetings, enclosed please find comments, objections and a request for a contested case hearing submitted on behalf of Wood Duck Farms by my firm regarding MSW Application No. 2406. Identical comments were submitted online prior to the virtual public meeting held September 28, 2021.

If you have any questions regarding this submission, please feel free to contact me at the contact information provided.

Thank you for the attention you afford our concerns.

Sincerely,

Bryan French

Law Office of Bryan French, PLLC
P.O. Box 4191
Pirates Beach
Galveston, Texas 77554

PLACE STICKER AT TOP OF ENVELOPE TO THE RIGHT OF THE RETURN ADDRESS, FOLD AT DOTTED LINE

CERTIFIED MAIL

7020 1290 0000 5827 3471

1000

78711

U.S. POSTAGE PAID
FCM LG ENV
GALVESTON, TX
77550
OCT 04, 21
AMOUNT
$8.56
R2305K142395-03

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
2021 OCT -7 PM 2:43
CHIEF CLERKS OFFICE

Laurie Gharis Chief Clerk
TCEQ
Mail Code 105
P.O. Box 13087
Austin, Texas 78711-3087

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Monday, September 27, 2021 3:52 PM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406
Attachments: Final Comments.pdf

H

From: Bfrenchelcs@earthlink.net <Bfrenchelcs@earthlink.net>
Sent: Monday, September 27, 2021 3:51 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Bryan French

E-MAIL: Bfrenchelcs@earthlink.net

COMPANY: Law Office of Bryan French

ADDRESS: 4191 PIRATES BCH
GALVESTON TX 77554-8042

PHONE: 4095993234

FAX:

COMMENTS: Dear Ms. Gharis; Attached, please find comments submitted on behalf of Wood Duck Farms to TCEQ objecting to MSW Permit No. 2406. If there are any questions please feel free to contact me at the contact information provided. Thank you for the attention you afford Wood Duck Farm's concerns. Sincerely, Bryan French

Law Office of Bryan French, PLLC
P.O. Box 4191 Pirates Beach
Galveston, Texas 77554
(409) 599-3234
bfrenchelcs@earthlink.net

September 27, 2021

Ms. Laurie Gharis
Chief Clerk
Texas Commission on Environmental Quality
Mail Code 105
P.O. Box 13087
Austin, Texas 78711-3087
By Certified U.S. Mail and Email: www14.tceq.texas.gov/epic/eComment/

Re: Comments, Objections and Request for Contested Case Hearing Regarding Peach Creek Environmental, LLC's, Proposed Municipal Solid Waste Permit Application No. 2406

Dear Ms. Gharis:

My firm respectfully submits these comments and requests a contested case hearing on behalf of Wood Duck Farms, LLC (WDF) who will be adversely affected by the proposed Peach Creek Environmental Park Type I landfill. Numerous problems with the proposed landfill's geography exist. Further, much of the material presented online is incomplete and presented in a scattershot manner that renders evaluation of the Application difficult. Because the Application is incomplete and riddled with deficiencies, Texas Municipal Solid Waste Permit No. 2406 (the Permit) for the proposed landfill located just off the intersection of Jayhawker and Rajack roads in San Jacinto County, Texas 78287 should be denied.

The materials included in these comments to TCEQ, specifically references to comments submitted by H.C. Clark to TCEQ, cited below, establish a clear causal relationship between geology and likely violations of the Teas Administrative Code (TAC). These violations include but are not limited to undetected leakages of contaminated landfill leachate into groundwater and contaminated runoff into surface waters. The Clark comments clearly identify the difficulty of monitoring groundwater for any leakage and the potential for contaminated leachates to enter the ground water via the gravel layer found in the geologic substrate, and hence into nearby wells on

adjacent properties. Here, groundwater contamination would likely render WDF defunct,[1] yet these are not the only problematic issues with this Application concerning water.

Existing drainage patters will be altered by the landfill, and an examination of the relevant topography shows that construction of the landfill access road to Rajack Road—glaringly absent from the permit application—will affect wetlands and certainly impound water on WDF causing flooding and economic loss. Additionally, any accidental or deliberate discharges of landfill leachate will flow into Jayhawker Creek then to Peach Creek and ultimately Lake Houston. Likewise, any rainfall runoff containing landfill contaminates—and worse leachates in general—will also be distributed downstream, transported by natural processes into Lake Houston, the primary water supply for the City of Houston, Texas. Contaminated runoff will degrade both water quality and aquatic life while adversely impacting the livelihood and health of those who are dependent on this watershed for income, recreational purposes and drinking water while simultaneously impairing the remarkable aesthetic quality of the area, including the adjacent National Forest. This subsequent degradation of drinking water quality surface waters will cause economic and aesthetic loss and must be avoided.

WDF's WRITTEN COMMENTS IN OPPOSITION TO PCE's PROPOSED LANDFILL AND REQUEST FOR A CONTESTED CASE HEARING

Because of these and other identified contested issues of law and fact enunciated below, WDF objects to MSW Permit No. 2406. Currently, WDF has identified a multiplicity of likely violations of 30 Texas Administrative Code §330, as well as some applicable federal laws related to this MSW Permit, the most serious of which ask if this permit compliant with:

A. TCEQ rule 330.61(h) that requires permit Applicants show that a proposed landfill be compatible with neighboring land uses, given this Application proposes to site a landfill directly nest to a National Forest, and a working produce farm.

B. TAC water pollution prohibitions found in §330.55 that require MSW facilities to not cause groundwater pollution, given the likely leakage of leachate into groundwater; the difficulty of monitoring for contaminants due to presence of a permeable gravel layer in the geologic stratum that is the uppermost aquifer boundary, and the Applications use of unlined detention ponds above the uppermost aquifer.

[1] Wood Duck Farms sells produce from the farm on site, at local farmer's markets and to area restauraunts, whose buyers visit the farm and are familiar with the owner and site where the produce is grown.

C. TAC §330.305(a), Additional Surface Water Drainage Requirements for Landfills and the requirement that existing or permitted drainage patterns must not be adversely altered, given the proposed landfill location immediately adjacent to an established floodplain, and the proposed construction of the landfill access road across wetlands that will impound water on upstream neighboring properties, as well as the landfill boundary.

D. TAC rule §330.303(a) and whether this Application is compliant with the 25-year flooding surface water drainage requirement prohibiting the off-site discharge of waste and feedstock material, given the well-documented increase in both rainfall volume and frequency, and concert with the Application's inconsistent use of rainfall data leading to erroneous flooding calculations.

E. TAC §330.153 regarding Site Access Roads, given the proposed access road location and the fact that the access road neither exists nor is included in this Application; that construction of the access road will necessarily require elevation not considered in the drainage analysis of the Application; that the existing public roads are wholly unsuitable for the heavy truck traffic proposed by this Application; as well as the mandates under §330.153(a) and (b) that the roads be "all weather roads;" and that dust from on-site roadways and other access roadways must not become a nuisance to surrounding areas.

F. 16 U. S. Code Sections 1531 thru 1544, also known as the Endangered Species Act, and whether the Application will violate prohibitions against taking, given the known presence of Red Cockaded Woodpeckers in the adjacent Sam Houston National Forest, and other assorted endangered species such as Timber Rattlesnakes, Louisiana Pine snakes and Houston Toads and the Application's plans to remove any threatened or endangered species from the project area without a required habitat conservation plan.

G. TAC rule §330.129 that requires MSW Applications provide a fire protection plan, given this Application's lack of a specific fire protection plan, and the heightened importance of such a plan at the proposed location.

H. TAC rule §330.139 mandating that MSW facilities properly manage windblown solid waste and litter, given the scant information included in the Application regarding how this important requirement will be performed.

I. TAC §330.159, regulating landfill gas control, and whether the Application is compliant with this mandate, given the absence of any triggering mechanisms regarding when such measures will be implemented and the precise means how landfill gas will be controlled.

J. TAC §330.15(a)(2), that prohibits the creation of nuisance conditions, given the Application's failure to include how nuisance behavior by vermin and other wild animals will be prevented, given that landfills remain notorious for attracting nuisance animals like seagulls, rats, and other scavengers as well as destructive insects, that stand to destroy WDF's produce.

Based upon the numerous deficiencies raised in these comments, WDF sole proprietor, Mr. Van Weldon, who may be reached at 270 Pine Valley Road, Cleveland, Texas 77328, requests that the above referenced Application be returned to the Applicant, Peach Creek Environmental Park, LLC for failure to submit a technically complete application, or in the alternative, requests a contested case hearing to resolve the disputed issues of fact and law.

I.

INTRODUCTION AND STANDING

Peach Creek Environmental, LLC (PCE) has applied to the TCEQ for a permit to operate a Type I Municipal Solid Waste facility on 636 acres of land to be accessed from Rajack Road via Jayhawker Road in San Jacinto County, Texas. Significantly the proposed landfill is immediately adjacent to WDF, as well as the Sam Houston National Forest.[2] TCEQ received PCE's initial Application on August 28, 2019 and published notice of Intent to Receive Permit (NORI) on February 10, 2021. The Commissioners have scheduled a virtual public meeting for September 28, 2021.

WDF Has Standing to Obtain a Contested Case Hearing

WDF has the requisite standing necessary to obtain a contested case hearing. Under Texas Code, standing to receive a contested case hearing for an individual is governed by Chapter 55 §55.251(a), and an affected person, when authorized by law may do so. Here, under §55.251(c), an affected person may request a contested case hearing but only if the request substantially complies with the following:

> "(1) give the name, address, and daytime telephone number of the person... who files the request.
>
> (2) identify the person's justiciable interest affected by the application, including a brief, but specific, written statement explaining in plain language the requesters location, and distance relative to the activity that is the subject of the application and how and why the requestor believes he or she will be affected by the activity in a manner not common to members of the public."[3]

---

[2] Peach Creek Environmental Park TCEQ MSW Permit No. 2406 Rev. 3, April 30, 2021, Solid Waste Permit Application Parts - I, & II, San Jacinto County, Texas, Summary of Technical Report p. 2.
[3] TAC §55.251(c).

WDF's JUSTICIABLE INTEREST AFFECTED BY THIS APPLICATION

Mr. Van Weldon, sole proprietor of Wood Duck Farms, LLC, has standing to request a contested case hearing because his economic interests affected by this application are not common to the general public. As a general proposition, to have standing a person or entity must show (1) injury in fact, (2) a causal relationship between the activity complained of and injury in fact, and (3) that the injury can be redressed by the matter pending before the court. In this case, the injury has not occurred. However, it is the potential for injury in fact and a causal relationship with the matter pending before the commission that is the basis for standing in a contested case context. Not only does WDF aver such injury in fact and causal relationship, proof of such likely injury and causal relationship is set forth in these comments. Such proof will be offered in live testimony if necessary in order to perfect a claim of standing.

As explained further below, WDF possesses standing to request a contested case hearing because of a justiciable interest in the preservation of water and air quality as well as general aesthetics relative to the proposed landfill's location immediately next to the farm. Specifically, WDF's concerns relate to the great potential for PCE to significantly degrade the groundwater quality upon which the farm is dependent, impair natural drainage patterns and as a consequence flood the farm via the impoundment the surface water caused by the construction of an access road—conspicuously absent from this permit application, degrade surface water quality via leachate runoff and drainage, impair the quality of produce by the deposition of the inevitable landfill dust carrying contaminants, attract nuisance animals that damage produce, in addition to irreparably damaging the bucolic nature of the farm with heavy truck traffic, landfill odors, as well as windblown dust and plastic debris, all under the growing shadow of what has already been dubbed "Mount Trashmore" by local children.

Background

Van Weldon purchased the first of approximately four tracts that now compose the 165 acres he transformed into WDF beginning around 1994. Shortly thereafter he relocated and restored a 1912 school house to serve as the farm's focal point. The farm's initial success led to a series of expansions around 2008 (approximately 47 acres), again around 2012 (approximately 55 acres) and finally around 2018 (approximately 19 acres). In an effort to expand the farm's business and educate the community about food and the importance of locally sourced food, WDF opened to the public on weekends during October and November of 2013, a tradition that continues today.

On these weekends, visitors learn about food and where it comes from, while enjoying hayrides, a sorghum maze, zip lines and other activities for children.[4]

Ironically, the seller accommodating the WDF expansions was none other than PC-II, the Mississippi investment group that is the parent company of Peach Creek Environmental, the Applicant. To describe Mr. Weldon as disappointed after he learned of PC-II's plans for the landfill, remains an understatement, not only because of the obvious threat posed by landfill to his investment and livelihood, but also because landfills are to rural residents what strip centers that house pawnshops, adult bookstores, and liquor stores are to suburban residents. Meanwhile, WDF, nestled deep in the verdant and unspoiled gently rolling piney woods about an hour north of Houston, remains a perfect and pastoral location for a vegetable farm. **See Figure 1 below.**

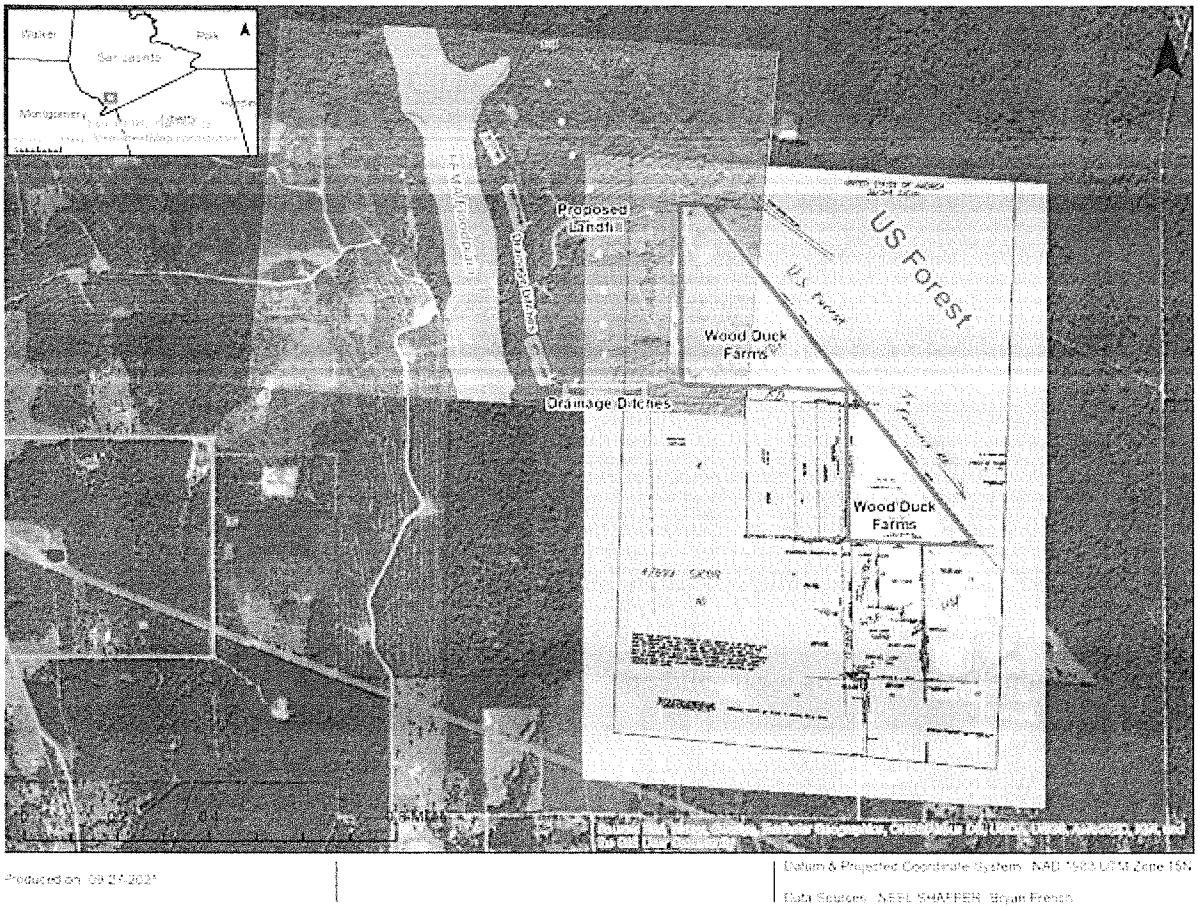


Figure 1. Survey of Wood Duck Farms shown on right as overlaid on map of PCE landfill showing proposed landfill cells between FEMA floodplain and Wood Duck Farms. Note Access road is not shown outside of Permit Boundary.

[4] Wood Duck Farm Festival, Citizens Environmental Coalition, October 19, 2013. https://cechouston.org/event/wood-duck-farm-festival-2/ Last Visited 8/17/2021.

Over the last 22 years Mr. Weldon invested his sweat equity in this property by improving and tending the land growing four seasons of fresh produce, and raising hogs, all of which are consumed in the Houston area. Currently, for instance, during the cooler fall and winter months, kale, broccoli, cauliflower, cabbage, carrots and strawberries are grown, while during the warmer spring and summer months, sweet corn, onions, arugula, tomatoes, green beans, peppers, melons and recently blueberries are produced. In addition to supplying locally sourced produce to the Whole Foods, WDF participates in farmer's markets, sells fresh produce to numerous Houston Area restaurants and raises enough food to feed about 300 Houston area families weekly.[5] Moreover, the farm has embraced an educational component for the community, while adapting to ever present changes in our world.

One such change, increased local rainfall, has complicated life for everyone in the greater Houston area and WDF is not immune to this climate change driven phenomenon. As recently as 2019, Tropical Storm Imelda deposited 22 inches of rain on the farm in 24 hours, and just earlier this year WDF received 4.5 inches of rain in two hours meaning that rapid drainage after large rain events is and will be vital to the sustainability and viability of the farm. Yet construction of the proposed access road to the landfill—only about 5 feet from WDF's western game fence—will impair natural drainage patterns. In short, PCE's proposed landfill threatens 22 years of financial investment and sweat equity in WDF and, therefore WDF satisfies the affected person requirement of TAC §55.251(c).

II.

Applicable Legal Standards

Title 30 Texas Administrative Code Chapter 330 governs TCEQ procedures to implement and regulate Municipal Solid Waste. Chapter 330 includes mandates intended to protect groundwater, and surface waters of the state of Texas as well as aquifers, in addition to prohibitions on landfill operations in certain areas as well as creating and maintaining a nuisance.

[5] Growing Awareness: Farmer opens up to the public. Kyle O'Conner, Houston Chronicle Sept. 24, 2013 https://www.houstonchronicle.com/life/columnists/oconnor/article/Growing-awareness-Farmer-opens-up-to-the-public-4840297.php Last Visited 8/17/2021.

III.

GENERAL COMMENTS AND OBJECTIONS

A. PCE's Application Violates TCEQ Rule 330.61(h) and Fails to Show that Proposed Landfill Is Compatible with Neighboring Land Uses.

1. Approval of PCE's Incomplete Application Sets a Terrible Precedent.

PCE's Application remains incomplete and virtually ignores the TCEQ requirement that the proposed facility is compatible with surrounding land use. This is readily apparent when (1) one considers the fact that the landfill is immediately next door to the Sam Houston National Forest, the virtual antithesis of a landfill, (2) no plans exist in the Application for the approximately one mile access road necessary to connect the landfill with local roads and how it will comply with TCEQ rules, (3) mitigation plans for the access road are not included in the Application, and (4) the vast number of boxes left incomplete on latest version of the TCEQ MSW Application checklist demonstrably show the Application remains woefully incomplete. The Application should be returned to the Applicant until such time as the Executive Director finds the Application technically complete for public comment. For example, no field survey for endangered species has been performed and no species protection mitigation plan has been formulated, despite the recommendation of Texas Parks and Wildlife Department.[6]

2. PCE's Application Fails to Show the Landfill is Compatible with Neighboring Land Uses.

TAC 330.61(h) requires that the Applicant demonstrate that a proposed landfill is compatible with neighboring land uses, however PCE's Application remains premised on fatally flawed assumptions and does not recognize the adverse impacts of this facility on nearby properties. Although the Application does mention the site is immediately adjacent to a working produce farm in a predominantly rural area, it fails to fully characterize current land uses within one mile of the site the affected area and worse provides no evidence that the facility is compatible

[6] Response Letter from Rachel Lange, Wildlife Habitat Assessment Program, Texas Parks and Wildlife Department to Matthew Udenenwu, MSW Permits Section TCEQ regarding TCEQ permit 2406, TPWD 45827.msg. dated January 25, 2021.

with local land use or the Sam Houston National Forest next door.[7] The dichotomy between the pastoral, almost spiritual nature of a natural forest juxtaposed against the image of a towering 160 foot tall mound of refuse, reeking of noxious odors, and inflicting plastic debris, dust, and noise, while attracting vermin to the neighborhood is startling and the obvious disparity in land use is more than noticeable, it is hard to ignore.

(a) PCE landfill incompatible next to a produce farm, National Forest and FEMA floodplain.

Location it is often said, is everything and should be afforded additional consideration in this MSW Application given the proposed landfill site is immediately adjacent to a produce farm, and a national forest, both of which will share a common border with the landfill along their southern and south-western edge of the landfill property. To the north of the project is the Sam Houston National Forest (the forest), established in 1934, one of only four National Forests in the State of Texas.[8] The forest encompasses approximately 163,037 acres of verdant wilderness interspaced with private properties that remains home to many popular game species and a sanctuary for endangered species, among them the Bald Eagle, and Red-Cockaded Woodpecker. Over 128 miles of hiking trails, open to the public, wind beside the lakes and ponds amongst the rivers, creeks and streams that meander through and around the multi-use forest.[9] This veritable green cathedral of loblolly and shortleaf pines that characterizes the forest ridges, is also home to a diverse population of deciduous hardwoods found along water bodies located in the bottomlands.[10] In fact, the Texas Health and Safety Code, contains a prohibition against landfills located in National Forest §361.123, and although this proposed landfill is not actually in the Sam Houston National Forest per se, the boundary line is an artificial property line and they are one and the same and approval of this permit would violate the intent of the statute.[11]

---

[7] Peach Creek Environmental Park TCEQ MSW Permit No. 2406 Rev. 3, April 30, 2021, Solid Waste Permit Application Parts - I, & II, San Jacinto County, Texas, Summary of Technical Report p. 8.
[8] National Forest and Grasslands in Texas Fact Sheet https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd531949.pdf Last Visited 8/17/2021.
[9] National Forests and Grass lands in Texas Sam Houston National Forest, USDA, United States Department of Agriculture. https://www.fs.usda.gov/detail/texas/about-forest/districts/?cid=fswdev3_008443 Last Visited 8/17/2021.
[10] National Forests and Grass lands in Texas Sam Houston National Forest, USDA, United States Department of Agriculture. https://www.fs.usda.gov/detail/texas/about-forest/districts/?cid=fswdev3_008443 Last Visited 8/17/2021.
[11] TAC §361.123.

(b) Significant opposition exists from municipalities, county officials, nearby property owners and residents including the Sam Houston National Forest

It is important for TCEQ to note that one barometer of compatibility with local land uses is support for—or in this case significant opposition against—this landfill. Even at this early stage in the permitting process over 1,100 comments have been submitted to TCEQ that object to this Application. Those concerned or opposed to this landfill include but are not limited to the Cities of Cleveland, Shepard, Houston, the U. S. National Park Service, US Congresswomen Sheila Jackson Lee, some San Jacinto County Commissioners, the Serra Club, and the San Jacinto County Farm Bureau among others. To date, over 3,986 individuals have signed a petition opposing this Application. It is important that TCEQ understand that those opposed to the landfill are not only concerned with the physical presence of the landfill and its adverse impact on the environment and human health but also that PCE's Type I MSW landfill Application, remains silent as to future plans except that there is a planned future expansion. This remains troublesome for those who fear that a future operator may apply for an amendment that would allow acceptance of hazardous waste, specifically highly profitable, but highly toxic coal ash, given the profit margin associated with acceptance of hazardous waste. Such an amendment remains even more problematic given site's underlying geology, in conjunction with the proposed landfill's proximity to the 100-year floodplain—one that is expected to expand once updated maps reflecting increased local rainfall become available. Of course, the Applicant could ameliorate these concerns by signing, and requiring a future operator to sign a binding statement that guarantees the Operator will not attempt to accept Class I waste in the future.

(c) PCE landfill will irreparably damage local aesthetics

PCE fails to adequately describe their proposed landfill and its impact on the surrounding area, as required by Texas Rule §330.61, which requires landfill applicants to describe the proposed landfill's "impact on surrounding area." Specifically, the Application fails to account for and describe PCE's impact as mandated under §330.61(H)(4) that the applicant include "sites with exceptional aesthetic quality, etc."[12] Here, PCE proposes to build and operate a landfill immediately next door to the Sam Houston National Forest, itself a living definition of

[12] TAC §330.61(h).

exceptionally high aesthetic values. Simply put, a landfill at this location irreparably damages the area's high aesthetic value.

This landfill if permitted, in addition to looming over the landscape, will increase and encourage unsightly litter and dumping due to the rural location and nature of the facility. In the nearby Sam Houston National Forest, illegal dumping remains a problematic issue and an adjacent landfill will only exacerbate the problem.[13] Furthermore, there is a certain amount of unsecured plastic and paper debris that will be blown from garbage trucks and other vehicles that transport waste to the facility. Finally, the landfill will operate and exist for decades towering 179 feet above the landscape—as high as a 16-story building—degrading the natural aesthetics of the area, and providing a vehicle for dust, debris and odors able to bypass any barrier erected to obscure the facility.[14]

Texans have long recognized the value and public benefit of undisturbed natural lands–as well as their associated watersheds and rivers—as valuable natural resources, increasingly utilized and enjoyed for commercial, recreational and aesthetic purposes. The Sam Houston National Forest in particular remains an impressive living treasure just north of the Houston area metropolis at the intersection of the State's famous East Piney Woods and the Coastal Plain.

(d) PCE's Landfill will diminish nearby property values

One final final issue related to PCE's proposed landfill and its compatibility with current neighboring land uses remains that of diminished property values. Without belaboring the obvious, landfills are not typically associated with an increased value of adjoining properties. Rather, research has confirmed that large landfill operations markedly diminish property values in direct proportion to the distance of the property location from the landfill.[15] In this instance, TCEQ's approval of this landfill will adversely impact nearby residential homesteads and communities through the diminution of property values. Further, it is more probable than not that

---

[13] *Illegal Dumping Called 'Epidemic' at Sam Houston National Forest*, Jose Gonzales, Houston Chronicle July 10, 2019, https://www.houstonchronicle.com/news/houston-texas/houston/article/Illegal-dumping-called-epidemic-at-Sam-14086195.php Last Visited 8/24/2021.

[14] Peach Creek Environmental Park TCEQ MSW Permit No. 2406 Rev. 0 08/27/2020 Parts III & IV, Attachment A at A2.

[15] Ready, Richard C. *Do Landfills Always Depress Nearby Property Values?* Rural Development Paper No. 7 The Northeast Regional Center for Rural Development Penn State University, (2005), at 18. http://www.cas.nercrd.psu.edu Last Visited 9/24/2021.

this landfill will adversely impact development, particularly residential development making it less likely in the surrounding area.

A study conducted by Penn State University in 2005 found that while not all landfills diminish property values, large "high volume" landfills—those accepting more than 500 tons of waste per day or more—adversely affect neighboring property values, lending credence to decades of complaints regarding landfill operations and their detrimental impact on the value of nearby properties. By this measure, PCE's proposed landfill will qualify as a high-volume landfill because the Application represents that PCE intends to receive 1,300 tons per of waste material per day.[16]

This study went further and actually calculated the diminished value of properties for both high volume and low volume landfills finding that: "On average, a high-volume landfill will depress the value of an adjacent property by 12.9%. This impact decreases with distance from the landfill at a gradient of 5.9% per mile. A low-volume landfill will depress the value of an adjacent property by only 2.5%, on average, with a gradient of 1.2% per mile."[17] Based on these metrics, and because PCE proposes to operate a high-volume landfill, local property values can be expected to decrease in direct relation to their proximity to the landfill. Of course, Van Weldon's property value as a vegetable farm will be virtually zero. Accordingly, WDF's property value will be adversely impacted the most along with other nearby neighboring properties.

Other than not being compatible with neighboring land uses, many problematic issues are raised by this Application, and the issue of the proposed site's subsurface geology remains one of critical importance. Here, the Application has not shown that the geology of the landfill contains soils that are sufficiently protective of groundwater and the underlying aquifer as required by subchapters H, J, and M of Chapter 330 TAC.

B. PCE Has Not Sufficiently Characterized and Addressed Subsurface Geology and Hydrology at the Site and Endangers Groundwater with Pollution,

The investigation and characterization of the subsurface geology performed by PCE is deficient, and the Application has not adequately characterized the hydrology of the groundwater

---

[16] Peach Creek Environmental Park TCEQ MSW Permit No. 2406, August 19, 2019, Solid Waste Permit Application Parts - I, & II, San Jacinto County, Texas, Summary of Technical Report p. 1.

[17] Ready, Richard C. *Do Landfills Always Depress Nearby Property Values?* Rural Development Paper No. 7 The Northeast Regional Center for Rural Development Penn State University, (2005), at 18.

and presence of groundwater at the site. Here, the proposed facility will pose a danger to groundwater that PCE has not adequately addressed as required under TAC §330.55(b).

1. PCE fails to account for gravel layer beneath proposed site.

Groundwater and aquifer protection remain of paramount importance to TCEQ and Texas residents as evidenced by TAC Chapter 330, Subchapters H and J, which addresses liner system design and operation as well as groundwater monitoring and corrective action respectively. In this instance, the underlying geology of the landfill raises several problematic issues specific to groundwater and monitoring, all of which arise due to the presence of a gravel layer immediately beneath the proposed landfill as identified in the permit Application Part III and IV.[18] Specifically the gravel layer raises the issue of whether this site's groundwater can ever be effectively monitored. Here, the gravel layer effectively controls the hydrology of the uppermost aquifer at the site. In turn, this is also the aquifer of concern and in this instance, the aquifer to be monitored due to its location directly beneath the proposed landfill and is the aquifer identified as the uppermost aquifer for purposes of groundwater monitoring.

The gravel layer forms the pervasive layer of Stratum II and it effectively "daylights" at Jayhawker Creek as shown on the maps and sections included in the Application. Because as Dr. H.C. Clark notes in his comments, this aquifer is "apparently unconfined," with a water table or potentiometric surface that appears to join Jayhawker Creek and hence, this aquifer serves as the creek's base flow.[19] The landfill location above this gravel layer imposes a hydrologic limitation and consequent legal limitation on the type of waste that may be accepted by PCE. The Texas Administrative Code wisely contains statutory restrictions that prohibit the acceptance of hazardous waste at such sites.[20] This Application and permit should expressly state that hazardous waste will never be acceptable at this landfill. Yet, as identified below, additional concerns present themselves due to this gravel layer.

---

[18] Peach Creek Environmental TCEQ MSW Permit No. 2406 Parts III & IV, August 8, 2020 Solid Waste Application, at E3.2; and Rev. 1 Dec. 11, 2020 at Appendix E3-5, and E3-6.
[19] Comments of Dr. H.C. Clark to TCEQ regarding MSW Permit Application Submitted August 13, 2021; and Citation from application with Map.
[20] TAC §335.204(e)(4)(5).

2. Groundwater monitoring system is inadequate because it fails to account for the permeable layer of gravel beneath the site.

As previously mentioned, a significant gravel layer lies directly below the landfill and its containment layers. This remains problematic as the upper stratum of sand and clays will be excavated for the landfill itself, leaving only a thin layer between the landfill cells, their liners and the underlying gravel. Because gravel has a higher hydraulic conductivity than sand and other materials, any leaks will literally race through the gravel layer and move downgradient.[21] Moreover, according to Dr. H.C. Clark, once the contaminated leachate reaches the gravel layer it will likely not have time to disperse, as it would in sand or other soils, but rather will quickly travel through the gravel layer.

3. Application's proposed groundwater monitoring system inadequate because it will not detect contamination in the uppermost aquifer underlying the facility.

In this instance, the gravel layer creates additional problems associated with detection because once in the uppermost aquifer and gravel layer, leachates will move quickly and migrate to the downgradient bound of the site mostly undispersed. This is precisely the situation described in a seminal ground water monitoring study conducted by J.A. Cherry.[22] Generally, leakage of leachate from landfill liners in typical groundwater pollution plumes contained in gravel, silt and sand only spread 10 to 20 feet wide by the time they reach the point of compliance. Here, this problem is compounded by the proposed 600 feet spacing between monitor wells.[23] Therefore, due to the speed of migration, contaminants will remain undetected by the monitoring system due to the monitor spacing at 600 feet intervals, too far apart for meaningful detection. **See Figure 2 below.**

---

[21] Cherry, J.A., "Groundwater Monitoring: Some Deficiencies and Opportunities," Hazardous Waste Site Investigations: Towards Better Decisions, Lewis Publishers, B.S. Berven & R.B. Gammage, Editors. Proceedings of the 10th ORNL Life Sciences Symposium, Gatlinburg, TN, GAO, "Funding of Post Closure Liabilities Remains Uncertain," GA. Last visited 9/9/2021.

[22] Cherry, J.A., "Groundwater Monitoring: Some Deficiencies and Opportunities," Hazardous Waste Site Investigations: Towards Better Decisions, Lewis Publishers, B.S. Berven & R.B. Gammage, Editors. Proceedings of the 10th ORNL Life Sciences Symposium, Gatlinburg, TN, GAO, "Funding of Post Closure Liabilities Remains Uncertain," GA. Last visited 9/9/2021.

[23] Ibid.

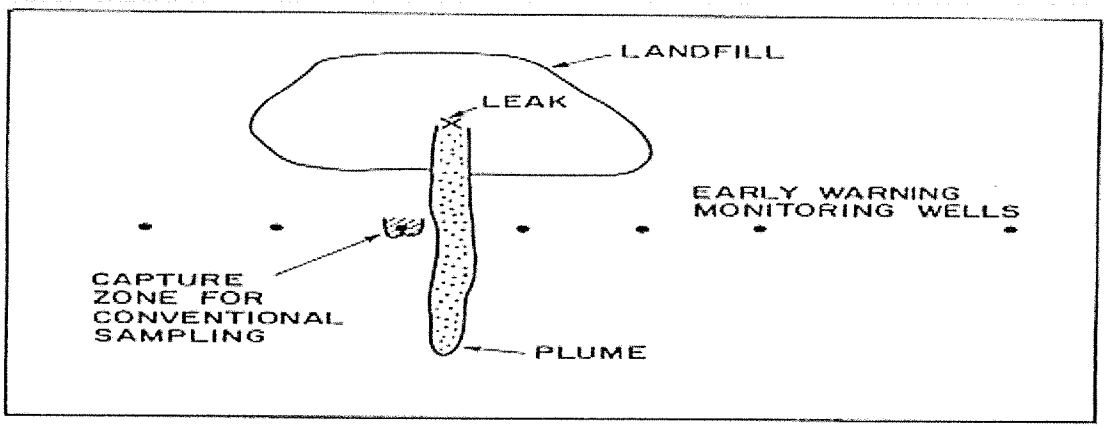


Figure 2.[24]

In short, the gravel layer will increase the speed of aquifer contamination and exponentially increase the chances of undetected groundwater contamination well beyond the bounds of the proposed landfill.

This problem may be rectified by closer spacing of the monitor wells and placement of the monitoring wells as far from landfill cells as possible but it remains especially problematic. Hypothetically, even if the wells were much closer together at 200 feet apart, due to the narrow "zone of capture," about 1 foot per well, a 10 to 20 ft. plume of contamination could easily pass undetected in the 198 feet between monitoring wells making meaningful leak detection virtually impossible to reliably monitor. Hence, leachate could travel great distances before it is ever detected.[25] Yet, for this particular landfill, meaningful contamination detection is rendered even more difficult by the landfill design, which requires long term dewatering, as discussed below.

4. Dewatering the uppermost aquifer beneath landfill creates conditions that will violate limits on contaminates under TAC §330.331(a)(1).

Because of PCE's below grade design, excavation is required. Yet, because the water table is so high at the proposed landfill location, extensive dewatering must take place in order to prevent hydrostatic pressure from raising or tearing the landfill cell liners until sufficient waste is placed in the cells to prevent this negative hydrostatic condition. It is significant that this dewatering is not for temporary construction purposes, but rather will serve as a long-term alteration of the uppermost aquifer, an alteration that effectively creates a sink beneath the landfill.

---

[24] Ibid at page 4. http://www.gfredlee.com/Groundwater/cherry_gw.pdf Last Visited 9/9/2021.
[25] Ibid.

This is important because this sink will draw water into the landfill rather than allowing it to pass under the liner and past leak detection devices as the water passes the point of compliance.[26] In short, the drawdown of the uppermost aquifer will cause water to flow into the landfill instead of out, never passing the point of compliance. Such a condition also violates the conditions set forth in TAC §330.331(a)(1) because the inflow of groundwater will predictably dilute concentrations of contaminates, thereby rendering meaningless the concentration levels established under §330.331(a)(1).[27]

5. PCE Application utilizes outdated HELP Model to evaluate future landfill performance.

The Application admits that groundwater will flow into the landfill sink in the discussion of leachate. PCE's use of the Hydrologic Evaluation of Landfill Performance (HELP) model expressly states that this model does "not predict inflow through the liner into the leachate collection system due to the exposure of the liner to a high groundwater table," although it does assume the liner will leak.[28] Significantly, todays hydrologic engineers consider the HELP and ICPR models outdated. TCEQ should require PCE to utilize the current industry standard for evaluating landfill hydraulics—the EPA's SWMM model system available at no cost.

6. Dilution of contaminates is not the solution to pollution.

As noted above, the inflow of groundwater into the sink created by landfill dewatering will dilute any leachate contaminants that have leaked from the landfill. Significantly, this condition thwarts the intent of TAC §330.331(a)(1) and any meaningful monitoring for landfill leachate contaminants, however, this is not the only dilution problem associated with this permit.

According to PCE's Application, monitoring wells 3, 4, 5, 6, 10 and 11 are slated to be located adjacent to unlined detention ponds.[29] These unlined detention ponds will recharge

---

[26] Peach Creek Environmental TCEQ MSW Permit No. 2406 Rev. 3, April 30, 2021 Solid Waste Application – Parts I and II San Jacinto County, Texas, page 65 D7-6; and Public Comments of Dr. H.C. Clark.

[27] TAC §330.331(a)(1), establishes maximum levels of known toxic contaminates, among them; arsenic, benzene, carbon tetrachloride, cadmium, chromium, lead, mercury, and vinyl chlorides, amongst others.

[28] Ibid. at D6-B-1.

[29] Peach Creek Environmental TCEQ MSW Permit No. 2406 Rev. 3, April 30, 2021 Solid Waste Application – Parts I and II San Jacinto County, Texas, at page

Stratum 1 immediately and rapidly to the uppermost aquifer following a rainfall event.[30] The practical effect here is that any contaminants passing the point of compliance will become diluted following rainfall events. Currently, this Application has no contingency plans to address this situation, and begs the question, will this dilution prevent compliance with the requirements of TAC §330.55(b) Water Pollution Control, and §330.331(a)(1), which imposes limits on leachate contaminants?

As noted previously, these problems are related to the gravel layer of the site. The current ground water monitoring system appears to be based on assumptions related to typical Texas sand, when actually, sand is not predominant in Stratum II, but rather, more highly permeable gravel predominates. In this instance, the Application improperly utilizes sand permeability when the presence of gravel is obvious. The Application uses the permeability of the aquifer as shown on the application to be 10^3, which is overly optimistic for dewatering, velocity and dispersion calculations and a more reasonable value should be used.[31] Because this permeability value is low, water will preferentially move through the gravel, at much greater velocities than this Application anticipates.

Finally, even properly constructed and operated landfills eventually experience leaks that contaminate groundwater with toxins, and even the HELP Model utilized by this Application assumes the liner will leak.[32] In such circumstances, these leaks often render the waters of the underlying aquifer unfit for human consumption or agriculture use. Any such leak would likely be catastrophic for neighboring landowners, particularly WDF, and TCEQ should consider major changes in the landfill design in addition to requiring a much more extensive groundwater monitoring system that will work as intended by Texas statute.

---

[30] Public Comments of Dr. H.C. Clark.

[31] application conductivity footnote

[32] Peach Creek Environmental TCEQ MSW Permit No. 2406 Rev. 3, April 30, 2021 Solid Waste Application – Parts I and II San Jacinto County, Texas, at D6-B-1.

C. PCE Has Not Demonstrated Compliance with TCEQ Requirements Related to Drainage, Floodplains and Pollution of Surface Waters.

1. PCE's failure to consider upstream alterations and water velocity violates TAC §330.305(a).

PCE's drainage analysis remains flawed due to the focus solely on downstream drainage impacts. Here, PCE's focus on downstream drainage ignores the significant impact the proposed facility will have on drainage upstream of the facility, is deficient, and will not meet the requirements of 30 TAC Sections §339.63 and 330.303.

Currently, TCEQ approval of this Permit without including the access road in the Permit Boundary will violate TAC §330.305 prohibiting impairment of surface water drainage. Here, the natural drainage of the area including WDF begins in the adjacent Sam Houston National Forest to the east and flows across WDF from east to west. Heavy rainwater is eventually channeled via two drain fields into the floodplain creek flowing north to south just outside the game fence on WDF's western fence and is visible on the maps included by PCE in the Application. The floodplain creek traverses about 1500-2000 feet to the south and remains undeniably located in FEMA's 2010 floodplain. Additionally, the removal of trees for the access road within the floodplain will probably increase flood water velocity. Further, the U.S. Army Corps of Engineers (USACE) analysis identified wetlands in this floodplain that appear to be located on or immediately adjacent to the proposed access road site.[33]

2. PCE has not shown compliance with TCEQ mandates related to floodplain and wetland impacts.

TAC mandates under §330.547(a) prohibit landfill operations within an established floodplain, and yet PCE's proposed MSW site will be as close to a FEMA floodplain as is physically possible. Can this proposed landfill remain compliant with prohibitions on MSW operations located in a 100-year floodway as defined by FEMA, given portions of the landfill remain on a floodplain and that the facility's proposed storm water runoff detention ponds storage cells are a mere 100 feet from an established FEMA floodplain? For this Application, TCEQ should consider the well-known increases in rainfall events and the near certain expansion of the FEMA floodplains in two years. Currently, this Application fails to adequately address the hazards

[33] U.S. Army Corps of Engineers Approved Jurisdictional Determination Form (Interim) Navigable Waters Protection Rule 11/23/2020 ORM Number SWG-2019-00646, pg. 2.

posed by potential flooding, and the impact of the facility on wetlands, even though the facility will significantly alter the area floodplain, with severe consequences likely.

Conversations with the USACE reveal the Corps agrees further study is necessary to prevent additional flooding downstream within the previously designated 2010 FEMA floodplain given the location of the proposed access road. Significantly the property PCE owns and intends to use for the access road is only about 100 feet wide, leaving little to no room for detention ponds or other actions to mitigate flooding. This is especially important because the natural drainage patterns that flow from east to west will intersect with the north to south flowing creek already within the FEMA floodplain which happens to be the location for PCE's proposed landfill access road. It is critical that a proper access roadway be designed and approved to ensure that WDF is not negatively affected by impaired drainage, and to remember that this access road will be utilized by hundreds of trucks weighing approximately 36 tons apiece each and every day.

Significantly, the USACE's determination that the identified wetlands were not waters of the US was made under the Trump administration's short-lived rule—now revoked—that restricted the designation of wetlands. This restrictive interpretation of this rule is now revoked and TCEQ should require a new determination under the current rule, which likely would result in the identified wetlands being included in the waters of the US rule and that would require a 404 permit.

3. PCE's Application lacks provisions to mitigate impoundment of surface water.

PCE's Application fails to include provisions to mitigate flooding caused by the landfill access road flooding WDF. Here, the proposed access road will be constructed approximately 600 ft. from 2010 FEMA Floodplain. The Application also lacks a sheet flow analysis to show drainage patterns across the affected area, including areas off the permit boundaries where water may be impounded by landfill activities.

The landfill requires large leachate storage tanks which must be pumped out (40,000-100,000 gal/day) into tanker trucks and hence makes them subject to leaks, accidents and spills on public roadways when the collection trucks leave the facility. The issue of roads and transportation off site is further addressed below.

4. PCE's Application Fails to Adequately Protect the Waters of the U.S. and Address Potential Pollution Caused by Rainfall Runoff and Leachate Leakage from Ponds.

Neighboring residences, and farms require both surface and groundwater water for their households, as well as livestock and irrigation water need. This is one of the purposes of Chapter 330 of TAC, yet, MSW Application No. 2406 does not provide adequate protections from contaminated discharges of leachate into Jayhawker Creek. Runoff and contaminants once in Jayhawker Creek, will flow into Peach Creek, then into the San Jacinto River before reaching Lake Houston only seventeen miles away.[34] For instance, the Application states only one foot of freeboard is planned for leachate and storm water detention ponds, when recently recorded rainfall indicates increased rainfall will over top the detention ponds causing the overflow of contaminated materials into the environment.[35]

Jayhawker Creek is considered Waters of the United States, and hence, subject to the Clean Water Act and special consideration.[36] Other leachate ponds are proposed less than 100 yards from the national forest boundary, and the nexus between the proposed facility and Jayhawker Creek raises jurisdictional issues with the USACE. TCEQ should require the Permit include testing for storm water and surface water quality in the downstream surface waters, and these should be made clear in the pending TPDES permit application. Moreover, it would be helpful if TCEQ required PCE to test for the biochemical oxygen demand imposed on the receiving waters of Jayhawker Creek. Monitoring for biochemical oxygen demand should be required to ensure a *de Minimis* effect and that current uses remain unaffected.

D. PCE's Application Utilizes Inconsistent Rainfall Data.

Under Texas rules, MSW applicants are required to provide modeling that shows the facility is designed for at a minimum 24 hr. 25-year rainfall events.[37] PCE has included the required modeling in the application, but inconsistently utilizes different rainfall amounts in the modeling calculations. For instance, the Application's Attachment C3, Erosion and sediment control for the

---

[34] Peach Creek Environmental Park San Jacinto County, Texas TCEQ Permit Application No. MSW 2406, Part III – Facility Investigation and Design, Attachment C Facility Drainage Report September 28, 2020, at C2-1.

[35] Peach Creek Environmental, TCEQ MSW Permit No. 2406 NOD Response, Parts I, II, III, IV Dec. 11, 2020. at D6-4.

[36] U.S. Army Corps of Engineers Approved Jurisdictional Determination Form (Interim) Navigable Waters Protection Rule 11/23/2020 ORM Number SWG-2019-00646, Section II C, page 5.

[37] TAC §330.63(c)(2)(C).

"Scour Calculation Side-slope reach" uses 10.5 inches of rain for the 25 year, 24-hour rainfall calculations,[38] markedly less than the 11.3 inches of maximum rainfall identified in NOAA Atlas 14 rainfall cited in Attachment C1 Appendix C1-B Existing condition hydrological calculations.[39] This inconsistent use of data is both confusing and irresponsible and lends itself to dangerous outcomes, because these calculations utilize 24 hr. rainfall calculations that do not reflect actual rainfall as established by NOAA. Further it is not clear exactly which of the two rainfall figures are utilized in the other drainage calculations. TCEQ should require PCE to: (1) utilize consistent data, and (2) recalculate all erosion and sediment control calculations that underestimate the actual rainfall expected using current up to date 25 year, 24 hr. rainfall data available from NOAA and resubmit the Application.

E. Permit Violates Rule §330. 61(i) Because Part II of the Application Fails to Adequately Address Transportation Requirements Under §330.153 Governing Site Access Roads

1. PCE's Application is misleading regarding the actual condition of local roads.

TAC §330.61(i) requires Landfill permit applicants to provide detailed transportation information including the "availability and adequacy of roads" to be utilized to access the site. PCE fails to do so, stating in part I and II of the Application that the "existing access roadways...are considered adequate to handle the existing traffic volumes associated with the proposed facility." This is not so, and the issue of access roads to PCE is especially problematic, notwithstanding the Application's glaring omission of the yet to be constructed access road to the landfill from Rajack Road, which must be included in the Application. Significantly, the Application's traffic plan is "not accurate to the actual conditions" according to David Brandon, the Commissioner for Precinct 3 of San Jacinto County, as stated in a letter to TCEQ dated January 25, 2021.[40] More troublesome to area residents is that this misrepresentation calls into question who will be responsible for the maintenance of the county roads utilized by landfill truck traffic and if local taxpayers will bear this burden.

---

[38] Peach Creek Environmental TCEQ MSW Permit No. 2406 Rev. 3, April 30, 2021 Solid Waste Application – Parts I and II San Jacinto County, Texas, Appendix C3 at C3-7 and 8.

[39] Ibid, at Attachment C1 Appendix C1-B, C1B-2. Significantly rainfall rates found on page C3-6 are lower at only 10 inches.

[40] Response Letter Regarding Roads and Traffic Routes to TCEQ's Request for Recommendations, from David Brandon, Commissioner Precinct 3, San Jacinto County, January 25, 2021 at page 1.

Here, Commissioner Brandon's letter to TCEQ expressly states that Rajack, Jayhawker and Fostoria Tram roads remain woefully inadequate for the type of heavy truck traffic envisioned by PCE, even though the application states that they are. Commissioner Brandon included the San Jacinto County Road Summary as provided by the Texas Department of Transportation to prove the point. These roads are classified by TXDOT as all-weather roads but only Fostoria Tram Road is actually paved, and at least one is prone to flooding. Importantly, San Jacinto County's all-weather roads are maintained with a motorized grader. Consider Rajack Rd, which is a TXDOT classified 32 surface (sand-ore). This road would "require extensive expansion, stabilizing and asphalting to meet the current standards to support traffic and weights for just one year of service." Further, the letter estimates that the cost to bring these roads up to "acceptable standards," will be $1.1 Million per mile, with over 5 miles of roadway requiring extensive work.[41] This cost should not burden San Jacinto County, but rather should be borne by the Applicant. Moreover, the application does not consider that these narrow rural roads—some of which are flood prone—with little to no shoulders will be shared by school buses, children delivery vehicles, first responders, postal carriers, law enforcement and residents of the area going about their daily activities.

This unanticipated and heavy use of these vulnerable rural roads, in a county deemed economically disadvantaged will deteriorate road conditions significantly due to the estimated 810 combined trips daily.[42] Not surprisingly, the Sam Houston National Forest denied access to PCE truck traffic seeking to access the landfill.

2. Landfill access road must be included in the Application.

TAC 330.153(b) governs the maintenance of landfill access roads, and includes provisions designed to prevent landfill dust from becoming a nuisance to neighboring properties.[43] Yet despite stated concerns regarding vehicular traffic and roads, this Application fails to include the entire access road in the Permit Boundary. This failure to include the access road in the Application artificially creates enforcement issues because without inclusion in the Application, it is unclear if TCEQ will have the authority enforce rules regarding dust control, fencing, and drainage etc. on the access road outside the permit boundary. Further, the Application fails to disclose how dust will be maintained and mitigated. Previous recommendations by SOAH judges reinforce the notion that

[41] Ibid, at pgs. 1 and 2.
[42] PCE Application, Appendix L, at L8.
[43] TAC 330.153(b).

the Application should include the entire access road in the permit boundary. For example, in 2017, SOAH Administrative Law Judges agreed that the entire length of a landfill access road should be included in the permit boundary.[44]

Additionally, the Application presupposes the routes for the estimated daily truck traffic to access the facility, but this is not necessarily true because PCE cannot enforce the suggested routes to the landfill and truckers are free to utilize whatever roads they deem the most efficient. Moreover, and perhaps more troublesome for county officials charged with the upkeep of county roads; the Application is unclear how maintenance and upkeep of the county roads to the facility will be achieved.

3. Application is unclear if leachate trucks are included in total trip calculations to facility.

Significantly, the application does not mention if it includes leachate transportation trucks in the daily vehicular traffic estimate. The Application makes it clear that leachates will be transported off site, which involves the movement of heavy liquid waste requiring specific trucks for the job. While the Application states that up to 500,000 gallons of contaminated leachate will be trucked off the facility for disposal, the Application neglects to identify what type of truck will be used and how many trips are expected daily.[45] For instance, will 10,000 gallon fracking trucks be used, or lighter 5,000 gallon trucks. In the case of the former, approximately 50 trips will be required and will be at least twice as heavy as the 5,000 trucks, yet the 5,000 gal. trucks while lighter will require 100 trips to dispose of the contaminated leachates. Further, the Application remains silent as to who will operate these leachate trucks, the facility or a third party, and where these heavy trucks will be marshalled on the property.

TCEQ should require the Applicant to include these trucks in the traffic summary and account for the effect of these trucks on local roads and the community. Moreover, during our more frequent "rain fall events" the Application should identify precisely what measures it will take to prevent leachate from overtopping the leachate ponds in the event that the heavy trucks are unable to transport the leachate off property. This potential inability to remove leachate due to

---

[44] State Office of Administrative Hearings Feb. 17, 2017, SOAH Docket No. 582-15-2082; TC EQ Docket No. 2015-0069-MSW; In RE: Application of 130 Environmental Park, L.L.C. for Proposed Permit No. 2383, at pg. 28. http://www.gghcorp.com/wp-content/uploads/2020/11/2017-02-17-PFD.pdf Last Visited 9/19/2021.

[45] Peach Creek Environmental Park, TCEQ MSW Permit No. 2406, April 30, 2021 Rev. 3 April 30 at D6-4.

excess rainfall, should be addressed by the Application before adverse circumstance necessitate the discharge of leachates into Jayhawker Creek. In short, TCEQ should require a more reasonably accurate traffic mitigation plan, a demonstration of the means by which local roads and taxpayers are protected from the wear and tear of heavy truck traffic and contingency plans for leachate in the event roads become impassable due to heavy rainfall.

F. PCE's Proposed Facility Will Adversely Impact Threatened and Endangered Species.

1. Endangered and threatened species are known to inhabit the area

Endangered species remain a concern under this Application, given the known presence of endangered species in the adjacent Sam Houston National Forest, and the methodology utilized to reach the Application's conclusion that they are not an issue. Moreover, the Application offers no support for the statement "that the construction and operation of the facility shall not result in the destruction or adverse modification of the critical habitat or cause or contribute to the taking of endangered or threatened species."[46] In short, PCE has no plan to avoid, minimize or mitigate impacts to wildlife, including protected species during the construction, operation or maintenance of the landfill, even though endangered and threatened species are known to be in the area. For instance, in the Sam Houston National Forest next door, as of 2016, there were 274 nesting households of Red-cockaded Woodpeckers in the forest.[47] Currently according to conversations with wildlife biologists, there are significantly more nesting households of Red-Cockaded Woodpeckers in the forest, indicating that as the population increased, the woodpecker habitat likely expanded.

2. Desktop reviews are inadequate and likely will lead to violations of ESA.

Significantly, the Biological Assessment included in the Application admits the assessment was essentially a desk top review without a field survey of the property. Absent a proper field study, the Application assumes but contains no support for the statement that "the construction and operation of the facility shall not result in the destruction or adverse modification of the critical

---

[46] Peach Creek Environmental Park, TCEQ MSW Permit No. 2406, Rev.0, 08/27/2020 Parts III & IV, at B-10.

[47] National Forest and Grasslands in Texas Fact Sheet. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd531949.pdf Last Visited 8/17/2021.

habitat or cause or contribute to the taking of endangered or threatened species."[48] Under the ESA, this is unacceptable. Simply put there is no way to know if there are any of the endangered or threatened species on the site that are known to exist in the area until a proper biological survey is performed. Additionally, the ESA requires that some form of habitat management plan exist *prior* to any take or removal of a species contrary to express statements included in PCE's dubious Species Protection/Management Plan, that proposes to simply remove any Endangered Species found during some future survey.[49] Another point, is that the Application did not include the required Texas Parks and Wildlife correspondence letter dated Oct. 21, 2019.[50]

3. Operational Plan neglects endangered and threatened species.

Under TAC §330.157 governing MSW facilities operational standards, "A facility and the operation of the facility must not result in the destruction or adverse modification of the critical habitat of endangered or threatened species. Facilities must be operated in conformance with any endangered or threatened species protection plan required by the Commission."[51] PCE's site operating plan does not contain provisions for the protection of any identified endangered species, and does not incorporate the measures requested by TPWD's wildlife specialist. These recommended actions—such as utilizing erosion control methods that do not utilize plastic mesh or micro plastics, which can entangle birds, mammals and reptiles or be ingested by wildlife to their detriment—remain absent. Neither does the Application appear to incorporate the TPWD lighting recommendations designed minimize the negative impacts of artificial nighttime lighting on migratory birds and other animals.[52] Instead, the Application proposes to move species, by an unnamed entity, if such an endangered species is located and incorporates no plan to "avoid, minimize or mitigate impacts" to wildlife. This absence of a definitive species protection and mitigation plan is unacceptable and likely will lead to violations of the ESA and Texas Parks and

---

[48] Response Letter from Rachel Lange, Wildlife Habitat Assessment Program, Texas Parks and Wildlife Department to Matthew Udenenwu, MSW Permits Section TCEQ regarding TCEQ permit 2406, TPWD 45827.msg. dated January 25, 2021.

[49] PCEP Permit Application Parts II and IV Appendix H.

[50] Response Letter from Rachel Lange, Wildlife Habitat Assessment Program, Texas Parks and Wildlife Department to Matthew Udenenwu, MSW Permits Section TCEQ regarding TCEQ permit 2406, TPWD 45827.msg. dated January 25, 2021.

[51] TAC §330.157.

[52] Response Letter from Rachel Lange, Wildlife Habitat Assessment Program, Texas Parks and Wildlife Department to Matthew Udenenwu, MSW Permits Section TCEQ regarding TCEQ permit 2406, TPWD 45827.msg. dated January 25, 2021, pgs. 2-6.

Wildlife code. Further, removal of species, while generally acceptable for vegetation, is far more complex a process for mammals, reptiles, amphibians and birds, and a detailed mitigation plan should be included in the Application as required under Texas rules.

G. PCE's Operating Plan Does Not Adequately Ensure Against the Danger of Fire for Adjoining Properties.

PCE's landfill will increase the threat of wildfire in the adjacent neighborhoods and within the Sam Houston National Forest immediately next door, and PCE's operating plan provides no explicit provisions or training for employees. TAC §330.129 mandates a fire protection plan for MSW facilities,[53] because landfills naturally generate explosive methane gas. Significantly, while the Application contains a "fire protection plan," it suffers a lack of detail and triggering mechanisms that render the plan deficient. This is important because landfills are notorious for spontaneous fires and approximately 8,300 fires occur per year at these facilities.[54] These fires remain difficult to extinguish because they burn and smolder underground like peat or coal fires.[55] One such fire in New Jersey burned for weeks, released noxious and dangerous hydrogen sulfide gas that spread into adjacent neighborhoods and ultimately cost the township of Danbury NJ over $1 million for a gas recovery system. [56]

A major contributor to landfill fires is flammable material that regularly is sent to MSW landfills. Here, landfill personal play a critical role in preventing acceptance of flammable and explosive material and reducing the chance of spontaneous fires, but no information is provided regarding landfill employee training, how flammable materials will be excluded, and how the fires will be extinguished. Risk of fire takes an increased significance given the climate change driven record number of wildfires that have scorched western states over the last two years.

Less than a decade ago, Texas experienced droughts that led to record wildfires in 2013 and 2011. Future drought conditions, in conjunction with a wildfire initiated at the landfill that spreads into the National Forest would have catastrophic consequences for Wood Duck Farms, the National Forest, neighboring residents, regional air and water quality and the wild life dependent

---

[53] TAC §330.129.

[54] Landfill Fires, U.S. Fire Administration Topical Fire Research Series Volume 1, Issue 18 March 2001, https://www.hsdl.org/?view&did=19520 Last visited 8/24/2021.

[55] Waste Today Magazine. https://www.wastetodaymagazine.com/article/preventing-landfill-fires-waste-today/ Last visited 9/22/2021.

[56] Landfill Fires, U.S. Fire Administration Topical Fire Research Series Volume 1, Issue 18 March 2001, https://www.hsdl.org/?view&did=19520 Last visited 8/24/2021.

on the forest for habitat. TCEQ should require PCE to produce a comprehensive fire protection plan to be included in PCE's Operational Plan such as a very wide fire break adjacent to the bounds of the forest.

H. PCE Application Fails to Adequately Address Windblown Debris, and Dust

TAC §330.139 requires MSW Operators to control and confine windblown waste and litter and for good reason, as landfills remain notorious for their association with windblown debris and plastics. This issue is of paramount importance to WDF due to the nature of farm produce and the marked reluctance of consumers to purchase produce grown in such close proximity to a landfill. This is especially so with WDF customers such as Whole Foods and high end restaurants who market natural and organic produce to customers concerned about the presence of toxins in the food they consume. The fact of the matter is that the mere presence of a landfill next to WDF will certainly cause a loss in customers as well as income to WDF because of the association many consumers have made between landfills and airborne contaminants.

TAC rule §330.153(b) requires that landfill access roadways control their dust generated by truck traffic.[57] Yet, it is important to note that PCE included no dust mitigation plans in their Application and TCEQ should require PCE to do. Further, PCE's Application includes no details in its Operations Plan about how landfill employees will screen incoming waste for prohibited materials. This proposed permit will already allow household, commercial, as well as some industrial and special wastes. This waste material could include garbage, ashes, street cleanings, dead animals, slaughter house offal, contaminated soils, asbestos containing material, sludge, construction and demolition waste, grit and grease trap materials, empty pesticide and herbicide containers, medical waste, electronic waste and others as well as waste generated outside of Texas. Despite the importance of screening waste material before it is accepted, the Application does not make clear how employees will be trained or how the waste material will be screened for prohibited items.

TCEQ should require that PCE demonstrate exactly how windblown dust—which may contain toxins due the nature of the landfill waste—will be mitigated. The Application must also better address the issue of windborne plastic debris, which remains particularly problematic due to the breakdown of plastics and their subsequent ingestion or entrapment by wildlife.

---

[57] TAC §330.153(b).

This issue takes on a heightened concern due to the well established presence of endangered species in the National Forest, and the written statements from Texas Parks and Wildlife Department regarding plastics and the risk they carry to all manner of wildlife. Farmers and ranchers also have cause for concern due to the risk that forage hay and farm produce may become unharvestable due to landfill trash contaminating production fields.

Finally, landfills are inherently noisy operations because of the heavy equipment utilized to move and bury the waste material as well as the heavy truck traffic necessary to bring wastes to the site. Moreover, because of the landfills proximity to the National Forest, the Application should address the effect that the back-up beepers found on operating equipment and trucks do not adversely impact wildlife. It is noteworthy that the wild blown dust, odors, waste, plastic debris and obnoxious noises produced and inflicted upon the PCE's landfill's neighbors, are not remotely compatible with the area's current land uses.

I. Application Fails to Adequately Address the Impact of Methane and Other Noxious Landfill Gasses on Adjacent Properties.

TAC §330.371 mandates landfill gas management because methane off gassing remains a reoccurring issue with landfills, particularly Type I landfills accepting putrescible waste. Here, the gasses are not only noxious, but are also dangerous because of the well-known adverse health effects of methane and hydrogen sulfide gas on humans and wildlife in addition to the explosive nature of methane gas and risk of fire discussed above.

Based on the information available in Appendix G found in the Response to a Notice of Deficiency sent by TCEQ to PCE, landfill gasses will be flared.[58] Here, PCE's proposed landfill gas management is inadequate. TAC §330.371(g) requires a timeline for the installation and monitoring of gas detection systems and control procedures.[59] Yet the Application remains vague as to when this process will be implemented, stating "as the site develops extraction wells will be installed as needed to control landfill gas and meet regulatory requirements." Such a promise to take action at some future date is not compliant with the language and intent of TAC §330.371, which is designed to prevent off gassing and reduce the risk of explosion, fire and injury. Moreover, PCE's nebulous adherence to TCEQ's statutory requirements for landfill gas

[58] PC-II No. 2406 Technical Notice of Deficiency Response 022420219, Appendix G.
[59] TAC §330.371(g).

management increases the probability that PCE will violate TAC §330.15(a)(2), which prohibits the creation and maintenance of a nuisance.

J. PCE's Operating Plan is Deficient Because It Fails to Adequately Address Landfill Vermin and the Impact of Nuisance Wildlife on Adjacent Properties

Texas MSW rules include §330.15(a)(2), TCEQ's provision that prohibits landfills from becoming a nuisance. Here, PCE's landfill will certainly attract birds and other animals including pests such as mice, and rats, all generally considered nuisance animals—especially if one operates a produce farm for a living. Raccoons, Opossums and bats as well as predators will follow, and a high probability exists the facility will attract feral hogs, well known for their highly destructive foraging habits.

Unwanted nuisance animals such as rats, raccoons and opossums pose a direct threat to the produce growing in WDF, in addition to the real threat of seagull infestations and the subsequent foraging and defecation on adjacent produce crops. Feral hogs create another well-known subset of problems associated with feces, and property destruction as well as the real danger they pose to humans who might encounter them.[60] PCE's Operating Plan does not demonstrate how landfill vermin will be addressed. Here, PCE's representations that these issues will be resolved in and of itself does not solve them, but rather calls into question the viability of PCE's Operating Plan. This Application's Operating Plan remains deficient in this respect and TCEQ should require that PCE address these issues specifically and directly.

PCE Lacks Competency to Operate a MSW Facility and Statements Regarding Future Sale to an Unknown Future Operator Create Transparency Issues.

PCE and its investors are a Mississippi based outfit with no known experience regarding the construction and operation of landfills. Currently, PCE has failed to provide information that demonstrates it has any experience owning, or operating any other solid waste facility, or that it has any direct financial interest in any other waste facilities or any management experience with organizations engaged in solid waste activities or experience earthmoving and landfilling. Specifically, who will be operating this landfill if a permit is approved by TCEQ remains unknown,

---

[60] Emily Foxhall, *Officially, an Anahuac woman was kicked in a rare feral hog attack. But some aren't convinced.* Houston Chronicle, February 21, 2020. https://www.houstonchronicle.com/news/houston-texas/houston/article/Feral-hogs-killed-a-woman-in-Anahuac-officials-15072296.php Last Visited 9/23/2021.

given Peach Creek's oral representations to WDF that they will sell the landfill to another unknown Operator once the permit is issued. Generally, landfills are only as compliant as their Operators which are critical to successfully maintaining the permit conditions required by TCEQ, and upon which the health, safety and well-being or nearby residents depend. This is precisely why TCEQ regulations consider an Operator's compliance record for certain permit applications and amendments to be a relevant factor in new or amended landfill operations.

CONCLUSION

For the aforementioned reasons, WDF objects to Peach Creek Environmental Park, LLC's Permit Application and challenges the Permit's compliance with Title 30 Texas Administrative Code, Chapter 330, 16 USC Section 1538 and the Clean Water Act. Specifically, Wood Duck Farms challenges whether or not the Application complies with the following TCEQ rules:

-Compliance with TAC §330.15(a)(2), which prohibits the creation and maintenance of a nuisance, or the endangerment of human health and welfare or the environment, given the current permit application will likely leak toxic landfill leachates into the surface and ground water, and landfill odors, wind-blown trash and debris clearly will constitute a nuisance for neighbors and a hazard for those that rely on ground water or surface waters downstream.

- Compliance with TAC §330.303 and the prohibition of off-site discharge of waste material during 25-yer rain events, given PCE's Application inconsistently utilizes 25-year rainfall data.

- Compliance with TAC §330.305(a), and the requirement that "existing or permitted drainage patterns must not be adversely altered, given that the necessary access road for the landfill is not included in the permit application and road construction to access county roads from the site will certainly alter drainage patterns as the road will transect a significant drain field that runs from the SHNF thru Wood Duck Farms.

- Compliance with TAC §330.305(c) that requires the operator or owner maintain a runoff management system to collect and control rainwater volume from a 24-hr. 25-year storm given the permit utilizes outdated 24 hr. flood projections.

- Compliance with TAC330.305(g) regarding leachate runoff, given the Application rain water detention ponds only have 1 foot of freeboard, while increased rainfall amounts indicate the near certainty of rainfall events with over 1 foot of rain, which will overtop both leachate and detention ponds.

- Compliance with TAC §330.305(g) that regulates the handling, storage, treatment and disposal of surface and groundwater that has become contaminated by contact with the working face of the landfill or the treatment of leachate, given the mandates of TAC § 330.207, and the presence of unlined storage tanks directly above a porous aquifer.

- Compliance with TAC §330.331(a)(1) governing the landfill liner system, design and operation criteria and the accompanying table that lists the maximum acceptable concentration values of common landfill contaminants, given the substantial gravel layer under the proposed site and the consequent hydrological issues that will make accurate evaluation and monitoring of these contaminants virtually impossible under the current permit application.

- Compliance with §330.331(c) which enumerates 6 factors the TCEQ may utilize in the determination of compliance with §330.331(a) above, given §330(c)(1) hydrologic characteristics of the facility and surrounding land, (c)(2) climactic factors of the area, (c)(4) the quantity, quality and direction of flow of groundwater, (c)5) the proximity and withdrawal rate of the groundwater users; and (c)(6) the availability of alternative drinking water supplies, given Wood Duck Farms sole reliance on groundwater for drinking, irrigation and all other conceivable uses of a produce farm.

- Compliance with TAC §330.371 Landfill Gas Management and if the proposed methane monitoring system is adequate to ensure that methane gas concentrations do not exceed 1.25% in facility structures and 5% by volume in monitoring points or off the property, given that such a monitoring program is mandated by TAC § 330.371(b).

- Compliance with 16 U.S.C. §1531 (1973) otherwise known as the Endangered Species Act (ESA), and whether the permit will violate the ESA's prohibition on the Taking of endangered Red Cockaded Woodpeckers and Louisiana Pine Snakes known to inhabit the area and their established critical habitat in the adjacent Sam Houston National Forest.

- Compliance with Texas Parks and Wildlife Code Section 64.002 regarding protection of nongame birds and the prohibition that provides "no person may destroy or take the nests, eggs, or young and any wild game bird, wild bird, or wild fowl..." given the Applications cursory treatment of wildlife.

- Future Compliance with regarding the prohibition on accepting hazardous waste, given the rule prohibiting such waste when the underlying geology remains incompatible with hazardous waste disposal.

These enumerated issues are likely violations of Texas law and are contested issues of fact. WDF opposes this Application because this MSW facility threatens to ruin the water quality and

habitat of an important watershed. Preservation of the state's natural resources and compliance with Texas law is of paramount importance. Therefore, TCEQ is urged to afford Wood Duck Farms and the adjoining affected neighbors—as well as those living in this watershed that remain dependent on quality drinking water—all the appropriate protection available under Texas law. Preservation of Texas's water, this unspoiled portion of the San Jacinto National Forest, and the surrounding San Jacinto watershed is important and Texas citizens depend upon TCEQ to do so.

WDF respectfully requests that the above referenced MSW Application No. 2406 be returned to the Applicant, Peach Creek Environmental Park, LLC for failure to submit a complete Application. In the alternative, WDF seeks denial of the Permit Application No. 2406 and requests a contested case hearing to evaluate these contested issues of fact and law.

Thank you and the TCEQ staff for the attention you afford Wood Duck Farm's concerns. Please contact the undersigned counsel if you have any questions or need clarification regarding the comments contained herein.

Sincerely,

/S/ Bryan French
Bryan French
Texas State Bar No. 24091372
The Law Office of Bryan French, PLLC
bfrenchelcs@earthlink.net
(409) 599-3234
ATTORNEY FOR WOOD DUCK FARMS

Law Office of Bryan French, PLLC
4191 Pirates Beach
Galveston, Texas 77554
(409) 599-3234
bfrenchelcs@earthlink.net

January 6, 2022

REVIEWED
JAN 12 2022
By GCW PM

CHIEF CLERKS OFFICE
2022 JAN 12 PM 2:02
TCEQ
MSW
117709

Ms. Laurie Gharis
Chief Clerk
Texas Commission on Environmental Quality
Mail Code 105
P.O. Box 13087
Austin, Texas 78711-3087
By Certified Mail and Email: www14.tceq.texas.gov/epic/ecomment/

Re: Comments, and Complaint Regarding the Failure of Peach Creek Environmental, LLC to Provide a Copy of Draft Permit MSW No. 2406 for Public Review at the San Jacinto Public Library or Online, as Required Under TAC §39.405(g).

Dear Ms. Gharis:

My firm respectfully submits these comments and complaint on behalf of Wood Duck Farms, LLC who will be adversely impacted by Peach Creek Environmental Park LLC's Type I landfill. Specifically, these comments address a fatal deficiency with PCE's notification—the absence of the draft permit at the public library for public review as required under Texas Administrative Code §39.405(g).

The current unavailability of the Draft Permit violates Texas law, the intent of the Texas legislature who crafted the notice provision and the rights of my client and other affected persons. Statutory notice provisions are designed to afford the public the right to participate in the permitting process and to review, appraise and object to permit applications during the permitting process. The current situation remains at odds with TCEQ's long and very public commitment to meaningful Public participation.[1] The absence of the draft permit, including attachments, at the public library and online subverts public participation, and makes meaningful comments impossible. Therefore, Wood Duck Farms respectfully requests The Executive Director toll the

[1] Resolution Concerning Public Participation, 1996, TCEQ website https: //www.tceq.texas.gov/agency/decisions/participation/permitting-participation/particip_res.html. Last Visited 1/6/2022.

current comment period to reflect the number of days the Draft Permit has been unavailable after the publication date of December 16, 2021 or in the alternative, grant another public meeting and extend the comment period until such time as a public meeting is held.

Unavailability of Draft Permit at Shepard Library Violates TAC Notice Provisions and the Rights of Affected Persons

Chapter 30 of the Texas Administrative Code and TCEQ guidance documents make clear the right of the public to meaningful participation in the permitting process, which includes the right to review and copy a draft permit application beginning on the date of publication.[2] Under TAC Rule 39.405(g) "the applicant **shall** make a copy of the application available for public review and copying at a public place in the county where the facility is located or proposed to be located...The copy of the application **must** comply with the following.

> (2) A copy of the complete application (including any subsequent revisions to the application) and executive director's preliminary decision must be available for review and copying beginning on the first day of newspaper publication required by this section and remain available until the commission has taken action on the application or the commission refers issues to the State office of Administrative hearings."[3]

Here, PCE published notification of the draft permit on December 16, 2021, the text of which states that the "permit application, Executive Director's preliminary decision, and draft permit are available for viewing and copying at the Shephard Public Library, 30 North Liberty Street, Shepard, Texas 7737."[4] Yet, 22 days after publication, the Executive Directors Preliminary Decision and Draft Permit are neither unavailable at the Public library in Shephard Texas, San Jacinto County, nor online. Because these important documents are unavailable, meaningful comments designed to respond to issues arising from the permit's deficiencies remain impossible to submit. The material below describes the diligent efforts Wood Duck Farms has undertaken to access the Executive Director's Preliminary Decision and Draft Permit.

---

[2] TCEQ Mission Statement and Philosophy, https://www.tceq.texas.gov/agency/mission.html Last Visited 2/5/2022.

[3] TAC 39.405(g)(Emphasis Added).

[4] Texas Commission on Environmental Quality Notice of Application and Preliminary Decision for Municipal Solid Waste Permit, Proposed Permit No. 2406. December 9, 2021.

After Wood Duck Farms received notice the Executive Director had released the Draft Permit, an effort was made to access the Executive Directors preliminary decision and draft permit. Wood Duck Farms patiently waited several days for the Permit to arrive before calling the library on December 22 to inquire about the availability of the documents. He was informed by the librarian that the material was not in the library. On December 23, the Law Office of Bryan French made a Public Information Request to TCEQ seeking the documents. On January 5, 2022 TCEQ responded with the Executive Director's Draft permit. This material however was without two Attachments, identified in the Draft Permit as parts I-IV of the permit and addendums, modifications and corrections to the permit, all of which is necessary to evaluate the permit application.

On December 29, David Van Weldon, owner of Wood Duck Farms made a personal visit to the Shephard library to search for the documents. After a discussion and diligent search of the building with Ms. Terri MacIntyre, the library director and full time library employee, an old copy of the initial application was located and identified, but significantly no new material had been added since at least February 2021 when Ms. MacIntyre began her job. In fact, the latest date stamped document is dated September 2020. The head librarian then concluded that indeed there was no Executive Directors preliminary decision or draft permit in the library, a task made easier by the fact that the Shephard public library is a small rural library with only several rooms. A conversation with Ms. MacIntyre revealed that since she began working at the library no material had been added to the permit application, specifically the permit addendums that were added to PCE's webpage containing the landfill permit application. See Exhibit A, the Declaration of Terri MacIntyre. Mr. Weldon reached the same conclusion, that the documents simply are not in the library. See Exhibit B the Affidavit of David Van Weldon. A photo of the last dated file available at the Shephard public library may be found in Exhibit C.

As a matter of diligence, Mr. Weldon visited the city hall of Shephard next door to the library to make sure the documents were not there; they were not. Upon learning December 29, 2021 from Mr. Weldon that the material was not at the public library, despite the representations contained in the notice, the Law Office of Bryan French reached out to TCDQ's Public Interest Counsel assigned to this matter. After an inquiry, the Public Interest Counsel located and forwarded the Executive Director's Preliminary Decision, however it did not include Attachment A and B, purported to contain parts I-IV of the application and any addendums, modifications and

corrections respectively. The draft permit is critical to any evaluation of a MSW permit and to the best of our knowledge is still not available. This constitutes an unacceptable violation of the rights of affected persons who desire to comment on the permit application.

Due to the unavailability of this critical information juxtaposed against a 30-day comment period deadline, Wood Duck Farms requests that the Draft Permit be made available as required by Texas law and the comment period be extended once the complete draft permit is made available at the library, or in the alternative grant a public meeting to be held at a future date and extend the comment period until that time.

Thank you and the TCEQ staff for the attention you afford our concerns. Please contact the undersigned counsel of there are questions regarding the comments contained herein.

Respectfully Submitted,

/s/Bryan A. French
Bryan French
Texas State Bar No. 24091372
The Law Office of Bryan French, PLLC
bfrenchelcs@earthlink.net

ATTORNEY FOR WOOD DUCK FARMS

EXHIBIT A

DECLARATION OF TERRI K. MACINTYRE

THE STATE OF TEXAS §

§

COUNTY OF HARRIS §

1. My name is Terri K. MacIntyre. I am the library director at the Shephard Public Library located at 30 North Liberty Street, Shephard, Texas 77371. I began working as the library director and have worked full time at the Shephard Public library since February 2021. I have never been convicted of a felony or any other crime involving moral turpitude. I have personal knowledge of the facts stated herein and they are true and correct and any opinions are based on my firsthand observations.

2. On December 29, 2021, David Van Weldon came to the Shephard public library seeking a TCEQ Draft permit for the Peach Creek Environmental Park. I assisted him in his search and we found some Peach Creek Environmental Park permit application materials but none dated after the summer of 2021.

3. I am familiar with TCEQ permit material, and on this occasion, it became apparent to me that the material Mr. Weldon sought was not available in my library. Because the Shephard public library is a small rural library and I am very familiar with all the material that comes in and out of this facility, I feel confident that the Draft permit and other material that Mr. Weldon sought is not in the Shephard library.

I declare under penalty of perjury that all information in this Declaration of Terri K. MacIntyre, is true and correct. Signed in San Jacinto County, Texas on January 6, 2022.

Terri K MacIntyre

EXHIBIT B
AFFIDAVIT
OF
DAVID VAN WELDON

STATE OF TEXAS	§	
	§	**KNOW ALL MEN BY THESE PRESENTS:**
COUNTY OF GALVESTON	§	

Before me, the undersigned authority, on this day personally appeared David Van Weldon ("Affiant") who, being first duly sworn, upon oath states:

1. I, DAVID VAN WELDON personally called the public library located at 30 North Liberty Street, Shephard Texas on or around December 22, 2021 to inquire about the availability of the MSW Draft Permit No. 2406. I was informed that the new Draft Permit and associated documents could not be located in the library at that time.

2. I DAVID VAN WELDON personally visited the Shephard Public library located at 30 north Liberty Street, Shephard, Texas on December 29, 2021 to check on the availability of MSW Draft Permit No. 2406. While there I performed a diligent search of the library accompanied by the head librarian Ms. Terri MacIntyre. Some older application material was located but none was dated after December 2020.

3. Ms. Terri MacIntyre expressed to me that no material regarding this permit application had been received in the Shephard public library since she began work as Library Director in February 2021.

4. After a lengthy and diligent search, I concluded that the Executive Director's preliminary decision, the complete draft permit and any subsequent revisions, modifications and corrections are not in the Shephard Public Library as indicated by the TCEQ notice published December 9, 2021.

5. To ensure I was not in error, I also checked the Shephard City Hall, which is adjacent to the library. None of the permit material could be located there either.

6. To the best of my knowledge, the complete permit application, the Executive Director's preliminary decision and the draft permit are not available in the Shephard public library.

Signed this 6th day of ~~December~~ JANUARY, 2022.

DAVID VAN WELDON, Affiant

Signed this 6th day of JANUARY, 2022.

STATE OF TEXAS §

COUNTY OF SAN JACINTO §

Sworn to and subscribed to before me on January 6th, 2022, by DAVID VAN WELDON.

Notary Public, State of Texas

SHARON DENISE ELDRIDGE
Notary Public, State of Texas
Comm. Expires 02-17-2025
Notary ID 126808141

EXHIBIT C

PEACH CREEK ENVIRONMENTAL PARK
SAN JACINTO COUNTY, TEXAS
TCEQ PERMIT APPLICATION NO. MSW 2406

TYPE I PERMIT APPLICATION

VOLUME 4 OF 4
PARTS III/IV

Prepared for

PC-II, LLC

Rev. 1, September 28, 2020

Prepared by

NEEL-SCHAFFER, INC.
13430 NW Freeway, Suite 650
Houston, TX 77040
713-783-7117

Texas Board of Professional Engineers
Firm Registration No. F-2697

Law Office of Bryan French, PLLC
4191 Pirates Beach
Galveston, Texas 77554
(409) 599-3234
bfrenchelcs@earthlink.net

January 6, 2022

Ms. Laurie Gharis
Chief Clerk
Texas Commission on Environmental Quality
Mail Code 105
P.O. Box 13087
Austin, Texas 78711-3087

Re: Comments submitted to TCEQ Regarding MSW Permit NO. 2406

Dear Ms. Gharis;

Enclosed, please find comments submitted by my firm on behalf of Wood Duck Farms objecting to Draft MSW Permit No. 2406, and the unavailability of the Draft Permit and associated documents at the Shephard Public Library.

If there are any questions please feel free to contact me at the information provided above.

Thank you for the attention you afford my concerns.

Sincerely,

Bryan French

CHIEF CLERKS OFFICE
2022 JAN 12 AM 9:41
TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Friday, January 7, 2022 10:58 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406
Attachments: Comments Regarding Absence of Draft Permit.pdf

PM

From: Bfrenchelcs@earthlink.net <Bfrenchelcs@earthlink.net>
Sent: Thursday, January 6, 2022 2:29 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Bryan A French

E-MAIL: Bfrenchelcs@earthlink.net

COMPANY: Law Office of Bryan French, PLLC

ADDRESS: 4191 PIRATES BCH
GALVESTON TX 77554-8042

PHONE: 4095993234

FAX:

COMMENTS: Mr. Gharis; Attached please find comments and a complaint regarding the failure of the Applicant, Peach Creek Environmental, LLC to provide a copy of the draft Permit MSW 2406 for public review at the San Jacinto public library as required under TAC 39.405(g). If there are any questions please contact me. Thank you for the attention you afford our concerns. Sincerely, Bryan French

Law Office of Bryan French, PLLC
4191 Pirates Beach
Galveston, Texas 77554
(409) 599-3234
bfrenchelcs@earthlink.net

January 6, 2022

Ms. Laurie Gharis
Chief Clerk
Texas Commission on Environmental Quality
Mail Code 105
P.O. Box 13087
Austin, Texas 78711-3087
By Certified Mail and Email: www14.tceq.texas.gov/epic/ecomment/

Re: Comments, and Complaint Regarding the Failure of Peach Creek Environmental, LLC to Provide a Copy of Draft Permit MSW No. 2406 for Public Review at the San Jacinto Public Library or Online, as Required Under TAC §39.405(g).

Dear Ms. Gharis:

My firm respectfully submits these comments and complaint on behalf of Wood Duck Farms, LLC who will be adversely impacted by Peach Creek Environmental Park LLC's Type I landfill. Specifically, these comments address a fatal deficiency with PCE's notification—the absence of the draft permit at the public library for public review as required under Texas Administrative Code §39.405(g).

The current unavailability of the Draft Permit violates Texas law, the intent of the Texas legislature who crafted the notice provision and the rights of my client and other affected persons. Statutory notice provisions are designed to afford the public the right to participate in the permitting process and to review, appraise and object to permit applications during the permitting process. The current situation remains at odds with TCEQ's long and very public commitment to meaningful Public participation.[1] The absence of the draft permit, including attachments, at the public library and online subverts public participation, and makes meaningful comments impossible. Therefore, Wood Duck Farms respectfully requests The Executive Director toll the

[1] Resolution Concerning Public Participation, 1996, TCEQ website https: //www.tceq.texas.gov/agency/decisions/participation/permitting-participation/particip_res.html. Last Visited 1/6/2022.

current comment period to reflect the number of days the Draft Permit has been unavailable after the publication date of December 16, 2021 or in the alternative, grant another public meeting and extend the comment period until such time as a public meeting is held.

Unavailability of Draft Permit at Shepard Library Violates TAC Notice Provisions and the Rights of Affected Persons

Chapter 30 of the Texas Administrative Code and TCEQ guidance documents make clear the right of the public to meaningful participation in the permitting process, which includes the right to review and copy a draft permit application beginning on the date of publication.[2] Under TAC Rule 39.405(g) "the applicant **shall** make a copy of the application available for public review and copying at a public place in the county where the facility is located or proposed to be located...The copy of the application **must** comply with the following.

> (2) A copy of the complete application (including any subsequent revisions to the application) and executive director's preliminary decision must be available for review and copying beginning on the first day of newspaper publication required by this section and remain available until the commission has taken action on the application or the commission refers issues to the State office of Administrative hearings."[3]

Here, PCE published notification of the draft permit on December 16, 2021, the text of which states that the "permit application, Executive Director's preliminary decision, and draft permit are available for viewing and copying at the Shephard Public Library, 30 North Liberty Street, Shepard, Texas 7737."[4] Yet, 22 days after publication, the Executive Directors Preliminary Decision and Draft Permit are neither unavailable at the Public library in Shephard Texas, San Jacinto County, nor online. Because these important documents are unavailable, meaningful comments designed to respond to issues arising from the permit's deficiencies remain impossible to submit. The material below describes the diligent efforts Wood Duck Farms has undertaken to access the Executive Director's Preliminary Decision and Draft Permit.

---

[2] TCEQ Mission Statement and Philosophy, https://www.tceq.texas.gov/agency/mission.html Last Visited 2/5/2022.
[3] TAC 39.405(g)(Emphasis Added).
[4] Texas Commission on Environmental Quality Notice of Application and Preliminary Decision for Municipal Solid Waste Permit, Proposed Permit No. 2406. December 9, 2021.

After Wood Duck Farms received notice the Executive Director had released the Draft Permit, an effort was made to access the Executive Directors preliminary decision and draft permit. Wood Duck Farms patiently waited several days for the Permit to arrive before calling the library on December 22 to inquire about the availability of the documents. He was informed by the librarian that the material was not in the library. On December 23, the Law Office of Bryan French made a Public Information Request to TCEQ seeking the documents. On January 5, 2022 TCEQ responded with the Executive Director's Draft permit. This material however was without two Attachments, identified in the Draft Permit as parts I-IV of the permit and addendums, modifications and corrections to the permit, all of which is necessary to evaluate the permit application.

On December 29, David Van Weldon, owner of Wood Duck Farms made a personal visit to the Shephard library to search for the documents. After a discussion and diligent search of the building with Ms. Terri MacIntyre, the library director and full time library employee, an old copy of the initial application was located and identified, but significantly no new material had been added since at least February 2021 when Ms. MacIntyre began her job. In fact, the latest date stamped document is dated September 2020. The head librarian then concluded that indeed there was no Executive Directors preliminary decision or draft permit in the library, a task made easier by the fact that the Shephard public library is a small rural library with only several rooms. A conversation with Ms. MacIntyre revealed that since she began working at the library no material had been added to the permit application, specifically the permit addendums that were added to PCE's webpage containing the landfill permit application. See Exhibit A, the Declaration of Terri MacIntyre. Mr. Weldon reached the same conclusion, that the documents simply are not in the library. See Exhibit B the Affidavit of David Van Weldon. A photo of the last dated file available at the Shephard public library may be found in Exhibit C.

As a matter of diligence, Mr. Weldon visited the city hall of Shephard next door to the library to make sure the documents were not there; they were not. Upon learning December 29, 2021 from Mr. Weldon that the material was not at the public library, despite the representations contained in the notice, the Law Office of Bryan French reached out to TCDQ's Public Interest Counsel assigned to this matter. After an inquiry, the Public Interest Counsel located and forwarded the Executive Director's Preliminary Decision, however it did not include Attachment A and B, purported to contain parts I-IV of the application and any addendums, modifications and

corrections respectively. The draft permit is critical to any evaluation of a MSW permit and to the best of our knowledge is still not available. This constitutes an unacceptable violation of the rights of affected persons who desire to comment on the permit application.

Due to the unavailability of this critical information juxtaposed against a 30-day comment period deadline, Wood Duck Farms requests that the Draft Permit be made available as required by Texas law and the comment period be extended once the complete draft permit is made available at the library, or in the alternative grant a public meeting to be held at a future date and extend the comment period until that time.

Thank you and the TCEQ staff for the attention you afford our concerns. Please contact the undersigned counsel of there are questions regarding the comments contained herein.

Respectfully Submitted,

/s/Bryan A. French
Bryan French
Texas State Bar No. 24091372
The Law Office of Bryan French, PLLC
bfrenchelcs@earthlink.net

ATTORNEY FOR WOOD DUCK FARMS

EXHIBIT A

DECLARATION OF TERRI K. MACINTYRE

THE STATE OF TEXAS §

§

COUNTY OF HARRIS §

1. My name is Terri K. MacIntyre. I am the library director at the Shephard Public Library located at 30 North Liberty Street, Shephard, Texas 77371. I began working as the library director and have worked full time at the Shephard Public library since February 2021. I have never been convicted of a felony or any other crime involving moral turpitude. I have personal knowledge of the facts stated herein and they are true and correct and any opinions are based on my firsthand observations.

2. On December 29, 2021, David Van Weldon came to the Shephard public library seeking a TCEQ Draft permit for the Peach Creek Environmental Park. I assisted him in his search and we found some Peach Creek Environmental Park permit application materials but none dated after the summer of 2021.

3. I am familiar with TCEQ permit material, and on this occasion, it became apparent to me that the material Mr. Weldon sought was not available in my library. Because the Shephard public library is a small rural library and I am very familiar with all the material that comes in and out of this facility, I feel confident that the Draft permit and other material that Mr. Weldon sought is not in the Shephard library.

I declare under penalty of perjury that all information in this Declaration of Terri K. MacIntyre, is true and correct. Signed in San Jacinto County, Texas on January 6, 2022.

Terri K MacIntyre

EXHIBIT B
AFFIDAVIT
OF
DAVID VAN WELDON

STATE OF TEXAS	§	
	§	**KNOW ALL MEN BY THESE PRESENTS:**
COUNTY OF GALVESTON	§	

Before me, the undersigned authority, on this day personally appeared David Van Weldon ("Affiant") who, being first duly sworn, upon oath states:

1. I, DAVID VAN WELDON personally called the public library located at 30 North Liberty Street, Shephard Texas on or around December 22, 2021 to inquire about the availability of the MSW Draft Permit No. 2406. I was informed that the new Draft Permit and associated documents could not be located in the library at that time.

2. I DAVID VAN WELDON personally visited the Shephard Public library located at 30 north Liberty Street, Shephard, Texas on December 29, 2021 to check on the availability of MSW Draft Permit No. 2406. While there I performed a diligent search of the library accompanied by the head librarian Ms. Terri MacIntyre. Some older application material was located but none was dated after December 2020.

3. Ms. Terri MacIntyre expressed to me that no material regarding this permit application had been received in the Shephard public library since she began work as Library Director in February 2021.

4. After a lengthy and diligent search, I concluded that the Executive Director's preliminary decision, the complete draft permit and any subsequent revisions, modifications and corrections are not in the Shephard Public Library as indicated by the TCEQ notice published December 9, 2021.

5. To ensure I was not in error, I also checked the Shephard City Hall, which is adjacent to the library. None of the permit material could be located there either.

6. To the best of my knowledge, the complete permit application, the Executive Director's preliminary decision and the draft permit are not available in the Shephard public library.

Signed this 6th day of ~~December~~ JANUARY, 2022.

DAVID VAN WELDON, Affiant

Signed this 6th day of JANUARY, 2022.

STATE OF TEXAS §

COUNTY OF SAN JACINTO §

Sworn to and subscribed to before me on January 6th, 2022, by DAVID VAN WELDON.

Notary Public, State of Texas

SHARON DENISE ELDRIDGE
Notary Public, State of Texas
Comm. Expires 02-17-2025
Notary ID 126808141

EXHIBIT C

PEACH CREEK ENVIRONMENTAL PARK
SAN JACINTO COUNTY, TEXAS
TCEQ PERMIT APPLICATION NO. MSW 2406

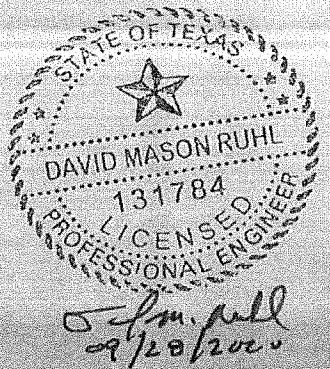
TYPE I PERMIT APPLICATION

VOLUME 4 OF 4
PARTS III/IV

Prepared for

PC-II, LLC

Rev. 1, September 28, 2020



Prepared by

NEEL-SCHAFFER, INC.
13430 NW Freeway, Suite 650
Houston, TX 77040
713-783-7117

Texas Board of Professional Engineers
Firm Registration No. F-2697

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Wednesday, April 28, 2021 9:38 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

PM
H

From: theatrejodi@yahoo.com <theatrejodi@yahoo.com>
Sent: Tuesday, April 27, 2021 6:42 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Jodi L Garrett

E-MAIL: theatrejodi@yahoo.com

COMPANY:

ADDRESS: 9901 ROBIN CT
CONROE TX 77385-4625

PHONE: 9364995627

FAX:

COMMENTS: I would like to REQUEST A PUBLIC HEARING on this issue. I am terribly concerned about the potential for hazardous contamination from this site that could potentially impact the drinking water and property of countless Texas residents as well as the wildlife of the national forest nearby. The potential for severe local and area consequences merits a public discussion on this topic. Many residents in the area could lose their livelihoods if this project fails to

contain all of the toxic material it is slated to hold. Local farmers and residents have learned to adapt to the local flooding in the area but the potential release of these harmful toxins could destroy their health, land, well water, and livestock. Additionally, the residents in the immediate vicinity will have to suffer a multitude of large trucks traveling down their rural, sometimes-unpaved roads, spinning dust and debris into their homes and children's play spaces. This site will also nestle up to national forest lands which contain threatened and endangered species which deserve protection. These areas are set aside for the use and enjoyment of future generations. Why leave behind a potential cesspool of contamination that they will have to avoid rather than enjoy? Toxins released in these areas could have serious and long-lasting consequences for this and future generations of Texans and our wildlife. The list of reasons for denial of this proposed site are too numerous to detail here, but at the very least, a public discussion should be held.

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Monday, November 15, 2021 2:28 PM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Denial Request

PM
H

From: CHIEFCLK <chiefclk@tceq.texas.gov>
Sent: Monday, November 15, 2021 1:00 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: FW: Denial Request

From: Jodi L. Garrett <jlgarrett@conroeisd.net>
Sent: Monday, November 15, 2021 11:43 AM
To: CHIEFCLK <chiefclk@tceq.texas.gov>
Subject: Denial Request

To: TCEQ Staff and all concerned

Please review upcoming EPA actions and regulations.

I ask for denial of permit #2406 based on new and incoming data and legislation. I strongly urge all at the TCEQ to read and research this attached link regarding PFAS as well as view the two attached documents. I also ask that the TCEQ follow the EPA's lead and hold permitting solid waste landfills until safer regulations can be implemented to ensure disposal of harmful chemicals can be handled properly.

Attached are PDFs of the above referenced information regarding new regulations concerning PFAS. Waste disposal is a big concern to the EPA and strides are being made toward more regulation of these chemicals due to the toxic effects on human, animal, and the environment.

With this new information and forthcoming regulation, I insist that the TCEQ deny permit #2406 based on scientific evidence that PFAS **do** and **will** cause **harm**. The EPA is considering placing a hazardous material rating on PFAS and I do **NOT** want my family, my community, neighboring communities, local farmers, the natural forest, local waterways, and aquifers to be affected for YEARS to come.

Please deny this permit based on impending regulation that **will drastically** affect the lives of everyone locally and downstream of this proposed site in a life-threatening way.

The TCEQ cannot turn a blind eye to evidence that exists but has not yet been legislated. It is unkind, cruel, and irresponsible to **knowingly** subject the environment to **hazardous** chemicals.

The future of waste disposal is changing, and I urge the Executive Director, Commissioners, and all TCEQ staff to consider the potential harm that will devastate communities and natural ecosystems.

Please deny permit #2406.

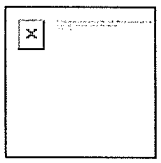
I request another public meeting where individuals who have no internet access can hear more information on this application and understand the life altering effects it will have if permitted.

I also request a contested case hearing.
To knowingly subject individuals, communities, and drinking water sources to KNOWN harmful substances is negligent!

With all due respect, this permit #2406 is wrought with flaws. The burden has been placed upon an economically challenged county and the local residents to prove the deficiencies while the TCEQ allows for unlimited revisions! This is NOT EQUITABLE!

Sincerely,

J. Garrett



Jodi Garrett
Teach Hs/English
Caney Creek High School
Conroe Independent School District
936-709-2000 jlgarrett@conroeisd.net

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Monday, September 27, 2021 1:47 PM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

H

From: planetaryg@yahoo.com <planetaryg@yahoo.com>
Sent: Monday, September 27, 2021 1:00 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: MR Robert Gartner

E-MAIL: planetaryg@yahoo.com

COMPANY:

ADDRESS: 6319 SHERINGHAM ST
HOUSTON TX 77085-3244

PHONE: 3462031598

FAX:

COMMENTS: September 27, 2021 Office of Chief Clerk MC 105 Texas Commission on Environmental Quality P.O. Box 13087 Austin, Texas 78711-3087 Dear Chief Clerk, I urge you to amend Permit #2406, Peach Creek Municipal Landfill (PCML), to include the access road and hold a contested case hearing on this proposal because: I am concerned that unacceptable environmental impacts will occur on Sam Houston National Forest, Wood Duck Farm, and private homesteads due to PCML. I am concerned about road access, water, air, noise, odor, litter, and scenic pollutions,

flooding, fires, road overuse/damage, and other environmental impacts that PCML may have. Because of these problems I oppose Permit #2406. I am a landowner in the area and am concerned about direct effects to me and my property should Permit 2406 be allowed to proceed. I look forward to hearing from you soon about my request to amend Permit #2406 to include the access road and hold a contested case hearing. Thank you. Sincerely, Robert Gartner

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Thursday, February 24, 2022 8:55 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

H

From: Ogonzalez1996@gmail.com <Ogonzalez1996@gmail.com>
Sent: Thursday, February 24, 2022 5:48 AM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Olga Gonzalez

E-MAIL: Ogonzalez1996@gmail.com

COMPANY:

ADDRESS: PO BOX 2135
CLEVELAND TX 77328-2135

PHONE: 8327440863

FAX:

COMMENTS: I want Permit #2406, PCML, denied and if this doesn't occur that I want a contested case hearing. I am concerned about unacceptable environmental impacts that PCML may have on SHNF and WDF; state I am also concerned about road access, water, air, noise, odor, litter, scenic pollution, feral pigs, flooding, fires, road overuse/damage, and other impacts PCML may have. I OPPOSE the PCML.

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Tuesday, October 20, 2020 4:02 PM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

From: Ogonzalez1996@gmail.com <Ogonzalez1996@gmail.com>
Sent: Tuesday, October 20, 2020 10:36 AM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Olga Gonzalez

E-MAIL: Ogonzalez1996@gmail.com

COMPANY:

ADDRESS: PO BOX 2135
CLEVELAND TX 77328-2135

PHONE: 8327440863

FAX:

COMMENTS: I am against permit# 2406, a landfill in this area, this will impact our surrounding smell, water runoff water contamination. Impactbon the national forests. Health impacts for my family and myself. There already is a lanfill within a 5 mile radius, why add this other one?

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Wednesday, October 21, 2020 8:35 AM
To: Ogonzalez1996@gmail.com
Subject: Public comment on Permit Number 2406

Thank you for your comments.

A copy of your email will be forwarded to the Texas Commission on Environmental Quality (TCEQ) staff responsible for reviewing the application. All timely filed comments will be considered by the staff prior to the final decision on the application. You will be added to the mailing list for this application. After the opportunity to submit comments ends, a copy of the formal written response to all timely filed comments will be mailed to you.

The TCEQ appreciates your interest in environmental issues. If you have any further questions, please feel free to contact the Public Education Program staff at 800-687-4040.

Sincerely,
Office of the Chief Clerk

NOTE: Please do not respond to this email; it will not be answered. If you would like to submit additional comments, please use the online eComments system at: https://www.tceq.texas.gov/agency/decisions/cc/comments.html

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Olga Gonzalez

E-MAIL: Ogonzalez1996@gmail.com

COMPANY:

ADDRESS: PO BOX 2135
CLEVELAND TX 77328-2135

PHONE: 8327440863

FAX:

COMMENTS: I am against permit# 2406, a landfill in this area, this will impact our surrounding smell, water runoff water contamination. Impactbon the national forests. Health impacts for my family and myself. There already is a lanfill within a 5 mile radius, why add this other one?

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Friday, December 3, 2021 9:04 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: TCEQ MSW permit #2406

From: CHIEFCLK <chiefclk@tceq.texas.gov>
Sent: Friday, December 3, 2021 8:47 AM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: FW: TCEQ MSW permit #2406

From: Olga Gonzalez <ogonzalez1996@gmail.com>
Sent: Friday, December 3, 2021 8:46 AM
To: CHIEFCLK <chiefclk@tceq.texas.gov>
Subject: TCEQ MSW permit #2406

TCEQ Office of the Chief Clerk, MC-105
P.O. Box 13087
Austin, Texas 78711-3087

Re: Peach Creek Environmental Park (PCEP) Proposed Landfill Permit Application No. Permit #2406

I am writing to request that the permit for Peach Creek EP Landfill MSW No 2406 be denied. There are three main concerns that form the basis for my comments. 1) The SHNF sits on the east and north side of the proposed landfill. The USFS was started to help provide clean water to our country. When it rains, the SHNF acts as a filter to cleanse water going downstream to Lake Houston. The leachate tanks are to sit on the north side of the LF, within a few feet of the FEMA 100-year floodplain. Storm water overflow, leachate, and VOCs will make the Jayhawker Creek floodplain a conduit for contamination which will impact drinking water downstream. 2) Dr. HC Clark wrote a geological assessment to the TCEQ back in August, to quote him "The application implicitly recognizes the gravel location restriction insofar as Class I nonhazardous is not listed as waste to be accepted. Will the permit explicitly state that Class I waste may not be and never will be accepted here because of this hydrogeologic limitation?" ..... "The sink created by pumping will draw water into the landfill rather than allowing it to pass beneath the liner and detect a leak as that groundwater moves through the point of compliance. Water will move inward rather than out."...."How will this problem be addressed?" 3) It is a fact that millions of seagulls feast at LF across North America. South Wake MSW landfill in NC is comprised of approximately 179 acres and has an estimated seagull population of 50,000. Phase 1 of this 2406 LF will be about 124 acres, or almost 37% smaller which equates to almost 31,500 seagulls as an estimated flock number. Studies from Duke Univ School for the Environment determined that these seagulls dropped over a ton of droppings each year. A year-round fruit and vegetable operation, Wood Duck Farm is located bordering the 2406 LF from the east. What are the plans to keep seagull droppings off farm produce growing in the field? What are the plans to keep seagulls from eating the crops? What type of disease vector plan might be implemented? How will the applicant mitigate wild animal scavenging? How will the extra nitrogen and phosphorus impact the SHNF?
http://www.newsobserver.com/news/local/counties/wake-county/article158475619.html I strongly request that you take the next logical step and reject this current Application No. MSW-2406. Thank you for your consideration.

Sincerely,

Olga Gonzalez
81 Hulon Dr
Cleveland Tx 77328

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Thursday, September 9, 2021 3:01 PM
To: PUBCOMMENT-WPD; PUBCOMMENT-ELD; PUBCOMMENT-OCC2; PUBCOMMENT-OPIC
Subject: FW: Public comment on Permit Number 2406

H

From: porcelainpetal@yahoo.com <porcelainpetal@yahoo.com>
Sent: Thursday, September 9, 2021 11:04 AM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Melissa Grebe

E-MAIL: porcelainpetal@yahoo.com

COMPANY:

ADDRESS: 1619 W 10TH ST
FREEPORT TX 77541-5141

PHONE: 9798714066

FAX:

COMMENTS: I want Permit #2406, PCML: amended to include the access road; I support a contested case hearing. I am concerned about unacceptable environmental impacts that PCML may have on SHNF and WDF. I am concerned about road access, water, air, noise, odor, litter, and scenic pollutions, flooding, fires, road overuse/damage, and other impacts PCML may have. Thank you

MSW
117709

5239 FM 2
Navasota, Texas 77868
August 18, 2021

REVIEWED
AUG 20 2021
By GW

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
2021 AUG 20 PM 2:41
CHIEF CLERKS OFFICE

Office of Chief Clerk
MC 105
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

Dear Sir:

We have been informed via the Houston Sierra Club of plans to permit (Permit #2406) installation of a landfill in Sam Houston National Forest – the "Peach Creek Landfill."

We are in complete agreement with the points made by Mr. Brandt Mannchen in his July 30, 2021, letter to you, regarding the possible effects of such an undertaking in this cherished environment. The effects of such an undertaking would likely be felt for years to come and the environmental impacts would likely be all negative, sad to say.

We recognize Mr. Mannchen's concern about the lack of mention of road access in the current permit, and would like to add our own entreaty to his for inclusion thereof. Also, a "contested case hearing" would provide a means for representation of those of us whose main concerns are environmental.

We are residents of Grimes County and we raised our five children in the city of Houston. Our family spent MANY weekends "back in the day" in SHNF; we still take the occasional hike in the western region of the forest. We are aware that some of the NF campgrounds in the Rockies that we visited in the 70's through the 90's now begin their online description with the statement, "potable water not available." We would hate to see that happen to ANY of our few public spaces in Texas!

Let's all do our best to protect our green spaces...
Thank you.

Sincerely,

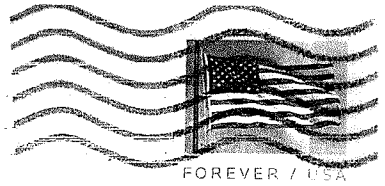
M. Sue Gregory

Sue & Walt Gregory
5239 FM 2
Navasota, Texas 77868
936-825-3995 waltsuelgp@gmail.com

MERCY CORPS

Walton C and M Sue Gregory
5239 FM 2 Rd.
Navasota, TX 77868

NORTH HOUSTON TX 773
18 AUG 2021 PM 5 L



RECEIVED
AUG 20 2021
TCEQ MAIL CENTER
AJ

Office of Chief Clerk
MC 105
Texas Commission on Environmental Quality
PO Box 13087
Austin, TX 78711-3087

78711-308787

ON BEHALF OF MERCY CORPS
2021 AUG 20 AM 9:41
CHIEF CLERKS OFFICE

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Wednesday, September 29, 2021 9:07 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

H

From: Dcgrijalva@sbcglobal.net <Dcgrijalva@sbcglobal.net>
Sent: Tuesday, September 28, 2021 6:57 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Beth Grijalva

E-MAIL: Dcgrijalva@sbcglobal.net

COMPANY:

ADDRESS: 21 E WEDGEMERE CIR
THE WOODLANDS TX 77381-4190

PHONE: 2813621801

FAX:

COMMENTS: I urge you to amend Permit #2406, Peach Creek Municipal Landfill (PCML), to include the access road and hold a contested case hearing on this proposal because: The proposed landfill poses a clear threat to the safety and production of Wood DUck Farm, a substantial source of produce for its CSA members, Urban Harvest shoppers and restaurants in 3 of the largest cities in Texas. The landfill would threaten the safety and enjoyment of all who visit and drive through the Sam Houston NAtional Forest as well as the populations of wildlife, both common and endangered

species. The landfill posses a threat to the main water supply for the millions of people who live, work and visit the City of Houston and surrounding areas. Don't allow out of state businesses to come to Texas, permit a huge dumpsite and then leave the state -- leaving all of us -- and you, holding the bag. You know what's in that bag? None of it is pretty.

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Thursday, September 9, 2021 10:15 AM
To: PUBCOMMENT-WPD; PUBCOMMENT-ELD; PUBCOMMENT-OCC2; PUBCOMMENT-OPIC
Subject: FW: Public comment on Permit Number 2406

H

From: p1jewel@aol.com <p1jewel@aol.com>
Sent: Thursday, September 9, 2021 9:48 AM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Pattie Gurley

E-MAIL: p1jewel@aol.com

COMPANY:

ADDRESS: 5194 ROLLING HILLS RD
CONROE TX 77303-4671

PHONE: 9364452050

FAX:

COMMENTS: Dear Chief Clerk, I urge you to amend Permit #2406, Peach Creek Municipal Landfill (PCML), to include the access road and hold a contested case hearing on this proposal because: 1. I am concerned that unacceptable environmental impacts will occur on Sam Houston National Forest, Wood Duck Farm, and private homesteads due to PCML. (if you have visited SHNF tell TCEQ this, why you visit, and what it means to you; if you have bought WDF produce state why you did so and what this means to you; if you live near the PCML site, tell TCEQ and describe how close you

are). 2. I am concerned about road access, water, air, noise, odor, litter, and scenic pollutions, flooding, fires, road overuse/damage, and other environmental impacts that PCML may have. (expand on these environmental concerns or add other issues that you are concerned about). Because of these problems I oppose Permit #2406. I look forward to hearing from you soon about my request to amend Permit #2406 to include the access road and hold a contested case hearing. Thank you. Sincerely, Pattie Gurley

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Wednesday, September 29, 2021 9:23 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Amend Permit #2406

H

From: CHIEFCLK <chiefclk@tceq.texas.gov>
Sent: Tuesday, September 28, 2021 1:56 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: FW: Amend Permit #2406

From: James Hannan <jameshannanjr@gmail.com>
Sent: Tuesday, September 28, 2021 1:08 PM
To: CHIEFCLK <chiefclk@tceq.texas.gov>
Subject: Amend Permit #2406

Dear Chief Clerk,

I urge you to amend Permit #2406, Peach Creek Landfill (PCL), to include the access road and hold a contested case hearing on this proposal because:

I am concerned that unacceptable environmental impacts will occur on Sam Houston National Forest, Wood Duck Farm, and private homesteads due to PCL.

I'm concerned about the damage that will occur to Sam Houston National Forest and the surrounding areas. My family and I enjoy hiking and being in the natural environment of the forest and we're concerned about how this landfill will alter and destroy parts of it.

I am also especially concerned about the impacts to Wood Duck Farm as my family gets a bulk of our produce from this local, sustainable operation. Small farmers and small businesses are the back bone of our economy and their livelihood is threatened with this.

I am concerned about road access, water, air, noise, litter, and scenic pollutions, flooding, fires, road overuse/damage, and other environmental impacts that PCL may have.

I look forward to hearing from you soon about my request to amend Permit #2406 to include the access road and hold a contested case hearing.

Thank you,

James "Jamie" Hannan, Jr.
20767 Kenswick Park Drive
Porter, TX 77365
jameshannanjr@gmail.com

281-799-0320

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Wednesday, April 28, 2021 9:12 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

From: jameshannanjr@gmail.com <jameshannanjr@gmail.com>
Sent: Monday, April 26, 2021 8:54 AM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: James Hannan

E-MAIL: jameshannanjr@gmail.com

COMPANY:

ADDRESS: 20767 KENSWICK PARK DR
PORTER TX 77365-1039

PHONE: 2817990320

FAX:

COMMENTS: I ask that TCEQ not support the permit application. I am concerned this landfill could negatively impact nearby farms and residents.

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Thursday, September 9, 2021 7:52 AM
To: PUBCOMMENT-WPD; PUBCOMMENT-ELD; PUBCOMMENT-OCC2; PUBCOMMENT-OPIC
Subject: FW: Public comment on Permit Number 2406

H

From: Tysonlaneh78@yahoo.com <Tysonlaneh78@yahoo.com>
Sent: Thursday, September 9, 2021 7:36 AM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Tyson Hatzl

E-MAIL: Tysonlaneh78@yahoo.com

COMPANY:

ADDRESS: 13108 AUTUMN ASH DR
CONROE TX 77302-3156

PHONE: 9367033388

FAX:

COMMENTS: I urge you to amend Permit #2406, Peach Creek Municipal Landfill (PCML), to include the access road and hold a contested case hearing on this proposal because: I am concerned that unacceptable environmental impacts will occur on Sam Houston National Forest, Wood Duck Farm, and private homesteads due to PCML. We have purchased weekly farm shares from the farm for the last 5 years. It provides our family healthy season produce while supporting sustainable and regenerative agriculture. I am concerned about road access, water, air, noise, odor, litter, and scenic

pollutions, flooding, fires, road overuse/damage, and other environmental impacts that PCML may have. (expand on these environmental concerns or add other issues that you are concerned about). Because of these problems I oppose Permit #2406. I look forward to hearing from you soon about my request to amend Permit #2406 to include the access road and hold a contested case hearing. Thank you.

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Wednesday, November 18, 2020 8:53 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

H

From: geraldhensley@ymail.com <geraldhensley@ymail.com>
Sent: Tuesday, November 17, 2020 6:55 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: MR Gerald Hensley

E-MAIL: geraldhensley@ymail.com

COMPANY:

ADDRESS: 150 SMITH LN
CLEVELAND TX 77328-4536

PHONE: 2816593283

FAX:

COMMENTS: I am a land/home owner less than 1/2 a mile from the proposed site. I am on a water well and I am concerned with pollution to the water table. I also do not want the smell when a North wind blows. I request a public hearing.

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Monday, September 27, 2021 3:37 PM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Permit #2406

H

From: CHIEFCLK <chiefclk@tceq.texas.gov>
Sent: Monday, September 27, 2021 3:27 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: FW: Permit #2406

From: Olive Hershey <olivehershey@mac.com>
Sent: Monday, September 27, 2021 2:37 PM
To: CHIEFCLK <chiefclk@tceq.texas.gov>
Cc: Hershey Olive <olivehershey@mac.com>
Subject: Permit #2406

Office of Chief Clerk September 27, 2021

MC 105

Texas Commission on Environmental Quality

P. O. Box13087

Austin, TX 78711-3087

Dear Chief Clerk of the Texas Commission on Environmental Quality'

I am a member of the Houston Regional Group and Lone Star Chapter of the Sierra Club.

As a long-time hiker in the Sam Houston National Forest, I urge you to amend Permit #2406, the 635-acre Peach Creek Landfill (PCL), to include analysis of the road leading to this proposed waste facility and its use by garbage trucks and other vehicles carrying waste.

Before any decision is made about Permit #2406, this vehicle access issue and all other issues should be assessed, evaluated and analyzed for environmental, social and economic impacts. An environmental impact statement (EIS) would be the most desirable method.

I am aware that the permit #2406, would allow solid waste including household, commercial, industrial and special wastes to be stored in the proposed Peach Creek landfill. Staggering amounts of waste, up to 1300 tons per day in 474 trucks, would travel roads leading in and out of the landfill, located in a rural area surrounded by farms, homes and Sam Houston National Forest. This is an obscene notion that makes no sense. There is no benefit for any neighbors of the landfill.

The owners of the landfill are investors from Mississippi, whose sole purpose is to sell the landfill for $20 million to another entity which plans to operate the facility. These investors don't know or care anything about the location or the farmers who grow vegetables for food or grain for animals, or employees of the Sam Houston National forest, who support recreation.

The waste business will damage the air and water quality near the Wood Duck Farm, producers of organic vegetables and Sam Houston National Forest where I enjoy walking.

In addition to amending Permit #2406 to include analysis of the access, I urge the TCEQ to also hold a contested case hearing in which participants would present evidence of unacceptable environmental impacts by the landfill. Many outdoor advocates in the greater Houston area would learn more about possible impacts of the landfill on our precious open space, clean air, clean water, and a peaceful site for recreation that Sam Houston National Forest affords in this stressful time of Covid-19.

I look forward to hearing from you soon about my request to amend Permit #2406 to include the access Road and hold a contested case hearing. Thank you.

Sincerely,

Olive Hershey, PhD.

2415 Yupon St.

Houston, TX 77006

713.202.1152

olivehershey@mac.com

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Monday, September 27, 2021 3:36 PM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Permit #2406

H

From: CHIEFCLK <chiefclk@tceq.texas.gov>
Sent: Monday, September 27, 2021 3:27 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: FW: Permit #2406

From: Olive Hershey <olivehershey@mac.com>
Sent: Monday, September 27, 2021 2:37 PM
To: CHIEFCLK <chiefclk@tceq.texas.gov>
Cc: Hershey Olive <olivehershey@mac.com>
Subject: Permit #2406

Office of Chief Clerk September 27, 2021

MC 105

Texas Commission on Environmental Quality

P. O. Box13087

Austin, TX 78711-3087

Dear Chief Clerk of the Texas Commission on Environmental Quality'

I am a member of the Houston Regional Group and Lone Star Chapter of the Sierra Club.

As a long-time hiker in the Sam Houston National Forest, I urge you to amend Permit #2406, the 635-acre Peach Creek Landfill (PCL), to include analysis of the road leading to this proposed waste facility and its use by garbage trucks and other vehicles carrying waste.

Before any decision is made about Permit #2406, this vehicle access issue and all other issues should be assessed, evaluated and analyzed for environmental, social and economic impacts. An environmental impact statement (EIS) would be the most desirable method.

I am aware that the permit #2406, would allow solid waste including household, commercial, industrial and special wastes to be stored in the proposed Peach Creek landfill. Staggering amounts of waste, up to 1300 tons per day in 474 trucks, would travel roads leading in and out of the landfill, located in a rural area surrounded by farms, homes and Sam Houston National Forest. This is an obscene notion that makes no sense. There is no benefit for any neighbors of the landfill.

The owners of the landfill are investors from Mississippi, whose sole purpose is to sell the landfill for $20 million to another entity which plans to operate the facility. These investors don't know or care anything about the location or the farmers who grow vegetables for food or grain for animals, or employees of the Sam Houston National forest, who support recreation.

The waste business will damage the air and water quality near the Wood Duck Farm, producers of organic vegetables and Sam Houston National Forest where I enjoy walking.

In addition to amending Permit #2406 to include analysis of the access, I urge the TCEQ to also hold a contested case hearing in which participants would present evidence of unacceptable environmental impacts by the landfill. Many outdoor advocates in the greater Houston area would learn more about possible impacts of the landfill on our precious open space, clean air, clean water, and a peaceful site for recreation that Sam Houston National Forest affords in this stressful time of Covid-19.

I look forward to hearing from you soon about my request to amend Permit #2406 to include the access Road and hold a contested case hearing. Thank you.

Sincerely,

Olive Hershey, PhD.

2415 Yupon St.

Houston, TX 77006

713.202.1152

olivehershey@mac.com

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Tuesday, September 28, 2021 8:56 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Permit #2406

H

From: CHIEFCLK <chiefclk@tceq.texas.gov>
Sent: Monday, September 27, 2021 5:08 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: FW: Permit #2406

From: Olive Hershey <olivehershey@mac.com>
Sent: Monday, September 27, 2021 2:37 PM
To: CHIEFCLK <chiefclk@tceq.texas.gov>
Cc: Hershey Olive <olivehershey@mac.com>
Subject: Permit #2406

Office of Chief Clerk September 27, 2021

MC 105

Texas Commission on Environmental Quality

P. O. Box13087

Austin, TX 78711-3087

Dear Chief Clerk of the Texas Commission on Environmental Quality'

I am a member of the Houston Regional Group and Lone Star Chapter of the Sierra Club.

As a long-time hiker in the Sam Houston National Forest, I urge you to amend Permit #2406, the 635-acre Peach Creek Landfill (PCL), to include analysis of the road leading to this proposed waste facility and its use by garbage trucks and other vehicles carrying waste.

Before any decision is made about Permit #2406, this vehicle access issue and all other issues should be assessed, evaluated and analyzed for environmental, social and economic impacts. An environmental impact statement (EIS) would be the most desirable method.

I am aware that the permit #2406, would allow solid waste including household, commercial, industrial and special wastes to be stored in the proposed Peach Creek landfill. Staggering amounts of waste, up to 1300 tons per day in 474 trucks, would travel roads leading in and out of the landfill, located in a rural area surrounded by farms, homes and Sam Houston National Forest. This is an obscene notion that makes no sense. There is no benefit for any neighbors of the landfill.

The owners of the landfill are investors from Mississippi, whose sole purpose is to sell the landfill for $20 million to another entity which plans to operate the facility. These investors don't know or care anything about the location or the farmers who grow vegetables for food or grain for animals, or employees of the Sam Houston National forest, who support recreation.

The waste business will damage the air and water quality near the Wood Duck Farm, producers of organic vegetables and Sam Houston National Forest where I enjoy walking.

In addition to amending Permit #2406 to include analysis of the access, I urge the TCEQ to also hold a contested case hearing in which participants would present evidence of unacceptable environmental impacts by the landfill. Many outdoor advocates in the greater Houston area would learn more about possible impacts of the landfill on our precious open space, clean air, clean water, and a peaceful site for recreation that Sam Houston National Forest affords in this stressful time of Covid-19.

I look forward to hearing from you soon about my request to amend Permit #2406 to include the access Road and hold a contested case hearing. Thank you.

Sincerely,

Olive Hershey, PhD.

2415 Yupon St.

Houston, TX 77006

713.202.1152

olivehershey@mac.com

Melissa Schmidt

From: PUBCOMMENT-OCC
Sent: Wednesday, August 18, 2021 8:12 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Please amend Permit#2406

H

-----Original Message-----
From: CHIEFCLK <chiefclk@tceq.texas.gov>
Sent: Tuesday, August 17, 2021 12:50 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: FW: Please amend Permit#2406

-----Original Message-----
From: Olive Hershey <olivehershey@mac.com>
Sent: Tuesday, August 17, 2021 11:55 AM
To: CHIEFCLK <chiefclk@tceq.texas.gov>
Subject: Please amend Permit#2406

Dear Chief Clerk,

I urge you to amend Permit #2406, Peach Creek Landfill to include the access road and hold a contested case hearing on this proposal because:
1. I am worried that negative environmental impacts will occur in Sam Houston National Forest, Wood Duck Farm, and private homesteads due to PCL I ha e visited Sam Houston Forest and treasured it's quiet beauty and privacy during COVID. Wood Duck Farm produce is sold to many of us in the Houston Farmers Market, and I rely on the purity of its water supply for the. Healthy vegetables I buy from Wood Duck Farm.

2.The threat of noise and air pollution from hundreds of truck trips on the access road to and from PCL, not to mention eventual pollution of the ground water underneath the site calls for a contested case hearing where people with concerns can voice them.

3. Siting a landfill near a beloved National Forest so close to the 4 th largest city in the state would make a mockery of the mantra Don't Mess with Texas. Please amend Permit#2406 to include the access road and hold a contested cas hearing.

I look forward to hearing from you soon about my request to amend Permit# 2406.

Sincerely,
Olive Hershey 2415 Yupon St. Houston TX , 77006
713.202.1152
Olivehershey@mac.com
August 16,2021

Sent from my iPad

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Thursday, September 9, 2021 9:17 AM
To: PUBCOMMENT-WPD; PUBCOMMENT-ELD; PUBCOMMENT-OCC2; PUBCOMMENT-OPIC
Subject: FW: Public comment on Permit Number 2406

H

From: 1979allie@gmail.com <1979allie@gmail.com>
Sent: Thursday, September 9, 2021 7:59 AM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Alice D Hothem

E-MAIL: 1979allie@gmail.com

COMPANY:

ADDRESS: 5850 LYNBROOK DR
HOUSTON TX 77057-2250

PHONE: 8327270414

FAX:

COMMENTS: Office of Chief Clerk MC 105 Texas Commission on Environmental Quality P.O. Box 13087 Austin, Texas 78711-3087 Dear Chief Clerk, I urge you to amend Permit #2406, Peach Creek Municipal Landfill (PCML), to include the access road and hold a contested case hearing on this proposal because: I am concerned that unacceptable environmental impacts will occur on Sam Houston National Forest, Wood Duck Farm, and private homesteads due to PCML. (if you have visited SHNF tell TCEQ this, why you visit, and what it means to you; if you have bought WDF produce

state why you did so and what this means to you; if you live near the PCML site, tell TCEQ and describe how close you are). I am concerned about road access, water, air, noise, odor, litter, and scenic pollutions, flooding, fires, road overuse/damage, and other environmental impacts that PCML may have. (expand on these environmental concerns or add other issues that you are concerned about). Because of these problems I oppose Permit #2406. I look forward to hearing from you soon about my request to amend Permit #2406 to include the access road and hold a contested case hearing. Thank you. Sincerely, Alice D Hothem

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Thursday, September 9, 2021 10:15 AM
To: PUBCOMMENT-WPD; PUBCOMMENT-ELD; PUBCOMMENT-OCC2; PUBCOMMENT-OPIC
Subject: FW: Public comment on Permit Number 2406

H

From: brunfelsia1953@gmail.com <brunfelsia1953@gmail.com>
Sent: Thursday, September 9, 2021 9:29 AM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Elizabeth Martha House

E-MAIL: brunfelsia1953@gmail.com

COMPANY:

ADDRESS: 15650 WALDEN RD apt 3111
MONTGOMERY TX 77356-1768

PHONE: 2814337397

FAX:

COMMENTS: I urge you to amend Permit #2406, Peach Creek Municipal Landfill (PCML), to include the access road and hold a contested case hearing on this proposal because: I am concerned that unacceptable environmental impacts will occur on Sam Houston National Forest, Wood Duck Farm, and private homesteads due to PCML. (if you have visited SHNF tell TCEQ this, why you visit, and what it means to you; if you have bought WDF produce state why you did so and what this means to you; if you live near the PCML site, tell TCEQ and describe how close you are). I am concerned about

road access, water, air, noise, odor, litter, and scenic pollutions, flooding, fires, road overuse/damage, and other environmental impacts that PCML may have. (expand on these environmental concerns or add other issues that you are concerned about). Because of these problems I oppose Permit #2406. I look forward to hearing from you soon about my request to amend Permit #2406 to include the access road and hold a contested case hearing. Thank you. Sincerely, Beth House

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Thursday, April 22, 2021 2:49 PM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

From: brunfelsia1953@gmail.com <brunfelsia1953@gmail.com>
Sent: Thursday, April 22, 2021 1:38 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Elizabeth Martha House

E-MAIL: brunfelsia1953@gmail.com

COMPANY:

ADDRESS: 15650 WALDEN RD c/o E Powers Apt 3111
MONTGOMERY TX 77356-1768

PHONE: 2814337397

FAX:

COMMENTS: The Type 1 Landfill in San Jacinto County is concerning. Not only for its neighbors but for Texas. Water is becoming a very precious source and having ground water compromised for future generations is not acceptable. We need to review how waste is handled and to investigate phyto-remediation plantings, instead of just dumping into the ground and relying on "liner" to protect our environment. This is an opportunity for careful review of the entire process, involving the community, business, and government.

MSW
117709

REVIEWED
SEP 14 2021
By

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
CHIEF CLERKS OFFICE
2021 SEP 13 AM 10:14

1743 Esperanza St.
Houston, TX 77023
September 10, 2021

Office of Chief Clerk
MC 105
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

Dear Chief Clerk:

I urge you to amend Permit #2406, Peach Creek Municipal Landfill (PCML), to include the access road and hold a contested case hearing on this proposal because:

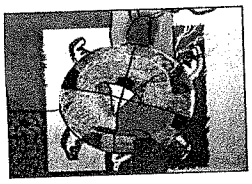
1. I am concerned that unacceptable environmental impacts will occur on Sam Houston National Forest, Wood Duck Farm, and private homesteads due to PCML. I think our national forests deserve protection, and I subscribed to Wood Duck Farm's community-supported agriculture for at least five years. I am very concerned that this project might contaminate ground water used by Houston and surrounding areas for drinking water.
2. I am concerned about road access, water, air, noise, odor, litter, and scenic pollutions, flooding, fires, road overuse/damage, and other environmental impacts that PCML may have. (expand on these environmental concerns or add other issues that you are concerned about). Because of these problems I oppose Permit #2406.

I look forward to hearing from you soon about my request to amend Permit #2406 to include the access road and hold a contested case hearing. Thank you.

Sincerely yours,

Sonora Hudson

Sonora Hudson



NORTH HOUSTON TX 773

Ms. Sonora Hudson
1743 Esperanza St
Houston, TX 77023-2401

11 SEP 2021 PM 2 L

RECEIVED
SEP 13 2021
TCEQ MAIL CENTER
WT

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
2021 SEP 13 AM 10 14
CHIEF CLERKS OFFICE

Office of Chief Clerk
MC 105
Texas Commission
on Environmental Quality
P.O. Box 13087
Austin, TX 78711-3087

78711-308787

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Wednesday, December 8, 2021 2:36 PM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Peach Creek Environmental Park Proposed Landfill Permit App. No. #2406

From: CHIEFCLK <chiefclk@tceq.texas.gov>
Sent: Wednesday, December 8, 2021 1:07 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: FW: Peach Creek Environmental Park Proposed Landfill Permit App. No. #2406

From: Hudson, Sonora <sonorah@bcm.edu>
Sent: Wednesday, December 8, 2021 12:52 PM
To: CHIEFCLK <chiefclk@tceq.texas.gov>
Subject: Peach Creek Environmental Park Proposed Landfill Permit App. No. #2406

TCEQ Office of the Chief Clerk, MC-105

P.O. Box 13087

Austin, Texas 78711-3087

Re: Peach Creek Environmental Park (PCEP) Proposed Landfill Permit Application No. Permit #2406

I am writing to request that the permit for Peach Creek EP Landfill MSW No 2406 **be denied**. There are three main concerns that form the basis for my comments.

1) The Sam Houston National Forest sits on the east and north side of the proposed landfill. The USFS was started to help provide clean water to our country. When it rains, the SHNF acts as a filter to cleanse water going downstream to Lake Houston. The leachate tanks are to sit on the north side of the LF, within a few feet of the FEMA 100-year floodplain. Storm water overflow, leachate, and VOCs will make the Jayhawker Creek floodplain a conduit for contamination which will impact drinking water downstream.

2) Dr. HC Clark wrote a geological assessment to the TCEQ back in August, to quote him "The application implicitly recognizes the gravel location restriction insofar as Class I nonhazardous is not listed as waste to be accepted. Will the permit explicitly state that Class I waste may not be and never will be accepted here because of this hydrogeologic limitation?" ….. "The sink created by pumping will draw water into the landfill rather than allowing it to pass beneath the liner and detect a leak as that groundwater moves through the point of compliance. Water will move inward rather than out."…."How will this problem be addressed?"

3) It is a fact that millions of seagulls feast at LF across North America. South Wake MSW landfill in NC is comprised of approximately 179 acres and has an estimated seagull population of 50,000. Phase 1 of this 2406 LF will be about 124 acres, or almost 37% smaller which equates to almost 31,500 seagulls as an estimated flock number. Studies from Duke Univ School for the Environment determined that these seagulls dropped over a ton of droppings each year. A year-round fruit and vegetable operation, Wood Duck Farm is located bordering the 2406 LF from the east. What are the plans to keep seagull droppings off farm produce growing in the field? What are the plans to keep seagulls from eating the crops? What type of disease vector plan might be implemented? How will the applicant mitigate wild animal scavenging? How will the extra nitrogen and phosphorus impact the SHNF?

http://www.newsobserver.com/news/local/counties/wake-county/article15847569.html

I strongly request that you take the next logical step and **REJECT** this current Application No. MSW-2406.

Thank you for your consideration.

Sincerely,

Sonora Hudson

1743 Esperanza St.

Houston, TX 77023

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Thursday, April 29, 2021 8:36 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

H

From: cdjackson03@gmail.com <cdjackson03@gmail.com>
Sent: Wednesday, April 28, 2021 7:25 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Clay Jackson

E-MAIL: cdjackson03@gmail.com

COMPANY:

ADDRESS: 10850 DAW COLLINS RD
SPLENDORA TX 77372-3169

PHONE: 8324884985

FAX:

COMMENTS: I believe there should be a public hearing on this project to tell the people who live in the area how this might effect their drinking water, health, quality of life and property values.

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Monday, September 13, 2021 7:20 AM
To: PUBCOMMENT-WPD; PUBCOMMENT-ELD; PUBCOMMENT-OCC2; PUBCOMMENT-OPIC
Subject: FW: Proposed landfill

H

From: Cherenne Kahler <cckahler@sbcglobal.net>
Sent: Friday, September 10, 2021 6:27 AM
To: CHIEFCLK <chiefclk@tceq.texas.gov>
Subject: Proposed landfill

Date: 9-10-21

Office of Chief Clerk
MC 105
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

Dear Chief Clerk,

I urge you to amend Permit #2406, Peach Creek Landfill (PCL), to include the access road and hold a contested case hearing on this proposal because:

1. I am concerned that unacceptable environmental impacts will occur on Sam Houston National Forest, Wood Duck Farm, and private homesteads due to PCL. (if you have visited SHNF tell TCEQ this, why you visit, and what it means to you; if you have bought WDF produce state why you did so and what this means to you; if you live near the PCL site, tell TCEQ and describe how close you are).

2. I am concerned about road access, water, air, noise, litter, and scenic pollutions, flooding, fires, road overuse/damage, and other environmental impacts that PCL may have. (expand on these environmental concerns or add other issues that you are concerned about)

I look forward to hearing from you soon about my request to amend Permit #2406 to include the access road and hold a contested case hearing. Thank you.

Sincerely,

Cherenne Kahler

10401 Daw Collins

Cleveland Texas 77328

281.435.5623

Cckahler@sbcglobal.net

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Thursday, September 9, 2021 10:13 AM
To: PUBCOMMENT-WPD; PUBCOMMENT-ELD; PUBCOMMENT-OCC2; PUBCOMMENT-OPIC
Subject: FW: Public comment on Permit Number 2406

H

From: slickmuslimk@yahoo.com <slickmuslimk@yahoo.com>
Sent: Thursday, September 9, 2021 10:01 AM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: MR Mohamed Magdy Kandil

E-MAIL: slickmuslimk@yahoo.com

COMPANY:

ADDRESS: PO BOX 590202
HOUSTON TX 77259-0202

PHONE: 8157645023

FAX:

COMMENTS: 9 September 2021 Office of Chief Clerk MC 105 Texas Commission on Environmental Quality P.O. Box 13087 Austin, Texas 78711-3087 Dear Chief Clerk, I urge you to amend Permit #2406, Peach Creek Municipal Landfill (PCML), to include the access road and hold a contested case hearing on this proposal because: I am concerned that unacceptable environmental impacts will occur on Sam Houston National Forest, Wood Duck Farm, and private homesteads due to PCML. Having gone hiking in the SHNF multiple times, I have always seen it as a natural refuge for

me to get away from the strains of everyday life. Its natural beauty and calm and serene scenery is something I've always had an appreciation for. I would be devastated if the landfill were to in any way disturb this natural beauty. I am concerned about road access, water, air, noise, odor, litter, and scenic pollution, flooding, fires, road overuse/damage, and other environmental impacts that PCML may have. Having previously resided in the Midwest, I can attest personally as to the long-term ecological effects of building a municipal landfill near ecologically sensitive areas. Because of these problems I oppose Permit #2406. I look forward to hearing from you soon about my request to amend Permit #2406 to include the access road and hold a contested case hearing. Thank you. Sincerely, Mohamed Magdy Kandil PO Box 590202 Houston, TX 77259 (815) 764-5023 slickmuslimk@yahoo.com

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Wednesday, November 18, 2020 10:42 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

H

From: rakelley41@gmail.com <rakelley41@gmail.com>
Sent: Tuesday, November 17, 2020 9:29 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Ruby Kelley

E-MAIL: rakelley41@gmail.com

COMPANY:

ADDRESS: 460 J A MORGAN RD
CLEVELAND TX 77328-7907

PHONE: 7134088968

FAX:

COMMENTS: Requesting a hearing on this permit. This landfill will have a direct impact on our property. We have a water well and it is our sole source of water to drink, cook and bath with. Impacts to wildlife, the national forest and our property values are tremendous.

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Monday, October 26, 2020 2:23 PM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

From: rakelley41@gmail.com <rakelley41@gmail.com>
Sent: Monday, October 26, 2020 2:02 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Ruby Kelley

E-MAIL: rakelley41@gmail.com

COMPANY:

ADDRESS: 460 J A MORGAN RD
CLEVELAND TX 77328-7907

PHONE: 7134088968

FAX:

COMMENTS: We need to stop the permit for the landfill on Forest Rd 201 in San Jacinto Cty. The residents have had no prior notice of this landfill which is against the law!!! This landfill will have a direct impact on our wildlife, endangered Woodpeckers live here. I have seen them, they are in my trees!!!! I have a water well, this landfill will cause damage to the water aquifer in and around out neighborhood. The National Forest will be effected, all of our deer will be infected by drinking the contaminated waters from the creeks that run through this landfill. Peach Creek, Jayhawker Creek, San Jacinto River, Caney Creek, Lake Houston and the Gulf of Mexico all of these bodies of water will be affected by the

landfill. Our health is at risk, our neighborhood and Peach Creek Plantation is too close to the land that was purchased for the landfill. Our land values will go down, we cannot have this. PLEASE STOP THE PERMIT OUR LIVES AND OUR WILDLIFE LIVES DEPEND ON TCEQ STOPPING THIS PERMIT!!!!!!!!!!!!!!!

:lisa Guerra

rom: PUBCOMMENT-OCC
ent: Monday, November 9, 2020 1:12 PM
'o: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
ubject: FW: Public comment on Permit Number 2406

rom: d4evbra@hotmail.com <d4evbra@hotmail.com>
ent: Monday, November 9, 2020 12:19 PM
o: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
ubject: Public comment on Permit Number 2406

EGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

N NUMBER: RN110843042

ERMIT NUMBER: 2406

OCKET NUMBER:

OUNTY: SAN JACINTO

RINCIPAL NAME: PC-II LLC

N NUMBER: CN605694611

ROM

AME: Debbie Kenna

-MAIL: d4evbra@hotmail.com

OMPANY:

DDRESS: PO BOX 674
IGHLANDS TX 77562-0674

HONE: 9362570029

AX:

OMMENTS: I am commenting on case #2406 regarding plans for a landfill off Fostoria Rd. We are requesting a public earing to contest this action. We would appreciate the right to express our views and opinions in hopes to save the im Houston National Forestry and surrounding area. The projected plan for the landfill in this area would not only estroy the natural preserve and endangered species but would create a health hazard in the community. We would ndly like to be heard in this matter with all due respect regarding our position and request reconsideration of this ndfill in our community. Sincerely. Debbie Kenna

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Monday, March 21, 2022 9:19 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

MSW
117709

H

From: eaglawrence@gmail.com <eaglawrence@gmail.com>
Sent: Sunday, March 20, 2022 8:37 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Erica Lawrence

E-MAIL: eaglawrence@gmail.com

COMPANY:

ADDRESS: 28262 CALAVERAS LAKE DR
SPRING TX 77386-4289

PHONE: 3614436052

FAX:

COMMENTS: Good afternoon, thank you for reading my comments regarding the proposed landfill at Peach Creek. My name is Erica Lawrence. I am a native Texan currently residing with my family in the Spring/The Woodlands area. I am writing to ask you to deny Permit #2406 for the Peach Creek Municipal Landfill (PCML). I am concerned about the impacts that will occur in the area of the proposed landfill. The areas that would be immediately affected by the landfill include Sam Houston National Forest, the Wood Duck Farm, as well as the surface and ground waters that sustain my

area. I have 4 young children, ages 7 to 14, who I worry would be severely impacted by a landfill in their backyard. Construction of such a thing would bring about environmental impacts, too. Most notably, I am horrified that the drinking water could be contaminated by the junk that is dumped into a landfill. This landfill is set to be built very near Sam Houston National Forest which provides clean ground/surface drinking water for local citizens and the City of Houston. Other problems that will arise include air, noise, and litter pollution. Because of these problems, I oppose Permit #2406 and I respectfully request the TCEQ deny this permit. If TCEQ does not deny this permit it should hold a contested case hearing so that those who will suffer environmental impacts due to the PCML can be heard. Thank you. Take care, Erica Lawrence 28262 Calaveras Lake Drive Spring, TX 77386 361-443-6052 cell eaglawrence@gmail.com

REVIEWED
JAN 18 2022
By

January 14, 2022

MSW
117709

Via U.S. Mail and electronically filed at https://www14.tceq.texas.gov/epic/eComment/

Texas Commission on Environmental Quality
Office of the Chief Clerk, MC-105
P.O. Box 13087
Austin, TX 78711.3087

Re: *Comments and Request for Contested Case Hearing*
Proposed Municipal Solid Waste Permit No. 2406

Dear Office of Chief Clerk:

Pursuant to the instructions in the Notice of Application and Preliminary Decision for Municipal Solid Waste Proposed Permit No. 2406 ("***Application***") which the Texas Commission on Environmental Quality ("***TCEQ***") Commissioner's Integrated Database indicates was mailed on December 15, 2021, Houston San Jacinto Ranch, LLC[1] submits the comments below on the Application. Based on the comments below, Houston San Jacinto Ranch, LLC also expressly requests a contested case hearing. Contact information for Houston San Jacinto Ranch, LLC is as follows:

Dennis L. Carey
P.O. Box 579
Montezuma, GA 31063
(478) 957-6879

Based on a comparison of mapping included in the Application which reflects a 1-mile radius from the perimeter of the proposed landfill permit boundaries to the property ownership mapping records available electronically from the San Jacinto County Appraisal District ("***CAD Records***"), two parcels of property owned by Houston San Jacinto Ranch, LLC clearly appear to be located within a 1-mile radius of the permit boundary of the proposed landfill. These two

[1] Houston San Jacinto Ranch, LLC is an entity created in the State of Delaware, and recently submitted documents to change its name from The Woodlands San Jacinto Ranch, LLC. The name change is not yet reflected in the current San Jacinto County Appraisal District records referenced herein.

parcels of property are located west to northwest of the proposed landfill site and are identified by CAD Records as Property ID#46683 and Property ID#46471.

Based on the proximity of property owned by Houston San Jacinto Ranch, LLC to the proposed landfill site, Houston San Jacinto Ranch, LLC would be adversely affected in a way not common to the general public by the proposed landfill which would be authorized if the Application is granted. A list of disputed issues of fact upon which the hearing request is based are provided in the comments below. The disputed issues are based on a high-level review of documentation relating to the Application ("***Application Materials***") which were made available on the internet, an evaluation of issues raised in other recent TCEQ landfill applications, and a review of information received in comments received by TCEQ on the Application to date. If all relevant information was not made available on the internet, then an additional fact issue arises regarding whether public notice has been proper. Although the Commissioner's Integrated Database indicates notice of the preliminary decision was mailed on December 15, 2021, the notice indicates 30 days after the publication date is the trigger that sets the deadline for comments. The comment deadline should be not be less than 30 days after the date notice was mailed by TCEQ and available in TCEQ's databases. Houston San Jacinto Ranch, LLC reserves the right after issuance of the TCEQ Executive Director's response to comments to provide additional detail regarding its property ownership and regarding the comments below, and also reserves the right to file a request for reconsideration.

1. Waste Screening Measures and Waste Acceptance

Per Part II, Section 2.2 of the Application, and supporting documentation, the Application Materials do not adequately demonstrate that waste will not be screened to prevent the possibility of the landfill accepting unauthorized, hazardous, or toxic wastes.

2. Potential Buffer Zone Encroachment

Per Part II, Section 2.3 of the Application, and supporting documentation, the Citizen's Collection Center and Truck Wheel Wash Area potentially encroach on the 125-foot buffer zone along the eastern side of the facility. Based on the description of this area, solid waste unloading appears to be proposed within the "CCC Traffic" area and within the identified 125-foot buffer zone. Also, the Truck Wheel Wash and the associated sump will contain "contaminated water" and are within 125 feet of the facility boundary, inferring the storage of waste within the buffer zone. Thus, the Application fails to demonstrate that these buffer zone requirements will be met.

3. Land Use Compatibility

Per Part II, Section 7 of the Application, and supporting documentation, inadequate information is provided in the Application Materials to demonstrate that land use, zoning in the vicinity, community growth patterns, water wells, and other factors associated with the public interest will be adequately addressed. The location of the landfill is incompatible with surrounding land use, such as the Wood Duck Farm which produces edible food products for public consumption, and the public's use of the nearby Sam Houston National Forest, which includes designated camping areas. As noted in the letter dated January 7, 2022 from State Representative Ernest Bailes, the proposed landfill would be in close proximity to many private residences. Comparing mapping readily available on Google mapping to CAD Records mapping shows that properties immediately adjacent to and south of the proposed landfill site appears to have been

essentially subdivided into dozens of tracts of property owned by dozens of individuals, many of whom have residences and homes on the properties. Other residences also appear to be nearby.

4. General Health, Public Safety, and Environmental Concerns

Per Part II, Section 7 of the Application, and supporting documentation, the Application Materials do not demonstrate that the landfill would not cause landowners and members of the surrounding community to suffer adverse health and environmental effects due to contaminants or pollutants from the landfill, or that the landfill would not negatively impact public safety or the environment, including negative impacts on nearby property. This includes a variety of impacts from the issues identified in this letter, including but not limited to negative impacts to groundwater, surface water, implications of odor generated from the activities, vectors resulting from the activities, increased traffic, etc. on the property owned by Houston San Jacinto Ranch, LLC.

5. Inadequate Roadways and Adequacy of Access Roads

Per Part II, Section 8 of the Application, and supporting documentation, the primary access roadways identified in the Application Materials are FM 1725, Fostoria Tram Road, Jayhawker Road, and Rajak Road; all of which are essentially rural, two lane roads. For the reasons explained in the comment letter dated January 25, 2021 from San Jacinto County Commissioner David Brandon, these roads are not sufficient to accommodate the proposed landfill. The Application fails to demonstrate that the roadways are adequate, or that appropriate coordination with local and state officials regarding adequacy of roadway maintenance or adequacy of roadways has taken place. Local road infrastructure would not be able to handle the road traffic generated by a landfill of this size, which would create traffic congestion and traffic hazards and endanger public safety. Appropriate traffic studies to identify and address traffic impacts on state and local roadways have not been adequately addressed.

6. Faulting and Subsurface Instability

Per Part II, Sections 9.4 and 9.6 of the Application, and supporting documentation, information included in the Application Materials infer subsurface movement, possibly associated with faulting, subsidence, or otherwise unstable areas. It is noteworthy that the area in close proximity to the proposed landfill facility is experiencing or has experienced withdrawal of crude oil, natural gas, and groundwater. Thus, whether the location of the proposed landfill is appropriate based on potential faulting and subsurface instability has not been demonstrated.

7. Wetlands

Per Part II, Section 11 of the Application, and supporting documentation, Application Materials do not demonstrate that wetlands, including jurisdictional wetlands, have been adequately considered, especially given the location of the nearby state watercourses such as Jayhawker Creek which appears to traverse the site, Peach Creek, and Gum Branch.

8. Endangered Species

Per Part II, Section 12 of the Application, and supporting documentation, Application Materials do not adequately identify potential state or federal threatened or endangered species, or to address how the proposed landfill would impact such endangered species and their habitats, especially given the proximate location of the Sam Houston National Forest. Further, Texas Parks

& Wildlife submitted a comment letter to TCEQ on January 12, 2022 incorporating previous comments from that agency and indicating that no Biological Assessment or species protection plan was included with the Application Materials.

9. Inadequate Stormwater Controls, Drainage Controls, Floodplains and Surface Water Quality

Per Part III, Attachment B of the Application, and supporting documentation, the Application Materials do not appear to adequately address the management of stormwater or surface water during all phases of landfill operation when compared to TCEQ's requirements. This includes the management of stormwater contact with reusable materials or with stockpiles of materials used for landfill operations. Further, drainage and surface water impacts of the landfill from construction and operation on neighboring properties has not been adequately addressed. Further, whether the landfill would be improperly located in a floodplain have not been adequately addressed, nor has an adequate demonstration been made that water contaminated after coming into contact with waste will not negatively impact nearby surface water quality. Protection of surface water quality is paramount given that Jayhawker Creek appears to traverse the site, which as noted by Texas Parks & Wildlife drains into Peach Creek, which drains into Caney Creek, which discharges into Lake Houston 17 miles south of the proposed site.

10. Odor, Dust, and Nuisance Abatement, and the Site Operating Plan

Per Part III, Attachment D, Sections 2 and 3 of the Application, and supporting documentation, the Application Materials do not demonstrate that the landfill would not produce nuisance odors, including dust from roads, or that the Site Operating Plan includes adequate odor control measures.

11. Birds, Buzzards, and other Disease and Vector Control

Per Part III, Attachment D, Sections 2 and 3 of the Application, and supporting documentation, Application Materials do not demonstrate that the landfill will not create health and environmental hazards by providing food or harborage for birds or buzzards, or that the landfill will not attracts other vectors and vermin, especially given the presence of wildlife in the adjacent Sam Houston National Forest.

12. Inadequate Hydrogeology, Groundwater Monitoring, and Soils

Per Part III, Attachment D2 of the Application, and supporting documentation, the Application Materials indicate that Class 1 wastes with asbestos content will be accepted, which should then require that the soils underlying the liner must meet certain standards set forth in the TCEQ's Industrial Solid Waste and Municipal Hazardous Waste rules. Based on the soil boring logs and subsurface descriptions presented in the Application Materials, unacceptable soil types immediately underlie the waste containment structures in several areas, including sands and gravels. Thus, the Application fails to demonstrate that soils underlying the liner would meet the technical requirements. Further, information submitted to TCEQ on August 13, 2021 from H.C. Clark highlights the problems with the hydrogeology due to the presence of gravel at the proposed site and the problems with assumptions utilized in groundwater monitoring.

13. Inadequate Subsurface Characterization and Landfill Design

Per Part III, Attachment E of the Application, and supporting documentation, only 19 boring logs are presented in the Application Materials. The number, proximity, and location of the boreholes associated with the boring logs has not been demonstrated to be sufficient for the establishment of subsurface stratigraphy across the proposed waste management units. Additionally, the only boring logs presented display a stratigraphic complexity which has not been demonstrated to meet applicable subsurface siting requirements. Without having adequately characterized the subsurface geology, the landfill design, including the design of the liners, has not been demonstrated to be adequate.

14. Inadequate Consideration of Groundwater Impacts

Per Part III, Attachment E of the Application, and supporting documentation, the Application Materials fail to adequately address the presence of groundwater and to address how groundwater that is present will be protected. For example, many, if not all, of the piezometer completion logs presented in the Application Materials present data that conflicts with the data presented on the associated Driller's Well Reports available through the Texas Water Development Board. Additionally, most of the piezometer completion logs do not illustrate the total depth of each boring or provide sufficient surface completion details to determine if the data from the piezometer wells are reliable. It has not been demonstrated that characterization of subsurface geology and hydrogeology is adequate, including whether sufficient soil borings were taken or whether sufficient piezometer wells were installed, which leads to inadequate consideration of the protection of groundwater resources.

15. Landfill Gas Creation, Migration and Control

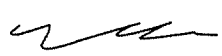
Per Part III, Attachment G of the Application, and supporting documentation, the Application Materials do not demonstrate that the landfill would not produce elevated levels of landfill gas, including methane, or that appropriate provisions are included to monitor and control such landfill gas, or to monitor and ensure that such landfill gas will not migrate off-site to nearby properties.

16. Closure and Post-Closure Care Cost Estimates, and Financial Assurance

Per Part III, Attachment J of the Application, and supporting documentation, the types and amounts of money proposed for closure and post closure care are not based on reasonable worst-case scenarios with closure by independent third parties, and all potential contingencies have not been addressed. Further, it has not been demonstrated that the applicant has the sufficient financial resources to operate and maintain the proposed landfill, including to address issues relating to surface or subsurface contamination and cleanup, or for appropriate closure and post-closure.

Thank you for your attention to this matter.

Sincerely yours,



Jennifer Lee
Houston San Jacinto Ranch, LLC

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Tuesday, January 18, 2022 2:49 PM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406
Attachments: Fional Clean Peach Creek Comment Letter 01-14-222.pdf

H

From: pinetimber@windstream.net <pinetimber@windstream.net>
Sent: Friday, January 14, 2022 3:29 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Jennifer Lee

E-MAIL: pinetimber@windstream.net

COMPANY: Houston San Jacinto Ranch, LLC

ADDRESS: 1940 FOUNTAIN VIEW DR Dr #3092
HOUSTON TX 77057-3206

PHONE: 4784728213

FAX:

COMMENTS: Please see the attached letter.

January 14, 2022

Via U.S. Mail and electronically filed at https://www14.tceq.texas.gov/epic/eComment/

Texas Commission on Environmental Quality
Office of the Chief Clerk, MC-105
P.O. Box 13087
Austin, TX 78711.3087

Re: *Comments and Request for Contested Case Hearing*
Proposed Municipal Solid Waste Permit No. 2406

Dear Office of Chief Clerk:

Pursuant to the instructions in the Notice of Application and Preliminary Decision for Municipal Solid Waste Proposed Permit No. 2406 ("***Application***") which the Texas Commission on Environmental Quality ("***TCEQ***") Commissioner's Integrated Database indicates was mailed on December 15, 2021, Houston San Jacinto Ranch, LLC[1] submits the comments below on the Application. Based on the comments below, Houston San Jacinto Ranch, LLC also expressly requests a contested case hearing. Contact information for Houston San Jacinto Ranch, LLC is as follows:

Dennis L. Carey
P.O. Box 579
Montezuma, GA 31063
(478) 957-6879

Based on a comparison of mapping included in the Application which reflects a 1-mile radius from the perimeter of the proposed landfill permit boundaries to the property ownership mapping records available electronically from the San Jacinto County Appraisal District ("***CAD Records***"), two parcels of property owned by Houston San Jacinto Ranch, LLC clearly appear to be located within a 1-mile radius of the permit boundary of the proposed landfill. These two

[1] Houston San Jacinto Ranch, LLC is an entity created in the State of Delaware, and recently submitted documents to change its name from The Woodlands San Jacinto Ranch, LLC. The name change is not yet reflected in the current San Jacinto County Appraisal District records referenced herein.

parcels of property are located west to northwest of the proposed landfill site and are identified by CAD Records as Property ID#46683 and Property ID#46471.

Based on the proximity of property owned by Houston San Jacinto Ranch, LLC to the proposed landfill site, Houston San Jacinto Ranch, LLC would be adversely affected in a way not common to the general public by the proposed landfill which would be authorized if the Application is granted. A list of disputed issues of fact upon which the hearing request is based are provided in the comments below. The disputed issues are based on a high-level review of documentation relating to the Application ("***Application Materials***") which were made available on the internet, an evaluation of issues raised in other recent TCEQ landfill applications, and a review of information received in comments received by TCEQ on the Application to date. If all relevant information was not made available on the internet, then an additional fact issue arises regarding whether public notice has been proper. Although the Commissioner's Integrated Database indicates notice of the preliminary decision was mailed on December 15, 2021, the notice indicates 30 days after the publication date is the trigger that sets the deadline for comments. The comment deadline should be not be less than 30 days after the date notice was mailed by TCEQ and available in TCEQ's databases. Houston San Jacinto Ranch, LLC reserves the right after issuance of the TCEQ Executive Director's response to comments to provide additional detail regarding its property ownership and regarding the comments below, and also reserves the right to file a request for reconsideration.

1. Waste Screening Measures and Waste Acceptance

Per Part II, Section 2.2 of the Application, and supporting documentation, the Application Materials do not adequately demonstrate that waste will not be screened to prevent the possibility of the landfill accepting unauthorized, hazardous, or toxic wastes.

2. Potential Buffer Zone Encroachment

Per Part II, Section 2.3 of the Application, and supporting documentation, the Citizen's Collection Center and Truck Wheel Wash Area potentially encroach on the 125-foot buffer zone along the eastern side of the facility. Based on the description of this area, solid waste unloading appears to be proposed within the "CCC Traffic" area and within the identified 125-foot buffer zone. Also, the Truck Wheel Wash and the associated sump will contain "contaminated water" and are within 125 feet of the facility boundary, inferring the storage of waste within the buffer zone. Thus, the Application fails to demonstrate that these buffer zone requirements will be met.

3. Land Use Compatibility

Per Part II, Section 7 of the Application, and supporting documentation, inadequate information is provided in the Application Materials to demonstrate that land use, zoning in the vicinity, community growth patterns, water wells, and other factors associated with the public interest will be adequately addressed. The location of the landfill is incompatible with surrounding land use, such as the Wood Duck Farm which produces edible food products for public consumption, and the public's use of the nearby Sam Houston National Forest, which includes designated camping areas. As noted in the letter dated January 7, 2022 from State Representative Ernest Bailes, the proposed landfill would be in close proximity to many private residences. Comparing mapping readily available on Google mapping to CAD Records mapping shows that properties immediately adjacent to and south of the proposed landfill site appears to have been

essentially subdivided into dozens of tracts of property owned by dozens of individuals, many of whom have residences and homes on the properties. Other residences also appear to be nearby.

4. General Health, Public Safety, and Environmental Concerns

Per Part II, Section 7 of the Application, and supporting documentation, the Application Materials do not demonstrate that the landfill would not cause landowners and members of the surrounding community to suffer adverse health and environmental effects due to contaminants or pollutants from the landfill, or that the landfill would not negatively impact public safety or the environment, including negative impacts on nearby property. This includes a variety of impacts from the issues identified in this letter, including but not limited to negative impacts to groundwater, surface water, implications of odor generated from the activities, vectors resulting from the activities, increased traffic, etc. on the property owned by Houston San Jacinto Ranch, LLC.

5. Inadequate Roadways and Adequacy of Access Roads

Per Part II, Section 8 of the Application, and supporting documentation, the primary access roadways identified in the Application Materials are FM 1725, Fostoria Tram Road, Jayhawker Road, and Rajak Road; all of which are essentially rural, two lane roads. For the reasons explained in the comment letter dated January 25, 2021 from San Jacinto County Commissioner David Brandon, these roads are not sufficient to accommodate the proposed landfill. The Application fails to demonstrate that the roadways are adequate, or that appropriate coordination with local and state officials regarding adequacy of roadway maintenance or adequacy of roadways has taken place. Local road infrastructure would not be able to handle the road traffic generated by a landfill of this size, which would create traffic congestion and traffic hazards and endanger public safety. Appropriate traffic studies to identify and address traffic impacts on state and local roadways have not been adequately addressed.

6. Faulting and Subsurface Instability

Per Part II, Sections 9.4 and 9.6 of the Application, and supporting documentation, information included in the Application Materials infer subsurface movement, possibly associated with faulting, subsidence, or otherwise unstable areas. It is noteworthy that the area in close proximity to the proposed landfill facility is experiencing or has experienced withdrawal of crude oil, natural gas, and groundwater. Thus, whether the location of the proposed landfill is appropriate based on potential faulting and subsurface instability has not been demonstrated.

7. Wetlands

Per Part II, Section 11 of the Application, and supporting documentation, Application Materials do not demonstrate that wetlands, including jurisdictional wetlands, have been adequately considered, especially given the location of the nearby state watercourses such as Jayhawker Creek which appears to traverse the site, Peach Creek, and Gum Branch.

8. Endangered Species

Per Part II, Section 12 of the Application, and supporting documentation, Application Materials do not adequately identify potential state or federal threatened or endangered species, or to address how the proposed landfill would impact such endangered species and their habitats, especially given the proximate location of the Sam Houston National Forest. Further, Texas Parks

& Wildlife submitted a comment letter to TCEQ on January 12, 2022 incorporating previous comments from that agency and indicating that no Biological Assessment or species protection plan was included with the Application Materials.

9. Inadequate Stormwater Controls, Drainage Controls, Floodplains and Surface Water Quality

Per Part III, Attachment B of the Application, and supporting documentation, the Application Materials do not appear to adequately address the management of stormwater or surface water during all phases of landfill operation when compared to TCEQ's requirements. This includes the management of stormwater contact with reusable materials or with stockpiles of materials used for landfill operations. Further, drainage and surface water impacts of the landfill from construction and operation on neighboring properties has not been adequately addressed. Further, whether the landfill would be improperly located in a floodplain have not been adequately addressed, nor has an adequate demonstration been made that water contaminated after coming into contact with waste will not negatively impact nearby surface water quality. Protection of surface water quality is paramount given that Jayhawker Creek appears to traverse the site, which as noted by Texas Parks & Wildlife drains into Peach Creek, which drains into Caney Creek, which discharges into Lake Houston 17 miles south of the proposed site.

10. Odor, Dust, and Nuisance Abatement, and the Site Operating Plan

Per Part III, Attachment D, Sections 2 and 3 of the Application, and supporting documentation, the Application Materials do not demonstrate that the landfill would not produce nuisance odors, including dust from roads, or that the Site Operating Plan includes adequate odor control measures.

11. Birds, Buzzards, and other Disease and Vector Control

Per Part III, Attachment D, Sections 2 and 3 of the Application, and supporting documentation, Application Materials do not demonstrate that the landfill will not create health and environmental hazards by providing food or harborage for birds or buzzards, or that the landfill will not attracts other vectors and vermin, especially given the presence of wildlife in the adjacent Sam Houston National Forest.

12. Inadequate Hydrogeology, Groundwater Monitoring, and Soils

Per Part III, Attachment D2 of the Application, and supporting documentation, the Application Materials indicate that Class 1 wastes with asbestos content will be accepted, which should then require that the soils underlying the liner must meet certain standards set forth in the TCEQ's Industrial Solid Waste and Municipal Hazardous Waste rules. Based on the soil boring logs and subsurface descriptions presented in the Application Materials, unacceptable soil types immediately underlie the waste containment structures in several areas, including sands and gravels. Thus, the Application fails to demonstrate that soils underlying the liner would meet the technical requirements. Further, information submitted to TCEQ on August 13, 2021 from H.C. Clark highlights the problems with the hydrogeology due to the presence of gravel at the proposed site and the problems with assumptions utilized in groundwater monitoring.

13. Inadequate Subsurface Characterization and Landfill Design

Per Part III, Attachment E of the Application, and supporting documentation, only 19 boring logs are presented in the Application Materials. The number, proximity, and location of the boreholes associated with the boring logs has not been demonstrated to be sufficient for the establishment of subsurface stratigraphy across the proposed waste management units. Additionally, the only boring logs presented display a stratigraphic complexity which has not been demonstrated to meet applicable subsurface siting requirements. Without having adequately characterized the subsurface geology, the landfill design, including the design of the liners, has not been demonstrated to be adequate.

14. Inadequate Consideration of Groundwater Impacts

Per Part III, Attachment E of the Application, and supporting documentation, the Application Materials fail to adequately address the presence of groundwater and to address how groundwater that is present will be protected. For example, many, if not all, of the piezometer completion logs presented in the Application Materials present data that conflicts with the data presented on the associated Driller's Well Reports available through the Texas Water Development Board. Additionally, most of the piezometer completion logs do not illustrate the total depth of each boring or provide sufficient surface completion details to determine if the data from the piezometer wells are reliable. It has not been demonstrated that characterization of subsurface geology and hydrogeology is adequate, including whether sufficient soil borings were taken or whether sufficient piezometer wells were installed, which leads to inadequate consideration of the protection of groundwater resources.

15. Landfill Gas Creation, Migration and Control

Per Part III, Attachment G of the Application, and supporting documentation, the Application Materials do not demonstrate that the landfill would not produce elevated levels of landfill gas, including methane, or that appropriate provisions are included to monitor and control such landfill gas, or to monitor and ensure that such landfill gas will not migrate off-site to nearby properties.

16. Closure and Post-Closure Care Cost Estimates, and Financial Assurance

Per Part III, Attachment J of the Application, and supporting documentation, the types and amounts of money proposed for closure and post closure care are not based on reasonable worst-case scenarios with closure by independent third parties, and all potential contingencies have not been addressed. Further, it has not been demonstrated that the applicant has the sufficient financial resources to operate and maintain the proposed landfill, including to address issues relating to surface or subsurface contamination and cleanup, or for appropriate closure and post-closure.

Thank you for your attention to this matter.

Sincerely yours,

Jennifer Lee
Houston San Jacinto Ranch, LLC

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Tuesday, January 18, 2022 2:53 PM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406
Attachments: Fional Clean Peach Creek Comment Letter 01-14-222.pdf

H

From: pinetimber@windstream.net <pinetimber@windstream.net>
Sent: Friday, January 14, 2022 2:57 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Jennifer Lee

E-MAIL: pinetimber@windstream.net

COMPANY: Houston San Jacinto Ranch, LLC

ADDRESS: 1940 FOUNTAIN VIEW DR Dr #3092
HOUSTON TX 77057-3206

PHONE: 4784728213

FAX:

COMMENTS: Please see the attached letter.

January 14, 2022

Via U.S. Mail and electronically filed at https://www14.tceq.texas.gov/epic/eComment/

Texas Commission on Environmental Quality
Office of the Chief Clerk, MC-105
P.O. Box 13087
Austin, TX 78711.3087

Re: *Comments and Request for Contested Case Hearing*
Proposed Municipal Solid Waste Permit No. 2406

Dear Office of Chief Clerk:

Pursuant to the instructions in the Notice of Application and Preliminary Decision for Municipal Solid Waste Proposed Permit No. 2406 ("***Application***") which the Texas Commission on Environmental Quality ("***TCEQ***") Commissioner's Integrated Database indicates was mailed on December 15, 2021, Houston San Jacinto Ranch, LLC[1] submits the comments below on the Application. Based on the comments below, Houston San Jacinto Ranch, LLC also expressly requests a contested case hearing. Contact information for Houston San Jacinto Ranch, LLC is as follows:

Dennis L. Carey
P.O. Box 579
Montezuma, GA 31063
(478) 957-6879

Based on a comparison of mapping included in the Application which reflects a 1-mile radius from the perimeter of the proposed landfill permit boundaries to the property ownership mapping records available electronically from the San Jacinto County Appraisal District ("***CAD Records***"), two parcels of property owned by Houston San Jacinto Ranch, LLC clearly appear to be located within a 1-mile radius of the permit boundary of the proposed landfill. These two

[1] Houston San Jacinto Ranch, LLC is an entity created in the State of Delaware, and recently submitted documents to change its name from The Woodlands San Jacinto Ranch, LLC. The name change is not yet reflected in the current San Jacinto County Appraisal District records referenced herein.

parcels of property are located west to northwest of the proposed landfill site and are identified by CAD Records as Property ID#46683 and Property ID#46471.

Based on the proximity of property owned by Houston San Jacinto Ranch, LLC to the proposed landfill site, Houston San Jacinto Ranch, LLC would be adversely affected in a way not common to the general public by the proposed landfill which would be authorized if the Application is granted. A list of disputed issues of fact upon which the hearing request is based are provided in the comments below. The disputed issues are based on a high-level review of documentation relating to the Application ("***Application Materials***") which were made available on the internet, an evaluation of issues raised in other recent TCEQ landfill applications, and a review of information received in comments received by TCEQ on the Application to date. If all relevant information was not made available on the internet, then an additional fact issue arises regarding whether public notice has been proper. Although the Commissioner's Integrated Database indicates notice of the preliminary decision was mailed on December 15, 2021, the notice indicates 30 days after the publication date is the trigger that sets the deadline for comments. The comment deadline should be not be less than 30 days after the date notice was mailed by TCEQ and available in TCEQ's databases. Houston San Jacinto Ranch, LLC reserves the right after issuance of the TCEQ Executive Director's response to comments to provide additional detail regarding its property ownership and regarding the comments below, and also reserves the right to file a request for reconsideration.

1. Waste Screening Measures and Waste Acceptance

Per Part II, Section 2.2 of the Application, and supporting documentation, the Application Materials do not adequately demonstrate that waste will not be screened to prevent the possibility of the landfill accepting unauthorized, hazardous, or toxic wastes.

2. Potential Buffer Zone Encroachment

Per Part II, Section 2.3 of the Application, and supporting documentation, the Citizen's Collection Center and Truck Wheel Wash Area potentially encroach on the 125-foot buffer zone along the eastern side of the facility. Based on the description of this area, solid waste unloading appears to be proposed within the "CCC Traffic" area and within the identified 125-foot buffer zone. Also, the Truck Wheel Wash and the associated sump will contain "contaminated water" and are within 125 feet of the facility boundary, inferring the storage of waste within the buffer zone. Thus, the Application fails to demonstrate that these buffer zone requirements will be met.

3. Land Use Compatibility

Per Part II, Section 7 of the Application, and supporting documentation, inadequate information is provided in the Application Materials to demonstrate that land use, zoning in the vicinity, community growth patterns, water wells, and other factors associated with the public interest will be adequately addressed. The location of the landfill is incompatible with surrounding land use, such as the Wood Duck Farm which produces edible food products for public consumption, and the public's use of the nearby Sam Houston National Forest, which includes designated camping areas. As noted in the letter dated January 7, 2022 from State Representative Ernest Bailes, the proposed landfill would be in close proximity to many private residences. Comparing mapping readily available on Google mapping to CAD Records mapping shows that properties immediately adjacent to and south of the proposed landfill site appears to have been

essentially subdivided into dozens of tracts of property owned by dozens of individuals, many of whom have residences and homes on the properties. Other residences also appear to be nearby.

4. General Health, Public Safety, and Environmental Concerns

Per Part II, Section 7 of the Application, and supporting documentation, the Application Materials do not demonstrate that the landfill would not cause landowners and members of the surrounding community to suffer adverse health and environmental effects due to contaminants or pollutants from the landfill, or that the landfill would not negatively impact public safety or the environment, including negative impacts on nearby property. This includes a variety of impacts from the issues identified in this letter, including but not limited to negative impacts to groundwater, surface water, implications of odor generated from the activities, vectors resulting from the activities, increased traffic, etc. on the property owned by Houston San Jacinto Ranch, LLC.

5. Inadequate Roadways and Adequacy of Access Roads

Per Part II, Section 8 of the Application, and supporting documentation, the primary access roadways identified in the Application Materials are FM 1725, Fostoria Tram Road, Jayhawker Road, and Rajak Road; all of which are essentially rural, two lane roads. For the reasons explained in the comment letter dated January 25, 2021 from San Jacinto County Commissioner David Brandon, these roads are not sufficient to accommodate the proposed landfill. The Application fails to demonstrate that the roadways are adequate, or that appropriate coordination with local and state officials regarding adequacy of roadway maintenance or adequacy of roadways has taken place. Local road infrastructure would not be able to handle the road traffic generated by a landfill of this size, which would create traffic congestion and traffic hazards and endanger public safety. Appropriate traffic studies to identify and address traffic impacts on state and local roadways have not been adequately addressed.

6. Faulting and Subsurface Instability

Per Part II, Sections 9.4 and 9.6 of the Application, and supporting documentation, information included in the Application Materials infer subsurface movement, possibly associated with faulting, subsidence, or otherwise unstable areas. It is noteworthy that the area in close proximity to the proposed landfill facility is experiencing or has experienced withdrawal of crude oil, natural gas, and groundwater. Thus, whether the location of the proposed landfill is appropriate based on potential faulting and subsurface instability has not been demonstrated.

7. Wetlands

Per Part II, Section 11 of the Application, and supporting documentation, Application Materials do not demonstrate that wetlands, including jurisdictional wetlands, have been adequately considered, especially given the location of the nearby state watercourses such as Jayhawker Creek which appears to traverse the site, Peach Creek, and Gum Branch.

8. Endangered Species

Per Part II, Section 12 of the Application, and supporting documentation, Application Materials do not adequately identify potential state or federal threatened or endangered species, or to address how the proposed landfill would impact such endangered species and their habitats, especially given the proximate location of the Sam Houston National Forest. Further, Texas Parks

& Wildlife submitted a comment letter to TCEQ on January 12, 2022 incorporating previous comments from that agency and indicating that no Biological Assessment or species protection plan was included with the Application Materials.

9. Inadequate Stormwater Controls, Drainage Controls, Floodplains and Surface Water Quality

Per Part III, Attachment B of the Application, and supporting documentation, the Application Materials do not appear to adequately address the management of stormwater or surface water during all phases of landfill operation when compared to TCEQ's requirements. This includes the management of stormwater contact with reusable materials or with stockpiles of materials used for landfill operations. Further, drainage and surface water impacts of the landfill from construction and operation on neighboring properties has not been adequately addressed. Further, whether the landfill would be improperly located in a floodplain have not been adequately addressed, nor has an adequate demonstration been made that water contaminated after coming into contact with waste will not negatively impact nearby surface water quality. Protection of surface water quality is paramount given that Jayhawker Creek appears to traverse the site, which as noted by Texas Parks & Wildlife drains into Peach Creek, which drains into Caney Creek, which discharges into Lake Houston 17 miles south of the proposed site.

10. Odor, Dust, and Nuisance Abatement, and the Site Operating Plan

Per Part III, Attachment D, Sections 2 and 3 of the Application, and supporting documentation, the Application Materials do not demonstrate that the landfill would not produce nuisance odors, including dust from roads, or that the Site Operating Plan includes adequate odor control measures.

11. Birds, Buzzards, and other Disease and Vector Control

Per Part III, Attachment D, Sections 2 and 3 of the Application, and supporting documentation, Application Materials do not demonstrate that the landfill will not create health and environmental hazards by providing food or harborage for birds or buzzards, or that the landfill will not attracts other vectors and vermin, especially given the presence of wildlife in the adjacent Sam Houston National Forest.

12. Inadequate Hydrogeology, Groundwater Monitoring, and Soils

Per Part III, Attachment D2 of the Application, and supporting documentation, the Application Materials indicate that Class 1 wastes with asbestos content will be accepted, which should then require that the soils underlying the liner must meet certain standards set forth in the TCEQ's Industrial Solid Waste and Municipal Hazardous Waste rules. Based on the soil boring logs and subsurface descriptions presented in the Application Materials, unacceptable soil types immediately underlie the waste containment structures in several areas, including sands and gravels. Thus, the Application fails to demonstrate that soils underlying the liner would meet the technical requirements. Further, information submitted to TCEQ on August 13, 2021 from H.C. Clark highlights the problems with the hydrogeology due to the presence of gravel at the proposed site and the problems with assumptions utilized in groundwater monitoring.

13. Inadequate Subsurface Characterization and Landfill Design

Per Part III, Attachment E of the Application, and supporting documentation, only 19 boring logs are presented in the Application Materials. The number, proximity, and location of the boreholes associated with the boring logs has not been demonstrated to be sufficient for the establishment of subsurface stratigraphy across the proposed waste management units. Additionally, the only boring logs presented display a stratigraphic complexity which has not been demonstrated to meet applicable subsurface siting requirements. Without having adequately characterized the subsurface geology, the landfill design, including the design of the liners, has not been demonstrated to be adequate.

14. Inadequate Consideration of Groundwater Impacts

Per Part III, Attachment E of the Application, and supporting documentation, the Application Materials fail to adequately address the presence of groundwater and to address how groundwater that is present will be protected. For example, many, if not all, of the piezometer completion logs presented in the Application Materials present data that conflicts with the data presented on the associated Driller's Well Reports available through the Texas Water Development Board. Additionally, most of the piezometer completion logs do not illustrate the total depth of each boring or provide sufficient surface completion details to determine if the data from the piezometer wells are reliable. It has not been demonstrated that characterization of subsurface geology and hydrogeology is adequate, including whether sufficient soil borings were taken or whether sufficient piezometer wells were installed, which leads to inadequate consideration of the protection of groundwater resources.

15. Landfill Gas Creation, Migration and Control

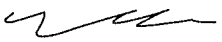
Per Part III, Attachment G of the Application, and supporting documentation, the Application Materials do not demonstrate that the landfill would not produce elevated levels of landfill gas, including methane, or that appropriate provisions are included to monitor and control such landfill gas, or to monitor and ensure that such landfill gas will not migrate off-site to nearby properties.

16. Closure and Post-Closure Care Cost Estimates, and Financial Assurance

Per Part III, Attachment J of the Application, and supporting documentation, the types and amounts of money proposed for closure and post closure care are not based on reasonable worst-case scenarios with closure by independent third parties, and all potential contingencies have not been addressed. Further, it has not been demonstrated that the applicant has the sufficient financial resources to operate and maintain the proposed landfill, including to address issues relating to surface or subsurface contamination and cleanup, or for appropriate closure and post-closure.

Thank you for your attention to this matter.

Sincerely yours,



Jennifer Lee
Houston San Jacinto Ranch, LLC

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Tuesday, January 18, 2022 3:14 PM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

From: pinetimber@windstream.net <pinetimber@windstream.net>
Sent: Monday, January 17, 2022 2:04 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Jennifer Lee

E-MAIL: pinetimber@windstream.net

COMPANY: Houston San Jacinto Ranch, LLC

ADDRESS: 1940 FOUNTAIN VIEW DR Dr #3092
HOUSTON TX 77057-3206

PHONE: 4784728213

FAX:

COMMENTS: Please note that we have uploaded the letter in pdf format last Friday (1/14/2022) but in an abundance of caution we are pasting the letter here again. The letter will be uploaded in two parts due to character limit for the comment box. Thank you! January 14, 2022 Via U.S. Mail and electronically filed at https://www14.tceq.texas.gov/epic/eComment/ Texas Commission on Environmental Quality Office of the Chief Clerk, MC-105 P.O. Box 13087 Austin, TX 78711.3087 Re: Comments and Request for Contested Case Hearing Proposed

Municipal Solid Waste Permit No. 2406 Dear Office of Chief Clerk: Pursuant to the instructions in the Notice of Application and Preliminary Decision for Municipal Solid Waste Proposed Permit No. 2406 ("Application") which the Texas Commission on Environmental Quality ("TCEQ") Commissioner's Integrated Database indicates was mailed on December 15, 2021, Houston San Jacinto Ranch, LLC submits the comments below on the Application. Based on the comments below, Houston San Jacinto Ranch, LLC also expressly requests a contested case hearing. Contact information for Houston San Jacinto Ranch, LLC is as follows: [Name] [Address] [City] [Phone] Based on a comparison of mapping included in the Application which reflects a 1-mile radius from the perimeter of the proposed landfill permit boundaries to the property ownership mapping records available electronically from the San Jacinto County Appraisal District ("CAD Records"), two parcels of property owned by Houston San Jacinto Ranch, LLC clearly appear to be located within a 1-mile radius of the permit boundary of the proposed landfill. These two parcels of property are located west to northwest of the proposed landfill site and are identified by CAD Records as Property ID#46683 and Property ID#46471. Based on the proximity of property owned by Houston San Jacinto Ranch, LLC to the proposed landfill site, Houston San Jacinto Ranch, LLC would be adversely affected in a way not common to the general public by the proposed landfill which would be authorized if the Application is granted. A list of disputed issues of fact upon which the hearing request is based are provided in the comments below. The disputed issues are based on a high-level review of documentation relating to the Application ("Application Materials") which were made available on the internet, an evaluation of issues raised in other recent TCEQ landfill applications, and a review of information received in comments received by TCEQ on the Application to date. If all relevant information was not made available on the internet, then an additional fact issue arises regarding whether public notice has been proper. Although the Commissioner's Integrated Database indicates notice of the preliminary decision was mailed on December 15, 2021, the notice indicates 30 days after the publication date is the trigger that sets the deadline for comments. The comment deadline should be not be less than 30 days after the date notice was mailed by TCEQ and available in TCEQ's databases. Houston San Jacinto Ranch, LLC reserves the right after issuance of the TCEQ Executive Director's response to comments to provide additional detail regarding its property ownership and regarding the comments below, and also reserves the right to file a request for reconsideration. 1. Waste Screening Measures and Waste Acceptance Per Part II, Section 2.2 of the Application, and supporting documentation, the Application Materials do not adequately demonstrate that waste will not be screened to prevent the possibility of the landfill accepting unauthorized, hazardous, or toxic wastes. 2. Potential Buffer Zone Encroachment Per Part II, Section 2.3 of the Application, and supporting documentation, the Citizen's Collection Center and Truck Wheel Wash Area potentially encroach on the 125-foot buffer zone along the eastern side of the facility. Based on the description of this area, solid waste unloading appears to be proposed within the "CCC Traffic" area and within the identified 125-foot buffer zone. Also, the Truck Wheel Wash and the associated sump will contain "contaminated water" and are within 125 feet of the facility boundary, inferring the storage of waste within the buffer zone. Thus, the Application fails to demonstrate that these buffer zone requirements will be met. 3. Land Use Compatibility Per Part II, Section 7 of the Application, and supporting documentation, inadequate information is provided in the Application Materials to demonstrate that land use, zoning in the vicinity, community growth patterns, water wells, and other factors associated with the public interest will be adequately addressed. The location of the landfill is incompatible with surrounding land use, such as the Wood Duck Farm which produces edible food products for public consumption, and the public's use of the nearby Sam Houston National Forest, which includes designated camping areas. As noted in the letter dated January 7, 2022 from State Representative Ernest Bailes, the proposed landfill would be in close proximity to many private residences. Comparing mapping readily available on Google mapping to CAD Records mapping shows that properties immediately adjacent to and south of the proposed landfill site appears to have been essentially subdivided into dozens of tracts of property owned by dozens of individuals, many of whom have residences and homes on the properties. Other residences also appear to be nearby. 4. General Health, Public Safety, and Environmental Concerns Per Part II, Section 7 of the Application, and supporting documentation, the Application Materials do not demonstrate that the landfill would not cause landowners and members of the surrounding community to suffer adverse health and environmental effects due to contaminants or pollutants from the landfill, or that the landfill would not negatively impact public safety or the environment, including negative impacts on nearby property. This includes a variety of impacts from the issues identified in this letter, including but not limited to negative impacts to groundwater, surface water, implications of odor generated from the activities, vectors resulting from the activities, increased traffic, etc. on the property owned by Houston San Jacinto Ranch, LLC. 5. Inadequate Roadways and Adequacy of Access Roads Per Part II, Section 8 of the Application, and supporting documentation, the primary access roadways identified in the Application Materials are FM 1725, Fostoria Tram Road, Jayhawker Road, and Rajak Road; all of which are essentially

rural, two lane roads. For the reasons explained in the comment letter dated January 25, 2021 from San Jacinto County Commissioner David Brandon, these roads are not sufficient to accommodate the proposed landfill. The Application fails to demonstrate that the roadways are adequate, or that appropriate coordination with local and state officials regarding adequacy of roadway maintenance or adequacy of roadways has taken place. Local road infrastructure would not be able to handle the road traffic generated by a landfill of this size, which would create traffic congestion and traffic hazards and endanger public safety. Appropriate traffic studies to identify and address traffic impacts on state and local roadways have not been adequately addressed. 6. Faulting and Subsurface Instability Per Part II, Sections 9.4 and 9.6 of the Application, and supporting documentation, information included in the Application Materials infer subsurface movement, possibly associated with faulting, subsidence, or otherwise unstable areas. It is noteworthy that the area in close proximity to the proposed landfill facility is experiencing or has experienced withdrawal of crude oil, natural gas, and groundwater. Thus, whether the location of the proposed landfill is appropriate based on potential faulting and subsurface instability has not been demonstrated. 7. Wetlands Per Part II, Section 11 of the Application, and supporting documentation, Application Materials do not demonstrate that wetlands, including jurisdictional wetlands, have been adequately considered, especially given the location of the nearby state watercourses such as Jayhawker Creek which appears to traverse the site, Peach Creek, and Gum Branch. 8. Endangered Species Per Part II, Section 12 of the Application, and supporting documentation, Application Materials do not adequately identify potential state or federal threatened or endangered species, or to address how the proposed landfill would impact such endangered species and their habitats, especially given the proximate location of the Sam Houston National Forest. Further, Texas Parks

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Tuesday, January 18, 2022 3:13 PM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

MSW
117709

From: pinetimber@windstream.net <pinetimber@windstream.net>
Sent: Monday, January 17, 2022 2:07 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Jennifer Lee

E-MAIL: pinetimber@windstream.net

COMPANY: Houston San Jacinto Ranch, LLC

ADDRESS: 1940 FOUNTAIN VIEW DR Dr #3092
HOUSTON TX 77057-3206

PHONE: 4784728213

FAX:

COMMENTS: Part II & Wildlife submitted a comment letter to TCEQ on January 12, 2022 incorporating previous comments from that agency and indicating that no Biological Assessment or species protection plan was included with the Application Materials. 9. Inadequate Stormwater Controls, Drainage Controls, Floodplains and Surface Water Quality Per Part III, Attachment B of the Application, and supporting documentation, the Application Materials do not appear to adequately address the management of stormwater or surface water during all phases of landfill operation when

compared to TCEQ's requirements. This includes the management of stormwater contact with reusable materials or with stockpiles of materials used for landfill operations. Further, drainage and surface water impacts of the landfill from construction and operation on neighboring properties has not been adequately addressed. Further, whether the landfill would be improperly located in a floodplain have not been adequately addressed, nor has an adequate demonstration been made that water contaminated after coming into contact with waste will not negatively impact nearby surface water quality. Protection of surface water quality is paramount given that Jayhawker Creek appears to traverse the site, which as noted by Texas Parks & Wildlife drains into Peach Creek, which drains into Caney Creek, which discharges into Lake Houston 17 miles south of the proposed site. 10. Odor, Dust, and Nuisance Abatement, and the Site Operating Plan Per Part III, Attachment D, Sections 2 and 3 of the Application, and supporting documentation, the Application Materials do not demonstrate that the landfill would not produce nuisance odors, including dust from roads, or that the Site Operating Plan includes adequate odor control measures. 11. Birds, Buzzards, and other Disease and Vector Control Per Part III, Attachment D, Sections 2 and 3 of the Application, and supporting documentation, Application Materials do not demonstrate that the landfill will not create health and environmental hazards by providing food or harborage for birds or buzzards, or that the landfill will not attracts other vectors and vermin, especially given the presence of wildlife in the adjacent Sam Houston National Forest. 12. Inadequate Hydrogeology, Groundwater Monitoring, and Soils Per Part III, Attachment D2 of the Application, and supporting documentation, the Application Materials indicate that Class 1 wastes with asbestos content will be accepted, which should then require that the soils underlying the liner must meet certain standards set forth in the TCEQ's Industrial Solid Waste and Municipal Hazardous Waste rules. Based on the soil boring logs and subsurface descriptions presented in the Application Materials, unacceptable soil types immediately underlie the waste containment structures in several areas, including sands and gravels. Thus, the Application fails to demonstrate that soils underlying the liner would meet the technical requirements. Further, information submitted to TCEQ on August 13, 2021 from H.C. Clark highlights the problems with the hydrogeology due to the presence of gravel at the proposed site and the problems with assumptions utilized in groundwater monitoring. 13. Inadequate Subsurface Characterization and Landfill Design Per Part III, Attachment E of the Application, and supporting documentation, only 19 boring logs are presented in the Application Materials. The number, proximity, and location of the boreholes associated with the boring logs has not been demonstrated to be sufficient for the establishment of subsurface stratigraphy across the proposed waste management units. Additionally, the only boring logs presented display a stratigraphic complexity which has not been demonstrated to meet applicable subsurface siting requirements. Without having adequately characterized the subsurface geology, the landfill design, including the design of the liners, has not been demonstrated to be adequate. 14. Inadequate Consideration of Groundwater Impacts Per Part III, Attachment E of the Application, and supporting documentation, the Application Materials fail to adequately address the presence of groundwater and to address how groundwater that is present will be protected. For example, many, if not all, of the piezometer completion logs presented in the Application Materials present data that conflicts with the data presented on the associated Driller's Well Reports available through the Texas Water Development Board. Additionally, most of the piezometer completion logs do not illustrate the total depth of each boring or provide sufficient surface completion details to determine if the data from the piezometer wells are reliable. It has not been demonstrated that characterization of subsurface geology and hydrogeology is adequate, including whether sufficient soil borings were taken or whether sufficient piezometer wells were installed, which leads to inadequate consideration of the protection of groundwater resources. 15. Landfill Gas Creation, Migration and Control Per Part III, Attachment G of the Application, and supporting documentation, the Application Materials do not demonstrate that the landfill would not produce elevated levels of landfill gas, including methane, or that appropriate provisions are included to monitor and control such landfill gas, or to monitor and ensure that such landfill gas will not migrate off-site to nearby properties. 16. Closure and Post-Closure Care Cost Estimates, and Financial Assurance Per Part III, Attachment J of the Application, and supporting documentation, the types and amounts of money proposed for closure and post closure care are not based on reasonable worst-case scenarios with closure by independent third parties, and all potential contingencies have not been addressed. Further, it has not been demonstrated that the applicant has the sufficient financial resources to operate and maintain the proposed landfill, including to address issues relating to surface or subsurface contamination and cleanup, or for appropriate closure and post-closure. Thank you for your attention to this matter. Sincerely yours, Houston San Jacinto Ranch, LLC

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Thursday, September 9, 2021 3:01 PM
To: PUBCOMMENT-WPD; PUBCOMMENT-ELD; PUBCOMMENT-OCC2; PUBCOMMENT-OPIC
Subject: FW: Public comment on Permit Number 2406

H

From: drew2000@hotmail.com <drew2000@hotmail.com>
Sent: Thursday, September 9, 2021 11:25 AM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: MR Andrew Leslie

E-MAIL: drew2000@hotmail.com

COMPANY:

ADDRESS: 6341 STEWART RD #216
GALVESTON TX 77551-1880

PHONE: 4097891202

FAX:

COMMENTS: I urge you to amend Permit #2406, Peach Creek Municipal Landfill (PCML), to include the access road and hold a contested case hearing on this proposal because: I am worried that irreversable environmental impacts will happen on Sam Houston National Forest, Wood Duck Farm, and private homesteads due to the PCML. I visit the SHNF frequently with my family, it's one of the few wild places we can go to get out of the city. I've seen first hand issues with road access and infrastructure burden to surrounding areas due to heavy traffic, not to mention the high potential for

litter, water, air, odor, noise, and scenic pollution, as well as flooding, fires, and other environmental impacts that PCML may have. Because of these problems I oppose Permit #2406.

Office of Chief Clerk
MC 105
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

REVIEWED
AUG 06 2021
By GCW H

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
2021 AUG -6 AM 10:39
CHIEF CLERKS OFFICE

MSW
117709

Dear Chief Clerk,

I urge you to amend Permit #2406, Peach Creek Landfill (PCL), to include the access road and hold a contested case hearing on this proposal because of the following concerns:

I am very concerned that unacceptable environmental impacts will occur on Sam Houston National Forest, Wood Duck Farm, and private homesteads due to PCL. I have lived in the Walker County and Grimes County areas since my birth, and the importance of the National Forest has only increased during that time as encroaching development and its associated pressures also increase.

For my own part, as a citizen of this area of Texas, I have visited all parts of the SHNF. I am concerned about water and air quality, noise, litter, and scenic pollutions, flooding, fires, road overuse/damage, and other environmental impacts that PCL may have. Landfills affect a vast area around them, as well as the immediate area of use. The smell is vile. The road traffic is virtually constant. Dangerous household chemicals can leach into adjacent watersheds that in turn feed into other watersheds. Inevitably, a landfill is filled to capacity and needs to expand and envelope even more land. (i.e.-- Twin Oaks Landfill in Grimes County).

The forest is a significant refuge for people trying to escape city/ daily life stresses, like myself. It is a source of recreation and income created by hiking, birding, hunting and fishing. Native species are reliant upon dwindling natural areas like the SHNF, and some of those species support our food crops with valuable pollinator services to nearby farms. The forest also acts as an air filter.

Among its most important services, the SHNF filters water that eventually ends up as a drinking source for Houston and communities surrounding the forest. Clean water is going to become more and more of an issue as people continue to move into this area and consume resources.

The actions that are taken now on this landfill proposal have ramifications far into the future. Please amend the permit as requested.

Sincerely,

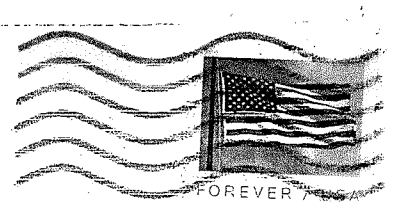
Mrs. Regina Levoy
PO Box 188 Shiro, Texas 77876
(936)-661-6969

drlevoy@protonmail.com

Regina Levoy

David & Regina Levoy
PO Box 188
Shiro, Texas 77876

NORTH HOUSTON TX 773
4 AUG 2021 PM 3 L



Office of Chief Clerk
MC 105
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Tx. 78711-3087

RECEIVED
AUG 06 2021
TCEQ MAIL CENTER

78711-308787

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
2021 AUG -6 AM 10: 39
CHIEF CLERKS OFFICE

TCEQ Office of the Chief Clerk, MC-105
P.O. Box 13087
Austin, Texas 78711-3087

REVIEWED
DEC 15 2021
By EAW

MSW
117709

Re: Peach Creek Environmental Park (PCEP) Proposed Landfill Permit Application No. Permit #2406

I am writing to request that the permit for Peach Creek EP Landfill MSW No 2406 be denied. There are three main concerns that form the basis for my comments.

1) The Sam Houston National Forest sits on the east and north side of the proposed landfill. The USFS was started to help provide clean water to our country. When it rains, the SHNF acts as a filter to cleanse water going downstream to Lake Houston. The leachate tanks are to sit on the north side of the LF, within a few feet of the FEMA 100-year floodplain. Storm water overflow, leachate, and VOCs will make the Jayhawker Creek floodplain a conduit for contamination which will impact drinking water downstream.

2) Dr. HC Clark wrote a geological assessment to the TCEQ back in August, to quote: "The application implicitly recognizes the gravel location restriction insofar as Class I nonhazardous is not listed as waste to be accepted. Will the permit explicitly state that Class I waste may not be and never will be accepted here because of this hydrogeologic limitation?" ..... "The sink created by pumping will draw water into the landfill rather than allowing it to pass beneath the liner and detect a leak as that groundwater moves through the point of compliance. Water will move inward rather than out... How will this problem be addressed?"

3) It is a fact that millions of seagulls feast at LF across North America. South Wake MSW landfill in NC is comprised of approximately 179 acres and has an estimated seagull population of 50,000. Phase 1 of this 2406 LF will be about 124 acres, or almost 37% smaller which equates to almost 31,500 seagulls as an estimated flock number. Studies from Duke Univ School for the Environment determined that these seagulls dropped over a ton of droppings each year. A year-round fruit and vegetable operation, Wood Duck Farm, is located bordering the 2406 LF from the east. What are the plans to keep seagull droppings off farm produce growing in the field? What are the plans to keep seagulls from eating the crops? What type of disease vector plan might be implemented? How will the applicant mitigate wild animal scavenging? How will the extra nitrogen and phosphorus impact the SHNF?
http://www.newsobserver.com/news/local/counties/wake-county/article58475619.html

I strongly request that you take the next logical step and REJECT this current Application No. MSW-2406.

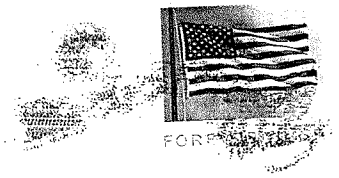
Thank you for your consideration.

Sincerely,

Regina Levoy

Regina Levoy
PO Box 188
Shiro, Texas 77876

Regina Levoy
P.O. Box 188
SHIRO, TEXAS 77876



TCEQ Office of the Chief Clerk, MC-105
PO Box 13087
Austin, Texas 78711-3087

RECEIVED
DEC 13 2021
TCEQ MAIL CENTER
AJ

78711-308787

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Monday, December 6, 2021 9:40 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: (PCEP) Proposed Landfill Permit Application No. Permit #2406

From: drlevoy <drlevoy@protonmail.com>
Sent: Sunday, December 5, 2021 12:20 PM
To: CHIEFCLK <chiefclk@tceq.texas.gov>
Subject: (PCEP) Proposed Landfill Permit Application No. Permit #2406

I am writing to request that the permit for Peach Creek EP Landfill MSW No 2406 **be denied**. There are three main concerns that form the basis for my comments.

1) The Sam Houston National Forest sits on the east and north side of the proposed landfill. The USFS was started to help provide clean water to our country. When it rains, the SHNF acts as a filter to cleanse water going downstream to Lake Houston. The leachate tanks are to sit on the north side of the LF, within a few feet of the FEMA 100-year floodplain. Storm water overflow, leachate, and VOCs will make the Jayhawker Creek floodplain a conduit for contamination which will impact drinking water downstream.

2) Dr. HC Clark wrote a geological assessment to the TCEQ back in August, to quote: "The application implicitly recognizes the gravel location restriction insofar as Class I nonhazardous is not listed as waste to be accepted. Will the permit explicitly state that Class I waste may not be and never will be accepted here because of this hydrogeologic limitation?" ..... "The sink created by pumping will draw water into the landfill rather than allowing it to pass beneath the liner and detect a leak as that groundwater moves through the point of compliance. Water will move inward rather than out."...."How will this problem be addressed?"

3) It is a fact that millions of seagulls feast at LF across North America. South Wake MSW landfill in NC is comprised of approximately 179 acres and has an estimated seagull population of 50,000. Phase 1 of this 2406 LF will be about 124 acres, or almost 37% smaller which equates to almost 31,500 seagulls as an estimated flock number. Studies from Duke Univ School for the Environment determined that these seagulls dropped over a ton of droppings each year. A year-round fruit and vegetable operation, Wood Duck Farm is located bordering the 2406 LF from the east. What are the plans to keep seagull droppings off farm produce growing in the field? What are the plans to keep seagulls from eating the crops? What type of disease vector plan might be implemented? How will the applicant mitigate wild animal scavenging? How will the extra nitrogen and phosphorus impact the SHNF?
http://www.newsobserver.com/news/local/counties/wake-county/article158475619.html

I strongly request that you take the next logical step and **REJECT** this current Application No. MSW-2406.

Thank you for your consideration.

Sincerely,

Regina Levoy
PO Box 188
Shiro, Tx. 77876

Sent with ProtonMail Secure Email.

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Tuesday, September 28, 2021 8:53 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

H

From: sharonliao4@gmail.com <sharonliao4@gmail.com>
Sent: Monday, September 27, 2021 5:36 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Sharon Liao

E-MAIL: sharonliao4@gmail.com

COMPANY:

ADDRESS: 5331 KANSAS ST
HOUSTON TX 77007-1212

PHONE: 8324175412

FAX:

COMMENTS: Dear Chief Clerk, I urge you to amend Permit #2406, Peach Creek Municipal Landfill (PCML), to include the access road and hold a contested case hearing on this proposal because: 1. I am concerned that unacceptable environmental impacts will occur on Sam Houston National Forest, Wood Duck Farm, and private homesteads due to PCML. 2. I am concerned about road access, water, air, noise, odor, litter, and scenic pollutions, flooding, fires, road overuse/damage, and other environmental impacts that PCML may have. Because of these problems I oppose Permit

#2406. I look forward to hearing from you soon about my request to amend Permit #2406 to include the access road and hold a contested case hearing. Thank you. Sincerely, Sharon Liao

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Wednesday, April 28, 2021 9:48 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

H

From: Rhlock@sbcglobal.net <Rhlock@sbcglobal.net>
Sent: Tuesday, April 27, 2021 9:28 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Kasey Lock

E-MAIL: Rhlock@sbcglobal.net

COMPANY:

ADDRESS: 25384 MOSS CIR
CLEVELAND TX 77328-6788

PHONE: 8327312631

FAX:

COMMENTS: Hello. I would like to request a public hearing regarding the proposed landfill in the area of Fostoria Road in Cleveland Texas. I believe this landfill would be extremely detrimental to the water supply and to the area in general. Our subdivision off of Morgan Cemetery Road, which is off of Fostoria Road, is serviced by a community well, and we are very concerned that our water supply will most certainly be contaminated by runoff from this landfill. Thank you for your consideration.

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Friday, September 24, 2021 9:26 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: TCEQ MSW permit #2406

-----Original Message-----
From: CHIEFCLK <chiefclk@tceq.texas.gov>
Sent: Friday, September 24, 2021 7:30 AM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: FW: TCEQ MSW permit #2406

-----Original Message-----
From: Randy Lock <rhlock@sbcglobal.net>
Sent: Friday, September 24, 2021 7:14 AM
To: CHIEFCLK <chiefclk@tceq.texas.gov>
Subject: TCEQ MSW permit #2406

I just recently heard about the Landfill application proposed to be built next to the Sam Houston National Forest, FEMA 100 yr. floodplain, and small family farms. I am concerned that the proposed landfill will contaminate both surface and groundwater. The county roads are dilapidated, flood, and are very narrow; they will not hold up to heavy truck traffic. Endangering the lives of school children with 400+ proposed garbage trucks traveling daily through the neighborhood? This is where kids wait for their school busses. This LF permit application idea is totally irresponsible to our future generations. I urge the TCEQ to deny this #2406 Landfill application.

Thank you for your consideration.

Kasey Lock
Cleveland, Tx Resident

Sent from Kasey's iPhone

:lisa Guerra

rom: PUBCOMMENT-OCC
ent: Friday, November 6, 2020 6:59 AM
o: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
ubject: FW: Public comment on Permit Number 2406

I

rom: sehayden82@yahoo.com <sehayden82@yahoo.com>
ent: Thursday, November 5, 2020 4:08 PM
o: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
ubject: Public comment on Permit Number 2406

EGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

N NUMBER: RN110843042

ERMIT NUMBER: 2406

OCKET NUMBER:

OUNTY: SAN JACINTO

RINCIPAL NAME: PC-II LLC

N NUMBER: CN605694611

ROM

AME: Sarah Lynskey

MAIL: sehayden82@yahoo.com

OMPANY:

DDRESS: 341 BIG BUCK DR
.EVELAND TX 77328-5002

HONE: 3464148907

AX:

OMMENTS: I would like to request a contested case hearing for the proposed landfill site in San Jacinto County. Permit 2406, applicant's name is PC-II LLC. My name is Sarah Lynskey, I am a land and home owner within a 1/4 mile of the oposed facility. My address is 341 Big Buck Dr. Cleveland, TX 77328 and my telephone number is 346-414-8907. I own ome on 15 acres in Peach Creek Estates. My property borders a portion of the south side of the property for the oposed landfill. My home and water well will be within the landfills 1/4 mile radius. Water wells are our only source of ater here. Having a landfill so close would greatly impact the water quality due to toxic gases from rotten trash

contaminating the groundwater. Blue Branch Creek runs through my property from the adjoining land where the landfill would be. Blue Branch Creek is fed by Jayhawker Creek which also runs through the landfill property. I would essentially have landfill runoff flowing through my land. We all have gardens and livestock that would be affected by having a landfill basically in our backyards. Hazardous, highly flammable methane gas build up would expose all of us around to the risk of an explosion. Landfills emit poisonous gases such as Hydrogen Sulphide which severely impacts respiratory organs and can cause lung cancer as well as many other serious health issues. Dumping sites release many other toxins from landfill sites which contaminate water, air and soil. Risks are so great when living within just a few miles of a landfill, imagine the health risks living only 1,320 feet away from such a massive cesspool of bacteria & contaminates, both solid and gas. Having a landfill so close by would surely cause us all to have major problems with rodents that would bring in their own health risks. Not to mention the effect it would have on my property value, I would never be able to sell without it taking a huge toll on my return on investment. I strongly oppose this landfill!

TCEQ Office of the Chief Clerk, MC-105
P.O. Box 13087
Austin, Texas 78711-3087

REVIEWED
AUG 02 2021
By GCW

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
2021 AUG -2 PM 4:
CHIEF CLERKS OFFICE

Date: 7/03/2021
Name: Sarah Lynskey
Address: 341 Big Buck Dr.
City, ST, Zip: Cleveland Tx 77328
Email Address: Sehayden82@yahoo.com

Re: Peach Creek Environmental Park (PCEP) Proposed Landfill Permit Application No. Permit #2406

I am writing to request that the permit for Peach Creek EP Landfill MSW No 2406 be denied. There are four main concerns that form the basis for my comments.

1. If PCEP were to encounter financial challenges or worse, forced into an unexpected bankruptcy, (hopefully not from an environmental issue) the access road owner is PC II; therefore, the TCEQ needs access to the bankrupt LF, but the TCEQ cannot access because the PCE permit boundary is landlocked. Surely, the TCEQ can get into the permit area to monitor/manage any inherited environmental issues that might arise? Recall that the same Mississippi investors that own PC II, also own PCEP.
2. The natural drainage from Wood Duck Farm begins in the Sam Houston National Forest on the east and travels across the mid part of the farm in an east to west-direction; heavy rainwater flows from two different intervals into a floodplain creek that flows north to south just outside the western fence; this can be seen on the PC II property, see map. This creek spans perhaps 1500-2000 feet to the south and is undeniably situated within the 2010 FEMA floodplain. Please be aware that the property owned by PC II for the proposed access road is only 100 feet wide, not much room for detention ponds, and runs/flows north to south within the FEMA floodplain. The Army Corp of Engineers even said that removing trees for the access road within the known floodplain path will likely increase flood water velocity.
3. Local access road to landfill currently is in a floodplain, the road has a NO weight limits and will not hold up to garbage trucks constantly traveling the road.
4. No garbage trucks should be traveling through the local neighborhoods where children are playing. Only state highways should be used.

I applaud the actions of TCEQ for protecting our families and environment. I strongly request that you take the next logical step and reject this current Application No. MSW-2406.

Thank you for your consideration.

Sincerely

Sarah Lynskey

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Monday, November 16, 2020 9:00 AM
To: sehayden82@yahoo.com
Subject: Public comment on Permit Number 2406

Thank you for your comments.

A copy of your email will be forwarded to the Texas Commission on Environmental Quality (TCEQ) staff responsible for reviewing the application. All timely filed comments will be considered by the staff prior to the final decision on the application. You will be added to the mailing list for this application. After the opportunity to submit comments ends, a copy of the formal written response to all timely filed comments will be mailed to you.

All requests for hearings, if timely filed and authorized by statute or rule, are considered by the Commissioners. The Commissioners will consider your request during a regularly scheduled Commission meeting that is open to the public, and a determination will be made as to whether or not the request will be granted. You will be notified in writing when your request is scheduled for consideration. If your request is granted, the matter will be referred to the State Office of Administrative Hearings (SOAH). The SOAH hearing will be a formal, legal proceeding, conducted in a manner similar to civil trials in state district court. While not required, parties are usually represented by legal counsel. In order for an issue to be considered at a contested case hearing, it must have been first raised in a comment or in a request for a contested case hearing during the public comment period by the affected person or group requesting the hearing.

The TCEQ appreciates your interest in environmental issues. If you have any further questions, please feel free to contact the Public Education Program staff at 800-687-4040.

Sincerely,
Office of the Chief Clerk

NOTE: Please do not respond to this email; it will not be answered. If you would like to submit additional comments, please use the online eComments system at: https://www.tceq.texas.gov/agency/decisions/cc/comments.html

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Sarah Lynskey

E-MAIL: sehayden82@yahoo.com

COMPANY:

ADDRESS: 341 BIG BUCK DR
CLEVELAND TX 77328-5002

PHONE: 3464148907

FAX:

COMMENTS: I would like to request a contested case hearing for the proposed landfill site in San Jacinto County. Permit # 2406, applicant's name is PC-II LLC. My name is Sarah Lynskey, I am a land and home owner within a 1/4 mile of the proposed facility. My address is 341 Big Buck Dr. Cleveland, TX 77328 and my telephone number is 346-414-8907. I own a home on 15 acres in Peach Creek Estates. My property borders a portion of the south side of the property for the proposed landfill. My home and water well will be within the landfills 1/4 mile radius. Water wells are our only source of water here. Having a landfill so close would greatly impact the water quality due to toxic gases from rotten trash contaminating the groundwater. Blue Branch Creek runs through my property from the adjoining land where the landfill would be. Blue Branch Creek is fed by Jayhawker Creek which also runs through the landfill property. I would essentially have landfill runoff flowing through my land. We all have gardens and livestock that would be affected by having a landfill basically in our backyards. Hazardous, highly flammable methane gas build up would expose all of us around to the risk of an explosion. Landfills emit poisonous gases such as Hydrogen Sulphide which severely impacts respiratory organs and can cause lung cancer as well as many other serious health issues. Dumping sites release many other toxins from landfill sites which contaminate water, air and soil. Risks are so great when living within just a few miles of a landfill, imagine the health risks living only 1,320 feet away from such a massive cesspool of bacteria & contaminates, both solid and gas. Having a landfill so close by would surely cause us all to have major problems with rodents that would bring in their own health risks. Not to mention the effect it would have on my property value, I would never be able to sell without it taking a huge toll on my return on investment. I strongly oppose this landfill!

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Thursday, October 22, 2020 10:55 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

From: sehayden82@yahoo.com <sehayden82@yahoo.com>
Sent: Wednesday, October 21, 2020 4:36 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Sarah Lynskey

E-MAIL: sehayden82@yahoo.com

COMPANY:

ADDRESS: 341 BIG BUCK DR
CLEVELAND TX 77328-5002

PHONE: 2819072530

FAX:

COMMENTS: I strongly oppose this landfill. My property borders the property for the proposed landfill. My front door of my home will be less than 1/2 mile from the landfill. We all have water wells for our only source of water. Having a landfill so close would greatly impact the water quality due to toxic gases from rotten trash contaminating the groundwater. Hazardous, highly flammable methane gas build up would expose all of those around to the risk of an explosion. Landfills emit poisonous gases such as Hydrogen Sulphide which severely impacts respiratory organs and can cause lung cancer. Dumping sites release many other toxins which contaminate water, air and soil. Not to mention the

effect it would have on my property value, I would never be able to sell without it taking a tremendous toll on my return on investment.

June 3, 2024

Reviewed By GCW

JUN 07 2024

CHIEF CLERKS OFFICE

2024 JUN -7 AM 11:14

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Office of Chief Clerk
MC 105
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

Dear Chief Clerk of the Texas Commission on Environmental Quality,

The Houston Regional Group and Lone Star Chapter of the Sierra Club (Sierra Club) provide additional comments for the Texas Commission on Environmental Quality (TCEQ) Permit #2406, 635-acre, Peach Creek Landfill (PCL), about environmental issues and the need for a contested case hearing.

1. The Sierra Club's concern is that the proposed PCL will have permanent and or long-term negative effects on Sam Houston National Forest (SHNF). The Sierra Club has reviewed many of the new documents for 2024 which state they respond to comments. However, it doesn't appear to the Sierra Club that the applicant has done a good job addressing our comments or hasn't addressed our comments at all.

What has been addressed is the minimum that TCEQ requires, like slurry walls for the landfill, and not potential contamination, both long and short-term, of the shallow water and deeper water aquifers and eventual degradation of the slurry wall. The Sierra Club statement that, "all landfills eventually leak" continues to be valid and the need for "forever bonds, insurance, and liability instruments" that the applicant must provide in perpetuity for comprehensive and total clean-ups is a significant issue that must be addressed.

Why allow the applicant to get away with externalizing its pollution and making the public, via TCEQ, pay for its irresponsibility? That's not right, fair, or allowed by law. TCEQ should require that the applicant guarantee that a worst-case release or leak scenario can be stopped and cleaned up completely before it decides whether a permit should be issued for the proposed PCL.

2. The applicant hasn't provided an effective and extensive study that deals with vectors like rats, mice, raccoons, opossums, crows, gulls, grackles, blackbirds, feral hogs, other meso-predators, and other animals that will be attracted to and cause damage to the proposed PCL, cause a nuisance to people who live near the landfill, and create impacts on SHNF vegetative ecosystems and the natural populations of animals that exist in this public forest.

The ecological degradation that will occur in SHNF is an externality that the applicant leaves to the public, via the U.S. Forest Service, to clean-up. An extensive vector control plan with mitigation measures should be required along with monitoring to determine how

successful the plan is, if changes need to be made, that they will be made, and that extensive public review and comment will occur about this plan.

TCEQ should require that the applicant use a daily cover of 1 foot of soil which is compacted and not 6 inches of soil that isn't compacted so that rainfall infiltration and vector problems are reduced.

3. Recent research has found that many landfills in the U.S. release far more methane, a climate change air pollutant, than estimated in the past (called "Super-emitters). The TCEQ should determine what the potential for additional methane air pollution from the proposed PCL is and then require additional monitoring, collection, and removal or destruction of methane gas from this proposed landfill. See the articles provided with these comments about increased release of methane from landfills:

a. **"Your Trash is Emitting Methane in the Landfill. Here's Why it Matters for the Climate",** James Bruggers, Phil McKenna, Any Green, and Robert Benincass, NPR, July 13, 2001.

b. **"More Than Half of U.S. Landfills May Be Methane Super-Emitters, Study Finds",** Will Sullivan, SMART NEWS, April 3, 2024.

TCEQ should require that the applicant state what happens to gas extracted via wells within or external to the landfill footprint. There is a need for methane and toxic gas monitoring and control equipment capture, treatment, and destruction of these air pollutants.

TCEQ should require that the applicant keep gas monitoring records for the life of PCL and afterward when it is decommissioned due to the risk that groundwater may be contaminated isn't discovered during the life of the landfill or may occur after the landfill shuts down.

TCEQ should require that the applicant test for methane in the landfill, water from the landfill, and PCL site at least twice/month. A methane reduction plan should be required with climate change mitigation measures.

TCEQ should require the applicant have a gas removal, treatment, and destruction control system to ensure that methane is not released or is released in very minor quantities to reduce explosion potential, toxic gas health effects, and greenhouse gas air pollution. A methane lead detection and repair plan is needed for this proposal.

The Sierra Club doubts the ability of a gas monitoring probe to "monitor the soil strata above the lowest planned future elevation of waste within 1,000 feet of the probe". The

Sierra Club supports a 100-foot placement of probes and not a 600-foot placement of probes to ensure that accurate gas monitoring occurs.

Gas monitoring should be done for toxic air pollutants and methane and gas shouldn't be vented unless it is first treated by a control device. A catalytic incinerator or condensing unit can be used to reduce volatile hydrocarbon air pollution. Flares aren't acceptable for methane or toxic air pollutant control due to their poor and variable control or destruction efficiency. Venting of air pollutants shouldn't be allowed without first ducting the air pollutants through a working air pollution control device.

4. Recently, DeLa Express LLC, has filed for an application with the FERC (Federal Energy Regulatory Commission) to build 750-miles, of 42-inch, natural gas pipelines, from the Permian Basin to Lake Charles, Louisiana. A Pipeline is slated to be constructed either near or within the PCL site near the San Jacinto and Montgomery Counties boundary. The TCEQ should require that the applicant determine the exact location and nature of this pipeline and its' potential effects on the PCL. Please see the articles provided with these comments about this proposed pipeline:

a. **"DeLa Express' 690-Mile Permian-to-Louisiana Gas Pipeline Seeks FERC Approval, Targets 2028 Launch",** Mary Holcomb, Pipeline and Gas Journal, April 9, 2024.

b. **"Moss Lake Partners Targeting 2028 Permian Gas Pipeline Start",** Mikaila Adams, Oil and Gas Journal, April 9, 2024.

c. **"Projects, DeLa Express Pipeline Project",** FERC website, Pre-filing Environmental Review Process, April 15, 2024, www.ferc.gov.

5. The Sierra Club is concerned about the externalities of light, litter, and odor pollutants. These pollutants will affect SHNF where its boundaries coincide with the PCL. A long-term and comprehensive plan to reduce these pollutants is needed so that SHNF is affected minimally.

Public review and comment are needed for this plan and the U.S. Forest Service, Texas Parks and Wildlife Department, and U.S. Fish and Wildlife Service should review the plan and their comments adopted and implemented for mitigation measures.

TCEQ should require that the applicant "will include" not "may include" measures to control odors and sources of odors. Don't give the applicant the discretion to mitigate odors, or this will provide an incentive to do little or nothing to prevent odors.

TCEQ should require that the applicant define "significant odors" and then should ensure that the definition is adequate to stop odor problems at PCL.

6. The applicant calls the landfill perimeter road "all weather" when it will be constructed of crushed stone, gravel, concrete rubble, masonry rubble, wood chips, caliche or other similar materials. This is hardly an "all weather" road. Erosion, sedimentation, and other water flow effects can occur on such roads. These road materials don't keep mud from being tracked onto public roads. TCEQ should ensure that "all weather roads" are in fact operable in "all weather conditions".

7. The proposed permit allows for asbestos containing materials (RACM) that may be stored at the PCL, empty containers of pesticides, herbicides, fungicides, and rodenticides, and other special wastes not named.

With reference to pesticide containers, they must be "triple-rinsed prior to receipt". TCEQ should require that the applicant state how it will check, monitor, and audit these containers to make sure they have been triple-washed.

"Empty containers" must be defined. If washing doesn't get all pesticide residues from the container, then there will be a greater risk of harmful contamination of leachate, water run-off, soil, and air. TCEQ should require that the applicant state how it will check, monitor, and audit that the 1,500-ppm petroleum hydrocarbon waste limit isn't exceeded.

TCEQ should require that the applicant state how it will dispose of material acquired either accidentally or on purpose which PCL can't legally dispose of in the landfill.

When the applicant states that facilities for large item storage, reusable materials staging, citizen's convenience center, used/scrap tire storage, and wood waste processing will "move as the landfill is developed", TCEQ should require that the applicant state and show on maps where these areas won't be allowed on the landfill property and why they shouldn't be allowed in certain areas.

8. TCEQ should require that the applicant have a 125-foot buffer zone between the permit boundary and the solid waste footprint. This reduces the chance for spillover and run-off from the landfill that may leave the property. There should be a very wide buffer zone between the boundary of the landfill and SHNF to reduce landfill impacts. The Sierra Club recommends at least a 300-foot buffer zone between the boundary of the landfill and SHNF.

9. The transportation report doesn't require that the applicant conduct repairs on public roads for the lifetime of the proposed landfill. Since thousands of heavy garbage trucks and other large vehicles will use public roads/year due to the proposal the applicant must be required to either conduct repairs for the lifetime of the landfill or create a fund that will be fully funded for the lifetime of the proposal and that has adequate money to make

repairs to public roads, whose pavement lifetimes will be considerably shortened by the heavy trucks that use the proposed landfill.

10. TCEQ should require that the applicant state what is the maximum landfill storage site footprint in acres, cubic feet, and tons for the life of the proposed landfill so the public knows the ultimate capacity of PCL and what the resulting environmental impacts may be.

TCEQ should require that all landfill phases and their environmental impacts are analyzed and presented to the public for review and comment now about cumulative impacts. Any changes that the applicant makes now to reduce the capacity of the landfill can be reversed since the applicant can always apply with TCEQ for larger landfill capacity. There should be a capacity limit for this proposed landfill that will never be exceeded.

11. TCEQ should require that the applicant have enclosed vehicles, and not just say, "will take steps to encourage that vehicles hauling waste to the site are enclosed or provided with a tarpaulin to ensure that debris, flying trash, and other waste is not deposited either outside or inside the PCL". Surcharges aren't sufficient as a deterrent to violations.

TCEQ should require that the applicant turn away any vehicle hauling waste if it's not enclosed or isn't using a tarpaulin to "properly secure the load".

TCEQ should require that the applicant report offenders, not just "may report habitual offenders" so that this unacceptable practice is caught as quickly as possible.

12. TCEQ should require that the applicant dismantle large items so they can be disposed of in the PCL without causing potential sources of surface or subsurface disruption of the landfill.

TCEQ should require that the applicant recycle items within 60 days and not 180 days. This allows too much time for storage of these items and thus increases the possible risk of fluid discharge or the creation of vector problems.

TCEQ should require that the applicant state what equipment it will use, procedures it will use, maintenance will be required, to remove and dispose of CFCs at the PCL.

13. TCEQ should require that the applicant state what "excessive accumulation of material" is and that the 180-day storage period be reduced to 30-day storage to ensure that the risk of spills, etc., is reduced as much as possible.

14. TCEQ should require that the applicant conduct a thorough, on-the-ground and below-the-ground search for all abandoned wells and ensure with documentation that wells are

capped and plugged and not assume that they are. The public should be told now if there are abandoned wells and this discovery should not be delayed until Phase I work is done.

TCEQ should require that the applicant be onsite and verify with TCEQ that all wells discovered have been properly capped, plugged, and closed.

15. TCEQ should require that the applicant have stockpiled material that is of similar permeabilities and porosities. A sandy soil taken from on the PCL site won't have the compaction capability that a clay soil has when serving as 6 inches of cover. Therefore, it won't have the same protection ability for the prevention of rain infiltration and vector prevention.

TCEQ should require that the applicant document, "The daily cover will be sloped to drain" and require records and reports about inspection for vector control and compaction of daily cover. The soil used for daily cover should be clay to retard or stop water from soaking into the landfill. The applicant defeats this compaction protection each day when TCEQ allows it to be stripped off "prior to additional waste placement and used as daily cover".

TCEQ should stop the applicant from doing this because it allows the disturbance of impermeable cover and thus encourages the landfill to fill-up with water like a bathtub.

The Sierra Club appreciates this opportunity to comment. Thank you.

Sincerely,

Brandt Mannchen

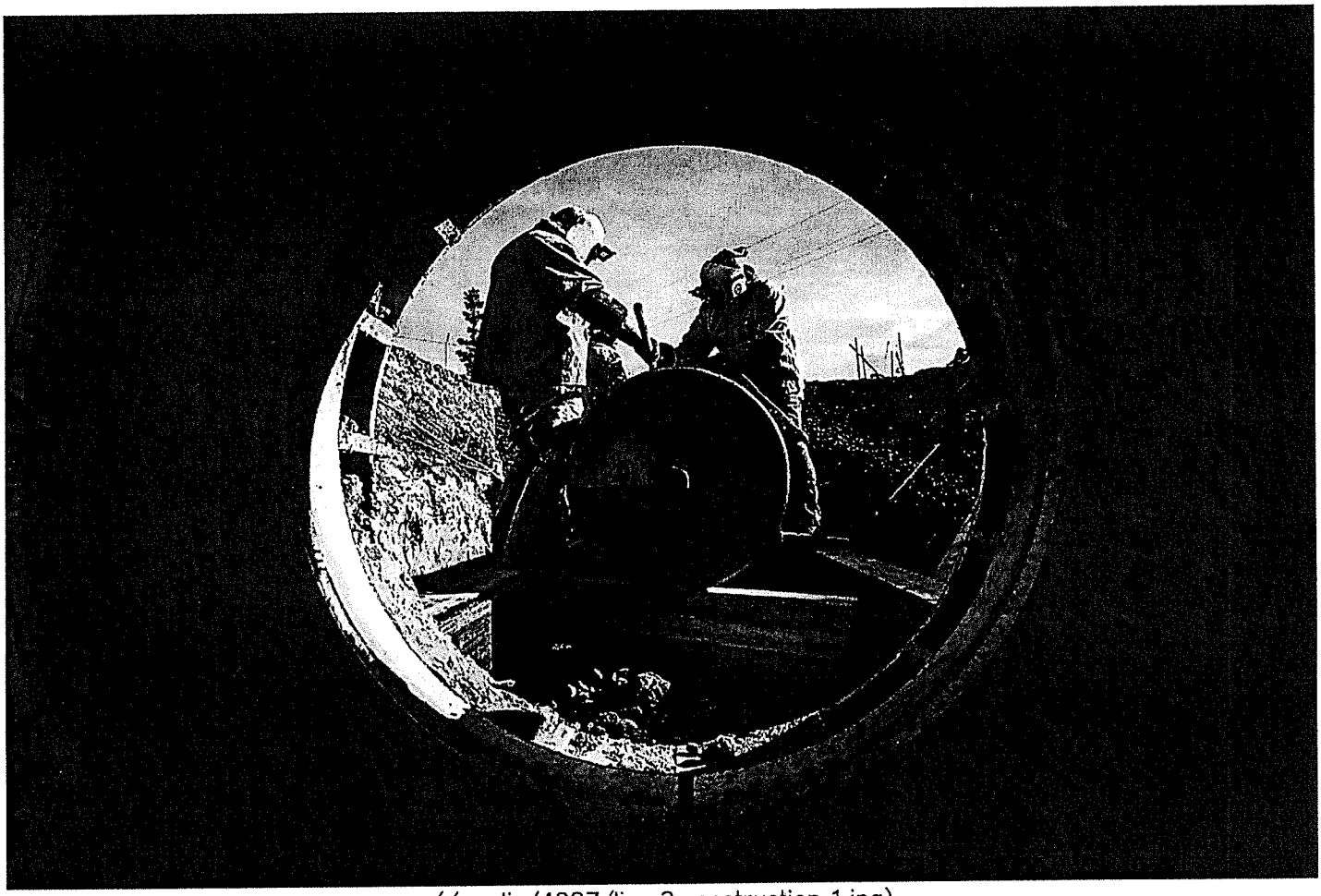
Brandt Mannchen
Forest Management Issue Chair
Lone Star Chapter of the Sierra Club
Chair, Forestry Subcommittee
Houston Regional Group of the Sierra Club
4300 Dunlavy St., Apt. 3138
Houston, Texas 77006
281-570-7212
brandt_mannchen@comcast.net

DeLa Express' 690-Mile Permian-to-Louisiana Gas Pipeline Seeks FERC Approval, Targets 2028 Launch

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
2024 JUN -7 AM 11:15
CHIEF CLERK'S OFFICE

4/9/2024
By **Mary Holcomb**, Digital Editor

(P&GJ) – DeLa Express LLC, an affiliate of Moss Lake Partners, has formally requested approval from the Federal Energy Regulatory Commission (FERC) to initiate the Pre-Filing Review Process for the proposed DeLa Express Project. This endeavor aims to transport natural gas from production sites in the Delaware Basin, Texas, to markets in and around Lake Charles, Louisiana.



(/media/4097/line-3-construction-1.jpg)

The ambitious project, which is poised to significantly impact the energy landscape, entails the construction of an approximately 690-mile, 42-inch diameter natural gas transportation mainline **pipeline ()**. Additionally, it includes the establishment of five lateral pipelines, eight compressor stations, multiple meter stations, and related facilities. The DeLa Express Project is expected to provide approximately 2 billion cubic feet per day of new liquids-rich natural gas transportation capacity.

Pipeline &
Gas Journal

COPYING AND DISTRIBUTING ARE PROHIBITED WITHOUT PERMISSION OF THE PUBLISHER

TEXAS
COMMISSION
ON ENVIRONMENTAL
QUALITY

2004 JUN -7 AM 11: 15

CHIEF CLERKS OFFICE

According to DeLa Express, the primary goal of seeking FERC approval for the Pre-Filing Review Process is to engage relevant regulatory agencies, affected landowners, and stakeholders in collaborative efforts to identify and address potential environmental concerns early in the project's development phase. By fostering open communication and early stakeholder engagement, DeLa Express aims to build and maintain strong relationships within the communities affected by the project.

The proposed timeline for the project outlines a series of key milestones, including conducting public open houses in May and June 2024, filing the Section 7 application in February 2025, and receiving the FERC certificate by April 2026. Construction is anticipated to commence in the second quarter of 2026, with the project scheduled for completion and service commencement in 2028.

DeLa Express has already undertaken significant preparatory work, including stakeholder outreach, agency consultations, project engineering, route planning, environmental surveys, and engagement with contractors. The company has also developed a preliminary Public Participation Plan to facilitate stakeholder communications and public information dissemination throughout the project lifecycle.

The request for approval to initiate the Pre-Filing Review Process marks a crucial step forward in the development of the DeLa Express Project. If approved, it will pave the way for further collaboration and regulatory review aimed at ensuring the project's compliance with environmental standards and regulatory requirements.

For further information or inquiries regarding the DeLa Express Project, interested parties are encouraged to contact representatives of DeLa Express LLC, Moss Lake Partners, or their legal counsel.

Related News

- Sudan Oil Pipeline Repair Near Completion, Says South Sudan Official (/news/2024/may/sudan-oil-pipeline-repair-near-completion-says-south-sudan-official)
- Aethon Energy to Acquire Tellurian's Upstream Assets for $260 Million (/news/2024/may/aethon-energy-to-acquire-tellurians-upstream-assets-for-260-million)
- Shell, Exxon Close to Selling North Sea Assets to Viaro Energy for $500 Million: Sources (/news/2024/may/shell-exxon-close-to-selling-north-sea-assets-to-viaro-energy-for-500-million-sources)
- ConocoPhillips to Acquire Marathon Oil in $22.5 Billion Deal Amid Ongoing Energy Mergers (/news/2024/may/conocophillips-to-acquire-marathon-oil-in-225-billion-deal-amid-ongoing-energy-mergers)
- U.S. Gulf Coast Hits Record High for Imports of Straight-Run Fuel Oil as Global Supply Jumps (/news/2024/may/us-gulf-coast-hits-record-high-for-imports-of-straight-run-fuel-oil-as-global-supply-jumps)
- Martin Resource Offers to Buy Remaining Stake in Martin Midstream Partners (/news/2024/may/martin-resource-offers-to-buy-remaining-stake-in-martin-midstream-partners)

COMMISSIONERS
BRANDON
ON ENVIRONMENTAL
QUALITY
2024 JUN -7 AM 11:46
CHIEF CLERKS OFFICE

how can you help shape the world's energy transition and accelerate your career? Discover how
aramco powered by how

Moss Lake Partners targeting 2028 Permian gas pipeline start

DeLa Express LLC, an affiliate of Moss Lake Partners, has requested approval to initiate the pre-filing review process for its proposed DeLa Express Project designed to transport 2 bcfd of Delaware basin natural gas from Texas to Louisiana.

Mikaila Adams

April 9, 2024

DeLa Express LLC, an affiliate of Moss Lake Partners, has requested approval to initiate the pre-filing review process for its proposed DeLa Express Project designed to transport 2 bcfd of Delaware basin natural gas from Texas to Louisiana.

The request to the Federal Energy Regulatory Commission (FERC) was filed Apr. 2.

This website uses cookies to enhance your browsing experience and serve personalized content. Privacy Policy

Accept All

The project will originate at a point near Red Bluff in Loving County, Tex., and terminate near Moss Bluff in Calcasieu Parish, La., to provide firm transportation of liquids-rich natural gas from the West Texas Permian basin to markets on the US Gulf Coast from Port Arthur, Tex., to Cameron Parish, La., including growing demand from LNG export plants as well as Moss Lake's affiliated NGL export project, Hackberry NGL.

LOGIN JOIN

pipeline, five lateral pipelines totaling 60 miles (17.6-mile, 42-in. OD supply lateral in Culberson, Loving, and Reeves Counties, Tex.; 7.7-mile, 14-in. OD supply lateral in Loving County, Tex.; 4.6-mile, 18-in. OD supply lateral in Loving County, Tex.; 25.8-mile, 16-in. OD supply lateral in Midland and Upton Counties, Tex.; and 6.2-mile, 20-in. OD delivery lateral in Calcasieu Parish, La.), eight new greenfield compressor stations with 65,000 horsepower expected at each station, multiple meter stations, and related

This website uses cookies to enhance your browsing experience and serve personalized content. **Privacy Policy**

2026 and to place the project in service in 2028.

ADVERTISEMENT

DeLa Express has completed certain planning and development work including project concept study; project pre-feasibility and constructability study; natural gas pipeline routing analysis; environmental permitting due diligence evaluation and desktop review; pipeline route refinement; preliminary engineering planning; and preliminary design basis including hydraulic calculations.

Sign up for Oil & Gas Journal Newsletters

☐ **OGJ Daily Update**

Timely news and analysis on rapidly changing industry conditions and events; upstream, midstream, and downstream. (Monday-Friday)

☐ **Energy Transition Update**

The energy transition intersects with the oil and gas industry at many points, from biofuels and carbon capture and sequestration to hydrogen and alternative ways of powering operations. This newsletter highlights the biggest developments in these areas. (Monthly)

☐ **Exploration, Drilling & Production**

Global updates on exploration

This website uses cookies to enhance your browsing experience and serve personalized content. Privacy Policy

liquid-rich plays. (Second & Fourth Tuesday)

Email Address Country SIGN UP

By submitting your information, you are agreeing to Endeavor Business Media's Terms of Service and Privacy Policy.

CONTINUE READING

Wooddy named Medco Ene

nounces Permian Express

This website uses cookies to enhance your browsing experience and serve personalized content. **Privacy Policy**

LATEST IN PIPELINES

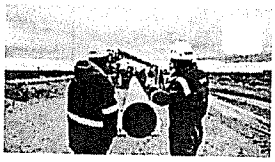
Pipelines

Aramco awards 800-km pipelay contracts to Kalpataru Projects

May 23, 2024

Pipelines

YPF begins construction of Vaca Muerta Sur



May 22, 2024

MOST READ

Energy Transfer signs $3.25-billion deal to add Permian gas pipeline, processing assets

Aethon deals move Tellurian's Driftwood LNG project toward development

Golden Pass LNG work continues despite EPC contractor Zachry's bankruptcy

This website uses cookies to enhance your browsing experience and serve personalized content. Privacy Policy

© 2024 Endeavor Business Media, LLC. All rights reserved.

This website uses cookies to enhance your browsing experience and serve personalized content. **Privacy Policy**

Projects

OPP will be updating this page to inform the public on significant projects that may be of interest. If you have any questions please contact OPP and staff will be happy to assist you.

Project Information

DeLa Express Pipeline Project

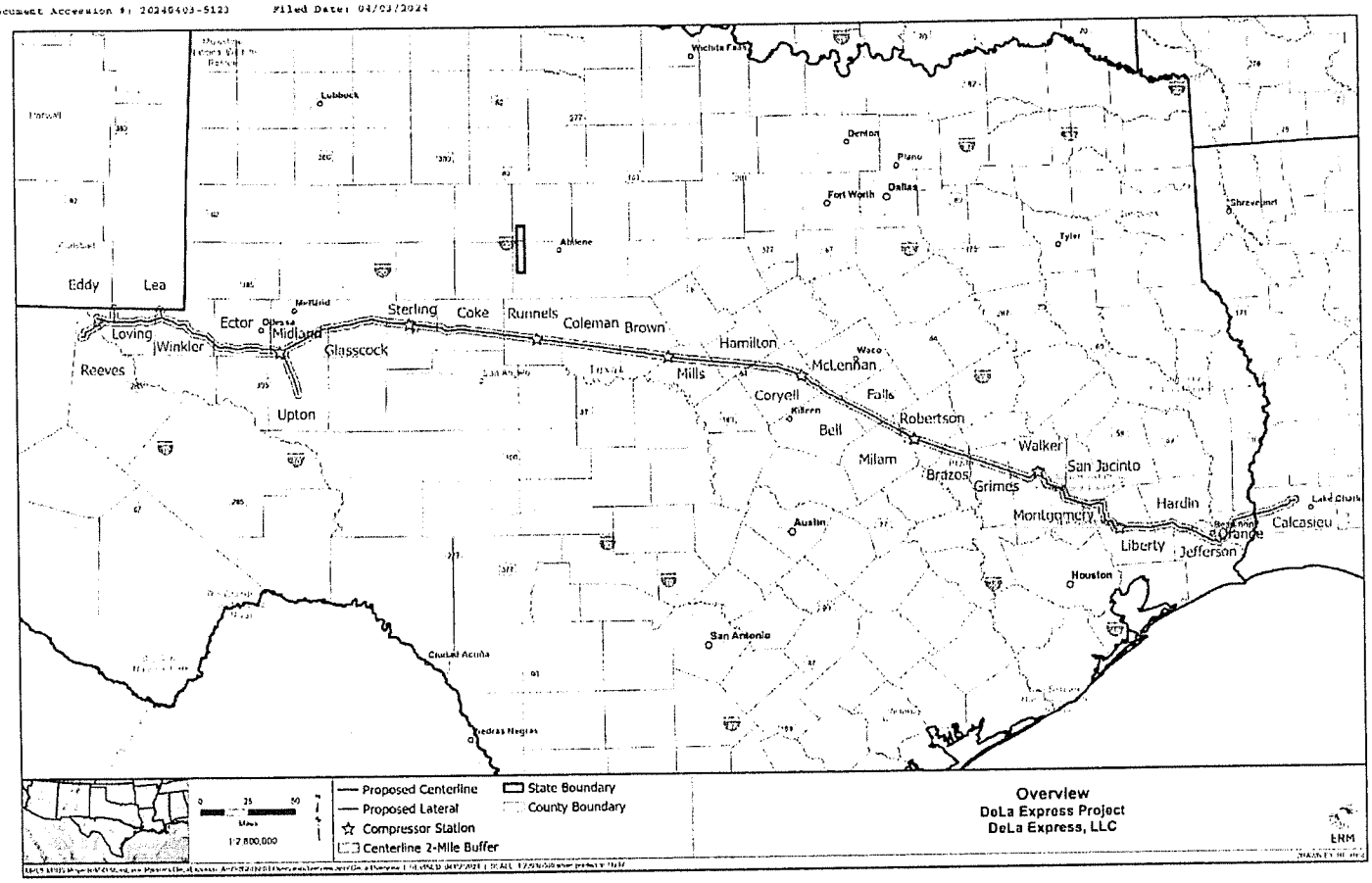
Introduction

On April 15, 2024, FERC staff approved DeLa Express, LLC's request to enter into the FERC's Pre-filing Environmental Review Process (Pre-filing Process) for the planned DeLa Express Project (Project). More information may be found in FERC Docket No. PF24-4-000 in FERC's eLibrary.

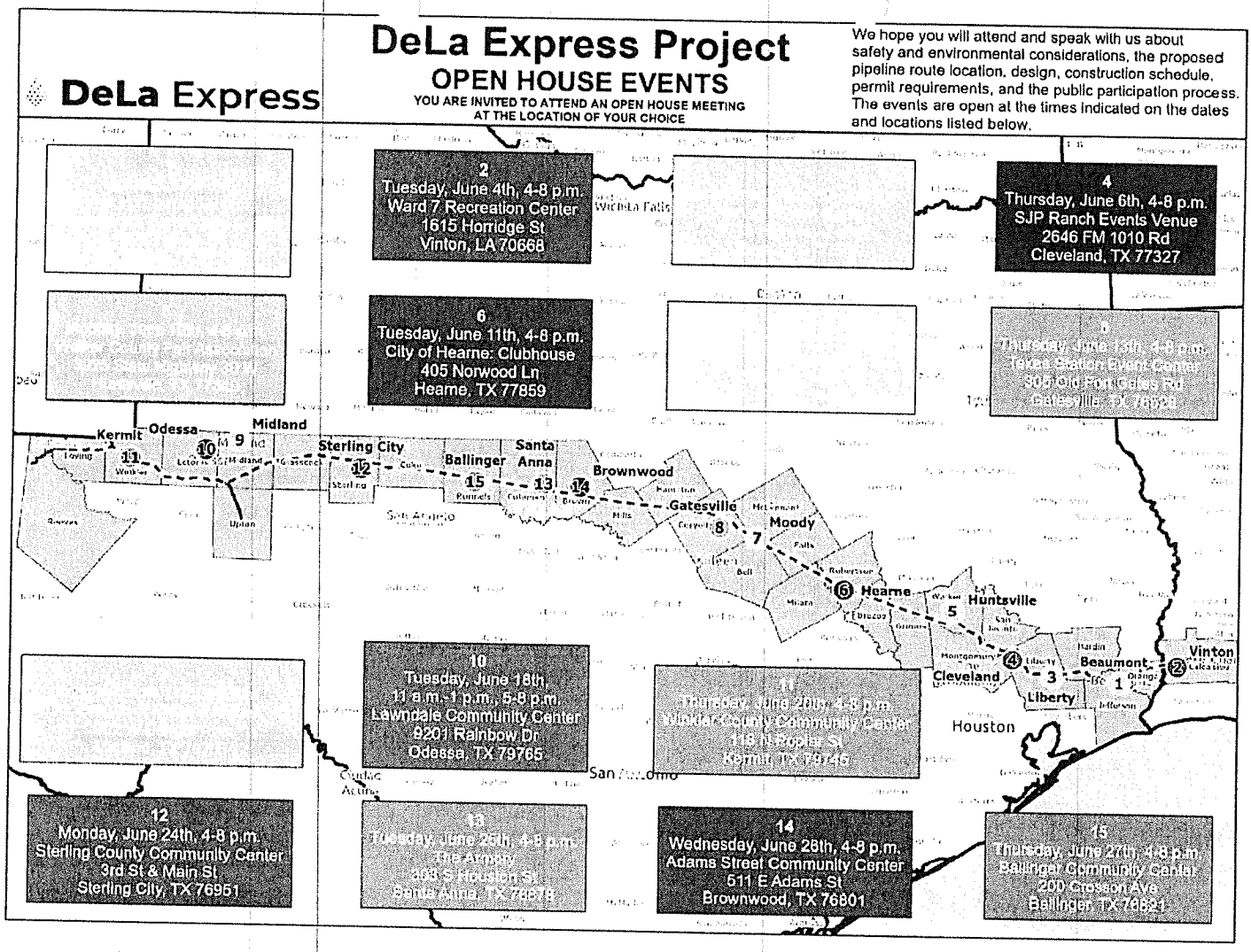
DeLa Express Project Pipeline Route and Facilities

The Project is designed to transport natural gas from the Permian Basin in West Texas to markets in and around Lake Charles, Louisiana. DeLa Express plans to construct over 750 miles of natural gas pipeline and associated facilities including 9 new compressor stations across 27 Texas counties and 1 Louisiana parish.

Document Accession #: 20240403-5123 Filed Date: 04/03/2024



DeLa Express Open House Schedule



City	Date	Time	Location
Beaumont, TX	June 3, 2024	11am-1pm; and 5pm-8pm	Central Park Community Center 2925 Fannin St, Beaumont, TX 77701
Vinton, LA	June 4, 2024	4pm-8pm	Ward 7 Recreation Center 1615 Horridge St, Vinton, LA 70668

Liberty, TX	June 5, 2024	4pm-8pm	Harvest Event Center 9775 N Hwy 146, Liberty, TX 77575
Cleveland, TX	June 6, 2024	4pm-8pm	SJP Ranch Events Venue 2646 Farm to Market 1010 Rd, Cleveland, TX 77327
Huntsville, TX	June 10, 2024	4pm-8pm	Walker County Fair Association 3925 SH 30, Huntsville, TX 77340
Hearne, TX	June 11, 2024	4pm-8pm	City of Hearne: Clubhouse 405 Norwood Lane, Hearne, TX 77859
Moody, TX	June 12, 2024	4pm-8pm	Bammie Moore Hall 508 Avenue E, Moody, TX 76557

Gatesville, TX	June 13, 2024	4pm-8pm	Texas Station Event Center 305 Old Fort Gates Rd, Gatesville, TX 76528
Midland, TX	June 17, 2024	4pm-8pm	Junior League of Midland Mabee Hall 902 W Dengar Ave, Midland, TX 79705
Odessa, TX	June 18, 2024	11am-1pm; and 5pm-8pm	Lawndale Community Center 9201 Rainbow Rd, Odessa, TX, 79765
Kermit, TX	June 20, 2024	4pm-8pm	Winkler County Community Center 118 N Poplar St, Kermit, TX, 79745
Sterling City, TX	June 24, 2024	4pm-8pm	Sterling County Community Center 3rd St &, Main St, Sterling City, TX, 76591

Santa Anna, TX	June 25, 2024	4pm-8pm	The Armory 303 S Houston, Santa Anna, TX, 76878
Brownwood, TX	June 26, 2024	4pm-8pm	Adams Street Community Center 511 E Adams St, Brownwood, TX, 76801
Ballinger, TX	June 27, 2024	4pm-8pm	Ballinger Community Center 200 Crosson Ave, Ballinger, TX, 76821

Pre-filing Environmental Review Process

Pre-filing is a "pre-application" phase in the overall environmental review process for interstate natural gas or liquefied natural gas projects under FERC's jurisdiction. The Pre-filing Process is designed to address all regulatory and environmental aspects of the project before an official application is filed. The Pre-filing Process was established to allow and encourage early involvement by all stakeholders during the earliest possible stages of the design and routing of a natural gas project.

During the Pre-filing Process, members of the public will have multiple opportunities to get involved and express their views, concerns, and issues. Those opportunities include public comment periods, open houses held by DeLa Express, and scoping sessions hosted by FERC. These opportunities will be posted in FERC's eLibrary in Docket No. PF24-4-000.

FERC's Office of Public Participation (OPP) will send announcements about upcoming participation opportunities, meet with interested stakeholders and organizations, and attend public meetings. To stay updated, follow OPP on its social media channels: X (formerly Twitter), Facebook, LinkedIn, and Instagram.

You are also encouraged to contact OPP staff to learn more about the Project and participation at FERC by email at OPP@ferc.gov or phone at 202-502-6595. If you would like to speak with someone in the region, please contact Ms. Pamela Young, OPP Outreach Specialist, at pamela.young@ferc.gov or by phone at 601-715-9009; or Mr. Vincente Carreon, OPP Outreach Specialist, at vincente.carreon@ferc.gov or by phone at 361-484-8323.

Resources

Guides on Public Participation

- Step-by-step guide on how to file a comment
- Step-by-step guide on how to intervene

Educational Videos

- Learn to eFile, eComment, and eSubscribe
- How to File an Intervention Using FERC's Online System
- Filing Comments Workshop and Demonstration
- Submitting Powerful Comments Workshop

Tips on Public Participation

- How to Submit Effective Comments
- Powerful Comments
- Filing an Intervention

Informational Handouts

- About FERC
- About OPP

Gulfstream LNG Terminal Project

Introduction

On May 16, 2024, FERC staff approved Gulfstream LNG Development, LLC (Gulfstream LNG) to enter into the FERC's Pre-filing Environmental Review Process (Pre-filing Process) for the planned Gulfstream LNG Terminal Project (Project). Below is more information about FERC's Pre-filing Process and Gulfstream LNG's Project. Additionally, the public can access submitted documents and Project details by searching Docket No. PF24-5-000 in FERC's eLibrary.

Gulfstream LNG Terminal Project

Gulfstream LNG plans to construct a new liquefied natural gas (LNG) export facility with gas processing facilities, 3 LNG trains, 1 LNG storage tank, 2 marine loading births, and 1 on-site power generation plant. They would all be located in Plaquemines Parish, Louisiana. The Project would expect to export a capacity of 4 million tonnes per year of LNG.

The Project will be constructed and located on an approximately 418-acre leased land with approximately 11,788 feet of frontage on the Mississippi River and south of Belle Chasse in Plaquemines Parish, Louisiana. Currently, the Project site is undeveloped and there is minimal habitation or other activity in the immediate vicinity of the Project site.

The closest populated place on the west side of the Mississippi River is Port Sulphur, Louisiana, which is approximately six miles from the Project site. The larger community of Belle Chasse is approximately 25 miles from the Project site.

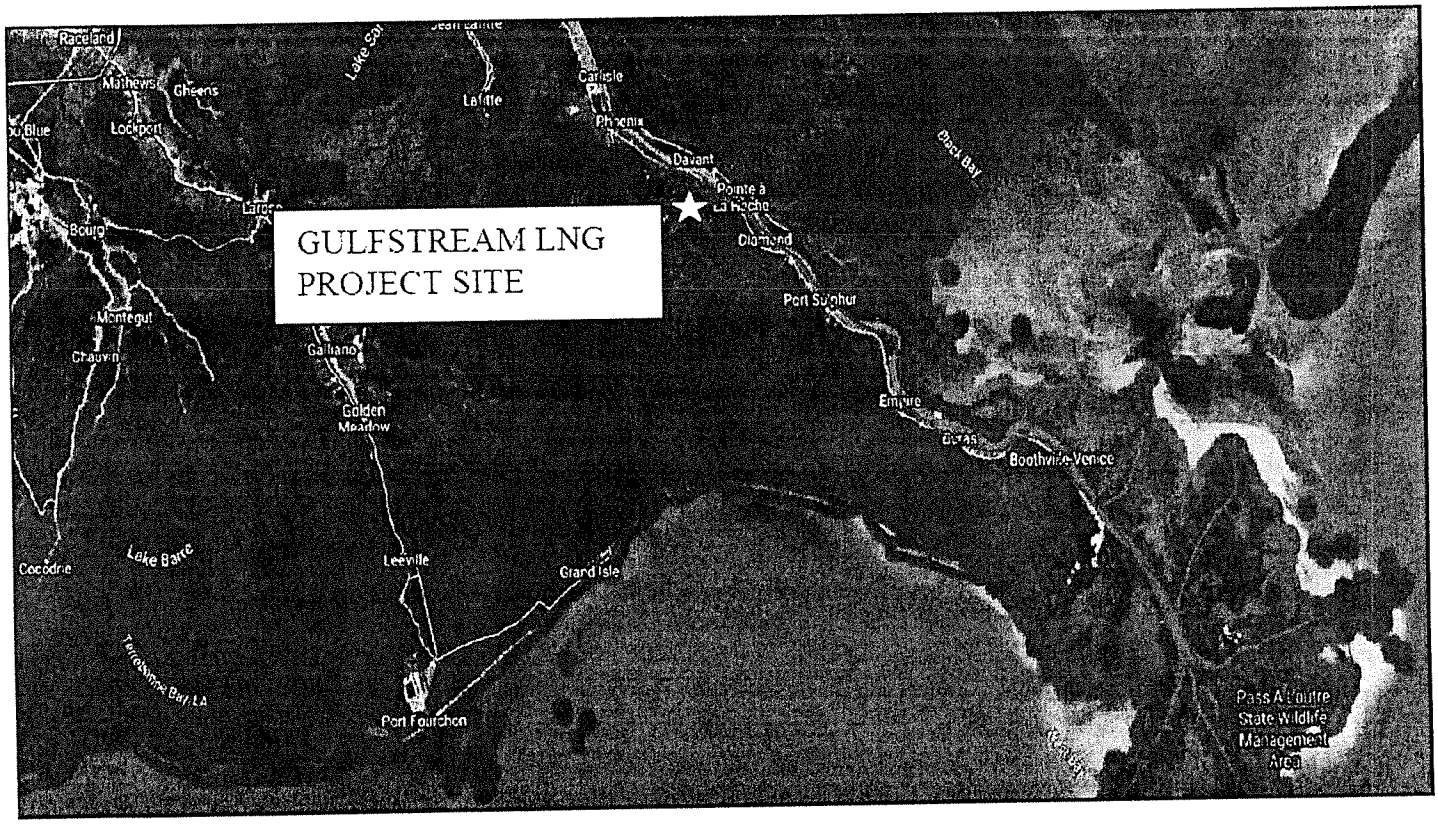


Figure 1. Gulfstream LNG Terminal Project site along route in Louisiana.

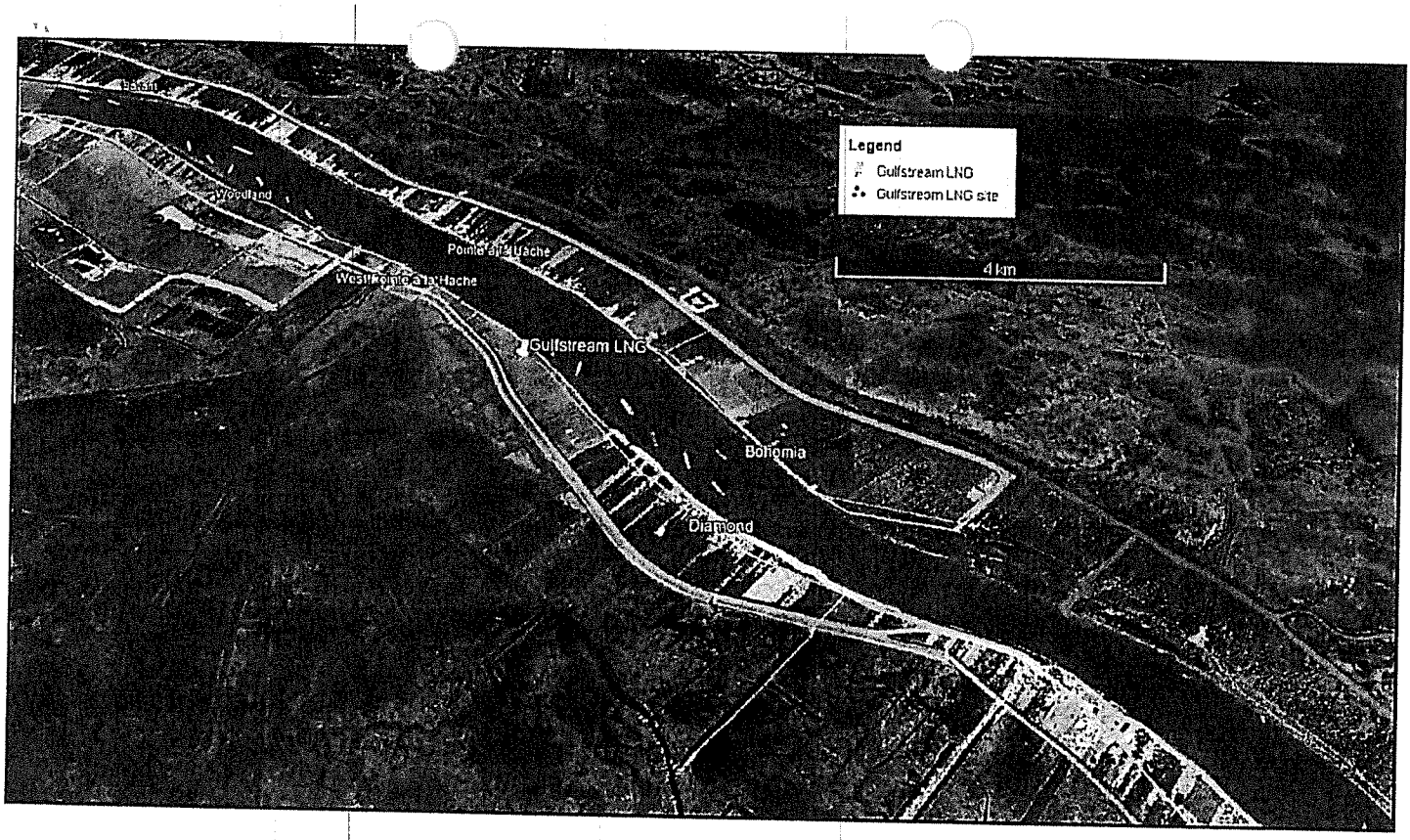
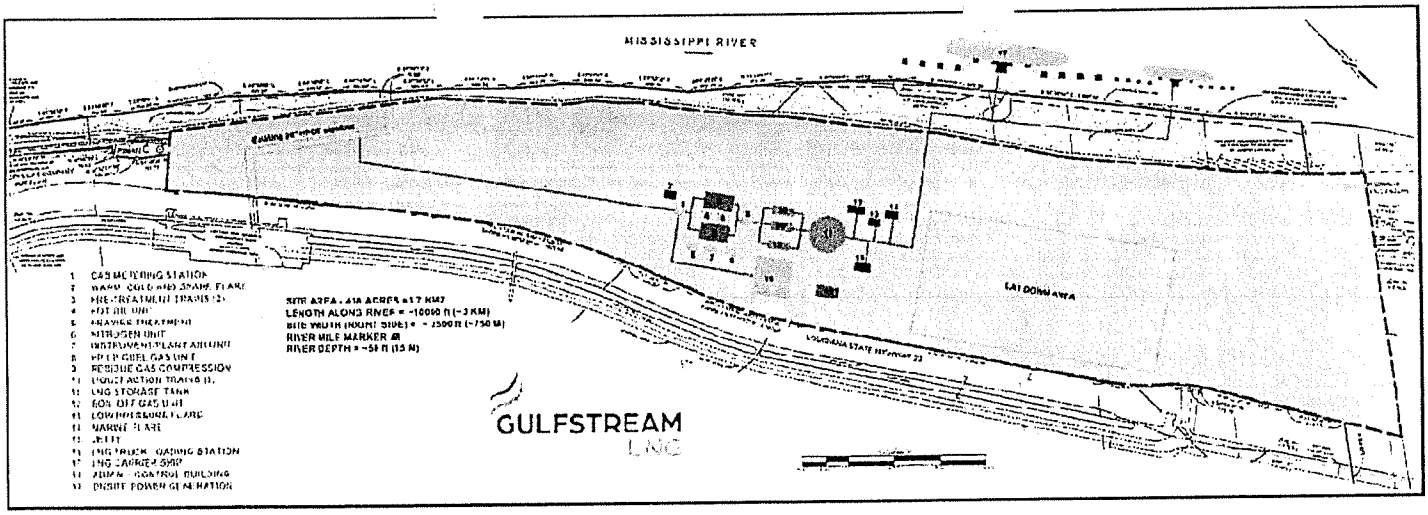


Figure 2. Ariel view of planned Gulfstream LNG Terminal Project site.

The Project's facility will process treated pipeline gas sourced from the U.S. natural gas pipeline network, primarily from High Point Gas Transmission, LLC, into LNG for export. Gulfstream LNG also intends to sell LNG and associated extracted natural gas liquids to domestic customers at the facility and marine port.

Preliminary Plans

On the planned site, the gas processing facilities would connect to the 26" HPGT pipeline so the Gulfstream LNG could treat the natural gas prior to liquefaction. The liquefaction facility would then process the gas and transport it to the marine and loading facilities. The Project would include an LNG storage tank.



Pre-filing Environmental Review Process

Upon completion of FERC's Pre-filing Process, Gulfstream LNG plans to file an application with FERC seeking authorizations under Section 3 of the Natural Gas Act (NGA).

Pre-filing is a "pre-application" phase in the overall environmental review process for interstate natural gas or liquefied natural gas projects under FERC's jurisdiction. The Pre-filing Process is designed to address all regulatory and environmental aspects of the project before an official application is filed. The Pre-filing Process was established to allow and encourage early involvement by all stakeholders during the earliest possible stages of the design, siting, and routing of a natural gas project.

During the Pre-filing Process, members of the public will have multiple opportunities to get involved and express their views, concerns, and issues. Those opportunities include public comment periods, open houses held by Gulfstream LNG, and scoping sessions hosted by FERC. These opportunities will be posted in FERC's eLibrary in Docket No. PF24-5-000.

More Information and Public Participation

You may learn more about the Project through FERC's eLibrary. When searching for the Project, please enter Docket No. PF24-5-000 in the "Enter Docket Number" text box. FERC's Office of Public Participation provides an educational video and demonstration on using eLibrary: WorkshOPP and Demonstration: FERC's eLibrary.

You are also encouraged to contact OPP staff to learn more about the Project and participation at FERC by email at OPP@ferc.gov or phone at 202-502-6595. If you would like to speak with someone in the region, please contact Ms. Pamela Young, OPP Outreach Specialist, at pamela.young@ferc.gov or by phone at 601-715-9009.

OPP will send announcements about upcoming participation opportunities, meet with interested stakeholders and organizations, and attend public meetings. To stay updated, follow OPP on its social media channels: X (formerly Twitter), Facebook, LinkedIn, and Instagram.

Resources

Guides on Public Participation

- Step-by-step guide on how to file a comment
- Step-by-step guide on how to intervene

Educational Videos

- Learn to eFile, eComment, and eSubscribe
- How to File an Intervention Using FERC's Online System
- Filing Comments Workshop and Demonstration
- Submitting Powerful Comments Workshop

Tips on Public Participation

- How to Submit Effective Comments
- Powerful Comments
- Filing an Intervention

Informational Handouts

- About FERC
- About OPP
- FERC & Liquefied Natural Gas (LNG) Export Facilities

East Tennessee Natural Gas, LLC : Ridgeline Expansion Project

Public Participation | Public Scoping Meetings and File Comments

FERC staff has issued a draft Environmental Impact Statement (draft EIS). Link to draft EIS document. This document looks at how the project might impact the environment, following the requirements of the National Environmental Policy Act (NEPA). The draft EIS is not a decision document. It documents FERC staff's independent analysis of the environmental issues. The public may comment on the draft EIS.

Your comments should focus on the draft EIS's disclosure and discussion of potential environmental impacts, measures to avoid or lessen environmental impacts, and other concerns on the alternatives, information, and analyses. Landowner comments are encouraged on the site-specific construction plans that East Tennessee developed for residences within 25 feet of construction work areas, provided in appendix J of the draft EIS.

Comments on the draft EIS are due by July 15, 2024 at 5:00 PM Eastern Time.

In addition, there will be public scoping meetings to answer questions about the Ridgeline Expansion Project. FERC encourages the public to attend one of the public comment scoping meetings. See below for more information.

- Tuesday, June 11, 2024, 6:00 to 8:00 pm EDT at Kingston Community Center, 201 Patton Ferry Road, Kingston, TN 37763.
- Wednesday, June 12, 2024, 6:00 to 8:00 pm CDT at Cookeville High School, 1 Cavalier Drive, Cookeville, TN 38501.
- Thursday, June 13, 2024, 6:00 to 8:00 pm CDT at Trousdale Community Center, 301 E. Main Street, Hartsville, TN 37074.

Date and Time	Location
Tuesday, June 11, 2024 6:00 to 8:00 pm EDT	Kingston Community Center 201 Patton Ferry Road Kingston, TN 37763 (865) 376-1356

Date and Time	Location
Wednesday, June 12, 2024 6:00 to 8:00 pm CDT	Cookeville High School 1 Cavalier Drive Cookeville, TN 38501 (931) 520-2287
Thursday, June 13, 2024 6:00 to 8:00 pm CDT	Trousdale Community Center 301 E. Main Street Hartsville, TN 37074 (615) 374-9574

History of This Project

There are two dockets associated with this project:

1. The Pre-Filing Docket: PF 22-7-000
2. The Application: CP23-516-000

These dockets can be found in FERC's eLibrary site. For a "Quick User Guide" and additional resources on using the eLibrary site, please go here. eLibrary support can be reached by phone at 866-208-3676 or by email at ferconlinesupport@ferc.gov .

In May 2022, the company, East Tennessee Natural Gas, LLC (East Tennessee) initiated a "Pre-Filing" docket. From that time until July 2023, the Company contacted landowners, regulators, and affected parties to discuss potential concerns.

On July 18, 2023, East Tennessee then filed an application under Sections 7(c), of the Natural Gas Act (NGA), and Part 157 of the Commission's regulations requesting authorization to provide 300,000 dekatherms per day of new firm natural gas transportation capacity and up to 95,000 dekatherms of Customized Delivery Service to the (TVA) Tennessee Valley Authority by construct, modify, install, own, and operate the following facilities of Ridgeline Expansion Project (Project). The Project is located in Trousdale, Smith, Jackson, Putnam, Overton, Fentress, Morgan, Roane, counties, Tennessee.

On July 28, 2023 the Federal Energy Regulatory Commission (FERC) issued a "Notice of Application" which established an intervention deadline of August 18, 2023. The July 28 Notice inadvertently omitted posting to Docket No. PF 22-7-000. On August 8, 2023 FERC issued an "Errata Notice" to correct the docket numbers.

Public Participation

There are three ways to become involved in the Commission's review of this project:

1. You can file comments on the project,
2. You can protest the filing, and
3. You can file a motion to intervene in the proceeding.

For public inquiries and assistance with making filings such as interventions, comments, or requests for rehearing, contact the Office of Public Participation (OPP) at (202) 502-6595 or OPP@ferc.gov.

Project Milestones and Key Documents

- Notice of Application
- Project Maps

Spire STL Pipeline Project

About Spire STL Pipeline Project in Docket No. CP17-40

Spire STL Pipeline LLC sought a Certificate of Public Convenience and Necessity under Section 7(c) of the Natural Gas Act (NGA) to construct and operate about 59.2 miles of 24-inch-diameter pipeline (the Mainline) in Scott, Greene, and Jersey Counties, Illinois and St. Charles and St. Louis Counties, Missouri; and about 6.0 miles of 24-inch diameter pipeline (the North County Extension) in St. Louis County, Missouri, and three new meter stations: one in Scott County, Illinois and two in St. Louis County, Missouri. The Commission granted the requested certificate on August 3, 2018. The Commission granted rehearing for further consideration on October 1, 2018, and subsequently denied rehearing requests on November 21, 2019.

In *Env'tl Def. Fund v. FERC*, 2 F.4th 953 (D.C. Cir 2021), the D.C. Circuit vacated and remanded to the Commission Spire's authorizations under the NGA. On August 6, 2021, Spire STL Pipeline filed an application requesting that the Commission issue a temporary certificate of public convenience and necessity for the Spire STL Pipeline Project to assure maintenance of service to Spire's customers while the Commission addresses the issues on remand from the U.S. Court of Appeals.

On September 14, 2021, the Commission issued an order that would provide Spire with a temporary certificate of public convenience and necessity, pursuant to section (c)(1)(B) of the NGA. It allows Spire STL Pipeline authorization to continue operations in the St. Louis region for 90-days while the Commission evaluates Spire's July 26 temporary certificate application and the responsive filings.

During this time, Spire must continue all restoration activities along the project right-of-way. Restoration compliance allegations should be referred to Commission staff, and comments may be filed on the record. For assistance commenting, please refer to the Step-by-Step Guide in How to file a Comment or contact OPP at 202-502-6595 or opp@ferc.gov. Stakeholders who are seeking to use Alternative Dispute Resolution to informally resolve their concerns, please contact the Landowner Helpline at 1-877-337-2237 and LandownerHelp@ferc.gov.

Project Documents – Docket No. CP17-40

Project Milestones

- Notice of Application February 6, 2017
- Notice of Intent to prepare an Environmental Assessment and Request for Comments on Environmental Issues was issued on March 3, 2017
- Notice of Schedule – August 3, 2017
- Notice of Availability of the Environmental Assessment-September 29, 2017
- Environmental Assessment for the Spire STL Pipeline Project – September 29, 2017
- Supplemental Notice of Availability of the Environmental Assessment and Reopening of Comment Period for the Proposed Spire STL Pipeline Project – November 22, 2017
- Order Issuing Certificate re Spire STL Pipeline, LLC – August 3, 2018
- Order Granting Rehearings for Further Consideration re Spire STL Pipeline LLC October 1, 2018
- Order Amending Certificate re Spire STL Pipeline LLC – October 28, 2019

- Order on Rehearing re Spire STL Pipeline LLC – November 21, 2019
- Order on Environmental Compliance – March 18, 2021
- Environmental Defense Fund v. FERC, 2 F.4th 953 (D.C. Cir. 2021) – June 22, 2021
- Notice of Application and Establishing Intervention Deadline re Spire STL Pipeline LLC – August 6, 2021
- Order Issuing Temporary Certificate – September 14, 2021
- Order on Rehearing re Spire STL Pipeline LLC Temporary Certificate – November 18, 2021
- Order Issuing Temporary Certificate – December 3, 2021
- Notice of Intent To Prepare A Supplemental Environmental Impact Statement for The Spire STL Pipeline Project – December 15, 2021
- Draft Environmental Impact Statement (EIS) for the Spire STL Pipeline Project (CP17-40-006) – June 16, 2022
    - The Draft EIS comment period closes on August 8, 2022

How To Seek Rehearing on a Commission Order

Participants seeking rehearing must have intervenor status in the proceeding by having already filed an intervention as set forth in section 385.214 (Rule 214) of the Commission's regulations.

Parties must file rehearing requests **30 days** from the date of a final Commission order.

Requirements to request rehearing can be found in section 385.713 (Rule 713) of the Commission's regulations. To file for a Rehearing Request, you must know the Docket number of the filing. In this case for Spire STL Pipeline it is Docket No. CP17-40.

Any request for rehearing must:

1. State concisely the alleged error in the final decision or final order;
2. Conform to the pleading requirements in Rule 203(a), and include a separate section entitled, "Statement of Issues," listing each issue in a separately enumerated paragraph that includes representative Commission and court precedent on which the party is relying; any issue not so listed will be deemed waived; and
3. Set forth the matters relied upon by the party requesting rehearing, if rehearing is sought based on matters not available for consideration by the Commission at the time of the final decision or final order.

For Step-by-Step instructions in how to file a rehearing request, click here.

Contact Information

Contact the Office of Public Participation with any questions or concerns regarding this project at 202-502-6595 or by email at OPP@ferc.gov.

Quick Links

- WorkshOPP on Filing Comments
- How to Seek Rehearing
- How to Contact FERC
- How to Intervene
- How to file a Comment
- FAQs

Contact Information

Office of Public Participation (OPP)
Telephone: 202-502-6595
Email: OPP@ferc.gov

FERC Online Support
Email: FERCOnlneSupport@ferc.gov

Landowner Helpline
Toll-free Telephone: 1-877-337-2237
Fax: 202-219-2730
Email: landownerHelp@ferc.gov

This page was last updated on May 23, 2024

All Things Considered

Your Trash Is Emitting Methane In The Landfill. Here's Why It Matters For The Climate

JULY 13, 2021 · 5:00 AM ET

HEARD ON ALL THINGS CONSIDERED

FROM

By James Bruggers, Phil McKenna, Amy Green, Robert Benincasa

4-Minute Listen

Landfills produce a lot of methane, a heat-trapping gas that contributes to global warming. With scientists calling for cuts in methane emissions, there are challenges to curbing these emissions from landfills, starting with even quantifying them. Pictured here is Waste Management landfill in Livermore, Calif.

Michael Macor/San Francisco Chronicle via Getty Images

A single flip-flop. An empty Chick-fil-A sandwich bag. A mattress. A sneaker, navy with a white sole. A little orange bouncy ball.

Garbage is strewn among thigh-high drifts of dirt, used to bury the filthy, weather-worn items at the Orange County Landfill in Florida and prevent the intrusion of insects, rats and pigs. Bulldozers smooth the dirt into place while tractor-trailers deliver ever more trash. Vultures and seagulls circle above. A bald eagle lands nearby.

"Anything you will see out in the real world you'll see it here," said David Gregory, manager of the solid waste division of the Orange County Utilities Department. "Because when people throw things away, this is where it comes."

Sponsor Message

According to the Environmental Protection Agency, landfills such as this one on the edge of Orlando are among the nation's largest sources of methane, a greenhouse gas far more potent than carbon dioxide and a major contributor to global warming. A seminal U.N. report published in May found that immediate reductions in methane emissions are the best, swiftest chance the planet has at slowing climate change. Landfills emit methane when organic wastes such as food scraps, wood and paper decompose.

But the challenges to reining in methane are big, beginning with even quantifying how much leaves landfills. Industry operators insist the EPA overestimates emissions. Yet independent research looking at emissions from landfills in California and a top EPA methane expert said that the agency significantly underestimates landfill methane.

The EPA has "been understating methane emissions from landfills by a factor of two," said Susan Thorneloe, a senior chemical engineer at the EPA who has worked on the agency's methane estimation methods since the 1980s.

Part of the problem may be that the EPA's methods for estimating landfill methane emissions are outdated and flawed, Thorneloe said.

Ryan Maher, an attorney with the Environmental Integrity Project, a watchdog group, said landfill methane emissions are "a neglected problem."

Three of the nation's top 10 methane-emitting landfills are in central Florida, including the Orange County Landfill pictured here, according to numbers provided by the facilities to the Environmental Protection Agency.
Amy Green/WMFE

"We're basing our emissions estimates on models rather than direct measurement," said Maher, who recently authored a study that found Maryland's landfill methane emissions were four times higher than that state had estimated. "We do have the capacity to measure these emissions directly. And we just haven't been."

Sponsor Message

The stakes are high for getting an accurate picture of methane emissions. Reducing methane could almost immediately curb climate change, because it stays in the atmosphere for a short time, unlike carbon dioxide, which lingers for a century or more. Landfills are one of three main sources of human methane pollution, along with livestock and the oil and gas industry. The United States is the third-biggest emitter of methane in the world.

The Biden administration has begun to implement a 2016 rule on landfill methane, but it will only cut a small percentage of emissions. Yet steep reductions in global methane emissions this decade would avoid nearly 0.3 degrees Celsius of additional warming by the 2040s, according to the U.N. assessment. That could go a long way to keeping average global temperatures from rising beyond 1.5 degrees Celsius compared with preindustrial times, and avoiding the worst effects of climate change, a goal of the Paris climate agreement.

"By reducing methane emissions, we can quickly reduce the atmospheric warming effect," said Jeff Chanton, a Florida State University climate scientist who studies methane. "And targeting landfills is a great place to start because by tuning the gas collection system, and getting it to work at its optimum level, you get a lot. You collect more methane, and you don't release it to the atmosphere."

Landfill Methane Capture and Use

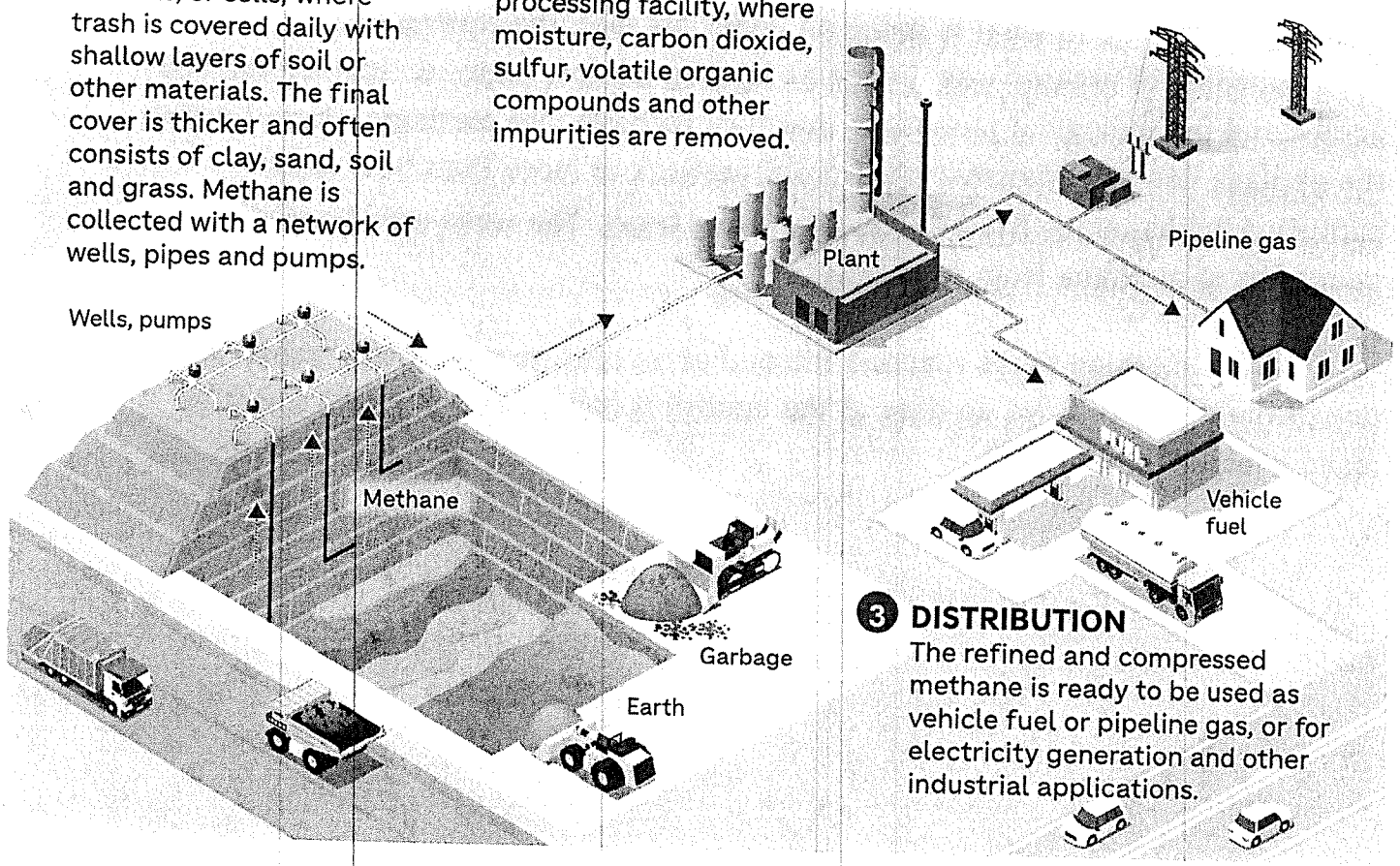
Methane is created when bacteria decompose organic waste in landfills. If it's not captured, methane vents into the atmosphere, where it can do fast damage to the climate. About 500 landfills around the country, a fraction of the total, capture methane and convert it to sources of energy. Here is how it can work.

1 COLLECTION

Landfills are constructed in sections, or cells, where trash is covered daily with shallow layers of soil or other materials. The final cover is thicker and often consists of clay, sand, soil and grass. Methane is collected with a network of wells, pipes and pumps.

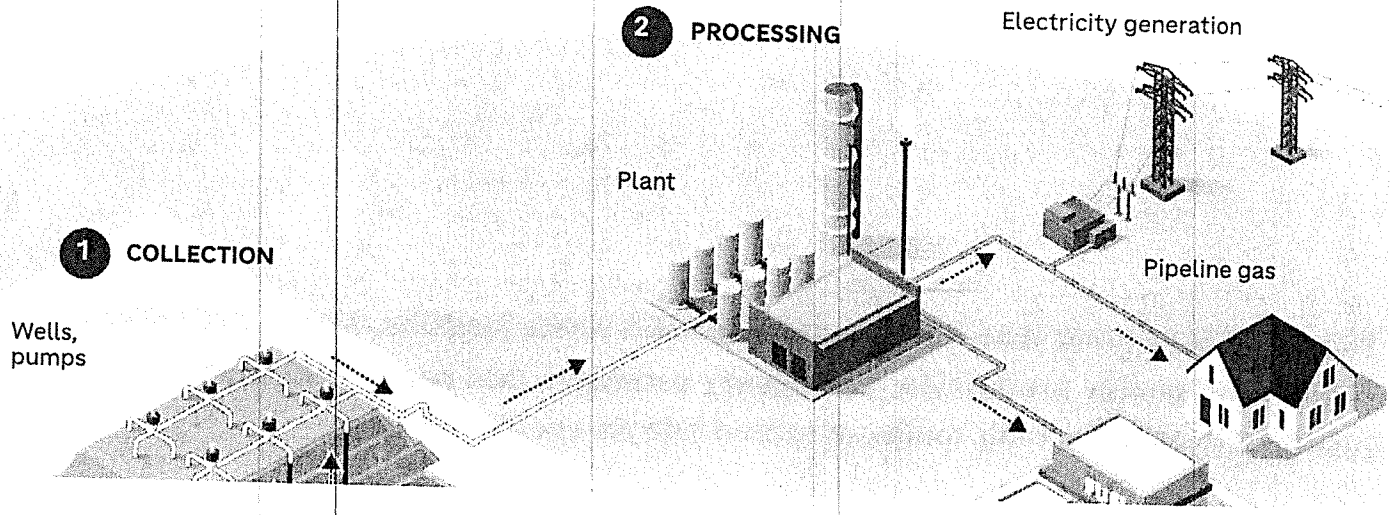
2 PROCESSING

Methane is piped to a processing facility, where moisture, carbon dioxide, sulfur, volatile organic compounds and other impurities are removed.



3 DISTRIBUTION

The refined and compressed methane is ready to be used as vehicle fuel or pipeline gas, or for electricity generation and other industrial applications.



Three of the top 10 methane-emitting landfills are in central Florida

Standing atop a 140-foot summit of refuse at the Orange County landfill, almost all of metro Orlando is in view: downtown high-rises, the control tower and runways of Orlando International Airport, and the looming cylinder-shaped cooling towers of Stanton Energy Center. It powers some 260,000 homes and businesses in Orange and Osceola counties, up to 15,000 of them with methane from this landfill.

Gregory finds value in what is going on under his feet, the rotting and decomposition of organic waste such as kitchen scraps, paper or spoiled canned goods, and the biological processes that turn garbage into methane. Buried within the garbage lies an expansive criss-cross network of more than 500 wells capturing methane gas from the decomposing trash. The wells also keep vast quantities of methane from escaping.

"You have something that's reached the end of its life," he said of the trash. "And one of the things that we do here at the landfill is collect that gas and use it to make energy."

Sponsor Message

The EPA tracks more than 2,600 municipal solid waste landfills. About 500 collect methane for energy production. The agency estimates that nearly 500 more could cost-effectively have their methane turned into an energy resource.

Projects such as these could play a key role in stemming the worst impacts of climate change.

David Gregory says his department has gone beyond regulations to contain methane emissions at the Orange County Landfill. He says he believes his department is not using the best equation to convey the steps it's taking to mitigate the climate-damaging emissions.
Amy Green/WMFE

Despite landfill operators' efforts nationally, large volumes of this invisible, odorless gas still escape from the sites each year. For all the emissions the Orange County Landfill captures, for example, an additional 32,000 metric tons of methane were released from the facility into the air in 2019, making it the third-largest source of methane emissions from a landfill in the country, according to the most current public information the company reported to the EPA. That represents a large, inexplicable increase from previous years — Orange County hadn't been a top 10 emitter in the decade before 2019, according to EPA data.

The Orange County site isn't alone in central Florida. Three landfills among the nation's top 10 emitters of methane are near Orlando, according to the EPA. Their collective emissions damage the climate in the near-term as much as all the 1.8

million cars and pickups registered in the three counties where the landfills are located.

For Orange County, the high ranking came as a surprise — an unwarranted one, officials said. Community leaders here take pride in sustainability initiatives. They consider the landfill's methane-to-energy system key to reducing greenhouse gas emissions.

Orange County's Gregory said he is reevaluating what the county has reported to the EPA.

"It's not like we have a measurement" of methane emissions, he said. "It's all based on the models. And that's where we need to make sure that we're not overlooking anything."

A spokeswoman for the top methane-emitting landfill in the nation, a facility near Cincinnati operated by Rumpke Waste & Recycling, also said the EPA ranking was misleading.

Sponsor Message

In an email, spokeswoman Amanda Pratt dismissed the emissions values her company reported as based on "a theoretical methane generation rate that is calculated using facility-provided data and US EPA derived equations."

Methane-Emitting Landfills: A Potent, Pervasive Problem

About 8,000 industrial facilities are required to report their greenhouse gas emissions annually, and the U.S. Environmental Protection Agency makes that data public. While a controversy exists over the accuracy of EPA methane reporting methods, here are the top 10 methane-emitting municipal solid waste landfills for 2019, based on company reports.

LANDFILL	OWNED BY	METHANE EMISSION, 2019 (METRIC TONS)
Rumpke Sanitary Landfill Cincinnati,	Rumpke Consolidated Cos. Inc.	49,089
JED Solid Waste Management Facility St. Cloud, Fla.	Waste Connections US Inc.	48,929
Orange County Landfill Orlando, Fla.	Orange County Utilities Solid Waste Division	32,182
Eagle Point Landfill LLC Ball Ground, Ga.	Advanced Disposal Services Inc.	29,955
Sampson County Disposal LLC Roseboro, N.C.	Sampson County Disposal LLC	29,233
Black Warrior Solid Waste Disposal Authority Coker, Ala.	Black Warrior Solid Waste Disposal Authority	22,268
McCommas Bluff Landfill Dallas,	City of Dallas	21,218
Brevard County Disposal Facility Cocoa, Fla.	Brevard County Board of Commissioners	20,923
Big Run Landfill Ashland, Ky.	Boyd County Sanitary Landfill Inc.	20,906
121 Regional Disposal Facility Melissa, Texas	North Texas Municipal Water District	20,747

Source: U.S. EPA Greenhouse Gas Reporting Program

Credit: Duy Nguyen/NPR, Paul Horn/Inside Climate News

Outdated methane emissions models create "a mess"

EPA figures may indeed be flawed.

A 2018 National Academy of Sciences report placed "low confidence" in EPA estimates for landfill methane emissions due to uncertainties and insufficient measurements. The report concluded that the agency's method for estimating methane emissions from landfills is "outdated" and was "never field-validated."

Further, the EPA allows for three different ways that individual landfill operators can calculate the amount of methane they generate and two different ways to calculate how much of that methane is emitted into the atmosphere. Depending on which methods an operator chooses, the estimated amount of methane emissions can vary significantly.

The EPA's Thorneloe helped craft the current estimate method, and she said it "was developed over 30 years ago using empirical data for about 40 landfills."

Citing new research out of California, she has come to believe the agency underestimates emissions.

Landfill operators agree that the EPA models are flawed but insisted those flaws lead to overestimating emissions from their sites. In a statement to NPR, David Biderman, chief executive officer of the industry group Solid Waste Association of North America, said, "The model relies on many assumptions and has not been updated to reflect changes in the waste sector such as reduced organic content in the waste stream that can result in overestimation of landfill emissions."

Jean Bogner, a University of Illinois at Chicago emeritus professor and a co-author of the National Academy of Sciences report, calls the EPA's methods "a mess." Bogner, in part, blames the deficiencies on methods first developed by the Intergovernmental Panel on Climate Change, a U.N. body.

Sponsor Message

"Methods should evolve with the science," Bogner said. "It's becoming more and more important as we move into more intensive climate change mitigation strategies to understand more precisely how much methane is coming out of specific landfills. In the past, you could sort of wave your hands and say, 'This may be a ballpark number,' but we need better numbers now to guide site specific mitigation strategies."

The National Academy of Sciences report made recommendations to improve methane measurement, and the EPA is working to address those that pertain to the agency, an EPA spokesperson said in an email.

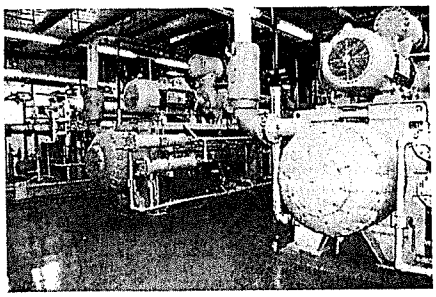
More broadly, EPA officials said they continually update estimates. The agency is reviewing scientific studies on landfill waste to better inform the agency's estimates for methane emissions, the spokesperson added.

Thorneloe said better measurement technologies will help EPA staffers make better estimates.

"If we're going to choose particular sources to reduce emissions, we need to know what those emissions are," Thorneloe said. "What I'm trying to do is develop better test methods rather than what we've relied on in the past."

Industry representative Biderman said that "any proposed changes to regulations should be technically feasible and commercially available."

With landfill gas capture systems, efficiency counts



Methane captured at the Orange County Landfill is processed at this Orlando Utilities Commission facility before being sent to the Stanton Energy Center.
Amy Green/WMFE

Capturing methane at a landfill is complex. A lot can go wrong with a landfill's plumbing, said Chanton, the Florida State University climate scientist. "It's very vulnerable to disruption," he said. "It takes a lot of attention."

Landfills aren't like a factory that sends nearly all emissions through individual smokestacks. Landfills can span hundreds of acres and leak at various rates from open areas or sections that have temporarily been covered or permanently closed and capped.

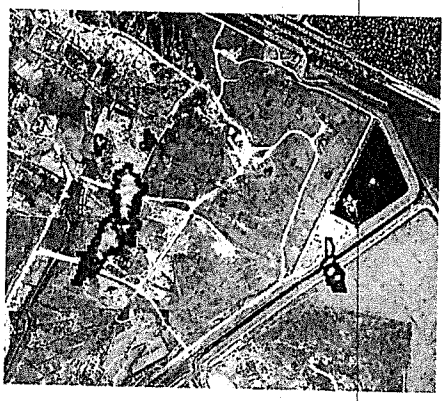
Operators have up to five years to start capturing methane from new landfill sections, called cells. But methane pollution begins much sooner than that, said Morton Barlaz, professor and head of the Department of Civil, Construction and Environmental Engineering at North Carolina State University.

Sponsor Message

The capacity to collect methane at landfills often depends on gas capture wells and how efficiently the collection system is operating. Landfill operators are required to cover waste disposal areas every night with a thin layer of soil or an alternative such as mulch or even plastic. Some of those materials are more porous than others, resulting in more methane releases, Barlaz said.

Weather can also play a role. Rain can both help produce more methane and flood gas collection systems, making them less effective.

"When you have a situation where your gas collection is impeded, the landfill will emit more methane than EPA estimates might suggest," Chanton said. But a well-run system can collect more methane in its wells while also harnessing methane-digesting microbes in the landfill's soil cover to help neutralize the greenhouse gas before it can escape, he added.



Remote sensing of methane from high-altitude aircraft in April reveals plumes of the gas at the River Birch Landfill outside New Orleans coming from the facility's active portion (left), where new waste is added each day, and from a vent (right). Researchers calculate the rate of methane venting at about 2,000 kilograms per hour, which would be 48 metric tons per day.

Riley Duren/University of Arizona, Arizona State University, NASA Jet Propulsion Laboratory and Carbon Mapper

Flights over landfills identify climate threats from "super emitters"

One hope for getting a better grip on methane emissions involves NASA and monitoring landfills from airplanes or space.

Riley Duren is a former engineer with the space agency's Jet Propulsion Laboratory in California who now works as a research scientist at the University of Arizona. He's also chief executive officer of Carbon Mapper, a new nonprofit consortium. Carbon Mapper announced in April it was launching "a constellation" of methane-sensing satellites with partners that include NASA, the state of California and various universities and organizations.

It's an extension of the California research praised by Thorneloe that, between 2016 and 2018, involved flying over hundreds of California methane emitters such as oil and gas operators, animal manure facilities and landfills. Published in 2019 in *Nature*, the study identified what Duren, the lead author, described as a small but substantial number of methane "super emitters." As many as 40% of those were landfills.

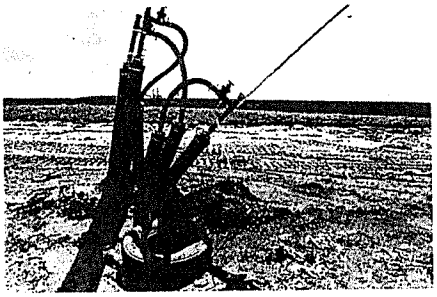
"Some of these landfills were emitting huge amounts of methane," far more than what the landfills were reporting, Duren said. "I am talking tons per hour of methane."

Sponsor Message

Many landfill operators take methane controls seriously, Duren said. But the massive leaks occur when gas capture systems are offline or workers are installing new systems. "And in other cases, it's the result of flawed management practices in terms of how the landfill is managing the daily cover," he said.

The satellites could help landfill operators find problems quickly so they can fix them, Duren said. That work is essential if the United States is going to meet the Biden administration's commitment to cut U.S. greenhouse gas emissions by 50% by 2030.

Focusing on super emitters could be an effective step. Duren said: "It's a smaller amount of the infrastructure ... that if we can target, there can be dramatic reductions over the next few years."



Buried within the Orange County Landfill are some 500 wells, which capture methane before it is emitted to the atmosphere. The Stanton Energy Center is visible in the distance.

EPA takes a modest step to curb landfill emissions

In May, the EPA implemented a 2016 Obama-era rule that will extend existing requirements for methane collection systems to 93 additional landfills. It lowers the emissions threshold for when landfills must install gas collection systems. Once in place, the rule will cut landfill methane emissions about 7% nationally.

Amy Green/WMFE

The regulator also told about 40 states with about 1,600 landfills that lack EPA-approved landfill gas capture plans that they needed to get one, or the agency would enforce its own.

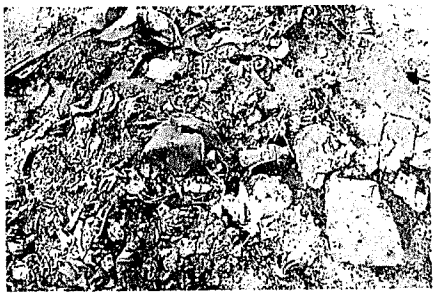
Biderman of the Solid Waste Association of North America said the EPA's move "should result in further reductions in emissions, continuing a trend which the industry has been investing in for decades."

To many scientists and advocates, the EPA's action falls far short of what's needed for the climate — and what's possible with existing technology. The agency's plans will have little effect on landfills that were already required to capture methane under an older rule, and the EPA should have lowered even further its threshold for requiring capture systems to make smaller landfills cut methane, said Maher of the Environmental Integrity Project.

Sponsor Message

In Maryland, for example, state officials are creating a landfill methane regulation. But if the EPA rules get adopted in Maryland, they would "only apply to four out of 40 gas-producing landfills in the state," Maher said.

The recent U.N. methane assessment goes even further. It calls for ending the practice of sending organic waste such as food scraps to landfills. Such waste should instead go to compost facilities or specially designed digesters that reduce or capture methane emissions better.



Eventually garbage such as kitchen scraps and yard waste will rot and decompose, producing a landfill gas made up in large part of methane, a greenhouse gas more potent than carbon dioxide.
Amy Green/WMFE

Landfill operators respond to their high EPA rankings

For their part, some landfill operators are scrambling to show why the EPA rankings are wrong and to explain what they are doing to reduce their emissions.

At the Rumpke landfill near Cincinnati, company spokeswoman Molly Yeager explained its top EPA ranking by pointing to a second alternative emissions model the company also used with some direct measurements that yielded lower emissions estimates. She said that by default, the EPA selected the higher number. An EPA spokeswoman agreed the reporting system defaults to using the higher of the two equations, but she added that landfill operators can choose the results of the other equation if they believe it better represents conditions at the landfill.

Central Florida is among the fastest-growing regions in the nation. In Brevard County, on the state's east coast, keeping up with the booming population and volume of trash presents a challenge to controlling methane emissions, said Thomas Mulligan, assistant director of the Brevard County Solid Waste Management Department.

"I know fully well that we have been in the top 10 for a while now," said Mulligan, who oversees the Brevard landfill some 45 miles east of Orlando. "It is really tough."

Like other industry representatives, he said he believes the EPA's reporting methods overestimate emissions. But he also said Brevard County could do more to reduce landfill emissions. For example, the county could speed installation of a gas collection system in the landfill expansion, he said.

Sponsor Message

"It's a matter of capital improvement money, and it's a matter of timing," he said.

The JED landfill, situated some 54 miles south of Orlando outside bucolic St. Cloud, is part of a national group of landfills owned by Waste Connections, a Texas company. JED officials declined requests for an interview, but vice president for engineering and sustainability, Kurt Shaner, said in an email the company has been tightening up the landfill's cover system and expanding gas collection.

In Orange County, Gregory said he was recalculating the landfill's emissions and making plans to file an updated report to the EPA, using alternative options the agency provides.

"We think with our robust system," he said, "and the amount of cover and the fact that we have a number of these landfill cells closed ... those numbers are going to come down drastically."

This story is a collaboration between Inside Climate News, NPR member station WMFE in Orlando, Fla., and NPR's Investigations Desk.

Understand one big story, in minutes

Subscribe to the Consider This newsletter, where we break down one of day's biggest news stories.

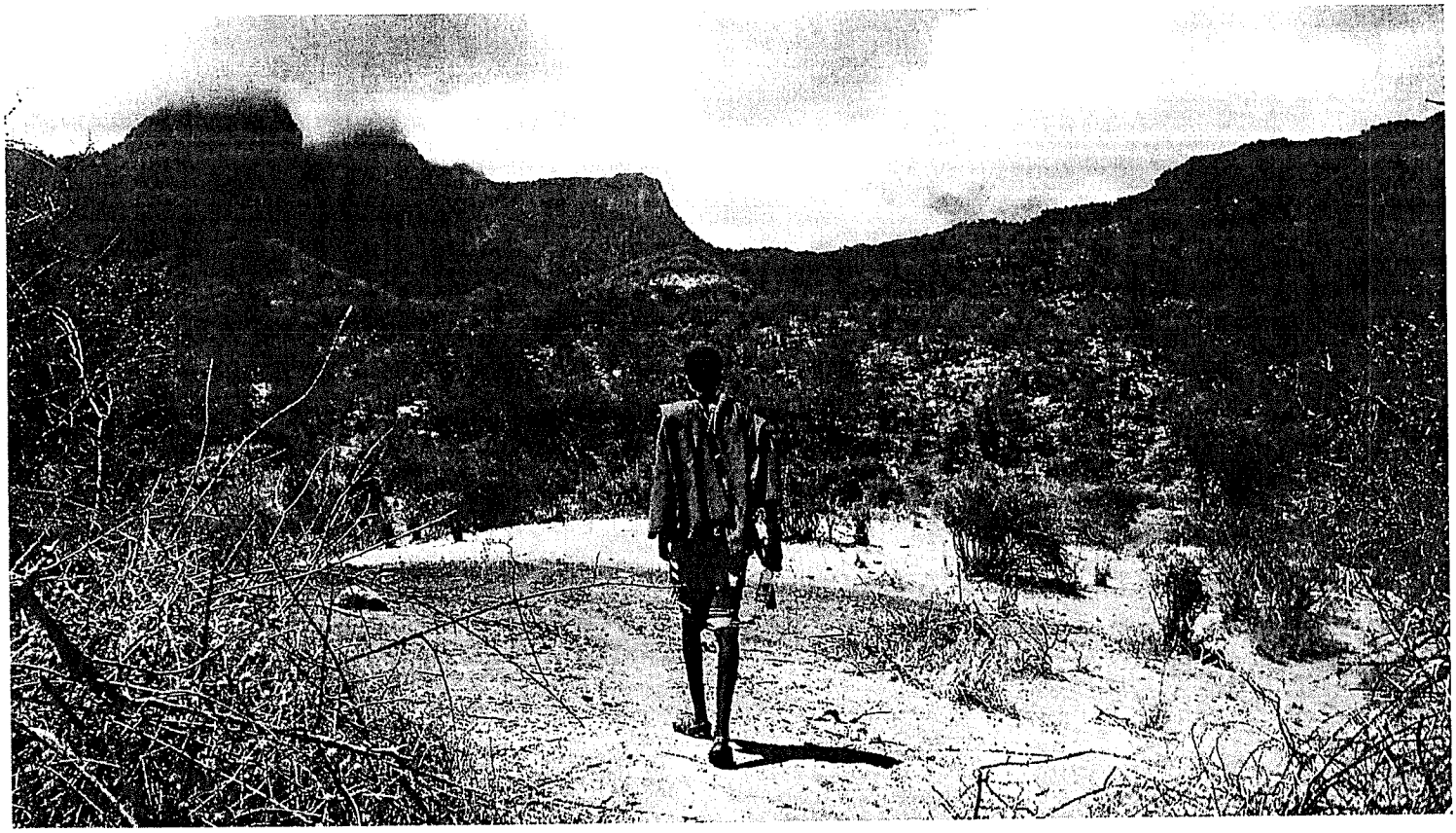
Email address

SUBSCRIBE

See more subscription options

By subscribing, you acknowledge and agree to NPR's Terms of Use and Privacy Policy. NPR may share your name and email address with your NPR station. See Details.

More Stories From NPR



GOATS AND SODA

Kenya's Samburu boys share a sacred bond. Why one teen broke with the brotherhood

SMART NEWS

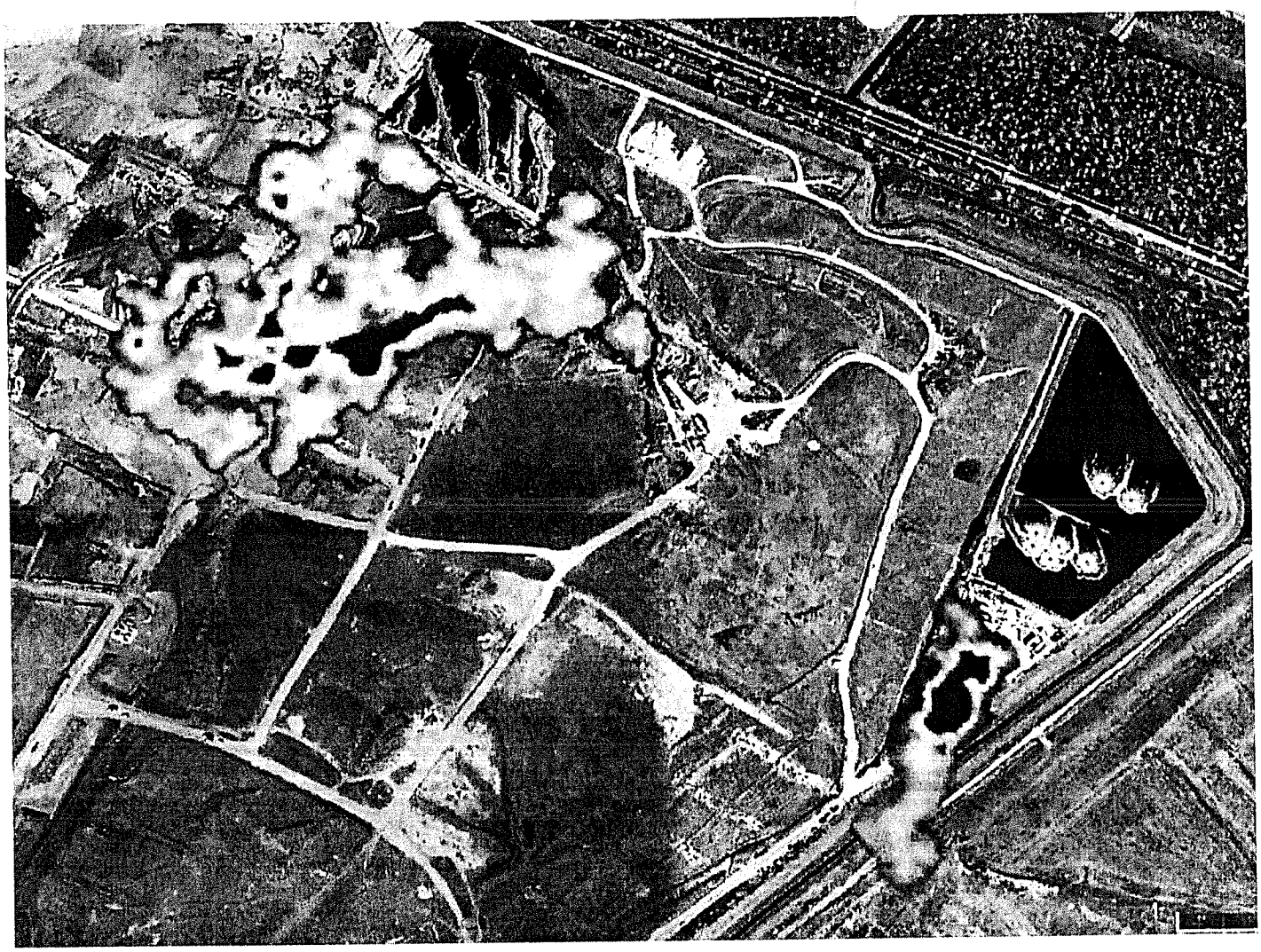
More Than Half of U.S. Landfills May Be Methane 'Super-Emitters,' Study Finds

Aerial observations of hundreds of large landfills across 18 states found they are leaking 40 percent more methane than is reported to the EPA

Will Sullivan

Daily Correspondent

April 3, 2024

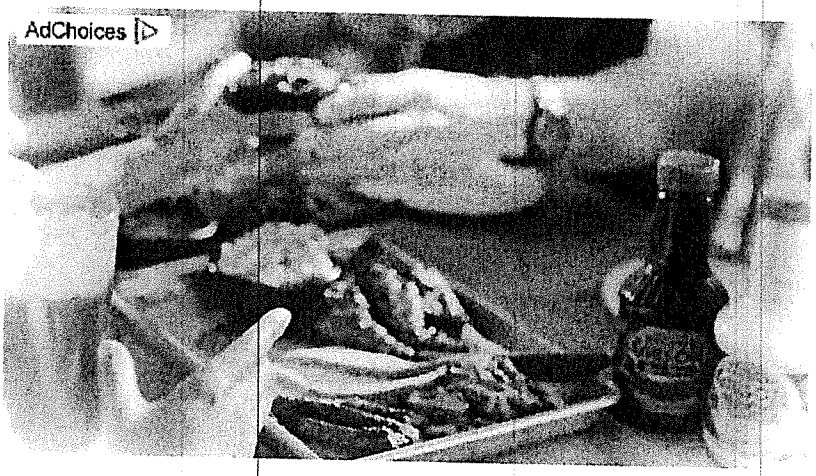


Methane plumes observed at a Louisiana landfill during the study. More than 14 percent of U.S. methane emissions were reported to have come from landfills in 2021. Arizona State University

Landfills in the United States are larger sources of methane than previously thought —according to a new study, more than half of these facilities are methane "super-emitters," releasing more than 100 kilograms of the potent greenhouse gas each hour.

Researchers used aircraft to conduct a survey of methane emissions from hundreds of large landfills across the country. They found that on average, emission rates were 1.4 times higher than what has been recorded in the Environmental Protection Agency's Greenhouse Gas Reporting Program, according to a statement from Arizona State University (ASU), a collaborator in the research.

AdChoices



The findings demonstrate that climate change mitigation policies need to include improved monitoring of landfill emissions, the researchers wrote last week in the journal *Science*.

"Airborne data such as these verify what we've been seeing on the ground for decades," Rob Jackson, an environmental scientist at Stanford University who did not contribute to the findings, tells CNN's Rachel Ramirez.

In 2018, Americans sent around 146.1 million tons of waste to landfills, according to the EPA. As organic material in landfills decomposes, it releases gas, and around half of that is methane.

A powerful greenhouse gas, methane traps 80 times as much heat as carbon dioxide does in a 20-year period. It's also hazardous to breathe—exposure to methane causes an estimated one million premature deaths each year, according to the United Nations Environment Program. But compared to carbon dioxide, methane is shorter-lived in the atmosphere—so cutting methane emissions can provide a quicker way to slow climate change.

"Addressing these high emission sources and mitigating persistent landfill sources offers a strong potential for climate benefit," study lead author Dan Cusworth, a

climate scientist with the nonprofit Carbon Mapper, says in the statement. "The ability to precisely identify leaks is an efficient way to make quick progress on methane reduction at landfills, which could be critical for slowing global warming."

A view from the aircraft during an aerial survey of methane emissions from U.S. landfills. Arizona State University

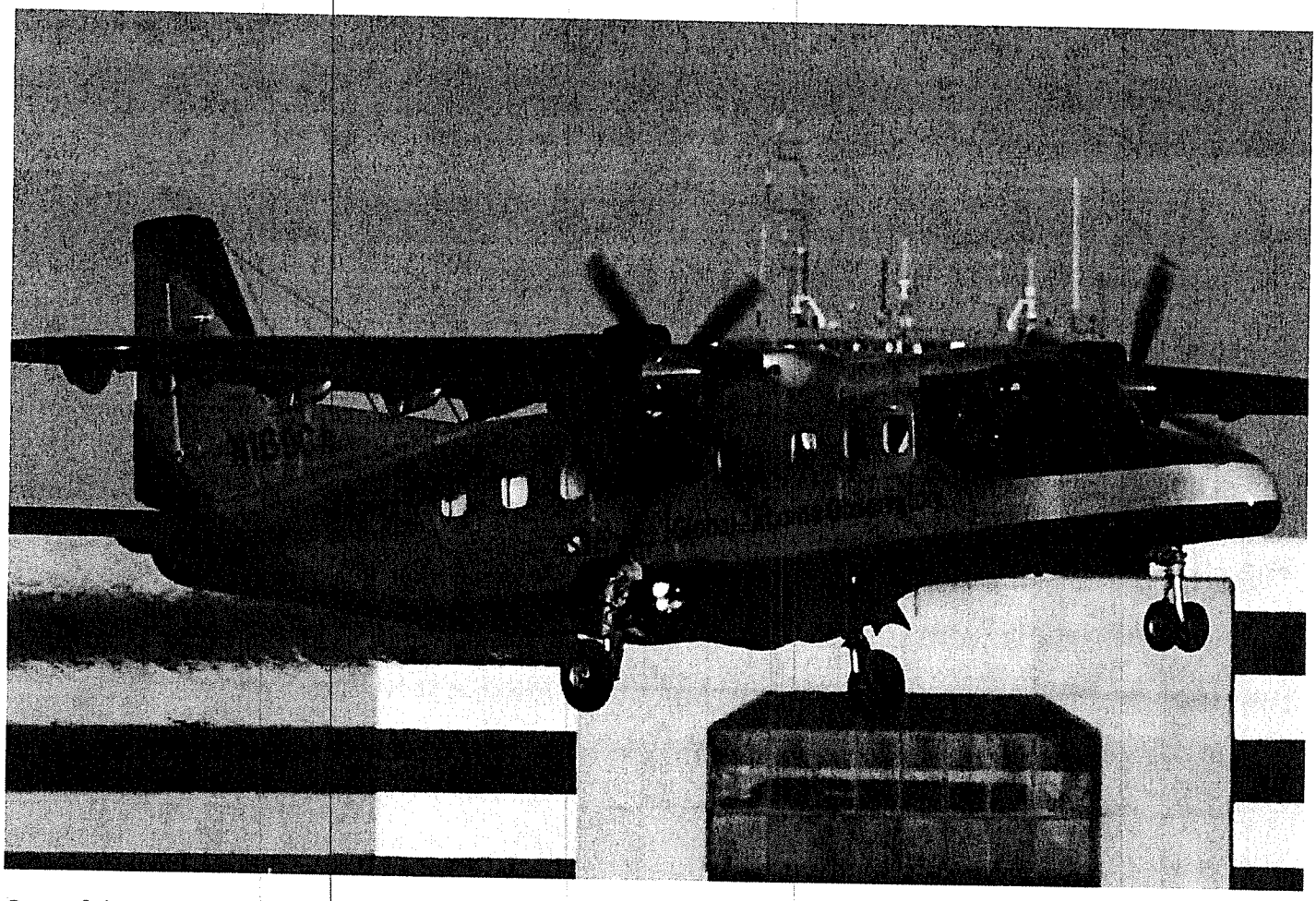
An estimated 50 to 65 percent of global methane emissions come from human activities, per the EPA. And landfill emissions are the third-largest source of human-generated methane in the U.S., accounting for more than 14 percent of this pollution in 2021.

But Cusworth tells *Business Insider*'s Catherine Boudreau that these estimates are based on computer models rather than observations. Facilities are required to

perform surveys on the ground four times per year, but Cusworth tells *Grist*'s Sachi Kitajima Mulkey that such surveys aren't as frequent or precise as they need to be.

"Those types of measurements really are not designed to do anything in terms of emissions," and are just for detecting methane "hotspots," Cusworth says to CNN.

For the new study, the researchers made observations across 18 states from two aircraft, measuring methane leaks using imaging spectrometers. Between 2016 and 2022, they studied 20 percent of the country's approximately 1,200 total open landfills. The effort was the most comprehensive study to-date of point sources of methane emissions from the waste sector, the authors write.



One of the two aircraft that used Earth-mapping technology to measure emissions in the study. Arizona State University

They found that 52 percent of the sites had significant, or "super-emitting," point source emissions of methane, and when they returned weeks and months later, they found emissions persisting at many landfills. Plumes continued for months or years at 60 percent of emitting sites, per the statement.

The researchers also found plenty of hotspots leaking more than the Clean Air Act's limit of 500 parts per million, per *Grist*.

Overall, the emissions detected in the study far outweighed those reported to the EPA—exceeding reported levels by 40 percent on average.

The findings point to the need for more comprehensive monitoring of emissions, per the statement. Remote sensing from satellites, aircraft and drones can better measure emissions from landfills. And recent innovations in methane valve caps and leak sensors can help reduce emissions at their source, writes *Grist*.

"In the waste sector, specifically, we know what technologies to implement—we've known for a number of years. They're feasible, readily available, and a number of them are actually quite cost effective," Kait Siegel, who is the waste sector manager for the methane pollution team at the Clean Air Task Force and was not involved in the study, tells *Grist*. "We need to have regulations in place."

The Environmental Defense Fund launched a satellite on March 4 to measure methane emissions from the oil and gas sector. Carbon Mapper is also working with the NASA Jet Propulsion Laboratory to launch additional satellites that will track carbon dioxide and methane from oil and gas sites and landfills, per *Business Insider*.

Get the latest stories in your inbox every weekday.

Email Address

SIGN UP

Will Sullivan 𝕏

Will Sullivan is a science writer based in Washington, D.C. His work has appeared in *Inside Science* and *NOVA Next*.

Filed Under: Airplanes, Climate Change, Environment, Global Warming, New Research, Pollution, Satellites, Technology

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
2024 JUN -7 AM 11:15
CHIEF CLERKS OFFICE

Brandt C. Mannchen
4300 Dunlavy St. Apt. 3138
Houston, TX 77006-5407

GREENPEACE

9589 0710 5270 1197 5811 33

Retail

UNITED STATES POSTAL SERVICE

78711

RDC 99

Office of Chief Clerk
MC 105
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
2011 JUN -7 PM 4:17
CHIEF CLERKS OFFICE

RECEIVED
JUN 07 2011
TCEQ MAIL CENTER

MSW
117709
21 DEC 29 AM 9:40
CHIEF CLERKS OFFICE
REVIEWED
DEC 29 2021
By GCW

December 27, 2021

Office of Chief Clerk
MC 105
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

Dear Chief Clerk of the Texas Commission on Environmental Quality,

The Houston Regional Group and Lone Star Chapter of the Sierra Club (Sierra Club) provide comments and request that the Texas Commission on Environmental Quality (TCEQ) amend Permit #2406 (635-acre Peach Creek Landfill (PCL)) to include how this proposed facility will be accessed by garbage trucks and other vehicles, address all environmental issues, and conduct a contested case hearing.

This letter provides to TCEQ comments about the October 28, 2021 response to TCEQ supplemental information request that was made by PC-II, LLC (300 Concourse Blvd. Suite 101, Ridgeland, Mississippi 39157), Peach Creek Environmental Park, for Permit No. 2406.

1. **October 28, 2021 letter from PC-II to TCEQ, TCEQ Comments and Responses,** TCEQ states that PC-II should remove language in Sections 8.20 and 8.21 about Class I industrial waste since this waste will not be accepted at the PCL.

It is important to note that PC-II can seek an amendment to accept Class I industrial waste in the future. This is not a dead issue. The public requires a statement which says that the PCL will never accept Class I industrial waste as long as PCL is in operation and afterward when it is decommissioned.

2. **Section 2.2.2.6 Special Waste, Page 5 and 8.21 Empty Containers, Page IV-36,** PC-II refers to asbestos containing materials (RACM) that may be stored at the PCL, empty containers of pesticides, herbicides, fungicides, and rodenticides, and other special wastes not named.

With reference to pesticide containers, it's stated that they must be "triple-rinsed prior to receipt". TCEQ should require that PC-II state how it will check, monitor, and audit these containers to make sure they have been triple-washed.

In addition, "empty containers" is not defined. If washing does not get all pesticide residues from the container, then there will be a greater risk of harmful contamination of leachate, water run-off, soil, and air. TCEQ should require that PC-II state how it will check, monitor, and audit that the 1,500-ppm petroleum hydrocarbon waste limit is not exceeded.

TCEQ should require that PC-II state how it will dispose of material acquired either accidentally or on purpose which PCL cannot legally dispose of.

When PC-II states that facilities for large item storage, reusable materials staging, citizen's convenience center, used/scrap tire storage, and wood waste processing will "move as the landfill is developed", TCEQ should require that PC-II state and show on maps where these areas will not be allowed on the landfill property and why they should not be allowed in certain areas.

3. **2.3 Easements and Buffer Zones, 2.3.1 Easement Protection, Page 6,** TCEQ should require that PC-II explain about the access easement that it has that goes through Wood Duck Farms property and thus exposes this farm to potential contamination via spills, releases, accidents, incidents, and events.

TCEQ should require that PC-II have a buffer of at least 25 feet from the utility and pipeline easement boundary and not allow waste disposal right up to easement boundaries.

4. **2.3 Easements and Buffer Zones, 2.3.2 Buffer Zones, Page 6,** TCEQ should require that PC-II have a 125-foot buffer zone between the permit boundary and where the solid waste footprint. This ensures that spillover and run-off from the landfill will not leave the property.

5. **Permit Condition Summary, Page A-2,** TCEQ should require that PC-II state what is the maximum landfill storage site footprint in acres and cubic feet or tons so the public knows the ultimate capacity of PCL and what the resulting environmental impacts may be. TCEQ should require that all Phases and their environmental impacts are analyzed and presented to the public for review and comment about cumulative impacts.

6. **Material Along the Route to the Site, Page IV-28,** TCEQ should require PC-II to have enclosed vehicles, and not just say, "will take steps to encourage that vehicles hauling waste to the site are enclosed or provided with a tarpaulin to ensure that debris, flying trash, and other waste is not deposited either outside or inside the PCL". Surcharges are not sufficient as a deterrent to violations.

TCEQ should require that PC-II turn away any vehicle hauling waste if it is not enclosed or is not using a tarpaulin to "properly secure the load".

TCEQ should require that PC-II to report offenders, not just "may report habitual offenders", so that this unacceptable waste practice is caught as quickly as possible.

7. **8.9 Disposal of Large Items, Pages IV-28 and 29,** TCEQ should require PC-II to dismantle large items so they can be disposed of in the PCL without causing potential sources of surface or subsurface disruption of the landfill.

TCEQ should require that PC-II recycle items within 60 days and not 180 days. This allows too much time for storage of these items and thus increases the possible risk of discharge of fluids or creation of vector problems.

TCEQ should require that PC-II clearly state what equipment it will use, procedures it will use, maintenance will be required, to remove and dispose of CFCs at the PCL.

8. **8.10 Odor Management Controls, Page IV-28,** TCEQ should require that PC-II "will include" not "may include" measures to control odors and sources of odors. Do not give PC-II the discretion to mitigate odors, or this will provide an incentive to do little or nothing to prevent odors.

TCEQ should require that PC II define "significant odors" and then should ensure that the definition is adequate to stop odor problems at PCL.

TCEQ should require that PC-II use a daily cover of 1 foot of soil which is compacted and not 6 inches of soil that is not compacted to reduce rainfall infiltration and vector problems.

TCEQ should require that PC-II state what happens to gas extracted via wells within or external to the landfill footprint. There is a need for methane and toxic gas monitoring and control equipment capture, treatment, and destruction of these air pollutants.

9. **8.11 Disease Vector Control, Page IV-29,** TCEQ should require that PC-II conduct an active feral hog removal program, via corrals, shooting, and traps on PCL to ensure that wallowing, rooting, and other surface disturbance of the landfill does not occur.

See the Sierra Club August 1, 2021 email sent to TCEQ with the article, "Sanitary Waste Landfill Effects on an Invasive wild Pig Population", The Journal of Wildlife Management, 2021, for more details about how destructive feral hogs can be at a landfill.

The TCEQ should require that PC-II should contact adjacent and nearby property owners (including Sam Houston National Forest – SHNF) about an area/regional feral hog control program.

TCEQ should require that PC-II begin to remediate areas that have been affected or may be conducive to feral hogs within 24 hours of being found. "Promptly addressed" does not soon enough take care of this serious problem.

10. **8.12 Site Access Road, Pages IV-29 and 30,** TCEQ should require that PC-II not just "routinely inspect the site" during wet weather but should do so every hour and ensure mud and dirt has been scraped off the road.

TCEQ should require that PC-II remove tracked mud and associated debris from public roadways within 2 miles not once/day but at least three times/day to keep the roads safe and clean.

TCEQ should require that PC-II not just conduct "periodic spraying" of water on landfill entrance and perimeter roads but should do so at least once/hour to reduce dust.

TCEQ should require that PC-II grade roads at least three times/week, and not once/week, to ensure that nuisance mud and dust are reduced as much as possible.

TCEQ should require that PC-II control dust on stockpiles of crushed stone, concrete rubble, masonry demolition debris, or other similar material that is used for roads or other purposes at PCL to ensure that nuisance dust is reduced as much as possible.

TCEQ should require that PC-II state clearly what dust reduction controls will be used, how often, and the appropriate maintenance to ensure they are kept in good working condition.

11. **8.13 Salvaging and Scavenging, Page IV-30,** TCEQ should require that PC-II state what "excessive accumulation of material" is and that the 180-day storage period be reduced to 30-day storage to ensure that the risk of spills, etc., be reduced as much as possible.

12. **8.14 Endangered Species Protection, Page IV-30,** TCEQ should require that PC-II change its biological assessment because it is incorrect that "no area on or near the proposed landfill site" has been designated as critical habitat.

Within about a quarter to half-a-mile or less, Compartments 121, 122, 123, and 124 in SHNF exist and are designated as habitat for the endangered Red-cockaded Woodpecker.

13. **8.15 Landfill Gas Control, Page IV-30,** TCEQ should require that PC-II keep gas monitoring records for the life of PCL and afterward when it is decommissioned due to the risk that groundwater may be contaminated and not discovered during the life of the landfill or may occur after the landfill shuts down.

14. **8.16 Oil, Gas, and Water Wells, 8.16.1 Water Wells, and 8.16.2 Oil and Gas Well, Pages IV-31 and 32,** TCEQ should require that PC-II test for methane in the landfill, water from the landfill, and PCL site at least twice/month. A methane reduction plan should be required for climate change mitigation.

TCEQ should require that PC-II conduct a thorough, on-the-ground and below-the-ground search for all abandoned wells and ensure with documentation that wells are capped and

plugged and not assume that they are. The public should be told now if there are abandoned wells and this discovery should not be delayed until Phase I work is done.

TCEQ should require that PC-II be onsite and verify with TCEQ that all wells discovered have been properly capped, plugged, and closed.

15. **8.17, Compaction, Page IV-32,** TCEQ should require that PC-II clearly explain whether 40,000 pounds from a landfill compactor is comparable to a bulldozer that compacts waste. If it is not, then PC-II should ensure a comparable force be placed on the ground when cover is placed and compacted.

TCEQ should require that large bulky items be dismantled so they do not cause potential disruption of soil surface and subsurface compaction and retention capabilities.

16. **8.18, Landfill Cover, 8.18.1 Soil Management, Pages IV-32,** TCEQ should require that PC-II have stockpiled material that is of similar permeabilities and porosities. A sandy soil taken from on the PCL site will not have the compaction capability as a clay soil when serving as six inches of cover. Therefore, it will not have the same protection ability for the prevention of rain infiltration and vector prevention.

19. **8.18.2 Daily Cover, Page IV-33,** TCEQ should require that PC-II document where "The daily cover will be sloped to drain" and require records and reports about inspection for vector control and compaction of daily cover. The soil used for daily cover should be clay to retard or stop water from soaking into the landfill. PC-II defeats this compaction protection each day when TCEQ allows it to be stripped off "prior to additional waste placement and used as daily cover".

TCEQ should stop PC-II from doing this or it allows the disturbance of impermeable cover and thus encourages the landfill to fill-up with water like a bathtub.

20. **8.18.3, Intermediate Cover, Page IV-33,** TCEQ should require that PC-II only be allowed 30 days of inactivity, rather than 180 days, before cover of compacted material is required of at least 12 inches. This ensures that rain infiltration will be prevented and good vector control.

21. **8.18.4 Alternative Daily Cover, Pages IV-33 and IV-34,** TCEQ should require that PC-II reveal what alternative daily cover is being considered so the public can comment on the appropriateness of this action.

TCEQ should require that PC-II state what chemicals it is considering to spray-apply as alternative daily cover, what the health effects are, what the environmental effects are, and what the chemical properties and effects are so the public can comment on the appropriateness of this action.

22. **8.18.5 Temporary Waiver, Page IV-34,** TCEQ should not grant PC-II any temporary waiver "due to extreme seasonal climatic conditions". This is a loophole which allows pollution with no consequences and encourages PC-II to create excuses about climatic conditions so it will not have to be responsible for its' actions.

TCEQ should require PC-II to plan for climate change, more storms, great intensity of storms, and how this will effect normal operation of PCL.

23. **8.18.6 Final Cover, Page IV-34,** TCEQ should require that PC-II manage surface water at PCL for as long as the landfill exists as either active or inactive. "In perpetuity protection" of PCL is needed and should be the responsibility of PC-II and its human owners.

TCEQ should require not only that it be notified when final cover placement is done but should be onsite when it is done to monitor and ensure its' correct placement.

24. **8.18.7 Cover Erosion, Page IV-34 and 35,** TCEQ should require that PC-II manage surface water at PCL for as long as the landfill exists as either active or inactive. "In perpetuity protection" of PCL is needed and should be the responsibility of PC-II and its human owners.

TCEQ should require that PC-II begin repair of final cover problems within 24 hours and repair them within 3 days.

25. **8.18.8 Cover Inspection record, Page IV-35,** TCEQ should require that PC-II have a copy of all cover inspection records onsite and online so the public has access to them.

26. **8.19 Ponded Water, Page IV-35,** TCEQ should require that PC-II state how its' site operations will minimize ponding water and what the operational requirements are that will ensure this occurs.

TCEQ should require that PC-II begin to fill depressions within 24 hours and fill them in within 3 days.

TCEQ should require PC-II to document how it will determine if ponded water has come into contact with waste or waste contaminated soils.

27. **8.20 Disposal of Special Wastes, Pages IV-35 and 36,** TCEQ should require that PC-II will never store Class I industrial waste in PCL at any time.

28. **8.23 Leachate and Gas Condensate Recirculation, Page IV-37,** TCEQ should require that PC-II monitor leachate and gas via cameras, sensors, and the most up-to-

date technology. The requirements for monitoring should be updated every 3 years to take into account the latest technological innovation.

TCEQ should require PC-II state how it will determine intermediate cover soils are not saturated and define what "significant accumulations of leachate in any one area" are.

29. **8.25 Storage and Processing Unit Operations, 8.25.1 Large Item Storage Area, Pages IV-37 and 38,** TCEQ should require PC-II not to store items for 180 days. TCEQ should require that PC-II store items for no more than 30 days to reduce contamination and vector risk.

TCEQ should require that PC-II keep containers covered with tarps at all times because rainfall events can occur with great intensity at any time and this can lead to water contamination.

30. **8.25.2 Reusable Materials Staging Area, Page IV-38,** TCEQ should require that PC-II limit the amount of reusable materials from the current allowable quantity. Currently, TCEQ allows an intake of 250 tons of inert materials/day which is 500,000 pounds and a maximum of 2,000 tons stored at one time which is 4 million pounds.

TCEQ also allows 50 tons/day of non-inert materials/day which is 100,000 pounds and a maximum storage of 500 tons which is 1 million pounds.

To reduce potential sediment and siltation outflows and oil discharge TCEQ should reduce these figures by one-half.

31. **8.25.3 Citizen's Convenience Center, Pages IV-38 and 39,** TCEQ should require PC-II have containers covered with tarps at all times when they are not being actively used to reduce rainfall contaminated water and vector issues.

32. **8.25.4, Use/Scrap Tire Storage Area, Page IV-39,** TCEQ should require that PC-II keep fewer tires at PCL. There is a contradiction currently between tire pieces in excess of 500 used/scrap tires (total number of pieces is not limited) and 2,000 used/scrap tires in enclosed and lockable containers.

All tires should be lock up and drained so there is little chance of mosquito breeding or other vector use. There should be a vector reduction plan for tire storage to ensure that this problem does not occur or increase.

33. **8.25.5 Wood Waste Processing Area, IV-39,** TCEQ should require PC-II to receive only a certain amount of wood waste and not use the term approximately.

Use of the term approximately for three tons of material/day for processing; maximum amount of 100 tons/stored at one time; and wood waste processing area size of 50 by 100 feet injects legal and administrative uncertainty into the inspection, enforcement, and compliance process. This makes it more difficult for inspectors to determine whether PC-II is in compliance with its' permit.

TCEQ should require that PC-II have 30 days to store wood waste before it is processed instead of 60 days to ensure that vector proliferation is not enhanced by this longer time.

34. **8.25.6 Storage Facility, Page IV-40,** TCEQ should require that PC-II reduce its maximum amount of leachate storage from 500,000 gallons to 100,000 gallons and reduce the time leachate is stored from 12 months to 30 days.

This reduces the possibility of leachate leaks and spills and makes the point that leachate is a toxic product that should not be stored for long periods of time and should be treated and disposed of as soon as possible.

35. **8.25.7 Truck Wheel wash, Page IV-40,** TCEQ should require that PC-II reduce the amount of time it stores sediment from 90 days to 30 days. This ensures that this pollutant is not allowed to build-up and create a condition where its' release will cause a significant pollution event.

36. **3.1 Perimeter Monitoring, 3.1.1 Perimeter Monitoring Network and 3.1.2 Landfill Gas Monitoring Probes, Page G-5,** TCEQ should require PC-II have a gas removal, treatment, and destruction control system to ensure that methane is not released or is released in very minor quantities to reduce explosion potential, toxic gas health effects, and greenhouse gas air pollution.

The Sierra Club doubts the ability of a gas monitoring probe to "monitor the soil strata above the lowest planned future elevation of waste within 1,000 feet of the probe".

The Sierra Club supports a 100-foot placement of probes and not a 600-foot placement of probes to ensure that accurate gas monitoring occurs.

Gas monitoring should be done for toxic air pollutants and methane and gas should not be vented unless it is first treated by a control device. A catalytic incinerator or condensing unit can be used to reduce volatile hydrocarbon air pollution. Venting of air pollutants should not be allowed without first ducting the air pollutants through a working air pollution control device.

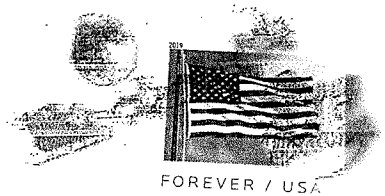
The Sierra Club appreciates this opportunity to comment. Please keep the Sierra Club informed about the status of this proposal. Thank you.

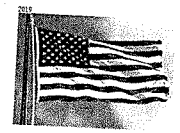
Sincerely,

Brandt Mannchen
Forest Management Issue Chair
Lone Star Chapter of the Sierra Club
Chair, Forestry Subcommittee
Houston Regional Group of the Sierra Club
20923 Kings Clover Court
Humble, Texas 77346
281-570-7212
brandt_mannchen@comcast.net

Brandt Mannchen
20923 Kings Clover Ct.
Humble, TX 77346-1326

NORTH HOUSTON TX 773
27 DEC 2021 PM 4 L





RECEIVED
DEC 28 2021
TCEQ MAIL CENTER
DA

Office of Chief Clerk
MC 105
Texas Commission on Environmental Quality
P. O. Box 13087
Austin, Texas 78711-3087

78711-308787

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Tuesday, December 28, 2021 9:32 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Additional Sierra Club Comments on Proposed Peach Creek Landfill Permit #2406
Attachments: Landfill SHNF TCEQ Comments III 2021.docx

H

From: CHIEFCLK <chiefclk@tceq.texas.gov>
Sent: Monday, December 27, 2021 4:44 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: FW: Additional Sierra Club Comments on Proposed Peach Creek Landfill Permit #2406

From: Brandt Mannchen <brandt_mannchen@comcast.net>
Sent: Monday, December 27, 2021 11:13 AM
To: CHIEFCLK <chiefclk@tceq.texas.gov>
Cc: Brandt Mannchen <brandt_mannchen@comcast.net>
Subject: Additional Sierra Club Comments on Proposed Peach Creek Landfill Permit #2406

Dear TCEQ,

I have submitted these additional Sierra Club comments about the proposed Peach Creek Landfill Permit #2406 via the www14.teceq.gexas.gov website but wanted to also send them to you via this email to make sure you got them. I also will mail you a hard copy so you have my signature.

Hope you have a great New Year's!

Brandt Mannchen
Lone Star Chapter of the Sierra Club
20923 Kings Clover Court
Humble, Texas 77346
281-570-7212
brandt_mannchen@comcast.net

December 27, 2021

Office of Chief Clerk
MC 105
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

Dear Chief Clerk of the Texas Commission on Environmental Quality,

The Houston Regional Group and Lone Star Chapter of the Sierra Club (Sierra Club) provide comments and request that the Texas Commission on Environmental Quality (TCEQ) amend Permit #2406 (635-acre Peach Creek Landfill (PCL)) to include how this proposed facility will be accessed by garbage trucks and other vehicles, address all environmental issues, and conduct a contested case hearing.

This letter provides to TCEQ comments about the October 28, 2021 response to TCEQ supplemental information request that was made by PC-II, LLC (300 Concourse Blvd. Suite 101, Ridgeland, Mississippi 39157), Peach Creek Environmental Park, for Permit No. 2406.

1. **October 28, 2021 letter from PC-II to TCEQ, TCEQ Comments and Responses,** TCEQ states that PC-II should remove language in Sections 8.20 and 8.21 about Class I industrial waste since this waste will not be accepted at the PCL.

It is important to note that PC-II can seek an amendment to accept Class I industrial waste in the future. This is not a dead issue. The public requires a statement which says that the PCL will never accept Class I industrial waste as long as PCL is in operation and afterward when it is decommissioned.

2. **Section 2.2.2.6 Special Waste, Page 5 and 8.21 Empty Containers, Page IV-36,** PC-II refers to asbestos containing materials (RACM) that may be stored at the PCL, empty containers of pesticides, herbicides, fungicides, and rodenticides, and other special wastes not named.

With reference to pesticide containers, it's stated that they must be "triple-rinsed prior to receipt". TCEQ should require that PC-II state how it will check, monitor, and audit these containers to make sure they have been triple-washed.

In addition, "empty containers" is not defined. If washing does not get all pesticide residues from the container, then there will be a greater risk of harmful contamination of leachate, water run-off, soil, and air. TCEQ should require that PC-II state how it will check, monitor, and audit that the 1,500-ppm petroleum hydrocarbon waste limit is not exceeded.

TCEQ should require that PC-II state how it will dispose of material acquired either accidentally or on purpose which PCL cannot legally dispose of.

When PC-II states that facilities for large item storage, reusable materials staging, citizen's convenience center, used/scrap tire storage, and wood waste processing will "move as the landfill is developed", TCEQ should require that PC-II state and show on maps where these areas will not be allowed on the landfill property and why they should not be allowed in certain areas.

3. **2.3 Easements and Buffer Zones, 2.3.1 Easement Protection, Page 6,** TCEQ should require that PC-II explain about the access easement that it has that goes through Wood Duck Farms property and thus exposes this farm to potential contamination via spills, releases, accidents, incidents, and events.

TCEQ should require that PC-II have a buffer of at least 25 feet from the utility and pipeline easement boundary and not allow waste disposal right up to easement boundaries.

4. **2.3 Easements and Buffer Zones, 2.3.2 Buffer Zones, Page 6,** TCEQ should require that PC-II have a 125-foot buffer zone between the permit boundary and where the solid waste footprint. This ensures that spillover and run-off from the landfill will not leave the property.

5. **Permit Condition Summary, Page A-2,** TCEQ should require that PC-II state what is the maximum landfill storage site footprint in acres and cubic feet or tons so the public knows the ultimate capacity of PCL and what the resulting environmental impacts may be. TCEQ should require that all Phases and their environmental impacts are analyzed and presented to the public for review and comment about cumulative impacts.

6. **Material Along the Route to the Site, Page IV-28,** TCEQ should require PC-II to have enclosed vehicles, and not just say, "will take steps to encourage that vehicles hauling waste to the site are enclosed or provided with a tarpaulin to ensure that debris, flying trash, and other waste is not deposited either outside or inside the PCL". Surcharges are not sufficient as a deterrent to violations.

TCEQ should require that PC-II turn away any vehicle hauling waste if it is not enclosed or is not using a tarpaulin to "properly secure the load".

TCEQ should require that PC-II to report offenders, not just "may report habitual offenders", so that this unacceptable waste practice is caught as quickly as possible.

7. **8.9 Disposal of Large Items, Pages IV-28 and 29,** TCEQ should require PC-II to dismantle large items so they can be disposed of in the PCL without causing potential sources of surface or subsurface disruption of the landfill.

TCEQ should require that PC-II recycle items within 60 days and not 180 days. This allows too much time for storage of these items and thus increases the possible risk of discharge of fluids or creation of vector problems.

TCEQ should require that PC-II clearly state what equipment it will use, procedures it will use, maintenance will be required, to remove and dispose of CFCs at the PCL.

8. **8.10 Odor Management Controls, Page IV-28,** TCEQ should require that PC-II "will include" not "may include" measures to control odors and sources of odors. Do not give PC-II the discretion to mitigate odors, or this will provide an incentive to do little or nothing to prevent odors.

TCEQ should require that PC II define "significant odors" and then should ensure that the definition is adequate to stop odor problems at PCL.

TCEQ should require that PC-II use a daily cover of 1 foot of soil which is compacted and not 6 inches of soil that is not compacted to reduce rainfall infiltration and vector problems.

TCEQ should require that PC-II state what happens to gas extracted via wells within or external to the landfill footprint. There is a need for methane and toxic gas monitoring and control equipment capture, treatment, and destruction of these air pollutants.

9. **8.11 Disease Vector Control, Page IV-29,** TCEQ should require that PC-II conduct an active feral hog removal program, via corrals, shooting, and traps on PCL to ensure that wallowing, rooting, and other surface disturbance of the landfill does not occur.

See the Sierra Club August 1, 2021 email sent to TCEQ with the article, "Sanitary Waste Landfill Effects on an Invasive wild Pig Population", The Journal of Wildlife Management, 2021, for more details about how destructive feral hogs can be at a landfill.

The TCEQ should require that PC-II should contact adjacent and nearby property owners (including Sam Houston National Forest – SHNF) about an area/regional feral hog control program.

TCEQ should require that PC-II begin to remediate areas that have been affected or may be conducive to feral hogs within 24 hours of being found. "Promptly addressed" does not soon enough take care of this serious problem.

10. **8.12 Site Access Road, Pages IV-29 and 30,** TCEQ should require that PC-II not just "routinely inspect the site" during wet weather but should do so every hour and ensure mud and dirt has been scraped off the road.

TCEQ should require that PC-II remove tracked mud and associated debris from public roadways within 2 miles not once/day but at least three times/day to keep the roads safe and clean.

TCEQ should require that PC-II not just conduct "periodic spraying" of water on landfill entrance and perimeter roads but should do so at least once/hour to reduce dust.

TCEQ should require that PC-II grade roads at least three times/week, and not once/week, to ensure that nuisance mud and dust are reduced as much as possible.

TCEQ should require that PC-II control dust on stockpiles of crushed stone, concrete rubble, masonry demolition debris, or other similar material that is used for roads or other purposes at PCL to ensure that nuisance dust is reduced as much as possible.

TCEQ should require that PC-II state clearly what dust reduction controls will be used, how often, and the appropriate maintenance to ensure they are kept in good working condition.

11. **8.13 Salvaging and Scavenging, Page IV-30,** TCEQ should require that PC-II state what "excessive accumulation of material" is and that the 180-day storage period be reduced to 30-day storage to ensure that the risk of spills, etc., be reduced as much as possible.

12. **8.14 Endangered Species Protection, Page IV-30,** TCEQ should require that PC-II change its biological assessment because it is incorrect that "no area on or near the proposed landfill site" has been designated as critical habitat.

Within about a quarter to half-a-mile or less, Compartments 121, 122, 123, and 124 in SHNF exist and are designated as habitat for the endangered Red-cockaded Woodpecker.

13. **8.15 Landfill Gas Control, Page IV-30,** TCEQ should require that PC-II keep gas monitoring records for the life of PCL and afterward when it is decommissioned due to the risk that groundwater may be contaminated and not discovered during the life of the landfill or may occur after the landfill shuts down.

14. **8.16 Oil, Gas, and Water Wells, 8.16.1 Water Wells, and 8.16.2 Oil and Gas Well, Pages IV-31 and 32,** TCEQ should require that PC-II test for methane in the landfill, water from the landfill, and PCL site at least twice/month. A methane reduction plan should be required for climate change mitigation.

TCEQ should require that PC-II conduct a thorough, on-the-ground and below-the-ground search for all abandoned wells and ensure with documentation that wells are capped and

plugged and not assume that they are. The public should be told now if there are abandoned wells and this discovery should not be delayed until Phase I work is done.

TCEQ should require that PC-II be onsite and verify with TCEQ that all wells discovered have been properly capped, plugged, and closed.

15. **8.17, Compaction, Page IV-32,** TCEQ should require that PC-II clearly explain whether 40,000 pounds from a landfill compactor is comparable to a bulldozer that compacts waste. If it is not, then PC-II should ensure a comparable force be placed on the ground when cover is placed and compacted.

TCEQ should require that large bulky items be dismantled so they do not cause potential disruption of soil surface and subsurface compaction and retention capabilities.

16. **8.18, Landfill Cover, 8.18.1 Soil Management, Pages IV-32,** TCEQ should require that PC-II have stockpiled material that is of similar permeabilities and porosities. A sandy soil taken from on the PCL site will not have the compaction capability as a clay soil when serving as six inches of cover. Therefore, it will not have the same protection ability for the prevention of rain infiltration and vector prevention.

19. **8.18.2 Daily Cover, Page IV-33,** TCEQ should require that PC-II document where "The daily cover will be sloped to drain" and require records and reports about inspection for vector control and compaction of daily cover. The soil used for daily cover should be clay to retard or stop water from soaking into the landfill. PC-II defeats this compaction protection each day when TCEQ allows it to be stripped off "prior to additional waste placement and used as daily cover".

TCEQ should stop PC-II from doing this or it allows the disturbance of impermeable cover and thus encourages the landfill to fill-up with water like a bathtub.

20. **8.18.3, Intermediate Cover, Page IV-33,** TCEQ should require that PC-II only be allowed 30 days of inactivity, rather than 180 days, before cover of compacted material is required of at least 12 inches. This ensures that rain infiltration will be prevented and good vector control.

21. **8.18.4 Alternative Daily Cover, Pages IV-33 and IV-34,** TCEQ should require that PC-II reveal what alternative daily cover is being considered so the public can comment on the appropriateness of this action.

TCEQ should require that PC-II state what chemicals it is considering to spray-apply as alternative daily cover, what the health effects are, what the environmental effects are, and what the chemical properties and effects are so the public can comment on the appropriateness of this action.

22. **8.18.5 Temporary Waiver, Page IV-34,** TCEQ should not grant PC-II any temporary waiver "due to extreme seasonal climatic conditions". This is a loophole which allows pollution with no consequences and encourages PC-II to create excuses about climatic conditions so it will not have to be responsible for its' actions.

TCEQ should require PC-II to plan for climate change, more storms, great intensity of storms, and how this will effect normal operation of PCL.

23. **8.18.6 Final Cover, Page IV-34,** TCEQ should require that PC-II manage surface water at PCL for as long as the landfill exists as either active or inactive. "In perpetuity protection" of PCL is needed and should be the responsibility of PC-II and its human owners.

TCEQ should require not only that it be notified when final cover placement is done but should be onsite when it is done to monitor and ensure its' correct placement.

24. **8.18.7 Cover Erosion, Page IV-34 and 35,** TCEQ should require that PC-II manage surface water at PCL for as long as the landfill exists as either active or inactive. "In perpetuity protection" of PCL is needed and should be the responsibility of PC-II and its human owners.

TCEQ should require that PC-II begin repair of final cover problems within 24 hours and repair them within 3 days.

25. **8.18.8 Cover Inspection record, Page IV-35,** TCEQ should require that PC-II have a copy of all cover inspection records onsite and online so the public has access to them.

26. **8.19 Ponded Water, Page IV-35,** TCEQ should require that PC-II state how its' site operations will minimize ponding water and what the operational requirements are that will ensure this occurs.

TCEQ should require that PC-II begin to fill depressions within 24 hours and fill them in within 3 days.

TCEQ should require PC-II to document how it will determine if ponded water has come into contact with waste or waste contaminated soils.

27. **8.20 Disposal of Special Wastes, Pages IV-35 and 36,** TCEQ should require that PC-II will never store Class I industrial waste in PCL at any time.

28. **8.23 Leachate and Gas Condensate Recirculation, Page IV-37,** TCEQ should require that PC-II monitor leachate and gas via cameras, sensors, and the most up-to-

date technology. The requirements for monitoring should be updated every 3 years to take into account the latest technological innovation.

TCEQ should require PC-II state how it will determine intermediate cover soils are not saturated and define what "significant accumulations of leachate in any one area" are.

29. **8.25 Storage and Processing Unit Operations, 8.25.1 Large Item Storage Area, Pages IV-37 and 38,** TCEQ should require PC-II not to store items for 180 days. TCEQ should require that PC-II store items for no more than 30 days to reduce contamination and vector risk.

TCEQ should require that PC-II keep containers covered with tarps at all times because rainfall events can occur with great intensity at any time and this can lead to water contamination.

30. **8.25.2 Reusable Materials Staging Area, Page IV-38,** TCEQ should require that PC-II limit the amount of reusable materials from the current allowable quantity. Currently, TCEQ allows an intake of 250 tons of inert materials/day which is 500,000 pounds and a maximum of 2,000 tons stored at one time which is 4 million pounds.

TCEQ also allows 50 tons/day of non-inert materials/day which is 100,000 pounds and a maximum storage of 500 tons which is 1 million pounds.

To reduce potential sediment and siltation outflows and oil discharge TCEQ should reduce these figures by one-half.

31. **8.25.3 Citizen's Convenience Center, Pages IV-38 and 39,** TCEQ should require PC-II have containers covered with tarps at all times when they are not being actively used to reduce rainfall contaminated water and vector issues.

32. **8.25.4, Use/Scrap Tire Storage Area, Page IV-39,** TCEQ should require that PC-II keep fewer tires at PCL. There is a contradiction currently between tire pieces in excess of 500 used/scrap tires (total number of pieces is not limited) and 2,000 used/scrap tires in enclosed and lockable containers.

All tires should be lock up and drained so there is little chance of mosquito breeding or other vector use. There should be a vector reduction plan for tire storage to ensure that this problem does not occur or increase.

33. **8.25.5 Wood Waste Processing Area, IV-39,** TCEQ should require PC-II to receive only a certain amount of wood waste and not use the term approximately.

Use of the term approximately for three tons of material/day for processing; maximum amount of 100 tons/stored at one time; and wood waste processing area size of 50 by 100 feet injects legal and administrative uncertainty into the inspection, enforcement, and compliance process. This makes it more difficult for inspectors to determine whether PC-II is in compliance with its' permit.

TCEQ should require that PC-II have 30 days to store wood waste before it is processed instead of 60 days to ensure that vector proliferation is not enhanced by this longer time.

34. **8.25.6 Storage Facility, Page IV-40,** TCEQ should require that PC-II reduce its maximum amount of leachate storage from 500,000 gallons to 100,000 gallons and reduce the time leachate is stored from 12 months to 30 days.

This reduces the possibility of leachate leaks and spills and makes the point that leachate is a toxic product that should not be stored for long periods of time and should be treated and disposed of as soon as possible.

35. **8.25.7 Truck Wheel wash, Page IV-40,** TCEQ should require that PC-II reduce the amount of time it stores sediment from 90 days to 30 days. This ensures that this pollutant is not allowed to build-up and create a condition where its' release will cause a significant pollution event.

36. **3.1 Perimeter Monitoring, 3.1.1 Perimeter Monitoring Network and 3.1.2 Landfill Gas Monitoring Probes, Page G-5,** TCEQ should require PC-II have a gas removal, treatment, and destruction control system to ensure that methane is not released or is released in very minor quantities to reduce explosion potential, toxic gas health effects, and greenhouse gas air pollution.

The Sierra Club doubts the ability of a gas monitoring probe to "monitor the soil strata above the lowest planned future elevation of waste within 1,000 feet of the probe".

The Sierra Club supports a 100-foot placement of probes and not a 600-foot placement of probes to ensure that accurate gas monitoring occurs.

Gas monitoring should be done for toxic air pollutants and methane and gas should not be vented unless it is first treated by a control device. A catalytic incinerator or condensing unit can be used to reduce volatile hydrocarbon air pollution. Venting of air pollutants should not be allowed without first ducting the air pollutants through a working air pollution control device.

The Sierra Club appreciates this opportunity to comment. Please keep the Sierra Club informed about the status of this proposal. Thank you.

Sincerely,

Brandt Mannchen
Forest Management Issue Chair
Lone Star Chapter of the Sierra Club
Chair, Forestry Subcommittee
Houston Regional Group of the Sierra Club
20923 Kings Clover Court
Humble, Texas 77346
281-570-7212
brandt_mannchen@comcast.net

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Tuesday, January 4, 2022 9:51 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: 2nd Public Meeting Request, MSW application #2406

PM

From: CHIEFCLK <chiefclk@tceq.texas.gov>
Sent: Friday, December 31, 2021 1:39 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: FW: 2nd Public Meeting Request, MSW application #2406

From: van weldon <woodduckfarm@yahoo.com>
Sent: Friday, December 31, 2021 8:18 AM
To: CHIEFCLK <chiefclk@tceq.texas.gov>
Subject: 2nd Public Meeting Request, MSW application #2406

I request that the TCEQ Executive Director please grant a second public meeting for the 2406 MSW permit application. This application location is in San Jacinto County, cited by the San Jacinto County Commissioners Court as "being an economically disadvantaged area." It is estimated by a local church that as many as 820 families in the immediate neighborhood area are at or below the $32,000 federal poverty income level for a family of five.

For those that use a phone for Internet, service is sparse in this area partly due to the Sam Houston National Forest limiting electricity and cell phone towers. It is common for elderly people to sometimes find it challenging when using new "apps" with the internet, so an "in person" public meeting may well better serve their needs. The local paper that published the September 28th public meeting, the San Jacinto News-Times is located approximately 20 miles away from where the landfill is to be built and has no circulation in the area. Most of the SJNT newspaper coverage focuses on the northern part of the county, surrounding the county seat town Coldspring. The online version stopped free notifications in October 2020, see this link: https://www.sanjacnews.com/index.php/contact-us-item The Shepherd TX library of records does NOT draw families from the permit neighborhood area as it is also 20 miles away. The Cleveland, TX public library has many more resources and is almost 60% closer, being only 7 miles away from the landfill neighborhood. Consequently an estimated 2975 additional neighborhood residents, living nearby the proposed landfill, need to be provided another opportunity to be informed.

An estimated 80% of the nearby families in the proposed permit site receive their drinking water from ground water wells, with the majority of wells in the area being 100 ft or shallower. A fair amount of families use the Jayhawker Creek as a primary drinking water source for their livestock; this includes up to 600 Hispanic families living downstream in the "Trails End" community. The TCEQ should do their best to insure that everyone is fully aware of more traffic congestion on dilapidates flood prone roads. The TCEQ should do their best to insure that everyone downstream the 2406 site is aware that leachate discharge into Jayhawker Creek is legally allowed under certain environmental situations. The TCEQ should do their best to insure that everyone knows that this landfill is proposed to be built immediately adjoining the Sam Houston National Forest.

The TCEQ has granted additional Public Meetings over the past few years in other MSW permit applications located in Laredo, Hempsted, and Waco (Axtell), possibly other locations as well.

The TCEQ has received over 2000 public comments thus far, so the TCEQ knows that local interest exists with this #2406 landfill application. As a proud citizen of Texas I urge the TCEQ Executive Director to give the public more time to learn about the MSW #2406 permit application facts and grant a second public meeting.

Sincerely yours,
Van Weldon
270 Pine Valley Road
Cleveland TX 77328

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Tuesday, December 28, 2021 9:34 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406
Attachments: Landfill SHNF TCEQ Comments III 2021.docx

MSW
117709

H

From: brandt_mannchen@comcast.net <brandt_mannchen@comcast.net>
Sent: Monday, December 27, 2021 10:52 AM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Brandt Mannchen

E-MAIL: brandt_mannchen@comcast.net

COMPANY:

ADDRESS: 20923 KINGS CLOVER CT
HUMBLE TX 77346-1326

PHONE: 2815707212

FAX:

COMMENTS: Please see the attachment for the Sierra Club's December 27, 2021 comment letter about the proposed Peach Creek Landfill Permit # 2406. Brandt Mannchen

December 27, 2021

Office of Chief Clerk
MC 105
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

Dear Chief Clerk of the Texas Commission on Environmental Quality,

The Houston Regional Group and Lone Star Chapter of the Sierra Club (Sierra Club) provide comments and request that the Texas Commission on Environmental Quality (TCEQ) amend Permit #2406 (635-acre Peach Creek Landfill (PCL)) to include how this proposed facility will be accessed by garbage trucks and other vehicles, address all environmental issues, and conduct a contested case hearing.

This letter provides to TCEQ comments about the October 28, 2021 response to TCEQ supplemental information request that was made by PC-II, LLC (300 Concourse Blvd. Suite 101, Ridgeland, Mississippi 39157), Peach Creek Environmental Park, for Permit No. 2406.

1. **October 28, 2021 letter from PC-II to TCEQ, TCEQ Comments and Responses,** TCEQ states that PC-II should remove language in Sections 8.20 and 8.21 about Class I industrial waste since this waste will not be accepted at the PCL.

It is important to note that PC-II can seek an amendment to accept Class I industrial waste in the future. This is not a dead issue. The public requires a statement which says that the PCL will never accept Class I industrial waste as long as PCL is in operation and afterward when it is decommissioned.

2. **Section 2.2.2.6 Special Waste, Page 5 and 8.21 Empty Containers, Page IV-36,** PC-II refers to asbestos containing materials (RACM) that may be stored at the PCL, empty containers of pesticides, herbicides, fungicides, and rodenticides, and other special wastes not named.

With reference to pesticide containers, it's stated that they must be "triple-rinsed prior to receipt". TCEQ should require that PC-II state how it will check, monitor, and audit these containers to make sure they have been triple-washed.

In addition, "empty containers" is not defined. If washing does not get all pesticide residues from the container, then there will be a greater risk of harmful contamination of leachate, water run-off, soil, and air. TCEQ should require that PC-II state how it will check, monitor, and audit that the 1,500-ppm petroleum hydrocarbon waste limit is not exceeded.

TCEQ should require that PC-II state how it will dispose of material acquired either accidentally or on purpose which PCL cannot legally dispose of.

When PC-II states that facilities for large item storage, reusable materials staging, citizen's convenience center, used/scrap tire storage, and wood waste processing will "move as the landfill is developed", TCEQ should require that PC-II state and show on maps where these areas will not be allowed on the landfill property and why they should not be allowed in certain areas.

3. **2.3 Easements and Buffer Zones, 2.3.1 Easement Protection, Page 6,** TCEQ should require that PC-II explain about the access easement that it has that goes through Wood Duck Farms property and thus exposes this farm to potential contamination via spills, releases, accidents, incidents, and events.

TCEQ should require that PC-II have a buffer of at least 25 feet from the utility and pipeline easement boundary and not allow waste disposal right up to easement boundaries.

4. **2.3 Easements and Buffer Zones, 2.3.2 Buffer Zones, Page 6,** TCEQ should require that PC-II have a 125-foot buffer zone between the permit boundary and where the solid waste footprint. This ensures that spillover and run-off from the landfill will not leave the property.

5. **Permit Condition Summary, Page A-2,** TCEQ should require that PC-II state what is the maximum landfill storage site footprint in acres and cubic feet or tons so the public knows the ultimate capacity of PCL and what the resulting environmental impacts may be. TCEQ should require that all Phases and their environmental impacts are analyzed and presented to the public for review and comment about cumulative impacts.

6. **Material Along the Route to the Site, Page IV-28,** TCEQ should require PC-II to have enclosed vehicles, and not just say, "will take steps to encourage that vehicles hauling waste to the site are enclosed or provided with a tarpaulin to ensure that debris, flying trash, and other waste is not deposited either outside or inside the PCL". Surcharges are not sufficient as a deterrent to violations.

TCEQ should require that PC-II turn away any vehicle hauling waste if it is not enclosed or is not using a tarpaulin to "properly secure the load".

TCEQ should require that PC-II to report offenders, not just "may report habitual offenders", so that this unacceptable waste practice is caught as quickly as possible.

7. **8.9 Disposal of Large Items, Pages IV-28 and 29,** TCEQ should require PC-II to dismantle large items so they can be disposed of in the PCL without causing potential sources of surface or subsurface disruption of the landfill.

TCEQ should require that PC-II recycle items within 60 days and not 180 days. This allows too much time for storage of these items and thus increases the possible risk of discharge of fluids or creation of vector problems.

TCEQ should require that PC-II clearly state what equipment it will use, procedures it will use, maintenance will be required, to remove and dispose of CFCs at the PCL.

8. **8.10 Odor Management Controls, Page IV-28,** TCEQ should require that PC-II "will include" not "may include" measures to control odors and sources of odors. Do not give PC-II the discretion to mitigate odors, or this will provide an incentive to do little or nothing to prevent odors.

TCEQ should require that PC II define "significant odors" and then should ensure that the definition is adequate to stop odor problems at PCL.

TCEQ should require that PC-II use a daily cover of 1 foot of soil which is compacted and not 6 inches of soil that is not compacted to reduce rainfall infiltration and vector problems.

TCEQ should require that PC-II state what happens to gas extracted via wells within or external to the landfill footprint. There is a need for methane and toxic gas monitoring and control equipment capture, treatment, and destruction of these air pollutants.

9. **8.11 Disease Vector Control, Page IV-29,** TCEQ should require that PC-II conduct an active feral hog removal program, via corrals, shooting, and traps on PCL to ensure that wallowing, rooting, and other surface disturbance of the landfill does not occur.

See the Sierra Club August 1, 2021 email sent to TCEQ with the article, "Sanitary Waste Landfill Effects on an Invasive wild Pig Population", The Journal of Wildlife Management, 2021, for more details about how destructive feral hogs can be at a landfill.

The TCEQ should require that PC-II should contact adjacent and nearby property owners (including Sam Houston National Forest – SHNF) about an area/regional feral hog control program.

TCEQ should require that PC-II begin to remediate areas that have been affected or may be conducive to feral hogs within 24 hours of being found. "Promptly addressed" does not soon enough take care of this serious problem.

10. **8.12 Site Access Road, Pages IV-29 and 30,** TCEQ should require that PC-II not just "routinely inspect the site" during wet weather but should do so every hour and ensure mud and dirt has been scraped off the road.

TCEQ should require that PC-II remove tracked mud and associated debris from public roadways within 2 miles not once/day but at least three times/day to keep the roads safe and clean.

TCEQ should require that PC-II not just conduct "periodic spraying" of water on landfill entrance and perimeter roads but should do so at least once/hour to reduce dust.

TCEQ should require that PC-II grade roads at least three times/week, and not once/week, to ensure that nuisance mud and dust are reduced as much as possible.

TCEQ should require that PC-II control dust on stockpiles of crushed stone, concrete rubble, masonry demolition debris, or other similar material that is used for roads or other purposes at PCL to ensure that nuisance dust is reduced as much as possible.

TCEQ should require that PC-II state clearly what dust reduction controls will be used, how often, and the appropriate maintenance to ensure they are kept in good working condition.

11. **8.13 Salvaging and Scavenging, Page IV-30,** TCEQ should require that PC-II state what "excessive accumulation of material" is and that the 180-day storage period be reduced to 30-day storage to ensure that the risk of spills, etc., be reduced as much as possible.

12. **8.14 Endangered Species Protection, Page IV-30,** TCEQ should require that PC-II change its biological assessment because it is incorrect that "no area on or near the proposed landfill site" has been designated as critical habitat.

Within about a quarter to half-a-mile or less, Compartments 121, 122, 123, and 124 in SHNF exist and are designated as habitat for the endangered Red-cockaded Woodpecker.

13. **8.15 Landfill Gas Control, Page IV-30,** TCEQ should require that PC-II keep gas monitoring records for the life of PCL and afterward when it is decommissioned due to the risk that groundwater may be contaminated and not discovered during the life of the landfill or may occur after the landfill shuts down.

14. **8.16 Oil, Gas, and Water Wells, 8.16.1 Water Wells, and 8.16.2 Oil and Gas Well, Pages IV-31 and 32,** TCEQ should require that PC-II test for methane in the landfill, water from the landfill, and PCL site at least twice/month. A methane reduction plan should be required for climate change mitigation.

TCEQ should require that PC-II conduct a thorough, on-the-ground and below-the-ground search for all abandoned wells and ensure with documentation that wells are capped and

plugged and not assume that they are. The public should be told now if there are abandoned wells and this discovery should not be delayed until Phase I work is done.

TCEQ should require that PC-II be onsite and verify with TCEQ that all wells discovered have been properly capped, plugged, and closed.

15. **8.17, Compaction, Page IV-32,** TCEQ should require that PC-II clearly explain whether 40,000 pounds from a landfill compactor is comparable to a bulldozer that compacts waste. If it is not, then PC-II should ensure a comparable force be placed on the ground when cover is placed and compacted.

TCEQ should require that large bulky items be dismantled so they do not cause potential disruption of soil surface and subsurface compaction and retention capabilities.

16. **8.18, Landfill Cover, 8.18.1 Soil Management, Pages IV-32,** TCEQ should require that PC-II have stockpiled material that is of similar permeabilities and porosities. A sandy soil taken from on the PCL site will not have the compaction capability as a clay soil when serving as six inches of cover. Therefore, it will not have the same protection ability for the prevention of rain infiltration and vector prevention.

19. **8.18.2 Daily Cover, Page IV-33,** TCEQ should require that PC-II document where "The daily cover will be sloped to drain" and require records and reports about inspection for vector control and compaction of daily cover. The soil used for daily cover should be clay to retard or stop water from soaking into the landfill. PC-II defeats this compaction protection each day when TCEQ allows it to be stripped off "prior to additional waste placement and used as daily cover".

TCEQ should stop PC-II from doing this or it allows the disturbance of impermeable cover and thus encourages the landfill to fill-up with water like a bathtub.

20. **8.18.3, Intermediate Cover, Page IV-33,** TCEQ should require that PC-II only be allowed 30 days of inactivity, rather than 180 days, before cover of compacted material is required of at least 12 inches. This ensures that rain infiltration will be prevented and good vector control.

21. **8.18.4 Alternative Daily Cover, Pages IV-33 and IV-34,** TCEQ should require that PC-II reveal what alternative daily cover is being considered so the public can comment on the appropriateness of this action.

TCEQ should require that PC-II state what chemicals it is considering to spray-apply as alternative daily cover, what the health effects are, what the environmental effects are, and what the chemical properties and effects are so the public can comment on the appropriateness of this action.

22. **8.18.5 Temporary Waiver, Page IV-34,** TCEQ should not grant PC-II any temporary waiver "due to extreme seasonal climatic conditions". This is a loophole which allows pollution with no consequences and encourages PC-II to create excuses about climatic conditions so it will not have to be responsible for its' actions.

TCEQ should require PC-II to plan for climate change, more storms, great intensity of storms, and how this will effect normal operation of PCL.

23. **8.18.6 Final Cover, Page IV-34,** TCEQ should require that PC-II manage surface water at PCL for as long as the landfill exists as either active or inactive. "In perpetuity protection" of PCL is needed and should be the responsibility of PC-II and its human owners.

TCEQ should require not only that it be notified when final cover placement is done but should be onsite when it is done to monitor and ensure its' correct placement.

24. **8.18.7 Cover Erosion, Page IV-34 and 35,** TCEQ should require that PC-II manage surface water at PCL for as long as the landfill exists as either active or inactive. "In perpetuity protection" of PCL is needed and should be the responsibility of PC-II and its human owners.

TCEQ should require that PC-II begin repair of final cover problems within 24 hours and repair them within 3 days.

25. **8.18.8 Cover Inspection record, Page IV-35,** TCEQ should require that PC-II have a copy of all cover inspection records onsite and online so the public has access to them.

26. **8.19 Ponded Water, Page IV-35,** TCEQ should require that PC-II state how its' site operations will minimize ponding water and what the operational requirements are that will ensure this occurs.

TCEQ should require that PC-II begin to fill depressions within 24 hours and fill them in within 3 days.

TCEQ should require PC-II to document how it will determine if ponded water has come into contact with waste or waste contaminated soils.

27. **8.20 Disposal of Special Wastes, Pages IV-35 and 36,** TCEQ should require that PC-II will never store Class I industrial waste in PCL at any time.

28. **8.23 Leachate and Gas Condensate Recirculation, Page IV-37,** TCEQ should require that PC-II monitor leachate and gas via cameras, sensors, and the most up-to-

date technology. The requirements for monitoring should be updated every 3 years to take into account the latest technological innovation.

TCEQ should require PC-II state how it will determine intermediate cover soils are not saturated and define what "significant accumulations of leachate in any one area" are.

29. **8.25 Storage and Processing Unit Operations, 8.25.1 Large Item Storage Area, Pages IV-37 and 38,** TCEQ should require PC-II not to store items for 180 days. TCEQ should require that PC-II store items for no more than 30 days to reduce contamination and vector risk.

TCEQ should require that PC-II keep containers covered with tarps at all times because rainfall events can occur with great intensity at any time and this can lead to water contamination.

30. **8.25.2 Reusable Materials Staging Area, Page IV-38,** TCEQ should require that PC-II limit the amount of reusable materials from the current allowable quantity. Currently, TCEQ allows an intake of 250 tons of inert materials/day which is 500,000 pounds and a maximum of 2,000 tons stored at one time which is 4 million pounds.

TCEQ also allows 50 tons/day of non-inert materials/day which is 100,000 pounds and a maximum storage of 500 tons which is 1 million pounds.

To reduce potential sediment and siltation outflows and oil discharge TCEQ should reduce these figures by one-half.

31. **8.25.3 Citizen's Convenience Center, Pages IV-38 and 39,** TCEQ should require PC-II have containers covered with tarps at all times when they are not being actively used to reduce rainfall contaminated water and vector issues.

32. **8.25.4, Use/Scrap Tire Storage Area, Page IV-39,** TCEQ should require that PC-II keep fewer tires at PCL. There is a contradiction currently between tire pieces in excess of 500 used/scrap tires (total number of pieces is not limited) and 2,000 used/scrap tires in enclosed and lockable containers.

All tires should be lock up and drained so there is little chance of mosquito breeding or other vector use. There should be a vector reduction plan for tire storage to ensure that this problem does not occur or increase.

33. **8.25.5 Wood Waste Processing Area, IV-39,** TCEQ should require PC-II to receive only a certain amount of wood waste and not use the term approximately.

Use of the term approximately for three tons of material/day for processing; maximum amount of 100 tons/stored at one time; and wood waste processing area size of 50 by 100 feet injects legal and administrative uncertainty into the inspection, enforcement, and compliance process. This makes it more difficult for inspectors to determine whether PC-II is in compliance with its' permit.

TCEQ should require that PC-II have 30 days to store wood waste before it is processed instead of 60 days to ensure that vector proliferation is not enhanced by this longer time.

34. **8.25.6 Storage Facility, Page IV-40,** TCEQ should require that PC-II reduce its maximum amount of leachate storage from 500,000 gallons to 100,000 gallons and reduce the time leachate is stored from 12 months to 30 days.

This reduces the possibility of leachate leaks and spills and makes the point that leachate is a toxic product that should not be stored for long periods of time and should be treated and disposed of as soon as possible.

35. **8.25.7 Truck Wheel wash, Page IV-40,** TCEQ should require that PC-II reduce the amount of time it stores sediment from 90 days to 30 days. This ensures that this pollutant is not allowed to build-up and create a condition where its' release will cause a significant pollution event.

36. **3.1 Perimeter Monitoring, 3.1.1 Perimeter Monitoring Network and 3.1.2 Landfill Gas Monitoring Probes, Page G-5,** TCEQ should require PC-II have a gas removal, treatment, and destruction control system to ensure that methane is not released or is released in very minor quantities to reduce explosion potential, toxic gas health effects, and greenhouse gas air pollution.

The Sierra Club doubts the ability of a gas monitoring probe to "monitor the soil strata above the lowest planned future elevation of waste within 1,000 feet of the probe".

The Sierra Club supports a 100-foot placement of probes and not a 600-foot placement of probes to ensure that accurate gas monitoring occurs.

Gas monitoring should be done for toxic air pollutants and methane and gas should not be vented unless it is first treated by a control device. A catalytic incinerator or condensing unit can be used to reduce volatile hydrocarbon air pollution. Venting of air pollutants should not be allowed without first ducting the air pollutants through a working air pollution control device.

The Sierra Club appreciates this opportunity to comment. Please keep the Sierra Club informed about the status of this proposal. Thank you.

Sincerely,

Brandt Mannchen
Forest Management Issue Chair
Lone Star Chapter of the Sierra Club
Chair, Forestry Subcommittee
Houston Regional Group of the Sierra Club
20923 Kings Clover Court
Humble, Texas 77346
281-570-7212
brandt_mannchen@comcast.net

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
2021 OCT -7 AM 9:40
CHIEF CLERKS OFFICE

MSW
117709

October 4, 2021

Office of Chief Clerk
MC 105
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

REVIEWED
OCT 08 2021
By GCW

Dear Chief Clerk of the Texas Commission on Environmental Quality,

The Houston Regional Group and Lone Star Chapter of the Sierra Club (Sierra Club) provide additional comments and request that the Texas Commission on Environmental Quality (TCEQ) amend Permit #2406 (635-acre Peach Creek Landfill (PCL)) to include how this proposed facility will be accessed by garbage trucks and other vehicles, address all environmental issues, and conduct a contested case hearing.

This comment letter provides a summary for TCEQ of some of the most important comments that the Sierra Club heard during the September 28, 2021 public meeting as well as additional comments that were prepared after that meeting.

1) The Sierra Club was appalled that the applicant made misleading statements (perhaps false) about leaks in its' presentation on September 28, 2021. The applicant's suggestion that there have been no landfill leaks from the composite liner technology in permitted Texas landfills for the past 30 years is inaccurate and wrong.

The applicant cannot possibly know the condition of each landfill and liner system that is in Texas. The Sierra Club believes even TCEQ does not know the status of each landfill with regard to leaks because leaks are not easy to find, many are created at the very beginning of a landfill's life during design and construction, and often they are undiscovered for years.

All landfills leak, which the U.S. EPA and others have acknowledged for years. This is documented in an article included with these comments, **"Leakage Through Liners Constructed with Geomembranes - Part I, Geomembrane Liners".** The beginning of the abstract for this article states, "How impermeable are impermeable liners? All liners leak, including geomembranes ...". That statement was made in 1989 and holds true today! **See attachment 1.**

Leaks are not just possible, but a way of life for landfills. The Sierra Club believes that TCEQ should ensure that applicants do not make statements that are misleading or false to the public, particularly during public meetings. This is a form of aid to the applicant that must be prevented. TCEQ should call out the applicant publicly when misleading information is provided during a public meeting.

2) The articles provided with these comments and listed below discuss leaks and landfills in general and document that leaks are a normal occurrence in landfill design, construction, and operation. These articles are provided to TCEQ as technical information that the Sierra Club believes will help TCEQ in its decision-making process for this application.

The Sierra Club opposes this proposal and urges TCEQ to deny Permit #2406, Peach Creek Landfill, because it is not sufficiently protective of Sam Houston National Forest (SHNF), residents, ground and surface waters, farms, and other environmental reasons, to be allowed to operate.

1. **"The Basics of Landfills",** March 26, 2003, http://ejnet.org/landfills/.

2. **"Geosynthetic Fundamentals in Landfill Design",** Gregory N. Richardson and Aigen Zhao, Proceedings of the International Symposium on Geoenvironmental Engineering, ISGE2009, September 8-10, 2009, Hangzhou, China.

3. **"Landfill Leaks",** Dennis E. Williams, Ph.D., January 2001.

4. **"A Groundwater Protection Strategy for Lined Landfills",** G. Fred Lee and Anne Jones-Lee, G. Fred Lee & Associates, El Macero, California, undated but after 1994.

5. **"Detection of the Failure of Landfill Liner Systems,"** G. Fred Lee, Ph.D., P.E., DEE. And Anne Jones-Lee, Ph.D., G. Fred Lee & Associates, El Macero, California, April 1996.

6. **"Leakage Through Lines Constructed with Geomembranes – Part I. Geomembrane Liners",** J. P. Giroud & R. Bonaparte, Geotextiles and Membranes, Volume 8, Pages 27-67, 1989.

7. **"All Landfills Leak, and Our Health and Environment Pay the Toxic Price",** Kirstie Pecci, July 23, 2018.

8. **"Landfill Liner and Cover Systems: Design Guidelines",** Morton A. Barlaz, North Carolina State University, undated.

9. **"Leakage analysis through composite liners in landfills",** Marcos A. Montoro, Franco M. Francisca, and Manuel A. Juarez, Fundamentals to Applications in Geotechnics, IOS Press, 2015.

10. **"Predicting Leakage Through Composite Landfill Liners",** Gary J. Foose, Craig H. Benson, and Tuncer B. Edil, Journal of Geotechnical and Geoenvironmental Engineering, June 2001.

11. **"Deficiencies in Subtitle D Landfill Liner Failure and Groundwater Pollution Monitoring",** G. Fred Lee, Ph.D. P.E., DEE. President, Anne Jones-Lee, Ph.D., Vice President, G. Fred Lee & Associates, El Mecero, California, undated but after 1998.

3) TCEQ should take into account that this proposal will create a structure that initially is about 185 feet tall and cover 124 acres. If Phase 2 is approved, then the landfill will be about 400 acres and probably taller in height. This would comprise an almost 200-foot-tall structure that will contain a dozen or more Minute Made Park Stadium volumes of municipal garbage and toxic materials.

This structure will dominate the landscape aesthetically (Mount Trash-more) and from an odor standpoint and will provide a large obstacle to drainage of overland flow and stream flood waters from the area. This will probably extend flooding or the level of flooding to other properties and acres in the area. This type of environmental impact should be analyzed and mitigated fully by the applicant.

4) The Bayou City Waterkeeper representative, stated that an anti-degradation assessment should be conducted for this proposal with reference to stream water quality. The Sierra Club supports such an assessment and urges TCEQ to coordinate with its' own water quality standards, TMDL, and WPP programs to ensure that all appropriate analysis and mitigation measures are required.

5) Several residents brought up that they enjoy and value quiet for their neighborhoods. Noise causes health problems and should be fully regulated as part of permit conditions.

6) Wood Duck Farm, others, and the Sierra Club believe that birds (like gulls), vectors of disease (rats and mice), and feral hogs are a significant problem that this proposal will exacerbate. The permit should analyze and provide mitigation measures to prevent these biological animals from causing problems at residents, farms, and SHNF.

7) Quality of Life was mentioned by some residents. They want their neighborhoods to remain places where they can raise their children and live with comfort and security. The idea that a proposed landfill will allow them to continue their Quality of Life is not likely if TCEQ does not take their concerns seriously.

At least one speaker, stated that she wants a positive looking area. The proposed landfill will detract from the beautification of the neighborhoods and area. Scenic quality in SHNF will not benefit positively from the construction and operation of this proposed landfill.

8) Local water well contamination was mentioned by several speakers. Since this is the only way people can get water in their neighborhoods, contamination is a permanent and serious threat. TCEQ should not just monitor the proposed landfill but also private wells surrounding the landfill within a mile to ensure that no contamination occurs and if it does

that it is discovered as soon as possible. Monitoring wells around landfills can miss leaks of contaminants so a wider well monitoring system is needed.

9) A resident mentioned that people, children, and pets walking in the neighborhood are in danger due to the large truck traffic increase that this proposal will bring. TCEQ should require that the applicant work with all road agencies to provide safe driving conditions from wherever garbage trucks approach this proposed landfill.

10) This proposed landfill will be a nuisance for its' neighbors. It is inappropriate that TCEQ did not have the employee from the local TCEQ Office talk about compliance and enforcement programs for landfills and how people can report and follow-through on compliance, enforcement, and other issues that these structures cause.

11) A speaker brought up concerns about side slope erosion. This has been a problem that other landfills have had. The Sierra Club supports the most stringent side slope erosion control measures possible including complete vegetation coverage.

12) TCEQ did not explain what special waste could be approved for the proposed landfill and what types of waste could be stored, not treated, in the landfill. The public should be provided with this information so that a "worst-case" scenario is provided.

A private landfill company wants to make money. That is its' purpose. It will store whatever waste it can in a landfill if that makes it money. A private landfill company is not concerned whether this is what is best for groundwater, neighborhoods, stream water quality, or any other factors. TCEQ should let the public know what long-term contamination problems could result from this proposal.

13) Once groundwater is polluted there is an expensive 'forever pollution problem" for the public, neighborhoods, State of Texas, and the Federal Government. The private entity and the people who run the private entity are off the hook due to closure and bankruptcy laws. This is another reason TCEQ should make sure that people who want to construct a landfill are responsible for its' total costs, including long-term (forever) contamination problems.

14) TCEQ and the applicant did not talk about expansion, even though Phase 2 is being planned. The ultimate capacity of the facility and how this affects traffic and other environmental issues must be revealed and analyzed by TCEQ as long-term cumulative effects that will impact the citizens of Texas.

15) At the public meeting, the applicant documented that no economic study had been done when it could not name one company that it had talked to about possible use of the proposed landfill (potential customers). In addition, competition is guaranteed with at least four other landfills located close by. The applicant apparently has also has not

considered the negative economic impacts on SHNF and how the positive economic benefits of SHNF will be degraded by the proposal. For the public meeting, there was no, there, there!

16) Wood Duck Farms revealed at the public meeting, and it's important that TCEQ understands this, that Mississippi Investors want to sell this permit for 10-20 million dollars and then "get out of Dodge". They have no commitment to SHNF or local communities. It's all about the money!

17) TCEQ knows landfills create methane gas which generates 80 times the climate change potential as carbon dioxide (CO2). Standard methane collection systems that are required by TCEQ do not make-up a climate change reduction plan.

Vehicular air pollution from garbage trucks and other vehicles release additional climate change gases that should be reduced. TCEQ should require that the applicant prepare a climate change reduction plan to protect SHNF and local communities from more flooding and intense rainfalls and other effects of climate change.

18) It was startling to hear TCEQ may not use the newest FEMA floodplain information because FEMA is behind updating its' maps. TCEQ should use the best information, available about rainfall and flooding, whether formally published or not to supplement what is currently available.

19) TCEQ should, as social and human environmental impacts, require the applicant to prepare an analysis of how devaluation of surrounding properties will affect the area. This is a concern for the State of Texas or at least it should be.

20) It was obvious from the public meeting that TCEQ doesn't know about local road conditions and applicant has mislead it on what these road conditions are. Coordination with TxDOT does not include county or local roads and those roads are in poor shape. The wear and tear these roads will take from 80,000 pound vehicles many times a day is an important issue that must be part of this permit's analysis for TCEQ.

21) Performance bonds are never enough to take care of long-term landfill contamination risk. Although there are closure requirements, companies get a pass from "forever contamination risk" that is caused by limited degradation of waste and toxins and guaranteed failure of liners over decades and centuries and limited liability.

The public has to clean-up company externalities from landfills because landfill companies and the people that run them are allowed to walk away from "forever monitoring" needed to protect water from long-term contamination. TCEQ should not allow this to occur.

22) Despite what was stated at the public meeting, all air pollution is not all taken up by methane gas system, treated, and destroyed. Much evaporation occurs at the working face of the landfill and over time air pollution gases migrate through the soil to the surface of the landfill and are released.

TCEQ and applicant did not state at the public meeting how the methane collection system would operate. Will there be a pipeline to take the methane to a clean-up facility and will it then be burned as natural gas? Will there be a flare onsite to burn-off the methane and create more CO2 climate change air pollution? What are the impacts of these systems on the environment, SHNF, and neighborhoods?

These environmental concerns were not brought up or answered at the public meeting. They should be addressed publicly, and the analysis provided to the public.

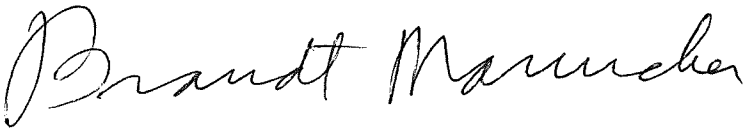
23) Truck leachate was not mentioned by the applicant and TCEQ as an environmental a problem. This leachate occurs when garbage trucks are not water-tight and spill or leak leachate while driving to and from landfills. The TCEQ should require that the landfill is responsible for such leaks along with the operator and owner of the trucks so that this type of hazardous waste pollution is not brought into neighborhoods and along routes to the landfill and leaks out to contaminate them.

24) The public meeting did not address security as an issue. Since the proposed landfill will be the tallest point in San Jacinto County, trespassers with off-road vehicles, bicycles, and other vehicles will be tempted to turn the landfill into a private off-road playland.

There must be security lights and a fence. The lights must be shielded so that they do not shine unnecessarily on SHNF and other properties and affect night-flying bats, insects, owls, other birds, nocturnal or crepuscular animals of all types, and human neighbors.

The Sierra Club appreciates this opportunity to comment. Please keep the Sierra Club informed about the status of this proposal. Thank you.

Sincerely,



Brandt Mannchen
Forest Management Issue Chair
Lone Star Chapter of the Sierra Club
Chair, Forestry Subcommittee
Houston Regional Group of the Sierra Club
20923 Kings Clover Court
Humble, Texas 77346
281-570-7212
brandt_mannchen@comcast.net

Attachment 1

Articles About Landfills and Landfill Leaks

1. "The Basics of Landfills", March 26, 2003, http://ejnet.org/landfills/.

2. "Geosynthetic Fundamentals in Landfill Design", Gregory N. Richardson and Aigen Zhao, Proceedings of the International Symposium on Geoenvironmental Engineering, ISGE2009, September 8-10, 2009, Hangzhou, China.

3. "Landfill Leaks", Dennis E. Williams, Ph.D., January 2001.

4. "A Groundwater Protection Strategy for Lined Landfills", G. Fred Lee and Anne Jones-Lee, G. Fred Lee & Associates, El Macero, California, undated but after 1994.

5. "Detection of the Failure of Landfill Liner Systems", G. Fred Lee, Ph.D., P.E., DEE. And Anne Jones-Lee, Ph.D., G. Fred Lee & Associates, El Macero, California, April 1996.

6. "Leakage Through Lines Constructed with Geomembranes – Part I. Geomembrane Liners", J. P. Giroud & r. Bonaparte, Geotextiles and Membranes, Volume 8, Pages 27-67, 1989.

7. "All Landfills Leak, and Our Health and Environment Pay the Toxic Price", Kirstie Pecci, July 23, 2018.

8. "Landfill Liner and Cover Systems: Design Guidelines", Morton A. Barlaz, North Carolina State University, undated.

9. "Leakage analysis through composite liners in landfills", Marcos A. Montoro, Franco M. Francisca, and Manuel A. Juarez, Fundamentals to Applications in Geotechnics, IOS Press, 2015.

10. "Predicting Leakage Through Composite Landfill Liners", Gary J. Foose, Craig H. Benson, and Tuncer B. Edil, Journal of Geotechnical and Geoenvironmental Engineering, June 2001.

11. "Deficiencies in Subtitle D Landfill Liner Failure and Groundwater Pollution Monitoring", G. Fred Lee, Ph.D. P.E., DEE. President, Anne Jones-Lee, Ph.D., Vice President, G. Fred Lee & Associates, El Mecero, California, undated but after 1998.

The Basics of Landfills

Landfill Basics -- *How They are Constructed and Why They Fail*

Questions to Ask About Landfills

Other Resources on Landfills

Landfill Articles

- Leaky Liners & Leachate
- Hazardous Waste & Environmental Racism
- Superfund & Health
- Landfill Politics
- Strategies & Alternatives

Primer on Landfill Gas as "Green" Energy

WHAT IS A LANDFILL?

A secure landfill is a carefully engineered depression in the ground (or built on top of the ground, resembling a football stadium) into which wastes are put. The aim is to avoid any hydraulic [water-related] connection between the wastes and the surrounding environment, particularly groundwater. Basically, a landfill is a bathtub in the ground; a double-lined landfill is one bathtub inside another. Bathtubs leak two ways: out the bottom or over the top.

WHAT IS THE COMPOSITION OF A LANDFILL?

There are four critical elements in a secure landfill: a bottom liner, a leachate collection system, a cover, and the natural hydrogeologic setting. The natural setting can be selected to minimize the possibility of wastes escaping to groundwater beneath a landfill. The three other elements must be engineered. Each of these elements is critical to success.

THE NATURAL HYDROGEOLOGIC SETTING:

You want the geology to do two contradictory things for you. To prevent the wastes from escaping, you want rocks as tight (waterproof) as possible. Yet if leakage occurs, you want the geology to be as simple as possible so you can easily predict where the wastes will go. Then you can put down wells and capture the escaped wastes by pumping. Fractured bedrock is highly undesirable beneath a landfill because the wastes cannot be located if they escape. Mines and quarries should be avoided because they frequently contact the groundwater.

WHAT IS A BOTTOM LINER?

It may be one or more layers of clay or a synthetic flexible membrane (or a combination of these). The liner effectively creates a bathtub in the ground. If the bottom liner fails, wastes will migrate directly into the environment. There are three types of liners: clay, plastic, and composite.

WHAT IS WRONG WITH A CLAY LINER?

Natural clay is often fractured and cracked. A mechanism called diffusion will move organic chemicals like benzene through a three-foot thick clay landfill liner in approximately five years. Some chemicals can degrade clay.

WHAT IS WRONG WITH A PLASTIC LINER?

The very best landfill liners today are made of a tough plastic film called high density polyethylene (HDPE). A number of household chemicals will degrade HDPE, permeating it (passing though it), making it lose its strength, softening it, or making it become brittle and crack. Not only will household chemicals, such as moth balls, degrade HDPE, but much more benign things can cause it to develop stress cracks, such as, margarine, vinegar, ethyl alcohol (booze), shoe polish, peppermint oil, to name a few.

WHAT IS WRONG WITH COMPOSITE LINERS?

A Composite liner is a single liner made of two parts, a plastic liner and compacted soil (usually clay soil). Reports show that all plastic liners (also called Flexible Membrane Liners, or FMLs) will have some leaks. It is important to realize that all materials used as liners are at least slightly permeable to liquids or gases and a certain amount of permeation through liners should be expected. Additional leakage results from defects such as cracks, holes, and faulty seams. Studies show that a 10-acre landfill will have a leak rate somewhere between 0.2 and 10 gallons per day.

WHAT IS A LEACHATE COLLECTION SYSTEM?

Leachate is water that gets badly contaminated by contacting wastes. It seeps to the bottom of a landfill and is collected by a system of pipes. The bottom of the landfill is sloped; pipes laid along the bottom capture contaminated water and other fluid (leachate) as they accumulate. The pumped leachate is treated at a wastewater treatment plant (and the solids removed from the leachate during this step are returned to the landfill, or are sent to some other landfill). If leachate collection pipes clog up and leachate remains in the landfill, fluids can build up in the bathtub. The resulting liquid pressure becomes the main force driving waste out the bottom of the landfill when the bottom liner fails.

WHAT ARE SOME OF THE PROBLEMS WITH LEACHATE COLLECTION SYSTEMS?

Leachate collection systems can clog up in less than a decade. They fail in several known ways:

1. they clog up from silt or mud;
2. they can clog up because of growth of microorganisms in the pipes;
3. they can clog up because of a chemical reaction leading to the precipitation of minerals in the pipes; or
4. the pipes become weakened by chemical attack (acids, solvents, oxidizing agents, or corrosion) and may then be crushed by the tons of garbage piled on them.

WHAT IS A COVER?

A cover or cap is an umbrella over the landfill to keep water out (to prevent leachate formation). It will generally consist of several sloped layers: clay or membrane liner (to prevent rain from intruding), overlain by a very permeable layer of sandy or gravelly soil (to promote rain runoff), overlain by topsoil in which vegetation can root (to stabilize the underlying layers of the cover). If the cover (cap) is not maintained, rain will enter the landfill resulting in buildup of leachate to the point where the bathtub overflows its sides and wastes enter the environment.

WHAT ARE THE PROBLEMS WITH COVERS?

Covers are vulnerable to attack from at least seven sources:

1. Erosion by natural weathering (rain, hail, snow, freeze-thaw cycles, and wind)
2. Vegetation, such as shrubs and trees that continually compete with grasses for available space, sending down roots that will relentlessly seek to penetrate the cover;
3. Burrowing or soil- dwelling mammals (woodchucks, mice, moles, voles), reptiles (snakes, tortoises), insects (ants, beetles), and worms will present constant threats to the integrity of the cover;

4. Sunlight (if any of these other natural agents should succeed in uncovering a portion of the umbrella) will dry out clay (permitting cracks to develop), or destroy membrane liners through the action of ultraviolet radiation;
5. Subsidence--an uneven cave-in of the cap caused by settling of wastes or organic decay of wastes, or by loss of liquids from landfilled drums--can result in cracks in clay or tears in membrane liners, or result in ponding on the surface, which can make a clay cap mushy or can subject the cap to freeze-thaw pressures;
6. Rubber tires, which "float" upward in a landfill; and
7. Human activities of many kinds.

Prepared by:

Environmental Research Foundation
P.O. Box 5036
Annapolis, MD 21403-7036
phone (410) 263-1584
fax (410) 263-8944

Environmental Research Foundation's
RACHEL's Environment & Health Weekly Articles

Leaky Liners & Leachate

#90 Municipal Dump Leachate Is As Toxic As That From Hazardous Waste Dumps
#119 Leachate Collection Systems: The Achilles' Heel Of Landfills
#37 EPA Says All Landfills Leak, Even Those Using Best Available Liners
#71 Decade-Old Study Revealed the Polluting Effects of Landfills
#116 Why All Landfills Leak
#117 The Best Landfill Liner: HDPE
#125 Clay Landfill Liners Leak In Ways That Surprise Landfill Designers
#216 Some Hidden Hazards Of A Plastic World [Plastics Aren't Biodegradable]
#217 Why Plastic Landfill Liners Always Fail
#316 New Evidence That All Landfills Leak
#109 Catch-22s of Landfill Design
#177 Unrecognized Cause of Landfill Failures
#226 Toxic Gases Emitted From Landfills

Hazardous Waste & Environmental Racism

#162 Fine Particles--Part 5: Incineration Worsens Landfill Hazards
#164 The Landfiller's New Plan: Megafills
#180 Commercial Hazardous Waste Landfills
#182 Chemical Dumps Make Good Homes For Poor Families, EPA indicates
#190 Incinerator Ash--Part 2: All Wastes Must Go Somewhere Forever
#403 EDF Proposes Incinerator Ash Dumps
#224 Nation's Greatest Danger: Secrecy [Military Toxics]
#227 The Military Toxics Scandal Deepens
#239 The Poisoners Invade Indian Country

#272 Government Facts on Dumps Remain Sketchy
#278 Government Burial Of Asbestos On Sacred Navajo Land
#183 Coming Your Way: Radioactive Garbage

Superfund & Health

#176 Hooked on Danger: Expanding Solid Waste Landfills
#271 National Academy Superfund Dumps Make People Sick
#332 Why Exalt Wise Use? [industry can't stop polluting]
#370 Superfund Dumps & Health, Part 2
#371 Superfund Dumps & Health, Part 3

Landfill Politics

#231 EPA Proposes A Perfect Solution For New Municipal Solid Waste Landfills
#238 The Regulatory-Industrial Complex
#241 Citizens Seek Reform Of The Nation's Hazardous Waste Law
#268 EPA's New Landfill Rules Protect Big Garbage Haulers
#288 New Tools For Citizens: 'Bad Boy' Laws
#292 Congress Creates A Monster: The ATSDR [superfund]

Strategies & Alternatives

#232 Public Ownership Of Dumps Is The Key
#260 Storing Superfund Waste In Concrete Buildings Seems to Make Sense
#289 Good Solid Waste Alternatives [composting]
#307 New Garbage Strategies Are Now Possible
#352 Composting Municipal Solid Waste

Environmental Research Foundation's
QUESTIONS TO ASK ABOUT LANDFILLS

It is important to have a basic understanding of the landfill being proposed for your community. We suggest that you ask the following questions of both the landfill operator and the local governing boards that will be giving the permits to the landfill operator.

- How big will the landfill be in acres?
- What is the depth of the landfill in feet, and what will be the height of the highest point of the cap after the landfill is closed?
- How much of the acreage will be filled with garbage?
- How much of the acreage will be used for the buffer zone?
- How much of the acreage will be unused?

- What is the maximum tons per day they will accept?

- Does the contract have a minimum tons per day quota (often called put or pay clauses)? If it does who is responsible for finding the additional tonnage or the money in lieu of the tonnage?

- What type of garbage will it be filled with:

  municipal solid waste
  medical waste
  hazardous waste
  low level radioactive waste
  below regulatory concern (brc) waste
  special waste (often incinerator ash)
  incinerator ash
  industrial solid waste
  demolition debris
  other waste

  - Will they be putting recyclables in the landfill (glass, aluminum, tin, paper, etc.)?

  - Will they be putting clean organic compostables in the landfill (for example, yard wastes)?

  - If they are putting recyclables and organic compostables in the landfill will they be putting them in separate cells?

  - In tons per day, how much of the garbage will come from your town, county, state, out-of-state?

  - How many years will the landfill be in operation?

  - Will it be lined and capped? If so what will these be made of?

  - How long will the operators be responsible for it once it is closed, often referred to as the post-closure period?

  - Who will be responsible for it once the post-closure period is over?

RESOURCES ON LANDFILLS

ORGANIZATIONS AND JOURNALS:

Center for Health, Environment & Justice
P.O. Box 6806
Falls Church, VA 22040
(703) 237-CCHW
Publishes bimonthly: EVERYONE'S BACKYARD

G. Fred Lee and Associates
27298 East El Macero Drive
El Macero, CA 95618
(530) 753-9630
www.gfredlee.com

Greenpeace
1436 U Street, N.W.
Washington, DC 20009
(202) 462-1177
Publishes quarterly: GREENPEACE
www.greenpeace.org

PAHLS (People Against Hazardous Landfill Sites)
Suite A
102 North Morgan
Valparaiso, IN 46383
(219) 465-7466

Southwest Research and Information Center
P.O. Box 4524
Albuquerque, NM 87106
(505) 262-1862
Publishes quarterly: THE WORKBOOK

SUGGESTED READING:

Citizen's Clearinghouse for Hazardous Wastes. LAND DISPOSAL ... THE DINOSAUR OF DISPOSAL METHODS. Falls Church, Va.: Citizen's Clearinghouse for Hazardous Wastes, April 1986.

Connett, Paul. WASTE MANAGEMENT: AS IF THE FUTURE MATTERED. Canton, N.Y.: Work on Waste USA, May 1988.

Cozza, Blythe I. DEBUNKING THE LANDFILL HIGH TECHNOLOGY MYTH. Wheeler, Ind.: PAHLS, Inc., 1989.

Lee, G. Fred and Anne R. Jones. MUNICIPAL SOLID WASTE MANAGEMENT IN LINED, "DRY TOMB" LANDFILLS: A TECHNOLOGICALLY FLAWED APPROACH FOR PROTECTION OF GROUNDWATER QUALITY. El Macero, Calif.: G. Fred Lee & Associates, March, 1992.

VIDEOS:

Greenpeace. WHY ALL LANDFILLS LEAK [this video features our very own Peter Montague explaining in detail everything you need to know about landfills]. Washington, D.C.: Greenpeace [Public Information; phone: (202) 319-2444], 1991.

Compiled by Maria B. Pellerano, revised by Brady Parkhurst, edited by Andrea K. Fearneyhough. March 1995.

Other Landfill Resources:

- Landfill Impact Publications (Dr. G Fred Lee's site)
- Friends of the Earth's Citizen's Guide to Municipal Landfills
- Grassroots Recycling Network's landfills page
- Landfills Leak (testimony and documentation on leakage studies)
- Landfills: Hazardous to the Environment

- **"From data compiled by LLSI, 82% of surveyed landfill cells had leaks while 41% had a leak area of more than 1 square feet."** (According to Leak Location Services, Inc., http://www.leaklocationservices.com/landfills.htm)

This site is maintained by the ACTION Center.

Last modified: 26 March 2003

http://www.ejnet.org/landfills/

Proc. of Int. Symp. on Geoenvironmental Eng., ISGE2009
September 8-10, 2009, Hangzhou, China

GEOSYNTHETIC FUNDAMENTALS IN LANDFILL DESIGN

Gregory N. Richardson[1], Aigen Zhao[2]

ABSTRACT: Contemporary design of lined landfills in the United States began in the early 1980's with Federal regulations focused on hazardous waste disposal. This regulatory framework was expanded to include municipal solid waste in the early 1990's. With nearly 30-years experience in the design of lined landfills, simple design practices have evolved to ensure the successful performance of lined landfills. Geosynthetic components play a critical role in the two main components of these landfills: (1) liners to limit the vertical migration of liquids, and (2) drainage field that collect the liquids and limit the potential for leaks to develop. Geomembrane liners provide a very stable barrier to the spread of liquids but must be built to very high standards, be protected from damage during construction and their service life, and come with the potential for stability problems generated by their slick surfaces. Geosynthetic drainage composites provide a means of draining the collected liquid from large areas of the liner surface. Properly designed, such geosynthetic drainage layers will add to the stability of the landfill by limiting hydrostatic forces due to the collected liquids. Past failures of lined landfills provide an effective means of demonstrating the inevitable consequences of not meeting fundamental design requirements for these components.

KEYWORDS: geosynthetics, landfill design, liners, drainage composites

INTRODUCTION

Over the past 25 years, design procedures for the liner and liquid collection systems have evolved with the development of both improved design methodology and geosynthetic components, and in response to observed failures in the field. A review of the more than 40 failure investigations performed by the authors indicates that failures can be minimized if design and construction fundamentals are observed. These fundamentals do not address the economics of the landfill or additional appurtenances that are also required. However, the fundamentals do protect the designer and owner from expensive failures.

Contemporary lined landfills rely on two key systems to control the migration of leachate draining from the waste: a low permeability liner system that limits the vertical and lateral movement of the leachate and a liquid collection/removal system (LCRS) to collect and remove the leachate that accumulates on the liner system. The design and construction considerations for these two systems are inherently very different and must be understood if landfill is to be a success.

An additional consideration not addressed in this paper is the need to operate the landfill in a manner consistent with its design. The operations manual prepared by the designers must provide the owner with clear guidance on field operational practices that must be followed to ensure failure free operation. All contemporary landfills can be failed by field operations that are inconsistent with the design assumptions.

COMPOSITE LINER SYSTEM PERFORMANCE

Modern landfills rely on a composite liner system that depends on a synergistic relationship between the geomembrane liner (GM) and an underlying soil liner. A better understanding of the important design and construction considerations for these two components is obtained by examining the theoretical basis for estimating leakage through the composite liner. Empirical modeling and field observations (Giroud and Badu-Tweneboah 1992) have resulted in the "*Giroud*" equation for estimating leakage through a hole in the geomembrane portion of a composite liner. The empirical equation takes the form of :

good contact

$$Q = 0.21 h^{0.9} a^{0.1} k^{0.74} \quad (1)$$

for poor contact

$$Q = 1.15 h^{0.9} a^{0.1} k^{0.74} \quad (2)$$

[1] Senior Consultant, Richardson Smith Gardner & Associates, USA, greg@rsgengineers.com
[2]Vice-President Engineering, Tenax Corporation, USA, azhao@tenax.com

where "contact" refers to the contact between the soil liner and the geomembrane, e.g. no wrinkles in the liner and a properly smoothed clay surface contribute to a good contact, Q = rate of leakage through a defect (m^3/s); h = head of liquid on top of the geomembrane (m); t = thickness of the soil component of the composite

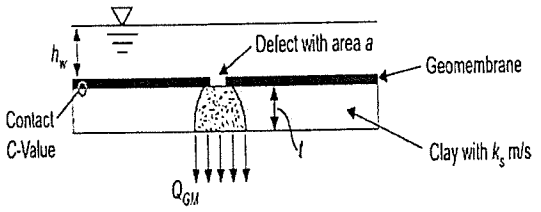


Figure 1 Composite Liner Variables

liner (m); a = area of defect in geomembrane (m^2); and k = hydraulic conductivity of the underlying clay liner (m/s). Equations (1) and (2) are incorporated into the latest versions of the HELP computer model (U.S. EPA 1994) used for predicting landfill leachate generation and leakage.

Leakage through a composite liner system **increases** with the following:

1. Increasing head, h, of leachate,
2. Decreasing soil liner thickness, t,
3. Increasing soil liner permeability, k,
4. Increasing area of defect in GM, a, and
5. Decreasing lack of good contact between the two liner components.

Item 1 is the focus of the design of the LCRS system, Items 2 and 3 are typically specified by the regulatory agency, and Items 4 and 5 are minimized using a Construction Quality Assurance program (CQA). A discussion of CQA programs is beyond the scope of this paper but readers are directed to Koerner and Daniels (1993), and Daniels and Koerner (2007).

Equations (1) and (2) are generally not used in the actual design of a lined landfill but does provide a means of recognizing key factors that influence liner leakage. The limitations of equation 1 relate to the uncertainty as to the number of actual defects in the liner. With a comprehensive CQA program as outlined above, it is estimated that 1 to 3 $1cm^2$ defects remain per 4000 m^2 area. This allows a rough estimate of potential leakage. Additionally, equations (1) and (2) are frequently used to evaluate problems with excessive leakage in existing lined landfills. This means that Equations (1) and (2) should be considered an excellent forensic tool and not a design tool.

GEOMEMBRANE LINER DESIGN

While the hydraulic performance of the GM requires a field CQA program to minimize defects, the stability of the GM must be verified in the design. The typical GM is formed of a thermo-plastic that has a very low inherent interface shear strength, e.g. is very slick. Before the stability of the liner system can be calculated, the interface shear strength between each of the layers forming the liner and collection system must be evaluated.

Liner Interface Strength Testing

Within the United States, the interface shear strength is measured using the direct shear test (ASTM-D5321) on the interfaces of concern under project specific conditions. This test must be performed on each interface of the liner and LCRS system that will be placed beneath the waste. Typically, the controlling interface, i.e. having the lowest strength, is one of the two interfaces related to the geomembrane, i.e. GM to soil or GM to LCRS.

Figure 2 show the results of a D5321 direct shear test to determine the interface shear strength between a textured GM and geosynthetic drainage composite, e.g. textured GM against a nonwoven geotextile. The test

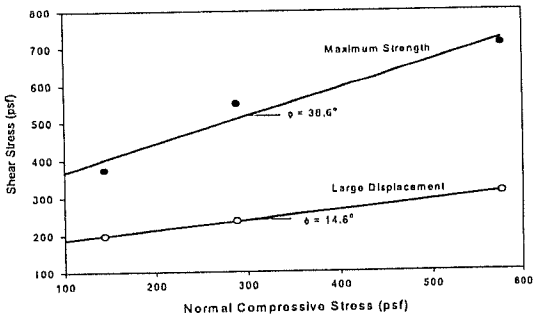


Figure 2 ASTM D5321 Direct Shear Test Results (1kPa = 20.5psf)

was performed at three normal loads typical of what would be anticipated for a GM in a landfill final cover system. The maximum strength data represents the peak shear strength at displacements typically less that 12.5mm. The large displacement data reflects shear strengths that occur at displacements greater that 25mm. The large displacement strengths are typically lower due to abrasion damage to the texturing. The large displacement strengths are commonly used in seismic stability evaluations where the static factor of safety can drop below 1.0 during the event.

As shown on Figure 2, the measured shear strength, τ, is typically represented by the Mohr-Coulomb equation

$$t = c + \sigma \tan \delta \qquad (3)$$

where c is apparent adhesion, σ is the normal pressure on the interface, and δ is the interface friction angle. For liners placed on slopes, c should be a minimum of 2.5 kPa based on stability considerations during construction. The normal loads used in the ASTM D5321 direct shear test should be representative of the normal loads anticipated during the service life of the liner system.

Liner Stability Analysis

One of the greatest challenges facing the design engineer is to accurately estimate the density and shear strength of the waste and geometry of future waste placement. All of these parameters are beyond the direct control of the design engineer but must be conservatively estimated or failure can result.

Waste Properties

The density of waste can be estimated from historical data but can be impacted by local waste characteristics. Lacking local data on waste density, the authors recommend the use of densities presented on Table 1. Waste densities are obtained using annual surveys to establish waste volumes and truck scales to record the actual weight of waste received each year. The weight of waste must be increased to account for the daily cover soils applied to the waste to control vectors.

Table 1 Default Waste Total Unit Weights

Waste Type	Total Unit Weight, kN/m^3
Municipal Solid Waste	8-10
Construction/Demolition	6.5-9
Industrial	6-13
Coal/Fly Ash	9-12

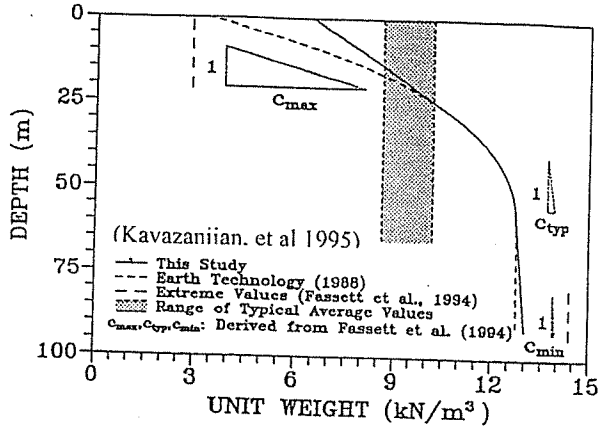


Figure 3 Waste Unit Weight Increase With Depth

Note that waste densities generally increase with increasing normal loads so that the upper limits of density should be assumed for wastes having a height greater than approximately 45m. Figure 3 shows this increase in density with depth for typical MSW (Kavazanjian,et.al, 1995).

Strength properties of common wastes are impossible to evaluate using typical geotechnical laboratory soil testing procedures due to the very large size gradation of the waste. What the design engineer must typically rely on is empirical strength values based on historic observation of both successful and failed waste placement conditions. Figure 4 shows rotational stability failure of waste that allowed back calculation of the average shear strength of the waste at the time failure occurred. The nearly 30-m vertical faces of the waste require the waste to have an apparent cohesion even though the material is essentially non-plastic. For

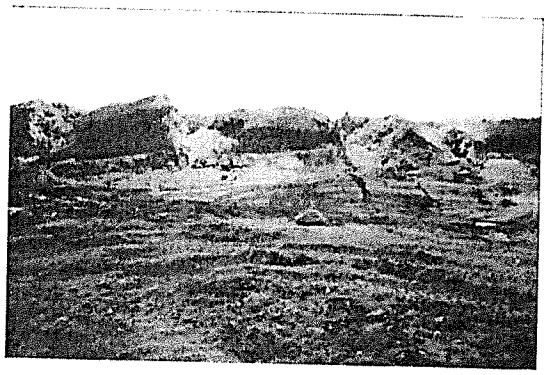


Figure 4 Landfill Waste Stability Failure

municipal solid waste, Figure 5 shows a compilation of back-calculated shear strengths with a recommended design shear strength envelop for MSW (Kavazanjian, et.al, 1995).

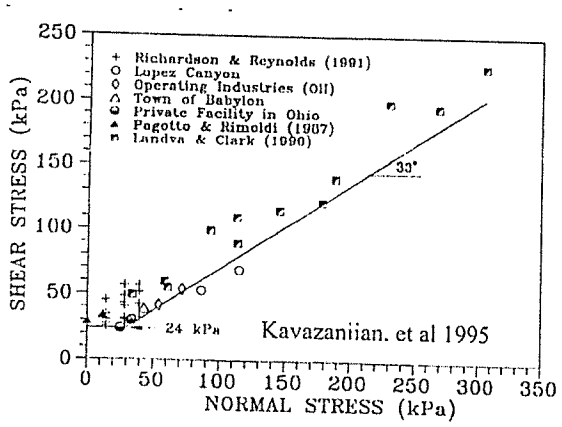


Figure 5 Shear Strength of MSW Waste

Waste Geometry

The future geometry of the waste is beyond the direct control of the design engineer but can be influenced if the designer prepares an operational manual for the landfill that provides waste placement guidance to the operator. The design engineer must understand that all lined landfills can be failed from the improper placement of waste within the landfill. Thus, a properly prepared operations manual protects both the design engineer and the owner.

Correct placement of waste is typically controlled by specifying a maximum lift thickness and exterior slope for the lift. Stability can be improved if the operations manual requires full placement of each lift before subsequent lifts are begun. Additionally, the operations manual should provide the operator guidance on interim features that can influence localized stability such as temporary roads for truck access during placement of each lift.

Numerical Analysis

Once the projected waste properties and geometry are defined, the stability analysis is performed using one of many slope stability programs commonly used by geotechnical engineers. The only real limitation on software selection is the need for the program to allow block type failures since the failure surface will follow much of the liner surface. Geotechnical programs that rely on circular failure surfaces cannot properly model the actual failure surface that will commonly along and rarely cross a portion of the liner surface. Figure 6 shows the results of a typical waste stability evaluation. This evaluation was performed with the software program STABL.

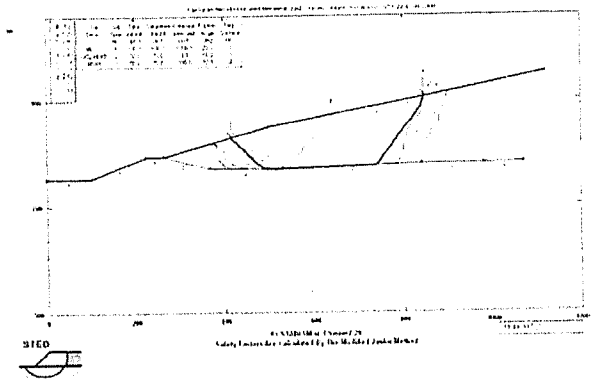


Figure 6 Slope Stability Evaluation of Landfill

LEACHATE COLLECTION SYSTEM DESIGN

Recalling Equations (1) and (2), the impact of a defect in the liner system is minimized by maintaining a low head, h, of leachate acting on the liner system. In addition to minimizing leakage, the leachate head must be minimized to ensure stability of the waste. In the USA, the maximum head of leachate acting on a liner system is limited to 30-cm.

For the above reasons, the liners system must be covered by a collector system that can withstand the normal loads generated by the weight of the waste and potential clogging due to both the suspended solids carried by the leachate and the biological clogging potential from the micro-organisms also carried by the leachate. The manner in which the landfill is operated will determine the potential for clogging of the leachate collection systems with landfills. Recirculation of leachate back into the waste has the greatest potential for clogging, thus demand an enhanced leachate collection system.

The LCS consists of two major systems: (1) an area collection system that covers the surface of the liner, and (2) a piping system that in turn drains the area collection system. The area collector is the primary mechanism for satisfying the regulatory limit on head acting on the liner while the piping system is responsible for draining the area system and directing the leachate to a sump for removal from the landfill.

Area Leachate Collection System

Area collection leachate collection systems were originally envisioned as sand layers placed immediately above the liner systems. In recent years, the sand layer is commonly replaced with a geocomposite drainage layer that consists of a geonet with a nonwoven geotextile bonded to one or both faces of the geonet. The variables in the analysis are shown on Figure 7 below and include the impingement rate, q_h, at which leachate is draining from the waste, the liner slope β, and the slope base length L.

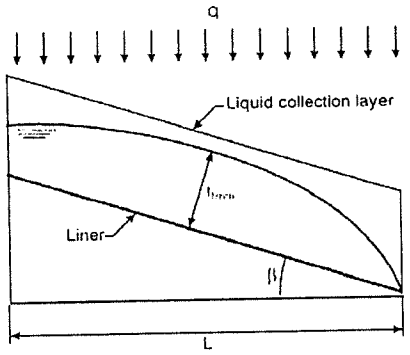


Figure 7 Leachate Mounding Analysis

A simplified but accurate analysis for the maximum head in the above analysis was developed by Giroud et al. (1992) and is discussed in Giroud et al. (2000). The maximum head on the liner, termed t_{max} by Giroud, is given by the following equation:

$$t_{max} = j \frac{\sqrt{\tan^2\beta + 4\, q_h / k} - \tan\beta}{2\cos\beta} L \qquad (4)$$

where k is the permeability of the lateral drain. The j term is a numerical modifying factor whose value is always slightly less than 1 such that it can be neglected in the typical landfill analysis. Generally, the uncertainty regarding the impingement rate q_h does not justify the use of the j factor.

The total flow rate through the collecter, Q, is equal to $q_h L$ per unit width of the drainage layer. For lateral drains constructed using geocomposite drainage layers, Giroud (2000) has shown that Eq. (4) can be simplified due to the small flow thickness in drainage composites to the following:

$$t_{max} = \frac{q_h L}{k \sin\beta} \qquad (5)$$

This greatly simplified equation is appropriate when the thickness of the geocomposite drainage layer is less than 20 mm over the range of slopes common to most landfills. This equation should not be used with thicker natural drainage layers. This allows the required transmissivity for a geocomposite drainage layer to be directly solved for as follows

$$\theta_{required} = \frac{q_h L}{\sin\beta} \qquad (6)$$

Solutions based on Giroud's numerical solution will be conservative and less than 5% in error. Again, the simplified solution in Equations (6) is applicable to geocomposite drainage systems only.

Published values of typical leachate generation values for non-arid regions show typical leachate generation rates of 11,000-20,000 liters/hector/day or a design rate of liquid supply of 1.3-2.3 x 10^{-6} cm/sec during active placement of waste. This reduces to 2000-5600 liters/hector/day once a 30cm interim cover is placed, and 500-1500 liters/hector/day after placement of the final cover. The accuracy of these values was confirmed through discussions with solid waste regulators in the USA. Leachate generation rates will be dramatically impacted by the degree of leachate/storm water separation that is inherent in the facilities design and operational practices. The leachate generation rates referenced above reflect typical design and operational efforts. The 10^{-6} cm/sec design rate of liquid supply approximately represents the infiltration into a leachate collection system through a silty/clayey protective soil layer during initial waste placement. Facilities that employ supplemental 'rain sheets' may have less leachate, while those using porous operational covers will have significantly more. The design is obviously conservative for long-term flows if it is designed properly for the short-term operational flows.

Long term performance

The long term performance of a lateral drain requires a larger allowed transmissivity, $\theta_{allowed}$, than that obtained from the design equations, $\theta_{req'd}$. This process was initially quantified by Koerner (1998) as follows:

$$FS_{dc} = \frac{\theta_{allowed}}{\theta_{req'd}} \qquad (7)$$

where FS_{dc} is the overall safety factor for drainage, $\theta_{req'd}$ is the required transmissivity based on Equation (6), and $\theta_{allowed}$, is the allowable transmissivity being determined under simulated condition for 100-hour duration using the following formula per GRI-GC8 standard (2001)

$$\theta_{allow} = \theta_{100} \frac{1}{RF_{CR} \times RF_{CC} \times RF_{BC}} \qquad (8)$$

where

$\theta_{allowed}$ = allowable transmisisivity
θ_{100} = laboratory measured transmissivity determined under simulated conditions for 100-hour duration
RF_{CR} = reduction factor for creep to account for long term behavior
RF_{CC} = reduction factor for chemical clogging
RF_{BC} = reduction factor for biological clogging

The creep reduction factor RF_{CR} is based on 10,000 hour compressive creep data and calculated according to the following equation developed by Giroud et. al (2000) where:

$$RF_{CR} = \left[\frac{(t_{CO}/t_{virgin}) - (1 - n_{virgin})}{(t_{CR}/t_{virgin}) - (1 - n_{virgin})}\right]^3 = \left[\frac{t_{CO} - \frac{\mu}{\rho}}{t_{CR} - \frac{\mu}{\rho}}\right]^3 \qquad (9)$$

t_{CO} = thickness after load application for 100hours
t_{virgin} = initial thickness
t_{CR} = thickness at the time period of interest (for instance, thickness at 50 year design life, extrapolated from the 10,000 creep curve)
n_{virgin} = initial porosity
μ = mass per unit area of the considered geonet

ρ = density of the polymeric compound used to make the geonet

Range of clogging reduction factors is provided by GRI-GC8. Combining equations (6), (7) and (8), a drainage safety factor, FS_{dc}, of the geocomposite drainage layer can then be calculated as follows:

$$FS_{dc} = \theta_{100} \times \frac{1}{RF_{CR} \times RF_{CC} \times RF_{BC}} \times \frac{\sin \beta}{q_h \times L} \quad (10)$$

The selection of drainage FS-value is dependent upon the design life and criticality of the project, 2 – 3 is recommended by Giroud et al (2000). The combination of drainage safety factor and reduction factors are sometimes called the Long-Term Services Factor.

Transmissivity testing

The in-plane flow capacity of a geocomposite is evaluated using a laboratory transmissivity test (ASTM D-4716). This test is performed using the transmissivity box setup shown on Figure 8. This apparatus allows a range of normal loads and boundary conditions, i.e., soil or geomembrane, to be applied to the face of the geocomposite. The head acting across the 300mm square sample can be varied to create a range of gradients that simulate field slope conditions. The flow gradient, i, is defined as the head divided by the flow length (300mm in the case of ASTM D4716).

Figure 9 shows typical results from a laboratory transmissivity test. In general, transmissivity decreases with increasing normal loads and increases with decreasing flow gradients. Great care must be taken to properly specify the proper boundary conditions and load duration for this test. Boundary conditions on both the upper and lower faces of the drainage composite should reflect the actual material that will be encountered in the field. This allows a proper simulation of intrusion that may occur due to soft soils or large particles in the soils. The flow gradient used in the test must be equal to or larger than the actual anticipated flow gradient. The normal load should be allowed to seat for a time period of not less than 100 hours before performing the flow test. Additionally, the manufacturer of the geocomposite drainage product should provide compressive creep test data indicating the performance of the specific product with a load duration of 10,000 hours. This effectively precludes the long-term collapse of the geonet core.

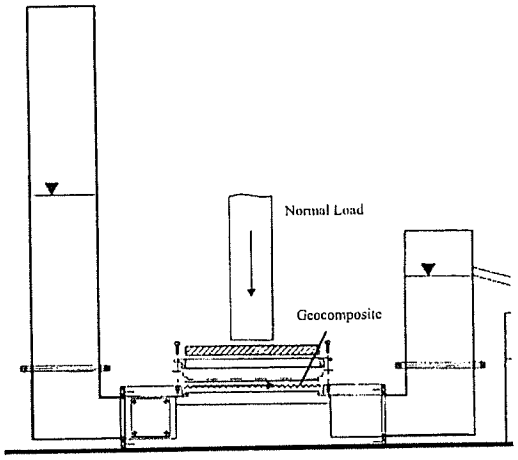


Figure 8 ASTM D-4716 Transmissivity Test

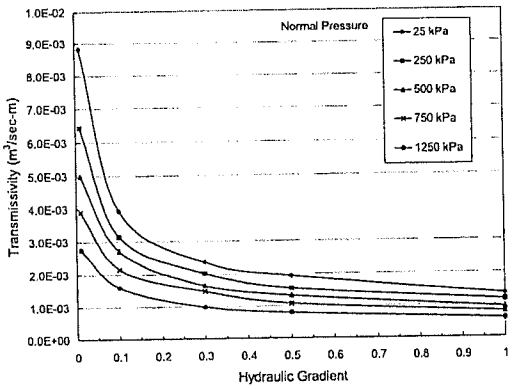


Figure 9 Typical ASTM D-4716 Test Date

Pipe Collection System

While not a 'geosynthetic' system, the network of pipes that drain the area collectors have several unique design 'geo' considerations. Figure 10 shows a typical collector pipe with an envelop of gravel placed around the pipe. This figure demonstrates two points should be understood by a designer: (1) the envelop of gravel not only filters leachate entering the pipe but significantly increases the normal load that the pipe can carry, and (2) no geotextile is ever placed between the waste and the drainage pipe. Typical leachate is rich in biological activity that can quickly clog a geotextile. Early work by Koerner et al (1993) showed that biological growth due to the leachate quickly and dramatically reduced the permittivity of a geotextile. For this reason, a geotextile may be used beneath the pipe and stone to provide a cushion to protect the geomembrane but it is never used as a filter around the leachate collection pipes.

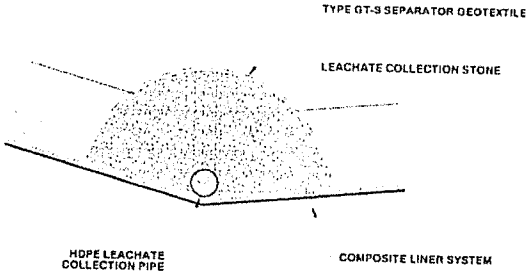


Figure 10 Leachate Drainage Pipe Detail

FINAL COVER DESIGN

Since the 80's, the convention in landfills in the USA is that a landfill cell that has a geomembrane liner must be closed with a final cover that also incorporates a geomembrane. The goal was to ensure that the final cover would allow less surface water infiltration that the anticipated leakage from the liner system. In recent years, this paradigm is changing and the control of gas emissions is now considered more important. This may result in fundamental changes in future designs of final cover systems.

Figure 11 shows the two distinct designs that must be performed for a typical landfill: (1) a flat sloped top-deck design with no slope stability concerns, and (2) the side slopes that may be as step as 3 horizontal-to-1 vertical. The first general rule in final cover design is to prevent water falling on the top-deck from running onto the side slopes. This prevents excessive erosion on the slopes but requires the use of down pipes or swales to carry the water to the base of the landfill. The second general rule in final cover design is to avoid the use of compacted clay layers in the barrier design. Compacted clays will quickly desiccate in the final cover and provide no long term barrier to water or gas migration.

The cover design will usually consist of (1) a layer of soil compacted to provide structural support to the cover system, (2) a geocomposite gas venting layer (for MSW landfill), (3) a geomembrane to limit water and gas migration, (4) a drainage geocomposite drainage layer and (5) a vegetative soil layer to protect the geomembrane, limit erosion, and for esthetic reasons. The geomembrane component will require a rigorous CQA program as previously described for the geomembrane in a liner system.

The design of side slopes presents the added complication of maintaining the slope stability of the veneer system on relatively steep slopes. Surface water percolating through the vegetative soil layer can produce seepage forces acting parallel to the slope if the soil layer saturates.

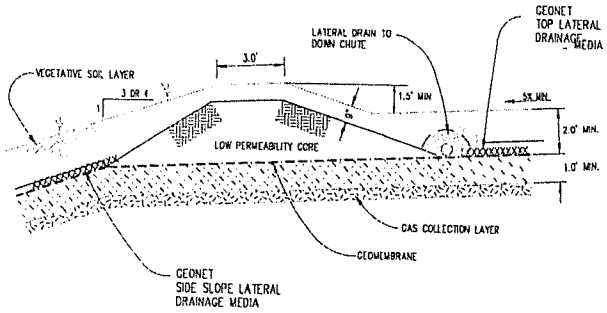


Figure 11 Final Cover Systems

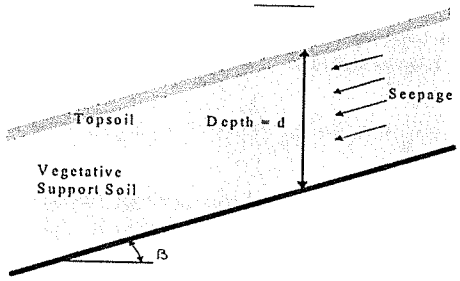


Figure 12 Seepage Forces acting on Side Slopes

If the cover soil fully saturates and the drain layer is inadequate, the slope stability factor of safety is given as:

$$FS = \frac{Resisting\ Forces}{Driving\ Forces} = \frac{\gamma_b d \cos\beta \tan\delta}{\gamma_b d \sin\beta + \gamma_w d \sin\beta} = \frac{\gamma_b \tan\delta}{\gamma_{sat} \tan\beta} \approx 0.5 \frac{\tan\delta}{\tan\beta} \quad (11)$$

where γ_{sat} is the saturated unit weight of the soil and γ_b is the buoyant unit weight of the soil, β is the slope angle, and δ is the interface friction angle.

When such seepage forces are eliminated by using high flow capacity geocomposite drainage layer, the slope safety factor, FS, becomes:

$$FS = \frac{\tan\beta}{\tan\delta} \quad (12)$$

Thus, the use of a geocomposite drainage layer doubles the sliding factor of safety under extreme surface water infiltration.

The geocomposite drainage layer must have sufficient transmissivity to carry the maximum anticipated percolation inflow and adequate interface friction with the adjacent geomembrane and vegetative soils. The

design of the pore water pressure drain underlying a saturated cover soil layer was first presented by Thiel and Stewart at the Geosynthetics '93 conference in Vancouver, B.C. The rate of water infiltration into the geocomposite drain can be readily calculated under a unit gradient since the infiltration velocity is equal to the permeability of the vegetative layer. Typical permeability values for vegetative systems range from 1 x 10^{-3} to 1 x 10^{-5} cm/sec. Tighter soils do not allow root penetration and soils looser do not provide adequate water storage. The basic lateral drainage model developed by Thiel is shown on Figure 13.

The quantity of water, Q_{in}, infiltrating into a unit width of drainage composite having a length L is given by

$$Q_{in} = k_{veg} \times L \times 1 \qquad (13)$$

The flow capacity of a drainage layer is solved for using Darcy's Law as follows:

$$Q_{out} = k_d \times i \times A = k_d \times i \times (t \times 1) = \left[k_d \times t\right] \times i = \theta \times i \quad (14)$$

where t is the thickness of the drainage layer, i is the flow gradient, and $[kt]$ is transmissivity, θ. For slopes, the gradient i is equal to $\sin\beta$, where β is the slope angle. The transmissivity of a geocomposite drainage layer is obtained from laboratory testing as previously described. It is important that the transmissivity be obtained at normal stress levels, boundary conditions, and gradients that reflect actual field conditions.

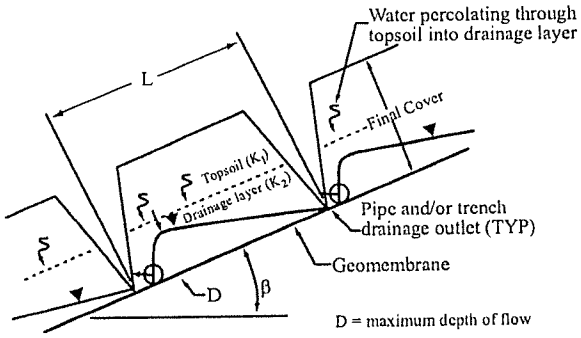


Figure 13 Head Buildup In The Drainage Layer (Thiel and Stewart, 1993)

It is important to understand the impact of both θ and L on the hydraulic factor of safety. Conveniently, the effective drainage length of the drain can be limited by draining it at each side slope swale commonly used to limit surface erosion. Such swales are commonly 30 to 50 m apart down the slope. The geocomposite drainage layer can be designed to drain into each swale as shown on Figure 14.

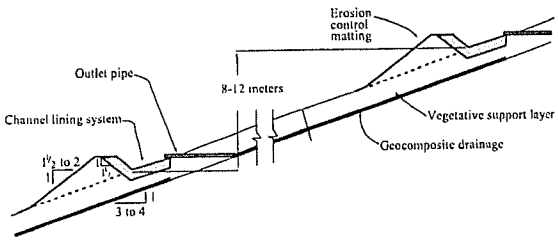


Figure 14 Side Slope Swales and Geocomposite Drains

LESSONS LEARNED FROM FAILURES

Case A

This failure is particularly interesting in that it occurred on a relatively gentle slope. Figure 14 demonstrates that cracks widening between sliding blocks. Figure 15 shows that the vegetative supporting soil was washed to slope base. Initially this failure was thought to a surface erosion problem since the slope was minor. However no erosion 'gullies' running down the slope are visible and the vegetation on the cover is excellent. This led to suspect that something other that run off erosion was occurring.

Figure 15. Cracks widening between sliding blocks

The details of the cover are as follows:

- slope angle = 8.5 degrees, slope length = 94 m
- cover profile: 15cm top soil, 45cm silty sands (k=5*10^{-4} cm/sec), single bonded geocomposite drainage net, and a smooth HDPE geomembrane.
- geocomposite transmissivity = 8*10^{-4} m^2/sec

Figure 16. Vegetative support soils washed to slope base

HELP analyses indicated that the topsoil and sand did not saturate and a peak flow into the geocomposite of 2.5 cm per day, r =2.9x10^{-5} cm/sec. Thus the peak flow into the geocomposite was calculated =2.7*10^{-5} m^3/sec-m (2.9*10^{-7} m/sec * 94 m * 1). The drainage capacity of the geocomposite is calculated = 1.2 *10^{-4} m^3/sec-m (8*10^{-4} m^3/sec-m * sin(8.5°)). This results in a predicted factor of safety of 1.2*10^{-4}/2.7*10^{-5} =4.5. However, inspection of the failed cover clearly indicated that the cover had saturated. Thus the flow into the geocomposite should not have been calculated using HELP model and should have been calculated using the unit gradient design. This produces a peak inflow into the geocomposite of 4.7*10^{-4} m^3/sec-m (5*10^{-6} m/sec * 94 m * 1) and an actual factor of safety of 1.2*10^{-4}/4.7*10^{-4} =0.26! Clearly the drainage layer was under-designed and the final cover was subject to saturation. As a note, this cover was 'repaired' by removing all materials over the geomembrane and rebuilding with a larger capacity geocomposite and perforated pipes that reduced the effective collection length of the geocomposite to approximately 30 m.

Figure 17. Massive Soils Loss on Slopes

Case B

Massive sliding of cover soils occurred after a major storm dropped 120mm of rain on an East Coast municipal solid waste landfill cap construction project. The rainfall occurred within a span of 5 to 6 hours and damaged approximately 14 hectares of cover. Figure 17 shows massive cover soil loss along the slope, and Figure 18 demonstrates landfill gas pressure built-up under the geomembrane.

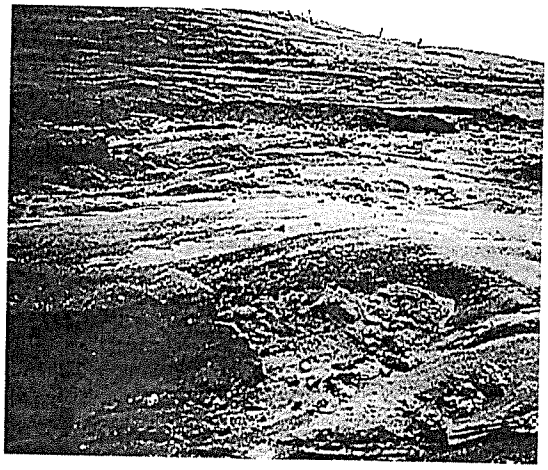


Figure 18. LFG buildup under the geomembrane

Investigation showed that the failure likely resulted from one or more of the following mechanisms:

(a) Inadequate transmissivity in the drainage layer, leading to excessive pore water pressures in the cover soil. Evaluation of the failure is based on the following field conditions that existed at the time of failure:

3:1 slope, β=18.4°
Slope length =122 m
Cover soil permeability, k=5*10^{-3} cm/sec
Saturated unit weight of soil γ_{sat}=17.6 kN/m^3
Transmissivity of the composite lateral drainage layer, θ=3.5*10^{-4} m^2/sec
Geocomposite/texture geomembrane interface friction angle δ=22°

Field observations and laboratory testing indicated that the in-place soil was saturated. This soil was composed of fine sugar sand containing a high percentage of silt fines. The Unified Classification for this soil is SP-SM. The soil was to function as a vegetative support layer immediately above the final cover geomembrane and drainage geocomposite. The vegetative support layer was to be covered with 150 mm of topsoil supporting grass. Failure occurred before the

topsoil layer and associated grass could be placed. Assuming saturation of the vegetative support sands, the factor of safety for the *drainage capacity*, FS_{dc}, of the geocomposite drainage layer can be calculated by the following equation:

$$FS_{dc} = 3.5 \times 10^{-4} \times \frac{0.32}{5 \times 10^{-5} \times 122} = 0.018 \quad (15)$$

Clearly, with a safety factor of 0.018, the transmissivity of the geocomposite is inadequate. Using equation (11), site conditions at this project results in

$$FS = \frac{\gamma_b}{\gamma_{sat}} \frac{\tan\delta}{\tan\beta} = \frac{(17.6-9.8)}{17.6} \frac{\tan 22^o}{\tan 18.4^o} = 0.54 \quad (16)$$

Thus, the slope is unstable if the drainage capacity of the drainage net is exceeded. No existing geocomposite drains or geotextiles prove sufficient interface friction to enable a cover soil to remain in place for such a steep slope if the cover soil becomes saturated. However, when seepage forces are eliminated, the slope factor of safety of the cover soil per equation (12) was = $\tan\delta / \tan\beta$ or 1.21. Note that a minimum static sliding factor of safety of 1.5 is typically recommended. Thus, even the non-saturated condition was marginal at this site.

In addition to a lack of adequate transmissivity, there were problems of: (b) inadequate gas venting layer, causing LFG pressure buildup below the geomembrane; and, (c) highly erodible silty sands used in the vegetative support layer, causing soil mass loss, especially during storm events.

The failure of the cover soils highlighted significant design errors and construction sequence problems. Each of the mechanisms evaluated above are sufficient to have caused major damage to the partially constructed cover. With the exception of facilities in arid climates, geocomposite lateral drainage systems must be designed assuming the overlying soils become saturated. Given the unusual weather trends that have dominated the past decade, long-term performance of these facilities must accommodate such weather extremes. The construction problems are related to construction in layers versus full sections. This construction practice leaves very large and highly erodible soil surfaces exposed for extended periods. Severe storms will cause major damage to construction when such practices are used. This is independent of the design adequacy of what is being constructed. Many contractors now limit the area of exposure allowed for erodible soil layers unless the contractor can demonstrate that excessive erosion will be mitigated. Incremental slope stability and soil loss evaluations will force this practice.

Based on the forensic analysis, revised analysis methods and repair techniques for this failure are proposed. These repair techniques include

- Reduction of the effective slope length of the drainage layer
- Increase in transmissivity of the drainage layer.
- Decrease the erosion potential of the soils.
- Increase the capacity of the existing gas collection blanket.

SUMMARY

Geosynthetic components provide the only means for economically containing the waste byproducts of or cultures. Fortunately, these components are economical and made to very high standards. This paper has developed the simple but essential design considerations that must be evaluated for the successful development of a contemporary lined landfill.

References

ASTM (2002), D5321-02 Standard Test Method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method, Annual Book of ASTM Standards, Vol 04.08.

ASTM D4716, (2001), "Test method for determining the (in-plane) flow rate per unit width and hydraulic transmissivity of a geosynthetic using a constant head".

Carpenter, J. R., (1986) STABL5/PCSTABL5 User Manual, Purdue University School of Engineering, Joint Highway Research Project JHRP-86/14, West Lafayette, IN 47907. Commercially available from Van Aller, Harald W., STEDwin (v. 2.80) Windows interface program, Queenstown, MD, Copyright 1999-2002

Daniels, D.E., and Koerner, R.M. (1993), Quality Assurance and Quality Control for Waste Containment Facilities, US-EPA, EPA/600/R-93/182.

Daniels, David and Koerner, Robert (2007), Waste Containment Facilities: Guidance for Quality Assurance and Quality Control of Liner and Cover Systems, ISBN 13:978-0-7844-0859-9, ASCE Press.

GRI-GC8 (2001), "Standard guide for determination of the allowable flow rate of a drainage geocomposite." Geosynthetic Research Institute.

Giroud, J.P., and Badu-Tweneboah, K. (1992), Rate of Leakage through a Composite Liner due to Geomembrane Defects, *Geotextiles and Geomembranes*, Vol. 11.

Giroud, J.P. , Zornberg, J.G., and Zhao, A. (2000), Hydraulic Design of Geosynthetic and Granular Liquid Collection Layers, *Geosynthetic International*, Vol. 7, Nos. 4-5.

Giroud, J.P., Zhao, A. and Richardson, G.N. (2000), "Effect of thickness reduction on geosynthetic hydraulic transmissivity", *Geosynthetics International*, Special Issue on Liquid Collection Systems, Vol. 7, Nos.4-6, pp. 433-452.

Koerner, G.R., Koerner, R.M., and Martin, J.P. (1993), Field Performance of Leachate Collection Systems and Design Implications, Proceedings of 31st Annual SWANA Conference, San Jose, Calif., pp. 365-380.

Koerner, R. M. (1998). Designing with Geosynthetics , 4th Edition, Prentice Hall, New Jersey.

Kavazanjian, Edward, Matasivic, Neven, Bonaparte, Rudolph, Schmertman, Gary (1995), Evaluation of MSW Properties for Seismic Analysis, GEOENVIRONMENT 2000, ASCE Specialty Conference, New Orleans, 24-26 February.

Richardson, G. N., Zhao, A. (1998), Issues on Geosynthetic Drainage Systems in Landfills, Proc. of the 12th GRI Conf on Lessons Learned from Geosynthetics Case Histories, Philadelphia, pp. 177-196.

Thiel, R.S., and Stewart, M.G., (1993) Geosynthetic Landfill Cover Design Methodology and Construction Experience in the Pacific Northwest, Proceedings Geosynthetics'93, Vancouver, IFAI, pp. 1131-1144.

U.S. EPA. (1994). The Hydrologic Evaluation of Landfill Performance (HELP) Model, User's Guide and Engineering Documentation for Version 3, Office of Research and Development, United States Environmental Protection Agency, Report U.S. EPA/600/R-94/168b.

.com
PLAY THE REAL U.S. POWERBALL
$570 MILLION
09:26:02 UNTIL PLAY CLOSES
GET TICKETS

LANDFILL LEAKS

Presentation By Dennis E. Williams, Ph.D.

Before The Board of Supervisors of San Bernardino County Madame Chair and Honorable Supervisors - My presentation today will focus on the following issues:
1. Quantity And Quality Of Ground Water Available In The Cadiz Valley Area

2. Ground Water Flow Directions And Rates

3. Probable Impacts Of The Bolo Station Landfill On Ground Water Development
- Leakage of leachate into ground water is inevitable. It will result from inherent leaks in the liner system
- Ground water contamination may result from leakage of small amounts of leachate. TCE is a carcinogen and one of the volatile organic compounds typically found in landfill leachate. It would take less than 4 drops of TCE mixed with the water in an average sized swimming pool (20,000 gallons) to render the water undrinkable (in accordance with drinking water standards).

Documented Cases Of Modern Landfill Liner Leakage:
Over the past several years, I have had extensive project experience with landfills and landfill liners of all types. I have conducted research on landfill liners and siting of landfills in Southern California. As part of
this research I have investigated documented cases in the scientific literature, of modern composite landfill liner leakage.

Based on the scientific literature, it is well documented that landfill liners will eventually leak. Geomembrane-lined landfills are a relatively new technology, and as a result, the number of documented cases through double-lined landfills is still being quantified. Holes in geomembranes, especially along seams, are the most immediate mechanism for leakage. My literature research identified at least 34 documented cases of leakage through modern landfill liner systems.

Double-lined landfill liner systems, such as that proposed for the Bolo Station Landfill, are too new for quantification of secondary liner leakage. State officials with the divisions of solid waste of the departments of environmental services of a number of U.S. states were contacted regarding experience with liner leakage. According to those officials, at least nine landfill facilities (mostly double-lined) exhibited leakage through the primary liner. Several of these officials also explained that there is currently no reliable method of assessing if leakage is occurring through the secondary liner.

Based on the literature review and contact with regulatory agencies, leakage through the primary liner of these modern-lined facilities has been, and is occurring. Authorities also agree, that if leaks occur in primary liners, leaks are expected to occur in secondary liners as well. The following is a discussion of some of those documented cases and studies. 1. Daren Laine (1989), a member of the Southwest Research Institute, authored a paper presenting the results of an investigation of 61 new or in-service geomembrane-lined waste storage facilities using the electrical leak location method. Approximately 92% of the facilities tested were HDPE geomembranes ranging in thickness from 60 mil to 100 mils.

He discovered that leaks were found in every liner except those at three smaller facilities. A total of 1,409 leaks were located at the 61 sites surveyed, ranging from 0.3 to 5 leaks per 10,000 square ft, with an average of 3.2 leaks per 10,000 square ft. Leaks were detected in both the parent material and the seams. 87% of the leaks detected were in the seams with the remaining 13% in the parent material.

Personal communication with Mr. Laine revealed that if leaks occur in the primary liner, one can expect leaks in the secondary liner. These leaks can be as high as 20-50 per acre. Furthermore, he explained the problem with the secondary liner is that it is extremely difficult to test for leaks once landfill operation begins, and that in the cases he has seen, nobody wants to know if the secondary liner is leaking.

2. A paper authored by Bonaparte and Gross (1990) summarized the field data collected regarding flow of liquid from the leakage detection layers of double-liner systems at 23 double-lined landfills and 7 surface impoundment facilities. There are four different types of facilities, ranging from Group I to Group IV. Group I and II facilities are constructed with a geomembrane top liner and a geonet (Group I) or sand (Group II) leakage detection layer. Group III and IV facilities are constructed with composite top liners and geonet (for Group III) or sand (for Group IV) leakage detection layers.

Leakage was detected in the leakage detection layer of all sixteen Group I and II type landfills studied. And with one exception, all of the Group III landfill cells exhibited flows from their leakage detection layers. Leakage was detected in the leakage detection layer in nine of the eleven Group IV facilities.

The leakage was attributed to top liner leakage. The seven cells of Group I exhibited top liner leakage ranging from 0.5 to 27 gallons per day per acre (gpd/acre), with maximum flow rates [usually following storm events] of up to about three times the average values. The liner leak rates from the nine Group II landfill cells ranged from 0.5 to 20 gpd/acre, with maximum flow being up to ten times larger than the average values. The paper summarizes that "...properly constructed geomembrane top liners (Group I and II) that have undergone CQA (construction quality assurance) cannot consistently limit top liner leakage to a value of less than 5 gpd/acre."

Another important statement of this study was as follows: "Based on the data in this study, an action leakage rate of 50 lphd [.5 gpd/acre] is too restrictive and presents a performance standard that, if promulgated by US EPA, frequently will not be met by facilities that were constructed to present standards with rigorous third-party CQA programs. An action leakage rate of 200 lphd [2.0 gpd/acre] appears to be reasonable for landfills that have been constructed using rigorous third-party CQA programs." (p. 71).

This study pointed out twenty cases of double-lined landfills, all with "state of the art construction for their time," and all which leak.

3. The next paper, also by Gross and Bonaparte (1990), documented two more cases of modern landfill liner leakage.

Landfill A (actual name not given) is a double-lined landfill made up of three cells, and consisted of a sand leachate collection layer, geomembrane top liner, geonet leakage detection layer, and composite bottom liner. Landfill A exhibited high leakage rates through the top liner immediately following construction due to high initial heads on the liner. At 21 to 33 months after construction, the average measured top liner leakage rate from cells 1 and 2 ranged from 1.7 to 4.6 gpd/acre.

Landfill B was a double-lined landfill made up of four cells, and consisted of a sand leachate collection layer, geomembrane top liner, sand leakage detection layer, and composite bottom liner. Potential sources of leakage from this configuration were top liner leakage, construction water, compression water, and consolidation water. Following closure of Cell 1, no flow was observed until about 46 months after construction, when a small sustained flow averaging 2 gpd/acre began. The average recorded flow rate increased to 13 gpd/acre by 52 months after construction. Investigation of the situation led to the conclusion that the flow was due to leakage through a hole that developed in the geomembrane at the leachate collection pipe penetration.

4. The next study by Giroud (1989) discussed several examples of the detection of leaks in double-lined landfills. In one case, the top liner of a landfill exhibited a total leakage rate of 250 gpd [unspecified area] through the geomembrane top liner when the landfill was filled with 6 inches of water. The authors calculated that a 4 mm diameter circular hole could have been the source of this leakage rate. According to the authors, there is no guarantee that these defects will not occur.

In another case, one seam defect was detected every 9 meters (30 ft) of seam length in a large landfill with a double liner. The scientific literature is filled with cases of double-lined, modern landfills which have leaked. And although the proposed liner system for the Bolo Station Landfill uses "state of the art technology" and is superior to the Subtitle D and California standards for liners, similar liners have only been tested in landfills for approximately 10 years. Long-term performance of the system has not been determined. History has shown that the liner cannot possibly be guaranteed to prevent leakage in the future. Construction defects, installation procedures, as well as long-term aging and degeneration of liner materials is certain for all landfill liner systems, including the one proposed for the Bolo Station Landfill.

REFERENCES:

Line, D.L., and Miklas, M.P., 1989, *Detection and Location of Leaks in Geomembrane Liners Using an Electrical Method: Case Histories*, 10th National Superfund Conference, November 27-29, 1989, Washington D.C.

Bonaparte, R. and Gross, B.A., 1990, *Field Behavior of Double-Liner Systems in Waste Containment Systems: Construction, Regulation, and Performance: ASCE Geotechnical Special Publication No. 26*, November 1990, pp. 52-83.

Gross, B.A., Bonaparte, R., and J.P. Giroud, 1990, *Evaluation of Flow from Landfill Leakage Detection Layers: Proceedings Fourth International Conference on Geotextiles*, Volume 2, The Hague, June 1990, pp. 481-486.

Giroud, J.P. and Bonaparte, R., 1989, *Leakage Through Liners Constructed With Geomembranes - Part I, Geomembrane Liners: Geotextiles and Geomembranes*, Volume 8, pp. 27-67.

GEOSCIENCE Support Services, Inc.
1326 Monte Vista Avenue, Suite 3
P.O. Box 220
Claremont, CA 91711

All Rights Reserved © 2001
Libertadnons On-Line
Page Last Updated 07 Jan 2001

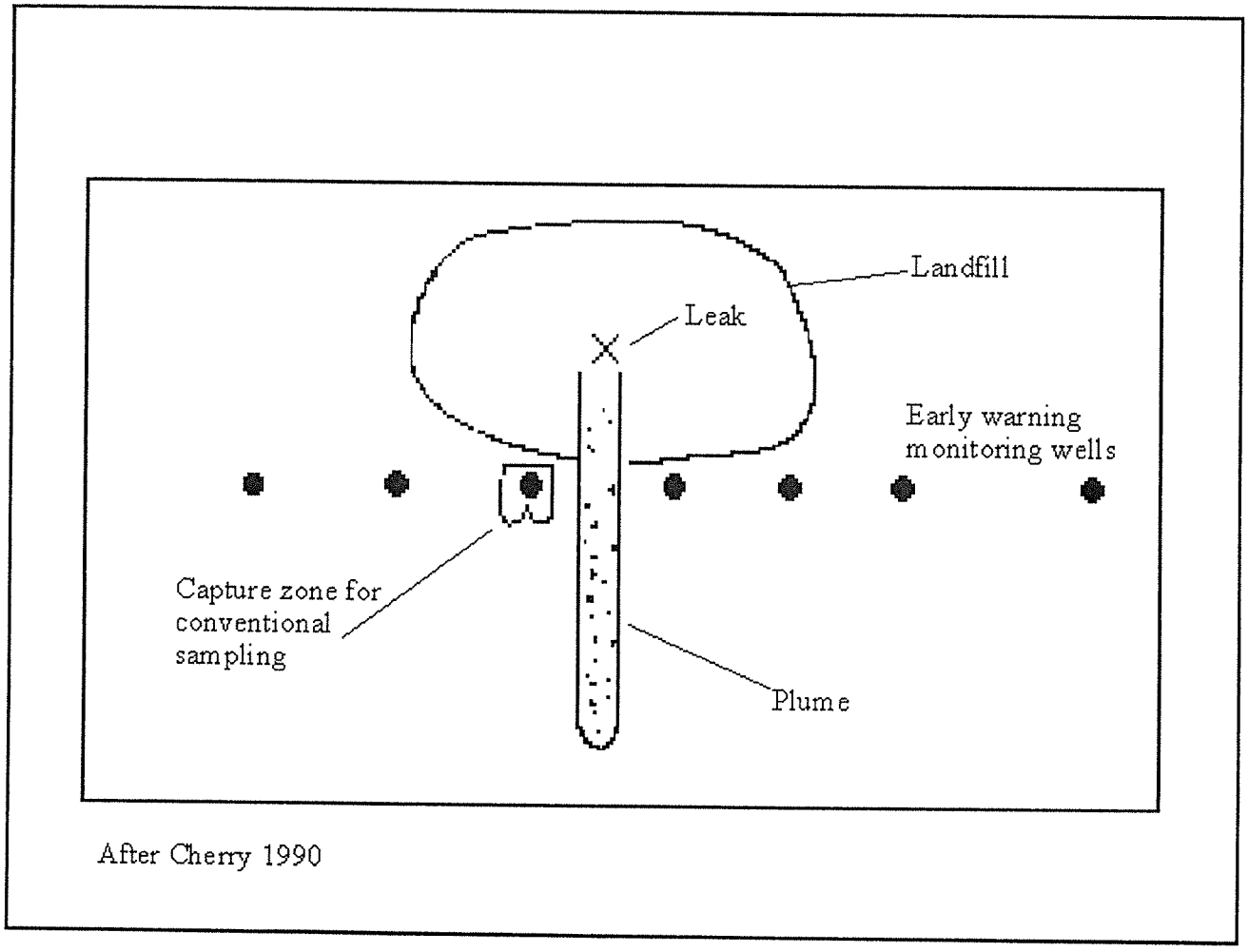
A Groundwater Protection Strategy for Lined Landfills

G. Fred Lee and Anne Jones-Lee
G. Fred Lee & Associates
El Macero, CA

EPA's groundwater monitoring program, ostensibly designed to detect failure of landfill liners for Subtitle C (hazardous waste) and Subtitle D (municipal solid waste) waste management facilities, does not support reliable early detection of groundwater pollution. A significantly different approach is needed to address the fundamental flaws in the design of the EPA program, which is being adopted by states to detect leakage from lined landfills. This strategy would utilize a leak detection system within the landfill liner and would require a reliable source of funds for the inevitable need for exhumation of landfill wastes once a leak is detected.

As shown in Figure 1, the nature of incipient leakage from a lined landfill is significantly different from that from an unlined landfill. The groundwater monitoring programs used today for lined landfills presume that the leachate plume develops across the landfill and moves in a wide front in the groundwater. However, initial leakage from a lined landfill will be from point sources--holes, tears, imperfections--in the liner system. Those point sources will produce leachate-contaminated groundwater plumes that move as fairly narrow "fingers" with limited lateral spread in the distance between the landfill and the point of compliance for groundwater monitoring (1). Because of the limited zone of capture of conventional vertical monitoring wells (about 1 ft), their wide spacing, and the nature of incipient leakage, the current practice of groundwater monitoring at lined landfills is cosmetic and of little utility in protecting groundwater resources from pollution by leachate.

Figure 1



After Cherry 1990

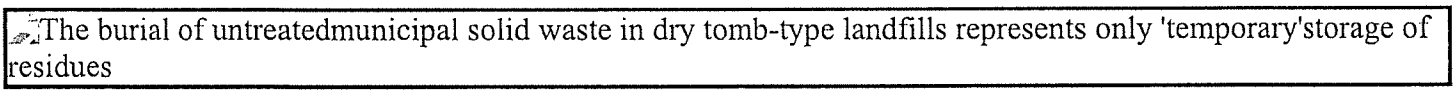
A reasonable requirement for a groundwater monitoring system is that it demonstrate at least a 95% probability of detecting the incipient presence of leachate-polluted groundwaters at the point of compliance for the monitoring system. Although it is technically feasible to implement that performance requirement with a "picket fence" of vertical monitoring wells spaced a few feet apart along the downgradient, the cost would be high.

A permanent threat

Hazardous waste and municipal solid waste dry-tomb landfills represent an ongoing threat to groundwater quality. Because the plastic sheeting used in the composite liners in Subtitle C and D landfills will eventually deteriorate, and because there is virtually no possibility that landfill covers of the type being constructed today will keep moisture out of the landfill for as long as the wastes represent a threat--that is, forever--it is inevitable that leachate will migrate through the liner to pollute the underlying groundwater.

At best, groundwater monitoring detects leachate pollution after the fact. In areas where groundwater could be used for domestic or any other purposes, the presence of Subtitle C and D landfills represents a continuing threat unless an approach is implemented and maintained to provide appropriate intervention before leachate can reach the groundwater. Thus, instead of relying on groundwater monitoring to detect liner failure, we suggest the practice of direct monitoring for failure of the uppermost composite liner in a Subtitle C landfill or the composite liner in a Subtitle D landfill.

We propose (2) the use of a pan lysimeter monitoring system that would underlie the full landfill area. This approach would include a double-composite liner system in which the lower composite liner would be used for leak detection. Such a system would reveal when leachate has leaked through the upper composite liner to a sufficient extent to pollute the groundwater under the landfill and render it unusable for domestic water supply purposes. Although Subtitle C landfills (and, in a number of states, Subtitle D landfills) incorporate double composite liner systems, the lower liner is simply relied upon as an additional barrier to leachate migration. In our system, however, the function of the lower liner is not the last level of containment but rather the first line of leak detection.


The burial of untreatedmunicipal solid waste in dry tomb-type landfills represents only 'temporary'storage of residues

Action plan and funding

A pan lysimeter leak detection system that underlies the full landfill area offers the possibility of determining, with a high degree of reliability, leakage through the upper composite liner before widespread groundwater pollution occurs. However, simply detecting a leak in the upper composite liner will not necessarily protect groundwater resources (2). With the current approach to landfill design, it is not possible to locate and repair a leak without waste exhumation, and the liner may be buried under hundreds of feet of solid waste.

We suggest that an integral part of any landfill liner leak detection system be an action program with a dedicated source of funding for as long as the wastes represent a threat. Potential action programs might include improving the efficacy of the cover so as to reduce the entrance of moisture into the landfill, which leads to leachate generation, or exhumation of the wastes from the dry-tomb landfill, proper treatment to remove the pollution potential of the waste constituents, and reburial of the nonrecyclable treated residues. This approach recognizes that the burial of untreated and treated hazardous waste as is now being practiced, and of untreated municipal solid waste in dry-tomb-type landfills, represents only "temporary" storage of residues.

This approach further recognizes that those residues will ultimate have to be exhumed and properly managed if groundwater quality is to be protected in accord with the overall performance standards contained in EPA and many states' landfill regulations. Regulations for protection of groundwater quality typically do not set a limit on the period during which such protection is to be achieved. Rather, they imply or even explicitly state--as in the case of California--that protection is to be achieved for as long as the wastes are a threat, which almost certainly will be forever for municipal solid waste, treated hazardous waste, and virtually all "nonhazardous" industrial waste in monofills (2, 3).

The approach currently being used by the EPA and many states to provide for only 30 years of post-closure care funding is inadequate (3, 4); municipal solid wastes and treated hazardous waste residues will be a threat to groundwater quality as long as they are in the dry-tomb landfill. Furthermore, many of the financial instruments being used for post-closure funding have limited reliability for ensuring that sufficient funds in fact will be available when needed to address not only routine maintenance and monitoring but also the inevitable failure of the liner systems.

A dedicated trust generated as part of disposal fees provides a mechanism by which funds can be made available to meet post-closure needs (5). The interest generated from the monitoring and maintenance trust funds has to be sufficient to provide a perpetual, self-generating funding base for cover maintenance and for eventual waste exhumation and appropriate treatment and management of the treated residues.

Although the proposed approach for operation and monitoring of dry-tomb type landfills will initially cost somewhat more for those who generate the wastes, it will be less costly in the long term and the costs will be paid by those using the facility. Future generations will not be required to endure the ramifications of leachate-polluted groundwater and to spend funds to stop the spread of groundwater pollution arising from the inadequacies of a dry-tomb landfilling approach that uses plastic sheeting, compacted clay liners, and groundwater monitoring programs to detect leachate leakage.

References

(1) Cherry, J. In *Hazardous Waste Site Investigations; Towards Better Decisions; Proc. 10th Oak Ridge National Laboratories' Life Sciences Symposium*; Lewis Publishers: Gatlinburg, TN, 1990.

(2) Lee, G. F.; Jones-Lee, A. *Proc. CISA '93 IV International Landfill Symposium* (Sardinia, Italy); CISA-Environmental Sanitary Engineering Centre: Cagliari, Sardinia, Italy, 1993; pp. 1787-96.

(3) Lee, G. F.; Jones-Lee, A. "Municipal Landfill Post-Closure Care Funding: The 30-Year Post-Closure Care Myth"; Report of G. Fred Lee & Associates, El Macero, CA, 1992.

(4) "Hazardous Waste Funding of Post-closure Liabilities Remains Uncertain," Report to Congress. General Accounting Office: Washington, DC, June 1990; GAO/RCED-90-64.

(5) Lee, G. F.; Jones-Lee, A. *Solid Waste & Power* 1993, 7, 35-39.

References as:"Lee, G. F., and Jones-Lee, A., 'A Groundwater Protection Strategy for Lined Landfills,' Environmental Science & Technology, 28:584-5 (1994)."

Detection of the Failure of Landfill Liner Systems

G. Fred Lee, PhD, PE, DEE and Anne Jones-Lee PhD
G. Fred Lee & Associates
El Macero, California

April 1996

It has been found that frequently, as part of permitting a new landfill or landfill expansion, landfill applicants and/or their consultants will claim that there is no evidence that the US EPA RCRA Subtitle C (hazardous waste) double composite-lined landfills and Subtitle D (municipal solid waste - MSW) single composite-lined landfills have failed to prevent leachate from passing through the liner system and polluting groundwaters. This situation then leads landfill applicants to try to convince regulatory agencies and others that, since there is no evidence for groundwater pollution by the plastic sheeting-lined landfills, this approach must be protective of groundwater quality and therefore a proposed landfill with this type of liner should be approved. Basically, the landfill applicants are trying to shift the burden of proof for protection of groundwater from the applicant to the regulatory agencies and/or the public where it is up to the agency - public to prove that the plastic sheeting-lined landfills will be protective of the groundwater resources in the vicinity of the landfill for as long as the wastes in the landfill will be a threat. As discussed herein, such an approach is highly inappropriate.

Burden of Proof for Groundwater Quality Protection Should Be on the Landfill Applicant

It is important that as part of developing a landfill, the landfill applicant, whether public or private, be required to convincingly demonstrate that a proposed landfill will be sited, designed, constructed, operated, closed and provide post-closure care such that it will protect the groundwater resources, public health, environment and the interests of those within the sphere of influence of the landfill, for as long as the wastes in the landfill represent a threat. For planning purposes, the wastes in a municipal solid waste landfill or the treated waste residues in a hazardous waste landfill should be considered a threat to public health, the environment and groundwater resources forever (Jones-Lee and Lee 1993). It is now well-understood that today's plastic sheeting-lined landfills that meet minimum or even somewhat above minimum design requirements will, at best, only postpone when groundwater pollution occurs by landfill leachate generated within the landfill. This issue is discussed in detail in the papers and reports developed by the authors. A list of these papers and reports is appended to these comments. Copies of them are available upon request.

Since, as discussed in the report entitled, "Recommended Design, Operation, Closure and Post-Closure Approaches for Municipal Solid Waste and Hazardous Waste Landfills," (Lee and Jones-Lee, 1995a) it is possible today to develop landfills that will be protective of public health, the environment and groundwater resources and the interests of those within the sphere of influence of the landfill, the landfill applicant should be required to develop landfills that will be protective for as long as the wastes in the landfill will be a threat.

If there are questions about any particular landfill being appropriately sited, designed, constructed, operated and whether there will be adequate post-closure care funding for as long as the wastes represent a threat, i.e., forever, then the landfill should not be developed or expanded. Those who own or use properties near proposed landfills should be protected from adverse impacts of the landfill. This will require those who generate wastes that are placed in a landfill pay the true cost associated with landfilling the wastes. In those situations where there is inadequate information to evaluate whether a proposed landfill will be protective, it is appropriate to err on the side of protection of public health, the environment and the interests of those who live near landfills rather than on the side of cheaper-than-real-cost waste disposal. The cost of proper solid waste management only represents a few cents per day more for those who generate the wastes than the cost associated with minimum Subtitle D landfills (Lee and Jones-Lee, 1993a). Similarly, the proper management of landfill hazardous waste would not significantly increase the cost of the goods that generate the waste.

Detection of the Leakage of Landfill Liner Systems

The basic reasoning (no pollution of groundwaters by landfill leachate has been detected) that is being used in support of continued development of Subtitle D minimum single composite-lined landfills and Subtitle C double composite-lined landfills is fundamentally flawed for a variety of reasons. These issues are discussed below.

Travel Time of Leachate. The way that leakage through a Subtitle D single composite liner is detected is by pollution of the groundwaters at the point of compliance for monitoring the presence of leachate. The point of compliance can, in a properly developed landfill that complies with minimum Subtitle D requirements, be no more than 150 meters from the down groundwater gradient edge of the waste management units. This means that any leakage from a Subtitle D landfill liner system must travel through the liner and unsaturated geological strata below the liner to the groundwaters and then horizontally to the point of compliance. Since Subtitle D landfill liner systems have only been required by the US EPA for less than three years, it is entirely possible that at many landfill sites the leakage through the liner that is likely occurring has not yet reached the point of compliance.

Unreliable Groundwater Monitoring. One of the primary reasons why Subtitle D and, for that matter, Subtitle C landfills have not been found to be polluting groundwaters is that the method of detection of groundwater pollution involves vertical monitoring wells spaced hundreds to a thousand or more feet apart at the point of compliance for monitoring. These monitoring wells have zones of capture into the aquifer of about one foot based on a three borehole volume purge of the well before sampling. This means that unless there is widespread general leakage throughout the whole bottom of the landfill liner system, the plumes that are generated from initial leakage would not likely be detected by the groundwater monitoring wells. Parsons and Davis (1992) have discussed the approach that should be used to develop reliable groundwater monitoring systems for lined landfills. Basically, the zone of capture of the monitoring wells at the point of compliance for groundwater monitoring must be of such dimensions (lateral extent) to intersect the leachate plumes that arise from leaks through the liner system.

Cherry (1990) and Lee and Jones-Lee (1994a) have reported that typically the plumes that are developed from plastic sheeting-lined landfills are fingerlike, i.e. with limited lateral dispersion. This creates a situation in which the groundwater monitoring systems used have a low probability of detecting groundwater pollution before widespread pollution occurs beyond the point of compliance for groundwater monitoring. In most plastic sheeting-lined landfills there will be several long, finger-like plumes of leachate extending well beyond the point of compliance before the failure of the liner system to prevent groundwater pollution is detected. This is one of the primary reasons why it is fundamentally flawed reasoning to assert that because the groundwater monitoring systems at Subtitle C and D landfills have not yet detected groundwater pollution that these types of landfills will be protective of groundwater resources for as long as the wastes in the landfill will be a threat.

Leakage Through Double-Lined Landfills. One of the best ways to judge whether leakage will occur through a single composite liner is to examine the results obtained for leaks into the leak detection system for landfills lined with double composite liners that have a leak detection system between the two composite liners. Examining this issue is the best indicator available at this time on what can be expected in the way of leaks through both the double composite liner and a single composite liner landfill system. As discussed by Lee and Jones (1992), Bonaparte and Gross (1990) reported on finding significant leaks in new landfills constructed with double-lined systems.

One of the issues that is of considerable concern with respect to leakage through composite liners in a double composite-lined system is the approach that is used to establish excessive leakage rates through the upper composite liner. Several years ago the US EPA attempted to establish a Liner Action Leakage Rate of a few gallons per acre per day as the rate at which a single composite liner in a double composite-lined system would be allowed to leak before remediation efforts would have to be undertaken. As it turned out, based on the review by Bonaparte and Gross, allowing only a few gallons per acre per day of leakage through the upper composite liner would mean that essentially all of the upper composite liners of double composite-lined systems would be found to have failed. This caused the US EPA and the states to take a different approach where the Liner Actual Leakage Rate is based on what can be achieved with current liner technology, rather than what is necessary to protect groundwater from pollution by landfill leachate.

As discussed by Lee and Jones (1992), the appropriate approach to take in establishing the Liner Action Leakage Rate is not what can be achieved with these types of liner materials, but what is necessary to protect the groundwaters from pollution by landfill leachate. This is the purpose of the liners. The approach that should be used is to determine, on a site-specific basis, the rate of leakage through the upper composite liner that can be allowed and not result in groundwater pollution if the lower composite liner were not present. For most situations, this will be on the order of a few gallons per acre per day.

Development of Liner Leak Detection Systems. While landfill applicants and their consultants often claim that a single and/or double composite liner system will not leak, it is obvious from the literature, principles of chemical thermodynamics and common sense that such claims have no technical validity. The facts are that composite-lined systems often can leak at the time of

construction due to imperfections in the construction. It is for this reason that I-Corp International of Daytona Beach, Florida; Gundle - GSE of Houston, Texas; and Robertson Barrier System Corp. of Vancouver, British Columbia have developed leak detection systems for liners. Such leak detection systems are needed to detect leaks that are occurring at the time of construction of the liner system that are not detected by conventional QA/QC approaches.

Landfill Operations Caused Leaks. Another important source of leaks for new landfills is the inadequate protection of the liner system from the initial placement of the wastes in the landfill. Often inadequate attention is given to developing a protective layer between the liner system and the lowermost layer of wastes to prevent punctures from occurring in the liner system associated with the initial placement of the wastes. An example of this type of problem occurred with Chemical Waste Management of Indiana's hazardous waste landfill unit located near New Haven, Indiana where as part of placing the first layer of wastes in that landfill, the landfill operator punched 83 holes in the liner. The leakage through these holes was of sufficient magnitude so that the state of Indiana required that the wastes that had been placed in the landfill be removed and the liners repaired.

Solvent Permeation. There is a special type of leakage of landfill liners that, thus far, is largely being ignored by the regulatory agencies, even though it is well-documented in the literature. This is the problem associated with permeation of the liner by various types of organic solvents. Common organic solvents that are present in municipal solid wastes and in treated hazardous waste residues such as the chlorinated solvents, benzene, TCE and its degradation products such as vinyl chloride, etc., can pass through an intact, with no holes, flexible membrane liner in a short period of time. This is a chemical process that does not cause the liner to deteriorate, but involves the diffusion of the organics into the plastic sheeting and then through the plastic sheeting into the media on the other side of the plastic sheeting which typically is the compacted clay layer. Permeation of dilute solutions of organic solvents through HDPE liners was discussed by Haxo and Lahey (1988). This process has been investigated in detail by Sakti et al. (1991). Recently, Buss et al. (1995) have published further information on it.

It is important to note that this mechanism of leakage is particularly significant since it results in the transport of highly hazardous persistent mobile constituents through the liner system under conditions where the liner is perfectly formed and intact. It occurs not only from concentrated solvent solutions, but also occurs with dilute aqueous solutions of the solvents. The various solvents that are of concern can be purchased by the public at the local hardware store and therefore are not exotic chemicals that would not be expected at a landfill, but are common chemicals that are expected in today's municipal landfills. Many of these solvents are known or expected carcinogens. The US EPA (1988a), as part of promulgating Subtitle D regulations, noted that one of the best ways to detect liner leakage of leachate is through measurement of organic solvents.

Long-Term Plastic Sheeting Liner Deterioration. Even if the liner is perfectly formed and no holes are punched in the liner at the time of waste deposition and if no organic solvents are present in the landfill, it is still only a matter of time until the liner system fails to prevent leachate from passing through it. The US EPA (1988a), as part of promulgating Subtitle D regulations governing municipal landfills, stated,

"First, even the best liner and leachate collection system will ultimately fail due to natural deterioration, and recent improvements in MSWLF (municipal solid waste landfill) containment technologies suggest that releases may be delayed by many decades at some landfills."

The US EPA (1988b) Criteria for Municipal Solid Waste Landfills stated,
"Once the unit is closed, the bottom layer of the landfill will deteriorate over time and, consequently, will not prevent leachate transport out of the unit."

Since the US EPA developed that position on the ultimate deterioration of flexible membrane liners, considerable additional work has been done which now further strongly supports this position. A recent example of this is the work of Hsuan and Koerner (1995) where they have reported on the initial phase of some long-term (10-year) studies that are underway on examining the rates of deterioration of flexible membrane liners. The focus of the Hsuan and Koerner's work is on the breakdown of the polymers in the plastic sheeting liners. They predict that this breakdown will occur due to free radical polymer chain scissions in 40 to 120 years. These estimates are indicated by Koerner to consider only some of the key issues that could cause breakdown. It is possible that breakdown could begin much earlier. Even if the breakdown of the plastic sheeting polymers took 100 years or so, there is still no question that ultimately the plastic sheeting in the flexible membrane liners will break down leading to an inability to prevent leachate from passing through it leading to groundwater pollution in the area.

It is important to put the ultimate breakdown of the flexible membrane liner in the perspective of the time at which the treated waste residues in a hazardous waste landfill and in a municipal solid waste landfill represent a threat. Both types of landfills contain waste components that will be a threat, effectively forever. Therefore, since it is only a matter of time until disintegration of the flexible membrane liner occurs, it is only a matter of time until groundwater pollution occurs at landfills lined with HDPE plastic sheeting.

Compacted Clay Liners. Today's Subtitle C and D landfills require that the plastic sheeting layer(s) be backed by compacted clay. The minimum design requirements for the clay layer is two feet of clay that has a permeability, at the time of construction, of no greater than 10-7 cm/sec. There are a variety of well-known mechanisms (see Lee and Jones 1992) that cause the compacted clay layers to increase their permeability over time. Factors such as desiccation cracking are important causes of increased permeability for clay liners.

There is an increasing tendency to substitute thin bentonite mats of clay for the two feet of compacted clay. These bentonite mats have advective permeabilities of about 10-9 cm/sec. However, the diffusional transport through such layers is much higher than this amount. Gray (1988) has found that diffusion is a much more important process for determining the transport through bentonite mats than the advective permeability. Further, as discussed by Lee and Jones (1992), bentonite clays are subject to significant shrink/swell properties where, for certain types of wastes that have excess calcium and magnesium over sodium, the sodium bentonite clay present in these mats would undergo ion exchange with calcium and magnesium, leading to a shrinkage of the clay and increased permeability. There are significant questions about the advisability of relying on bentonite mats as a reliable barrier for the transport of landfill leachate through them.

Overall, compacted clay layers will not prevent leachate transport through them. They have finite permeabilities which will ultimately allow, under design specifications, the transport of leachate through the layer. Further, there are a variety of mechanisms which can result in an increased permeability from that prescribed in the design and achieved at the time of construction.

Reliable Reporting on FML Properties

One of the problems with addressing the ultimate breakdown of the liner system is the failure of landfill applicants and their consultants to reliably report on the long-term stability problems with flexible membrane liners. There are numerous examples in the literature such as Fluet et al. (1992), Tisinger and Giroud (1993) and Flood (1994) where individuals who work for landfill applicants inadequately and/or unreliably report on the ultimate breakdown of flexible membrane liners. As discussed by Lee and Jones-Lee (1993b), the typical approach used by landfill consultants is to claim that the liner system will be "protective." However, they fail to discuss their definition of the duration of time in which they will be protective and fail to mention the fact that, ultimately, this protective definition that they use will result in groundwater pollution beyond the time that they are considering to be of significance. Often this time is considered to be only 30 years beyond the closure of the landfill.

As discussed by Lee and Jones-Lee (1994b), this 30-year post-closure care period, which is mandated as the minimum for Subtitle C and D landfills, is an infinitesimally small part of the total time that will ultimately have to be considered during which the wastes in the landfill will be a threat to cause groundwater pollution. Basically, the 30-year post-closure care period was an error on the part of the US Congress and environmental groups which the US EPA and Congress has yet to correct as part of the revisions of RCRA.

The problem of landfill applicants and those who serve as consultants to them not disclosing the "whole truth" about the ultimate failure of the landfill liner system to protect groundwaters for as long as the waste is a threat, is of sufficient concern such that the authors have developed a discussion of professional ethics issues. They discuss the situations associated with professional engineers failing to disclose the long-term public health and safety issues associated with a particular landfill as part of their advocating the construction of a landfill at a particular location based on a minimum or near-minimum Subtitle C or D landfill liner - containment system design.

As discussed by Lee and Jones-Lee (1995b), professional civil engineers and those who are members of the National Association of Professional Engineers are obligated to conform to the organizations' code of ethics which requires full disclosure of potential problems in those situations where public health and safety is at stake. This situation is routinely ignored by professional engineers, where they adopt an adversarial approach of only informing regulatory agencies of the potential benefits of a particular landfill liner - cover containment and monitoring system design and fail to disclose the significant long-term deficiencies with this design. This issue is discussed further by Lee and Jones-Lee (1995b) where they recommend that the landfill siting process be conducted in a true peer review arena where all advocates of a particular

position must present, for full public and peer review, the technical basis for their position under the conditions where their peers can discuss the validity of that position.

Developing Protective Landfills

One of the issues that needs to be considered is whether Subtitle C and D landfills could be developed using the "dry tomb" landfilling approach that would be protective of groundwater resources for as long as the wastes in the landfill represent a threat. Lee and Jones-Lee (1995a) have provided guidance on how this can be accomplished. Basically, it involves the construction of all hazardous waste landfills and so-called non-hazardous waste landfills using double composite-lined systems with a reliable leak detection system between the two composite liners. This is the approach that is used in Michigan's Rule 641 for municipal solid waste landfills. Such landfills consist of a double composite lined system where the lower composite liner is part of a leak detection system for the upper composite liner. It is also the approach that is used by the US EPA in Subtitle C landfills except that the US EPA has failed to develop adequate Liner Action Leakage Rates which will be protective of the groundwaters in the vicinity of the landfill when the lower composite liner is no longer an effective barrier and leachate passes through it.

The approach that should be followed is that whenever the leachate leakage through the upper composite liner is sufficiently great so that the groundwaters under the landfill could be polluted, i.e. impaired use for domestic or other purposes, by the leakage through the liner, then the landfill owner/operator must stop the leakage through the upper composite liner or exhume the waste.

Since this liner cannot be inspected and repaired without removal of the wastes, stopping the leakage through it will require that an impermeable cover be installed on the landfill which has a primary component a leak detection system that is operated and maintained in perpetuity, i.e. as long as the wastes in the landfill represent a threat. The Robertson system, the Gundle -GSE leak detection system, the I-Corp leak detection system as well as others that are being developed can all potentially be used for this purpose. While these systems cannot function effectively in the landfill liner system, they can be made to work in the landfill cover, which is accessible for repair.

Todays RCRA Subtitle C and D landfill covers involve the use of the equivalent of a composite liner in which thin plastic sheeting and a compacted clay layer is constructed on top of the waste layer. This low permeability layer is designed to minimize but not prevent moisture from entering the landfill and generating leachate. Daniel and Koerner (1991) discuss the variety of factors that influence the stability of a landfill cover such as the differential settling of the waste which can be highly disruptive of the cover integrity. Typically landfill owners/operators will assert at a landfill permitting hearing that if any problems develop in the integrity of the landfill cover, that these will be repaired. However, the low permeability layer of the landfill cover (the plastic sheeting and compacted clay) are buried below several feet of top soil and a drainage layer. Cracks can develop in the low permeability layer which cannot be perceived upon visual inspection of the landfill cover. It is for this reason that Lee and Jones-Lee (1995c) advocate that leak detectable covers be used in Subtitle C and D landfills.

If the landfill owner/operator cannot or will not stop the leakage of leachate through the upper composite liner, then the owner/operator must remove (exhume) the wastes in the landfill, properly treat them, and manage the residues from such treatment in such as way as to not lead to further groundwater pollution. Failure to adopt this approach will mean that the waste in a landfill will pollute the groundwaters of the area. As discussed by Lee and Jones-Lee (1995a), such an approach requires that a dedicated trust fund be developed from disposal fees during the landfill's active life. This trust fund should be of sufficient magnitude to ensure that sufficient funds are present to operate and maintain the leak detectable cover, leachate collection system and the leak detection system between the two composite liners. While other financial instruments are currently allowed in RCRA post-closure funding, such financial instruments are likely to be unreliable. Hickman (1992, 1995) has discussed the importance of using a dedicated trust as a reliable financial instrument to address long-term contingencies associated with "dry tomb" type landfills.

The typical 30-year post-closure fund associated with both hazardous and non-hazardous waste landfills is grossly deficient compared to the funds that will likely be required during the 30-year period, much less the infinite period of time that funds will be needed to address contingencies that will ultimately have to be addressed at the landfill. An important aspect of this situation is whether private landfilling companies will, in fact, be economically viable in the future when the funds will be needed--20, 50, 100 or so years from now. As discussed by Lee and Jones-Lee (1993c, 1994b), private landfilling companies are accruing massive liabilities that ultimately will cause these firms stockholders to sell their stock from the firms, making the firms financially unstable, ultimately leading to their bankruptcy. This past year, at the annual meeting of the Waste Management of North America Stockholders, the WMX CEO, D. Buntrock, noted that WMX was losing money on its hazardous waste management business. D. Buntrock is quoted in the Chicago Tribune as stating at this meeting, "Most of us in the company wish today we never heard of the business." Situations such as this give little confidence that landfill companies will, in fact, meet their long-term obligations associated with post-closure care of landfills.

The US Congress General Accounting Office (GAO 1990) informed Congress in a report entitled, "Hazardous Waste Funding of Postclosure Liabilities Remains Uncertain," that the current regulatory approaches do not necessarily provide the funding that will be needed to address contingencies during their post-closure period, i.e., while the wastes remain a threat. Further, the GAO (1995) has reviewed the potential for funding the monitoring and maintenance of hazardous waste landfills and concluded that, at this time, there are high degrees of uncertainty about whether federal and state funds will, in fact, be available to provide for monitoring and maintenance and periodic (five year review) of hazardous waste landfills in accord with current regulatory requirements.

Some states, such as South Carolina, are beginning to address this issue by requiring that waste management companies post cash bonds to address long-term landfill contingencies.

While generally today, regulatory agencies are not adequately addressing the long-term issues associated with municipal and hazardous waste landfills ultimately failing to protect public health, groundwater resources and the environment from waste derived constituents, there is growing recognition of the deficiencies of current regulatory approaches where the minimum

landfill design for Subtitle C and D landfills is recognized as being badly out of date and not protective of public health and the environment for as long as the wastes in the landfill will be a threat. An encouraging situation recently developed in the state of Indiana where the Hazardous Waste Facility Siting Authority reviewed a Chemical Waste Management of Indiana proposal to expand a hazardous waste landfill where it became clear, that ultimately, that landfill would pollute groundwaters of interest to the city of New Haven which is located immediately adjacent to this landfill. The Siting Authority concluding in an eight to one vote that the landfill should not be expanded because of its potential to ultimately pollute groundwaters of interest to New Haven, Indiana.

With respect to Subtitle D landfills, a number of states, such as New York, New Jersey, Michigan, Pennsylvania, Kentucky, Oregon and Arizona, have adopted double composite-lined landfills as the minimum landfill liner design for situations where there are groundwaters underlying the landfill that could be polluted by landfill leachate at any time in the future. California has had regulations (Water Resources Control Board, Chapter 15) since the mid-1980s that require that hazardous waste landfills not leak leachate through the liner system for as long as the wastes in the landfill represent a threat, and municipal solid waste landfills not allow sufficient leachate to pass through the liner system to potentially impair the uses of the groundwaters based on the concentrations of constituents in the unsaturated zone underlying the landfill for as long as the wastes represent a threat. While, such approaches appear, from a regulatory perspective to be highly protective, in fact, based on the way in which the Chapter 15 regulations have been implemented at the regional board level do not provide for this level of protection. Instead, the regional boards have been allowing landfill applications to construct landfills that, obviously, will not protect groundwaters from pollution by landfill leachate for as long as the wastes in the landfill will be a threat.

The justification for this approach is based on that mention is made in the regulations of minimum landfill liner cover - containment system design requirements. Even though the regulations explicitly state that the minimum requirements are not necessarily protective at all sites and that the liner cover - containment system must protect groundwaters from impaired use for as long as the wastes in the landfill represent a threat. The inappropriate interpretation of the regulations that is routinely occurring today in California by regional boards where the minimum design is determined to be equivalent to the groundwater quality protection performance standards set forth in the regulations is extremely short-sighted and contrary to public health, groundwater resources and the protection of the environment. This approach has allowed the construction of municipal solid waste landfills that will obviously not conform to the basic regulatory requirements of protecting groundwaters from impaired use from waste associated constituents for as long as the waste represent a threat.

Summary and Conclusions

Municipal solid waste and hazardous waste landfills of the type being developed today in which either a single composite or a double composite-liner is used as a containment system for the wastes and collection system for landfill leachate are likely and will ultimately lead to groundwater pollution by leachate for those landfills sited at locations where there is a hydraulic connection between the base of the landfill and groundwaters that are or could be used for

domestic and other water supply purposes at any time in the infinite future. The failure of being able to specifically show groundwater pollution by Subtitle C and D landfills today should not be interpreted to mean that groundwater pollution has not nor will not occur in the future. The basic problem with such an approach is that the monitoring systems used to detect landfill liner leakage involving vertical monitoring wells at the point of compliance for groundwater pollution is a fundamentally flawed approach that has a low probability of detecting initial liner leakage before widespread groundwater pollution occurs.

Based on characteristics of the rate of movement of leachate through the unsaturated and saturated zone, the characteristics of the liners and the reliability of the groundwater monitoring systems that are being used today, it is concluded that it would be, indeed, rare that groundwater pollution at the point of compliance for Subtitle C and D landfills would, in fact, be detected today. These landfills have only been constructed for a relatively short period of time. In many situations, the rate of migration of leachate through the liner and subsurface strata would not be sufficiently great to be detected in monitoring wells that happen to intercept the finger plumes of leachate that are being generated or will be generated by leakage through the liner system.

Ultimately, all Subtitle C and D landfills have the potential to pollute groundwaters hydraulically connected to them. It is only a matter of time when this occurs. There is an urgent need to update RCRA to develop regulatory approaches that will, in fact, protect groundwaters from pollution by landfill leachate for as long as the wastes in a hazardous waste or municipal solid waste landfill represent a threat. Until this update occurs, the siting of landfills should be done in accord with reliably informing the regulatory agencies and the public that the current regulatory approach in developing Subtitle C and D landfills is not protective of public health, groundwater resources and the environment from pollution by landfill leachate for as long as the wastes in the landfill represent a threat.

References

Bonaparte, R., and Gross, B., "Field Behavior of Double-Liner Systems," In: Waste Containment Systems: Construction, Regulation and Performance, Geotechnical Special Publication No. 26, ASCE, New York, pp. 52-83 (1990).

Buss, S.E., Butler, A.P., Johnston, P.M., Sollars, C.J., and Perry, R., "Mechanisms of Leakage through Synthetic Landfill Liner Materials," J. CIWEM 9:353-359 (1995).

Cherry, John A., "Groundwater Monitoring: Some Deficiencies and Opportunities," In: Proc. of the 10th ORNL Life Sciences Symposium, Gaitlinburg, TN, Hazardous Waste Site Investigations; Towards Better Decisions, Berven & R.B., Gammage, (editors), Lewis Publishers, B.A. (1990).

Daniel, D., and Koerner, R., "Landfill Liners from Top to Bottom," Civil Engineering 61:46-49 (1991).

Flood, D.R., "Synthetic Linings for Hazardous Wastes," National Environmental Journal, May/June (1994).

Fluet, J.E., Badu-Tweneboah, K., Khatami, A., "A Review of Geosynthetic Liner System Technology," Waste Management & Research, 10:47-65 (1992).

GAO, "Hazardous Waste Funding of Postclosure Liabilities Remains Uncertain," General Accounting Office, Report to Congress, RCED-90-64, Washington D.C., June (1990).

GAO, "Superfund Operations and Maintenance Activities Will Require Billions of Dollars," General Accounting Office, Report to Congress, RCED-95-259, Washington D.C., September (1995).

Gray, D., "Diffusion as a Transport Process in Fine-Grained Barrier Materials," Geotechnical News, 6(2), June (1988).

Haxo, H.E. and Lahey, T.P., "Transport of Dissolved Organics from Dilute Aqueous Solutions through Flexible Membrane Liners," Hazardous Wastes & Hazardous Materials, 5(4):275-294 (1988).

Hickman, L., "Financial Assurance-Will the Check Bounce?," Municipal Solid Waste News, March (1992).

Hickman, L., "Ticking Time Bombs?," Municipal Solid Waste News, Solid Waste Association of North America, March (1995).

Hsuan, Y.G. and Koerner, R.M., "Long Term Durability of HDPE Geomembranes Part I - Depletion of Antioxidants," Geosynthetic Research Institute Report #16, Drexel University, Philadelphia, PA, (1995).

Jones-Lee, A. and Lee, G. F., "Groundwater Pollution by Municipal Landfills: Leachate Composition, Detection and Water Quality Significance," Proceedings of Sardinia '93 IV International Landfill Symposium, Sardinia, Italy, pp. 1093-1103, October (1993).

Lee, G. F. and Jones, R. A., "Municipal Solid Waste Management in Lined, `Dry Tomb' Landfills: A Technologically Flawed Approach for Protection of Groundwater Quality," Report of G. Fred Lee & Associates, El Macero, CA, 68pp. March (1992).

Lee, G.F. and Jones-Lee, A., "The Cost of Groundwater Quality Protection in Landfilling," Report of G. Fred Lee & Associates, El Macero, CA, 8pp, July (1993a).

Lee, G. F. and Jones-Lee, A., "Geosynthetic Liner Systems for Municipal Solid Waste Landfills: An Inadequate Technology for Protection of Groundwater Quality?" Waste Management & Research, 11(4):354-360 (1993b).

Lee, G. F. and Jones-Lee, A., "Landfill Post-Closure Care: Can Owners Guarantee the Money Will Be There?", Solid Waste and Power, 7(4):35-39 (1993c).

Lee, G.F., and Jones-Lee, A., "A Groundwater Protection Strategy for Lined Landfills," Environmental Science & Technology, 28:584-5 (1994a).

Lee, G. F. and Jones-Lee, A., "Landfilling of Solid & Hazardous Waste: Facing Long-Term Liability," IN: Proceedings of the 1994 Federal Environmental Restoration III & Waste Minimization II Conference, Hazardous Materials Control Resources Institute, Rockville, MD, pp. 1610-1618, April (1994b).

Lee, G.F. and Jones-Lee, A., "Recommended Design, Operation, Closure and Post-Closure Approaches for Municipal Solid Waste and Hazardous Waste Landfills," Report to Greenpeace, Mexico, G. Fred Lee and Associates, El Macero, CA (1995a).

Lee, G.F. and Jones-Lee, A., "Practical Environmental Ethics: Is There an Obligation to Tell the Whole Truth?," Published in condensed form "Environmental Ethics: The Whole Truth" Civil Engineering, Forum, 65:6 (1995b).

Lee, G.F. and Jones-Lee, A., "Overview of Landfill Post Closure Issues," Presented at American Society of Civil Engineers Convention session devoted to "Landfill Closures - Environmental Protection and Land Recovery," San Diego, CA, October (1995c).

Parsons, A.M. and Davis, P.A., "A Proposed Strategy for Assessing Compliance with the RCRA Ground Water Monitoring Regulations," Current Practices in Ground Water and Vadose Zone Investigations, ASTM STP 1118, David M. Nielsen and Martin N. Sara, (editors), American Society for Testing and Materials, Philadelphia, PA (1992).

Sakti, J.P., Park, J.K., and Hoopes, J.A., "Permeation of Organic Chemicals through HDPE Geomembranes," In: Proceedings of ASCE National Environmental Engineering Conference, ASCE, New York, July (1991).

Tisinger, L.G., and Giroud, J.P., "The Durability of HDPE Geomembranes," Geotechnical Fabrics Report, p. 4-8, September (1993).

US EPA, "Solid Waste Disposal Facility Criteria; Proposed Rule," Federal Register 53(168):33314-33422, 40 CFR Parts 257 and 258, US EPA, Washington, D.C., August 30, (1988a).

US EPA, "Criteria for Municipal Solid Waste Landfills," US EPA Washington D.C., July (1988b).

~~~~~

References as: Lee, G. F. and Jones-Lee, A., "Detection of the Failure of Landfill Liner Systems," Report of G. Fred Lee & Associates, El Macero, CA, April (1996).
~~~~~

Geotextiles and Geomembranes 8 (1989) 27–67

NOTICE: This material may be protected by copyright law (Title 17 U.S. Code)

Leakage through Liners Constructed with Geomembranes—Part I. Geomembrane Liners*

J. P. Giroud & R. Bonaparte

GeoServices Inc. Consulting Engineers, 1200 South Federal Highway, Suite 204 Boynton Beach, Florida 33435, USA

(Received 18 June 1987; revised version received and accepted 23 September 1988)

ABSTRACT

How impermeable are 'impermeable liners'? All liners leak, including geomembranes, but how much? What are the mechanisms of leakage through liners constructed with geomembranes? To answer these questions, a detailed review of leakage mechanisms, published and unpublished test data, and analytical studies has been carried out with the goal of providing practical design recommendations. In particular, it appears that a composite liner (i.e. geomembrane on low-permeability soil) is more effective in reducing the rate of leakage through the liner than either a geomembrane alone or a soil liner (low-permeability soil layer) alone. However, the paper shows that the effectiveness of composite liners depends on the quality of the contact between the geomembrane and the underlying low-permeability soil layer.

NOTATION

A	Area (m^2)
A_s	Cross-sectional area of flow in soil (m^2)
a	Hole area (m^2)
B	Width (m)
b	Width of a two-dimensional hole (slot) in the geomembrane (m)
C_B	Dimensionless coefficient
C_F	Dimensionless coefficient

*Part II of this paper will follow in *Geotextiles and Geomembranes* 8(2).

Geotextiles and Geomembranes 0266-1144/89/$03.50 © 1989 Elsevier Science Publishers Ltd, England. Printed in Great Britain

C_1	Coefficient in the relationship between coefficient of migration and pressure difference (dimension depends on relationship)
d	Hole diameter (m)
D_g	Water vapor diffusion coefficient of geomembrane (s)
g	Acceleration due to gravity (m/s^2) (note: $g = 9{\cdot}81$ m/s^2)
H	Relative humidity of water vapor (dimensionless)
ΔH	Relative humidity difference (dimensionless)
H_L	Liner thickness (m)
H_s	Soil layer thickness (m)
h	Hydraulic head (m)
Δh	Hydraulic head difference (m)
h_w	Depth of liquid on top of the geomembrane (m)
i	Hydraulic gradient (dimensionless)
i_s	Vertical hydraulic gradient in soil (dimensionless)
k	Hydraulic conductivity (m/s)
k_g	Equivalent hydraulic conductivity of geomembrane (m/s)
k_p	Hydraulic conductivity of geotextile within its plane (m/s)
k_s	Hydraulic conductivity of soil layer (m/s)
M	Mass (kg)
m	Coefficient of migration (m^2/s)
m_g	Geomembrane coefficient of migration (m^2/s)
m_{gmax}	Maximum value of geomembrane coefficient of migration (m^2/s)
n	Exponent in eqn (19) (dimensionless)
p	Pressure (Pa)
Δp	Pressure difference (Pa)
$\Delta p_{plateau}$	Value of pressure difference where m_g reaches its plateau (Pa)
p_s	Pressure of saturated water vapor (Pa)
Q	Flow rate, leakage rate (m^3/s)
Q_g	Leakage rate due to geomembrane permeation (m^3/s)
Q_i	Interface flow rate (i.e. flow rate in the space between geomembrane and underlying soil) (m^3/s)
Q_r	Radial interface flow rate (m^3/s)
Q_s	Flow rate into the soil (m^3/s)
Q^*	Leakage rate per unit length in the direction perpendicular to the figure (m^2/s)
q	Unitized leakage rate (i.e. leakage rate per unit area of liner) (m/s)
q_g	Unitized leakage rate due to geomembrane permeation (m/s)
R	Radius of wetted area (m)
r	Radius (m)

s	Spacing between geomembrane and underlying soil (m)
T	Thickness (m)
T_g	Geomembrane thickness (m)
t	Time (s)
WVT	Water vapor transmission rate (kg/(m^2 s))
η	Viscosity of liquid (kg/(m s))
θ	Hydraulic transmissivity of the medium between the geomembrane and the underlying soil (m^2/s)
ρ	Density (kg/m^3)

1 INTRODUCTION

1.1 Scope

1.1.1 Some essential questions

Geomembranes are becoming the most commonly used material for the lining of containment facilities used to store water, chemicals, ore and waste. The use of geomembranes is mandatory in some countries for the lining of certain types of waste containment facilities, e.g. hazardous waste landfills and liquid impoundments. Even when municipal solid waste reduction processes are used (e.g. composting, recycling, incineration) there is still a substantial fraction of the waste (sometimes more than 50%) which must be landfilled and, when landfills are located over an aquifer, they should be lined.

Geomembranes are relatively new as compared to other lining materials, such as clay, concrete and asphaltic concrete. As a consequence, many questions arise when their use is considered. These include:

- *Engineer's questions at the conceptual design stage*. Should a geomembrane be placed on a low-permeability soil layer (thereby forming a geomembrane–soil composite liner), or should the geomembrane be placed directly on a drainage layer to collect leakage?
- *Engineer's questions at the detailed design stage*. How can leakage through a geomembrane be evaluated, and what is the influence of the permeability of the underlying soil? What size and number of geomembrane defects should be considered in leakage rate calculations? If a layer of low-permeability soil is placed under a geomembrane (to form a composite liner) what are the required properties of this soil layer? What is the influence of hydraulic head on the leakage rate through the liner? For composite liners, does a geotextile placed

between the geomembrane and the low-permeability soil layer significantly affect the leakage rate if there is a defect in the geomembrane?
- *Installer's and quality assurance monitor's question*. How critical are defects in a geomembrane due to puncture, inadequate seams, etc.?
- *Regulator's and specifier's question*. What 'reasonable' leakage rates should be considered in regulations and specifications?
- *Owner's question*. Should geomembranes be used alone or in association with low-permeability soils to meet performance criteria imposed in regulations and specifications?
- *Responsible citizen's question*. To what degree do geomembranes help protect human health and the environment when they are used for the lining of facilities containing waste or other potentially dangerous materials?
- *Researcher's question*. In which area of leakage evaluation do we need additional research?

All these questions are essential, considering that, for many years to come, storage and disposal in containment facilities will probably be the most practical way for handling waste, and water conservation will be a challenge that many societies will have to face.

1.1.2 Purpose and organization of this paper

The purpose of this paper is to present the state of the art regarding the above questions. A detailed review of leakage mechanisms, published and unpublished test data, and analytical studies are presented in two main sections:

- a section devoted to geomembrane liners placed directly on a pervious soil; and
- a section devoted to composite liners comprised of a geomembrane placed on a low-permeability soil layer.

The last section of the paper presents practical conclusions.

The remainder of this introduction presents general information on liners and lining systems and gives basic definitions regarding leakage.

1.2 Liners

1.2.1 Definition of liner

A liner is a low-permeability barrier used to impede liquid or gas flow. Note that 'low-permeability' is used, and not 'impermeable'. If there was such a thing as an impermeable barrier, it would be possible to prevent leakage, and many of the discussions and considerations presented in this

paper would be pointless. Although a glass may appear to be impermeable to water, none of the materials presently used in civil engineering to line large areas is impermeable.

1.2.2 Liner materials

Low-permeability materials used in civil engineering to construct liners include: low-permeability soils, geomembranes, concrete and asphaltic concrete. Only low-permeability soils and geomembranes are discussed in this paper:

- Low-permeability soils used to construct liners include clays, silty clays, clayey sands and silty sands. If such soils are not available at the site, it is possible to make a low-permeability soil by mixing bentonite with a more permeable soil such as sand.
- Geomembranes are low-permeability membranes used in civil engineering as fluid barriers. By definition, a membrane is a material that is thin and flexible. Geomembranes include asphaltic geomembranes and polymeric geomembranes. Examples of materials used to manufacture polymeric geomembranes are: high density polyethylene (HDPE); linear medium density polyethylene (LMDPE); polyvinyl chloride (PVC); and chlorosulfonated polyethylene (CSPE). Basic definitions regarding geomembranes are given by Giroud and Frobel[1] and Giroud.[2]

1.2.3 Composite liner

A composite liner is a liner comprised of two or more low-permeability components made of different materials in contact with each other. For example, a geomembrane and a low-permeability soil layer placed in contact with each other constitute a composite liner (Fig. 1(b)) (p. 34). Composite liners are not double liners, as discussed in Section 1.3.2.

The purpose of a composite liner is to combine the advantages of two materials, such as geomembranes and soils, which have different hydraulic, physical, and endurance properties.

Hydraulic properties. On one hand, the presence of the low-permeability soil component is beneficial:

- Geomembranes may have holes through which large amounts of leakage can occur if the geomembrane is placed on a pervious medium and subjected to a hydraulic head. The leakage rate through a geomembrane hole is reduced by several orders of magnitude, as discussed in this paper, if there is a low-permeability soil under the geomembrane.
- The amount of time (called 'breakthrough time') required for liquid

to flow through a geomembrane can be small. Even if the geomembrane has no hole and flow is only due to permeation, the breakthrough time through a geomembrane can be of the order of a few weeks or less. This is essentially due to the thinness of geomembranes. In contrast, soil layers are thick and the breakthrough time for a 1 m (3 ft) thick low-permeability clay with no cracks can be of the order of 10 years or more.

On the other hand, the presence of the geomembrane component is beneficial because its very low permeability decreases the leakage rate by several orders of magnitude, compared to the leakage rate through a soil liner alone.

The complementarity of the two components of a composite liner from a hydraulic standpoint can be summarized as follows: (i) the geomembrane component decreases the leakage rate, while the low-permeability soil component increases the breakthrough time; and (ii) the presence of the low-permeability soil in contact with the geomembrane decreases the rate of leakage due to a hole in the geomembrane.

Physical properties. The complementarity of the geomembrane and low-permeability soil components of a composite liner is also clear in the area of physical properties. One of the components of a composite liner may retain its integrity while the other is breached, and, in some cases, one of the components protects the integrity of the other:

- On one hand, geomembranes are thin and can be punctured and torn by shocks or concentrated stresses, whereas soil layers are thick and are rarely completely breached by shocks or concentrated stresses. Also, the low-permeability soil, which is smooth and relatively thick, protects the geomembrane from the concentrated stresses which might otherwise be exerted by underlying angular materials.
- On the other hand, clay liners may exhibit cracks, due to small strains or changes in moisture content, while geomembranes retain their continuity under these conditions. In addition, due to their extremely low permeability, geomembranes can prevent desiccation of the low-permeability soil.

Endurance properties. Chemical resistance and aging characteristics of geomembranes and soils are different. Therefore, it is conservative to use two different materials: if one of them does not last as long as predicted, the other may continue to perform. In many cases, this would not be acceptable since all components of a design are normally required to perform. However, this may be sufficient in some cases such as landfills where performance requirements decrease after a certain period of time since leachate generation dramatically decreases after landfill closure.

1.2.4 Terminology related to liners

A geomembrane used alone (i.e. not associated with a low-permeability soil layer) is called a 'geomembrane liner' (Fig. 1(a)). A low-permeability soil layer used alone (i.e., not associated with a geomembrane) is called a 'soil liner' (e.g. a 'clay liner', if the soil is a clay).

The geomembrane and the low-permeability soil used in a composite liner are referred to as the components of the composite liner. The terms 'geomembrane liner' and 'soil liner' should be reserved for geomembranes and soil layers used alone and should not be used to designate the components of a composite liner. The terms 'geomembrane' and 'soil layer' should be used for the components of a composite liner.

1.3 Lining systems

1.3.1 Definition of lining system

Since no liner is impermeable, leakage control cannot result only from liners. Leakage control, however, can result from a combination of liners and drainage layers, performing complementary functions:

- Liners (which are low-permeability barriers) impede the flow of liquids toward the ground.
- Drainage layers (which have a high permeability) intercept the liquids and convey the flow toward a controlled collection point.

The combination of liners and drainage layers in a containment facility is called a 'lining system'. Therefore, the terms 'liner' and 'lining system' are not synonymous.

1.3.2 Types of lining systems

Double liner. A 'double-liner lining system' simply called a 'double-liner system' or a 'double liner' is a lining system which includes two liners *with a drainage layer to detect, collect, and remove liquids between the two liners* (Fig. 1(c, d, e)). Clearly, two liners in contact (i.e. without an intermediate drainage layer) do not constitute a double liner; they constitute a composite liner, which is a single liner, as discussed below.

Single liner. A single liner is a lining system which includes only one liner (Fig. 1(a, b)). A single liner can be comprised of several components: this is the case of composite liners (defined in Section 1.2.3), which are comprised of a geomembrane on a low-permeability soil, *without* a drainage layer in between.

1.3.3 Terminology related to double liners

The two liners of a double liner are referred to as the *top liner* and the *bottom liner*. (The terminology *primary liner* and *secondary liner* is also

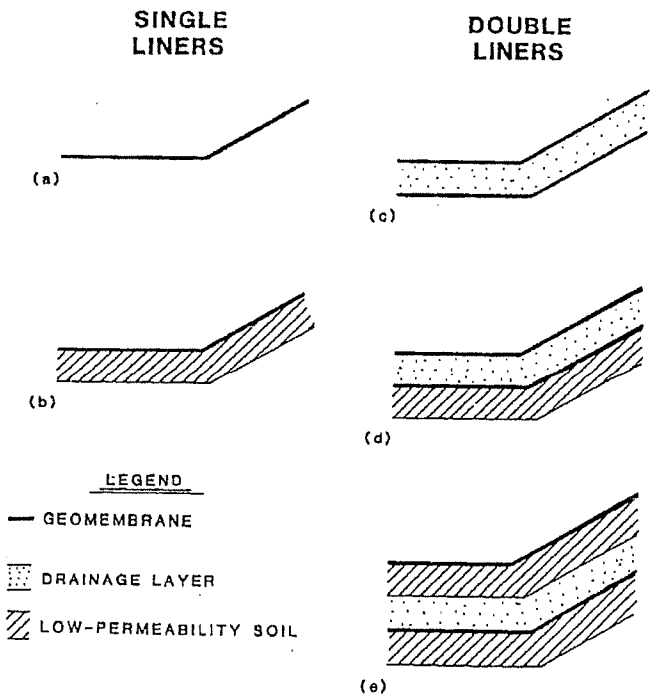


Fig. 1. Five examples of lining systems: (a) single geomembrane liner; (b) single composite liner; (c) double geomembrane liner; (d) double liner with geomembrane top (or primary) liner and composite bottom (or secondary) liner; (e) double composite liner.

used.) The intermediate drainage layer is the *leakage collection layer*. This layer is part of the *leakage detection, collection, and removal system*, which also includes collector pipes and sumps.

1.3.4 Materials used in lining systems

Review of materials. Liner materials were discussed in Section 1.2.2. High-permeability materials used to construct leakage collection layers include:

- high-permeability soils such as sands and gravels, often combined with pipes; and
- synthetic drainage materials (also called synthetic transmission media) such as thick needlepunched nonwoven geotextiles, geonets, geomats and corrugated or waffled plates.

In addition to their use as transmission media, geotextiles are used

extensively in lining systems: they are used as filters or separators to prevent contamination of high-permeability materials by fine soils or waste, and they are used as cushions to protect geomembranes from damage by adjacent materials.

Geomembranes, synthetic drainage materials, and geotextiles are all members of a class of products terms *geosynthetics*.

Comment on geotextile cushions. It may seem appropriate to use a geotextile cushion between the geomembrane upper component and the low-permeability soil lower component of a composite liner if the soil contains stones which might damage the geomembrane. Geotextiles typically used as cushions are thick; therefore, their hydraulic transmissivity is not negligible and they can convey liquids laterally within their plane. In a composite liner with leakage through a hole in the geomembrane upper component, lateral flow in the geotextile increases the rate of leakage through the composite liner because it increases the surface area of low-permeability soil exposed to a hydraulic head. It may also increase the leakage rate by establishing a connection between a hole in the geomembrane and cracks in the low-permeability soil layer. Therefore, the engineer faces a dilemma: on the one hand, a geotextile cushion placed between the two components of a composite liner will help to prevent holes in the geomembrane; on the other hand, if there is a hole, the leakage rate may be higher than without a geotextile.

In the vast majority of cases, no geotextile is used between the geomembrane and the low-permeability soil components of a composite liner, because (if the geomembrane is strong and the low-permeability soil does not contain sharp stones) a geotextile cushion is not usually necessary, whereas there is a significant risk of leakage rate increase as a result of the presence of the geotextile. However, test results and discussions presented in this paper show that there may be cases where the presence of the geotextile does not increase the leakage rate due to a hole in the geomembrane; in these cases, the use of a geotextile may be justified. The reader is cautioned, however, that more research is needed before it becomes possible to recommend the use of a geotextile between the geomembrane and the low-permeability soil components of a composite liner.

Of course, if a geotextile cushion is placed between the upper and the lower component of a composite liner, it must not be connected to a sump or any kind of outlet because the geomembrane, the geotextile, and the soil layer would then form a double liner, which is not the goal. In subsequent discussions, we will assume that, in the rare cases where a geotextile would be incorporated in a composite liner, it is not connected to a sump.

1.3.5 Uses of lining systems

Types of containment facilities. Typical examples of lining systems are shown in Fig. 1. Lining systems are used in three types of containment facilities:

- facilities containing liquids such as dams, canals, reservoirs (to which a variety of names are given such as ponds, lagoons, surface impoundments, liquid impoundments);
- facilities containing solids such as landfills, waste piles, and ore leach pads; and
- facilities containing mostly liquids at the beginning of operations and mostly solids at the end, such as settling ponds, evaporation ponds and sludge ponds.

Leachate collection. In facilities containing solids, there is generally a *leachate collection layer* above the top liner. This layer is usually made of high-permeability materials similar to those used to construct leakage collection layers. These materials were described in Section 1.3.4. The purpose of the leachate collection layer is to collect the leachate and convey it toward a sump where it is removed from the facility. The leachate is the liquid that has permeated through the solid contained in the facility (e.g. contaminated liquid that has seeped through the waste stored in a landfill, or pregnant solution in the case of an ore leach pad). The efficiency of the leachate collection layer governs the hydraulic head acting on the top liner of a facility containing solids. The hydraulic head governs the leakage rate through the liner, as discussed in the next section.

1.3.6 Hydraulic head

Definition. Leakage through a liner in contact with a liquid is governed by the hydraulic head difference to which the liner is subjected. Assuming that the liner is saturated, the hydraulic head difference across the liner is given by:

$$\Delta h = h_w + H_L \tag{1}$$

where: Δh = hydraulic head difference; h_w = hydraulic head acting on top of the liner; and H_L = liner thickness.

If the liquid on top of the liner is not flowing (with the exception of the slow movement due to leakage through the liner), the *hydraulic head acting on the liner* is equal to the *depth of liquid on top of the liner*. If the liquid located on top of the liner is flowing laterally (as in a leachate collection layer), the head is different from the depth of liquid. However, in most practical cases the difference between the *hydraulic head acting on the liner* and the *depth of liquid on top of the liner* is negligible and, in this paper, the two expressions will be used interchangeably.

Typical values. Liquid depths on liners (i.e. hydraulic heads acting on liners) are as follows:

- In facilities containing liquids, the top liner (of a double liner) or, simply, the liner (in the case of a single liner) is subjected to the depth of impounded liquid.
- In facilities containing solids there is always some liquid (leachate) in contact with the liner. In these facilities, the depth of liquid on the *liner exposed to the contained solids* is always designed to be less than a maximum value, typically 0·3 m (1 ft) when a layer of granular soil is used for the leachate collection system, or a few millimeters when a synthetic drainage layer is used for the leachate collection system. (The *liner exposed to the contained solids* is the top liner in the case of a double liner or, simply, the liner in the case of a single liner.) Leachate generation varies significantly over time (e.g. it peaks following a storm); consequently, most of the time, the depth of liquid on the liner exposed to solids is less than the maximum design value.
- In all cases, the bottom liner of a double liner is normally subjected to a very small liquid depth.

In the analyses presented in this paper, some typical liquid depth values will be considered, for the sake of examples or comparisons. Liquid depths of 0·03 m (0·1 ft) and 0·003 m (0·01 ft) will be considered for the bottom liner of a double liner. For the top liner of a double liner, or for the liner in the case of a single liner, the following liquid depths will be considered:

- 30 m (100 ft) for deep facilities containing liquids (such as dams and large water reservoirs);
- 3 m (10 ft) for shallow facilities containing liquids (such as canals, small water reservoirs, storage of industrial liquids, and storage of liquid chemical waste); and
- 0·3 m (1 ft) or 0·003 m (0·01 ft) for facilities containing solids depending on the type of high-permeability material used in the leachate collection layer, granular soil or synthetic drainage layer, respectively.

1.3.7 Uses of composite liners

Composite liners are used to decrease leakage rates and this paper will show that this objective is usually achieved. However, composite liners have two drawbacks that engineers must consider at the conceptual design stage:

- Composite liners must be used with caution in liquid containment facilities. If the geomembrane component of the composite liner is

directly in contact with the contained liquid (in other words, if the geomembrane is not covered with a heavy material such as a layer of earth or concrete slabs), and if there is leakage through the geomembrane, liquids will tend to accumulate between the low-permeability soil (which is the lower component of the composite liner) and the geomembrane, since the submerged portion of the geomembrane (whose specific gravity is close to 1) is easily uplifted. Then, if the impoundment is rapidly emptied, the geomembrane will be subjected to severe tensile stresses because the pressure of the entrapped liquids is no longer balanced by the pressure of the impounded liquid. Therefore, a composite liner should always be loaded, which is automatically the case in a landfill or in a waste pile, and which must be taken into account in the design of a liquid containment facility.

- If the top liner of a double-liner system is a composite liner (Fig. 1(e)) the compaction of the soil component of this liner will induce stresses in the underlying materials. These stresses may damage the geosynthetics (geotextile filter and geonet drain) that may be used in the leakage collection layer, and the geomembrane component of the bottom liner. Therefore, the soil component of a top composite liner must be compacted with great care and light equipment, and often will not be as well compacted as the soil component of a bottom composite liner.

In addition to these drawbacks which must be considered at the conceptual design stage, composite liners may have defects as indicated in Section 3.1.2.

1.4 Leakage definition

1.4.1 Definitions: leak and leakage

According to Webster's dictionary:

- A leak is 'a crack or opening that permits something to escape from or enter a container or conduit'.
- Leakage is 'something that escapes by leaking' or 'an amount lost as the result of leaking'.

1.4.2 Leak size and leakage rate

The term 'leak size' designates the size of a hole, expressed as a surface area or dimensions such as a diameter (e.g. a 1 cm^2 leak, a 1 in^2 leak, a 2 mm diameter leak, a 0·25 in diameter leak). The term 'leak size' is sometimes mistakenly used for 'leakage rate', which is the flow rate through a leak or a group of leaks. The leakage rate is expressed as a

volume per unit of time (m^3/s, liters/day, gallons/day). The term 'unitized leakage rate' will be used in this paper as an abbreviation for 'leakage rate per unit area of liner', which is expressed as a volume per unit of time per unit of area (m^3/s per m^2 (which is equivalent to m/s), liters/hectares per day (lphd), liters/1000 m^2/day (ltd), gallons/acre/day (gpad)). Unit conversions are given in Table 1. The relationship between unitized leakage rate and leakage rate is as follows:

$$q = Q/A \tag{2}$$

where: q = unitized leakage rate (i.e. leakage rate per unit area of liner); Q = leakage rate; and A = considered area of liner. Basic SI units are: q (m/s), Q (m^3/s), and A (m^2).

TABLE 1
Leakage Rate Units

Leakage rate (Q)	
1 m^3/s	= $8{\cdot}64 \times 10^7$ liters/day
	= $2{\cdot}28 \times 10^7$ gallons/day
1 liter/day	= $1{\cdot}16 \times 10^{-8}$ m^3/s
	= 0·26 gallon/day
1 gallon/day	= $4{\cdot}38 \times 10^{-8}$ m^3/s
	= 3·78 liters/day
Unitized leakage rate (q)	
1 m/s	= $8{\cdot}64 \times 10^{10}$ liters/1 000 m^2 per day
	= $8{\cdot}64 \times 10^{11}$ liters/ha per day
	= $9{\cdot}24 \times 10^{10}$ gallons/acre per day
1 liter/ha/day	= $1{\cdot}16 \times 10^{-12}$ m/s
	= 0·107 gallon/acre per day
	= 0·1 liters/1 000 m^2 per day
1 liter/1 000 m^2/day	= $1{\cdot}16 \times 10^{-11}$ m/s
	= 1·07 gallon/acre per day
	= 10 liters/ha per day
1 gallon/acre/day	= $1{\cdot}08 \times 10^{-11}$ m/s
	= 9·35 liters/ha per day
	= 0·935 liters/1 000 m^2 per day

From a practical standpoint, the following approximate conversions can be used:

1 lphd ≈ 0·1 gpad
1 gpad ≈ 10 lphd
1 ltd ≈ 1 gpad

where: lphd = liter/ha per day, ltd = liter/1 000 m^2 per day, gpad = gallon/acre per day.

Notes: 1 hectare = 100 m × 100 m = 10 000 m^2 = 2·47 acres. 1 acre = 55 yd × 88 yd = 4 840 yd^2 = 43 560 ft^2 = 4 047 m^2 = 0·4 ha. The term 'unitized leakage rate' is used as an abbreviation for 'leakage rate per unit area of liner'. Note that the SI unit for unitized leakage rate (m/s) results from m^3/s per m^2.

1.4.3 Darcy's equation

In this paper, reference is often made to Darcy's equation which governs the flow of liquids through porous media such as soils:

$$Q/A = ki = k\Delta h/T \quad (3)$$

where: Q = flow rate (i.e. leakage rate if the considered flow is through a liner); A = area perpendicular to the flow; k = hydraulic conductivity of the porous medium; i = hydraulic gadient; Δh = hydraulic head difference; and T = thickness of the porous medium. Basic SI units are: Q (m^3/s), A (m^2), k (m/s), Δh (m), and T (m); i is dimensionless.

In the case of laminar flow of water through porous media, the hydraulic conductivity, k, is a constant which depends only on the porous medium, the liquid and the temperature (in other words, k is independent of the liquid pressure and the hydraulic gradient). Flow is laminar if the openings of the porous medium are small, which is the case of pea gravel and all finer soils, and needlepunched nonwoven geotextiles. Flow is nonlaminar (turbulent or in the transition between laminar and turbulent) in clean gravel and all coarser materials, and in geosynthetics with large openings such as geonets, geomats and waffled structures. If Darcy's equation is used to express flow rate in materials where the flow is not laminar, k is not a constant, but depends on the hydraulic gradient.

Geomembranes are not porous media like soils and, therefore, flow of liquids through geomembranes is not governed by Darcy's equation. This is why the terminology 'permeation through geomembranes' (see Section 2.2) is preferred to the terminology 'permeability of geomembranes', the term 'permeability' being traditionally associated with porous media. However, for the sake of comparison with soils, the flow of water through geomembranes can be expressed using Darcy's equation, which leads to a value of k that is not a constant, but depends on the pressure of the liquid (and, therefore, the hydraulic gradient). Such a value of k can be called the 'equivalent hydraulic conductivity of the geomembrane for the considered hydraulic gradient (or pressure)'.

2 LEAKAGE THROUGH GEOMEMBRANE LINERS

2.1 Introduction

2.1.1 Scope of the section

As indicated in Section 1.2.4, two types of liners are considered: geomembrane liners (i.e. geomembranes alone) and composite liners (i.e. liners comprised of a geomembrane associated with a layer of low-permeability

soil). Section 2 discusses leakage through geomembrane liners. Leakage through composite liners will be discussed in Section 3.

Some of the information presented in Section 2 will be used in Section 3 since the first step of leakage through a composite liner is leakage through the geomembrane component of the composite liner.

2.1.2 Organization of the section

Leakage through a geomembrane can occur as a result of: (i) permeation through an intact geomembrane; and (ii) flow through defects in a geomembrane. Accordingly, leakage due to permeation will be discussed first (Section 2.2), followed by leakage due to geomembrane defects (Section 2.3).

Finally, conclusions regarding leakage through geomembrane liners will be presented in Section 2.4.

2.2 Leakage due to permeation through geomembranes

2.2.1 Limitation of the scope

The following discussion of permeation through geomembranes is primarily concerned with water as the permeant. It is well known that certain organic chemicals permeate geomembranes much more quickly than water. The significance of this fact is addressed in Section 2.2.10.

2.2.2 Liquid permeameter tests

Tests were conducted at the University of Grenoble (France), first by Giroud from 1973 to 1978, and then by Gourc and Faure, using a constant-head, fixed wall permeameter similar to fixed-wall cells sometimes used to measure soil permeability (Fig. 2). (Hereafter, these tests are referred to as 'liquid permeameter tests' to prevent any confusion with other types of permeameter tests used to evaluate permeation by gases or vapors.) These tests have shown that water passes through a geomembrane when there is water on both sides of the geomembrane and the water pressure on one side is different from the water pressure on the other side. Results of these tests were published by Giroud.[2,3] In these publications, Darcy's equation was used as follows to interpret the test results and calculate equivalent hydraulic conductivities:

$$q_g = Q_g/A = k_g i = k_g \Delta h/T_g \quad (4)$$

where: q_g = unitized leakage rate (i.e. leakage rate per unit area of geomembrane) due to geomembrane permeation; Q_g = leakage rate due to geomembrane permeation; A = surface area of the considered geomembrane; k_g = equivalent hydraulic conductivity of the geomem-

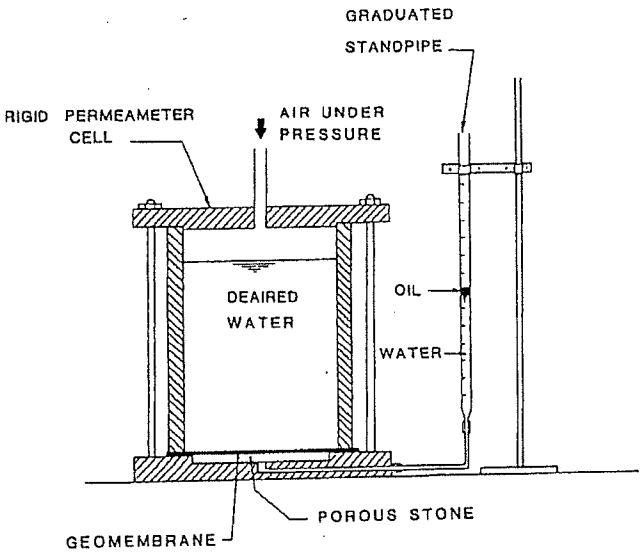


Fig. 2. Liquid permeameter test. The apparatus schematically shown above was used to evaluate water permeation through intact geomembranes at the University of Grenoble (France). Oil is used to prevent evaporation.

brane; i = hydraulic gradient; Δh = hydraulic head difference; and T_g = geomembrane thickness. Basic SI units are: q_g (m/s), Q_g (m^3/s), A (m^2), k_g (m/s), and Δh (m); i is dimensionless.

The equivalent hydraulic conductivities thus calculated vary with the water pressure (and, consequently, the hydraulic head and the hydraulic gradient), which indicates that permeation of water through a geomembrane is different from laminar flow through porous media (where the hydraulic conductivity is constant as discussed in Section 1.4.3). Also, as shown by Giroud,[2,3] the variation of geomembrane equivalent hydraulic conductivity with water pressure is very complex. It is therefore impractical to use equivalent hydraulic conductivities for geomembranes and another approach has been developed, as discussed below.

2.2.3 *The concept of coefficient of migration*

The liquid permeameter tests discussed above can be interpreted using a *coefficient of migration* defined as follows:

$$q_g = Q_g/A = m_g/T_g \tag{5}$$

where: q_g = unitized leakage rate (i.e. leakage rate per unit area of geomembrane) due to geomembrane permeation; Q_g = leakage rate due

to geomembrane permeation; A = surface area of the considered geomembrane; m_g = coefficient of migration of the geomembrane; and T_g = geomembrane thickness. Basic SI units are: q_g (m/s), Q_g (m^3/s), A (m^2), m_g (m^2/s), and T_g (m).

Comparing eqns (4) and (5) leads to the following relationship between k_g and m_g:

$$m_g = k_g \Delta h \tag{6}$$

There is no fundamental reason to prefer m_g or k_g. The use of m_g is recommended by the authors for the practical reasons discussed below.

The geomembrane coefficient of migration, m_g, varies with the water pressure (and, therefore, the hydraulic head and the hydraulic gradient), but in a way that seems simpler than the way the geomembrane equivalent hydraulic conductivity, k_g, varies. Therefore, for geomembranes, the use of the coefficient of migration seems more practical than the use of the equivalent hydraulic conductivity. In addition, when the term *geomembrane equivalent hydraulic conductivity* is used, there is a connotation that flow is due to advection through pores in the geomembrane. However, the actual mechanism of water migration through the geomembrane is different from pure advection. With the term *geomembrane coefficient of migration*, there is no implied assumption regarding the nature of the migration mechanism.

Values of the coefficient of migration obtained for various geomembranes using the liquid permeameter test results are given in Table 2. Although there are not enough data to draw firm conclusions, it appears that the coefficient of migration increases to some maximum value, m_{gmax}, as the liquid pressure increases. From available data, it appears that the coefficient of migration reaches a plateau $m_g = m_{gmax}$ for liquid pressure of the order of 50–100 kPa (7–14 psi) (i.e. hydraulic heads of the order of 5–10 m (15–30 ft)). The value of m_{gmax}, like the value of m_g, depends on the polymer used to make the geomembrane. (Note: The existence and value of m_{gmax} are tentative due to the difficulty in performing permeameter tests at high pressures and the potential for testing error. Even under high pressures, the flow rates are very small, while the high pressures could cause expansion of the hydraulic system or small amounts of leakage.)

When there is water on both sides of a geomembrane, there cannot be any flow if there is no pressure difference across the geomembrane. Therefore, eqn (6) shows that the coefficient of migration, m_g, must be equal to zero when there is no pressure difference across the geomembrane ($\Delta p = 0$, i.e. $\Delta h = 0$). Consequently, the first part of the curve of the coefficient of migration versus the pressure difference, Δp, increases

TABLE 2
Results of Liquid Permeameter Tests

Geomembrane type	*Pressure difference, Δp (kPa)*					
	50	*100*	*250*	*500*	*750*	*1000*
	Values of the migration coefficient, m_g (m^2/s)					
CSPE		3.8×10^{-12}		5.0×10^{-12}		5.5×10^{-12}
Butyl		7.7×10^{-12}		3.9×10^{-12}		3.1×10^{-12}
Butyl	3.5×10^{-15}	1.7×10^{-13}	1.9×10^{-12}	2.9×10^{-13}		3.0×10^{-13}
EPDM		1.1×10^{-12}		2.3×10^{-12}		2.2×10^{-12}
PVC		1.7×10^{-12}		2.5×10^{-12}		1.1×10^{-12}
PVC		1.6×10^{-12}		2.1×10^{-12}		4.4×10^{-13}
PVC		8.1×10^{-13}		2.0×10^{-12}		1.0×10^{-12}
Asphaltic	4.2×10^{-13}	7.4×10^{-13}	6.7×10^{-13}	6.5×10^{-13}	7.4×10^{-13}	
Asphaltic		1.6×10^{-13}	3.2×10^{-13}	6.5×10^{-13}	4.5×10^{-13}	

Note: Values of geomembrane migration coefficients (m_g) were obtained from tests conducted at the University of Grenoble (France) with the apparatus shown in Fig. 2.

TABLE 3
Results of Water Vapor Transmission Tests on Geomembranes

Polymer	*Geomembrane thickness T_g (mm)*	*Water vapor transmission WVT (g/(m². day))*	*Coefficient of migration m_g (m^2/s)*	*Equivalent hydraulic conductivity k_g (m/s)*
Butyl rubber	0·85	0·384	3.8×10^{-15}	2.7×10^{-14}
	0·85	0·020	2.0×10^{-16}	1.4×10^{-15}
	1·85	0·097	2.1×10^{-15}	1.5×10^{-14}
CPE	0·53	0·643	3.9×10^{-15}	2.8×10^{-14}
	0·79	1·400	1.3×10^{-14}	9.0×10^{-14}
	0·79	0·320	2.9×10^{-15}	2.1×10^{-14}
	0·85	0·264	2.6×10^{-15}	1.8×10^{-14}
	0·94	0·305	3.3×10^{-15}	2.3×10^{-14}
	0·97	0·643	7.2×10^{-15}	5.1×10^{-14}
CSPE	0·74	0·333	2.9×10^{-15}	2.0×10^{-14}
	0·76	0·663	5.8×10^{-15}	4.1×10^{-14}
	0·89	0·438	4.5×10^{-15}	3.2×10^{-14}
	0·91	0·748	7.9×10^{-15}	5.5×10^{-14}
	0·94	0·422	4.6×10^{-15}	3.2×10^{-14}
	1·07	0·252	3.1×10^{-15}	2.2×10^{-14}
Elasticized polyolefin	0·72	0·142	1.2×10^{-15}	8.3×10^{-15}
CO	1·160	20·18	2.7×10^{-13}	1.9×10^{-12}
	1·650	14·30	2.7×10^{-13}	1.9×10^{-12}

TABLE 3—*contd.*

Polymer	*Geomembrane thickness* T_g *(mm)*	*Water vapor transmission WVT* $(g/(m^2 . day))$	*Coefficient of migration* m_g (m^2/s)	*Equivalent hydraulic conductivity* k_g *(m/s)*
EPDM	0·51	0·270	$1·6 \times 10^{-15}$	$1·1 \times 10^{-14}$
	0·94	0·190	$2·1 \times 10^{-15}$	$1·5 \times 10^{-14}$
	1·70	0·172	$3·4 \times 10^{-15}$	$2·4 \times 10^{-14}$
Neoprene	0·51	0·304	$1·8 \times 10^{-15}$	$1·3 \times 10^{-14}$
	0·91	0·473	$5·0 \times 10^{-15}$	$3·5 \times 10^{-14}$
	1·27	0·429	$6·3 \times 10^{-15}$	$4·4 \times 10^{-14}$
	1·59	0·237	$4·4 \times 10^{-15}$	$3·1 \times 10^{-14}$
Nitrile rubber	0·76	5·51	$4·8 \times 10^{-14}$	$3·4 \times 10^{-13}$
Polybutylene	0·69	0·084	$6·7 \times 10^{-16}$	$4·7 \times 10^{-15}$
Polyester elastomer	0·20	10·50	$2·4 \times 10^{-14}$	$1·7 \times 10^{-13}$
LDPE	0·76	0·057 3	$5·1 \times 10^{-16}$	$3·5 \times 10^{-15}$
HDPE	0·80	0·017 2	$1·6 \times 10^{-16}$	$1·1 \times 10^{-15}$
	2·44	0·006 2	$1·8 \times 10^{-16}$	$1·2 \times 10^{-15}$
HDPE-alloy	0·86	0·047 2	$4·7 \times 10^{-16}$	$3·3 \times 10^{-15}$
PVC	0·28	4·42	$1·4 \times 10^{-14}$	$1·0 \times 10^{-13}$
	0·51	2·97	$1·8 \times 10^{-14}$	$1·2 \times 10^{-13}$
	0·76	1·94	$1·7 \times 10^{-14}$	$1·2 \times 10^{-13}$
	0·79	1·85	$1·7 \times 10^{-14}$	$1·2 \times 10^{-13}$
PVC-E	0·91	2·78	$2·9 \times 10^{-14}$	$2·1 \times 10^{-13}$
PVC-OR	0·83	4·17	$4·0 \times 10^{-14}$	$2·8 \times 10^{-13}$
Saran film	0·013	0·563	$8·5 \times 10^{-17}$	$5·9 \times 10^{-16}$

Notes: The water vapor transmission (WVT) rates are from Haxo *et al.*[5] From these WVT values, the values of the coefficient of migration (m_g) were derived using eqn (18) and the values of the equivalent hydraulic conductivity (k_g) were derived using eqn (15). (See also Table 4.) All these tests were conducted at 23°C with a relative humidity difference of 50%, which is equivalent to a vapor pressure difference, Δp, of 1·4 kPa (0·2 psi). Definitions of polymer symbols can be found in Refs 1 and 2.

from zero to m_{gmax} as the pressure difference increases from zero to a value, $\Delta p_{plateau}$, approximately equal to 50–100 kPa (7–14 psi).

2.2.4 Water vapor transmission tests

It is difficult to conduct water permeameter tests on geomembranes with a head of water smaller than 5 m (16 ft) (i.e. a pressure smaller than 50 kPa (7 psi)) because the rates of water permeation are too small to be accurately measured. As indicated in Section 1.3.6, hydraulic heads acting on liners are often smaller than 5 m (16 ft). Therefore, it is useful to

complement results from the liquid permeameter tests cited above with results from water vapor transmission tests. These tests are typically conducted with a vapor pressure difference across the geomembrane of the order of 1–10 kPa (0·15–1·5 psi).

Water vapor transmission tests have been extensively used on various types of membranes and the test procedures have been standardized (e.g. ASTM E96). In brief, the test is performed as follows: the two sides of a geomembrane specimen are subjected to two different relative humidities. Typically, one side is subjected to a 50% relative humidity while the other side is maintained at 0% relative humidity (using a desiccant) or 100% relative humidity (by having liquid water (at nearly zero pressure) in contact with the entire surface of the geomembrane specimen). The relative humidity difference corresponds to a vapor pressure difference which drives vapor through the geomembrane. The relationship between vapor pressure and relative humidity is as follows:

$$p = p_s H \tag{7}$$

where: p = vapor pressure; p_s = vapor pressure at the saturation point (which is a function of temperature and is tabulated in most physics handbooks); and H = relative humidity. Basic SI units are: p (Pa) and p_s (Pa); H is dimensionless.

The water vapor transmission rate (WVT) measured in the test is *the mass of vapor permeating the geomembrane per unit area of geomembrane per unit period of time*. The SI unit is kg/(m^2 s) and test results are often reported in g/(m^2 day). (Note: 1 g/(m^2 day) = $1{\cdot}16 \times 10^{-8}$ kg/(m^2 s).)

Results from water vapor transmission tests are given in Tables 3 and 4.

2.2.5 *Fick's equation*

Water vapor transmission tests are usually interpreted using Fick's equation:

$$\text{WVT} = \frac{M}{At} = D_g \Delta p / T_g \tag{8}$$

where: WVT = water vapor transmission rate; M = mass of vapor migrating through the geomembrane; A = geomembrane surface area; t = time (i.e. duration of permeation); D_g = water vapor diffusion coefficient of the geomembrane; Δp = vapor pressure difference between the two sides of the geomembrane; and T_g = geomembrane thickness. Basic SI units are: WVT (kg/(m^2 s)), M (kg), A (m^2), t (s), D_g (s), Δp (Pa), and T_g (m).

NOTICE: This material may be protected by copyright law (Title 17 U.S. Code)

TABLE 4
Results of Water Vapor Transmission Tests on Polymers

Geomembrane type	*Vapor pressure difference* Δp *(kPa)*	*Water vapor transmission WVT* $(g/(m^2 \cdot day))$	*Reference thickness T (mm)*	*Coefficient of migration* m_g (m^2/s)	*Equivalent hydraulic conductivity* k_g *(m/s)*
CSPE	6·4	161	0·025	$4{\cdot}7 \times 10^{-14}$	$7{\cdot}2 \times 10^{-14}$
Butyl	6·4	26	0·025	$7{\cdot}5 \times 10^{-15}$	$1{\cdot}2 \times 10^{-14}$
PVC	6·1	32	0·025	$9{\cdot}3 \times 10^{-15}$	$1{\cdot}5 \times 10^{-14}$
HDPE 0·92	6·4	28	0·025	$8{\cdot}1 \times 10^{-15}$	$1{\cdot}2 \times 10^{-14}$
0·94	5·8	14	0·025	$4{\cdot}1 \times 10^{-15}$	$6{\cdot}9 \times 10^{-15}$
0·95	6·1	6·7	0·025	$1{\cdot}9 \times 10^{-15}$	$3{\cdot}1 \times 10^{-15}$
0·96	5·8	.4	0·025	$1{\cdot}2 \times 10^{-15}$	$2{\cdot}0 \times 10^{-15}$

Notes: The pressure difference, Δp, was derived from the test relative humidity difference using eqn (7). Values ranging from 0·92 to 0·96 are HDPE specific gravities. The water vapor transmission (WVT) rates are from Rogers.[17] From these WVT values, the values of the coefficient of migration (m_g) were derived using eqn (18), and the values of the equivalent hydraulic conductivity (k_g) were derived using eqn (15). (See also Table 3.)

Combining eqns (7) and (8) leads to the following expression for Fick's equation:

$$\text{WVT} = \frac{M}{At} = D_g p_s \Delta H / T_g \tag{9}$$

where: ΔH = relative humidity difference between the two sides of the geomembrane.

Inspection of Fick's equation shows that the water vapor transmission rate (WVT) depends on the pressure used in the test. It also depends on the thickness of the geomembrane and therefore characterizes a given geomembrane (e.g. a 1·5 mm (60 mil) thick HDPE geomembrane), not a geomembrane material (e.g. HDPE). Consequently, *water vapor transmission rates (WVT) are meaningful only if the vapor pressure and the geomembrane thickness used in the test are known.* Values of WVT given in the literature should therefore be used with caution.

Knowing the water vapor transmission rate of a given geomembrane specimen obtained in a given test, the quantity of vapor permeating through a geomembrane made with the same material can be calculated

for different pressures and thicknesses using the following relationships derived from Fick's equation:

$$\frac{M}{At} = \text{WVT} = (\text{WVT})_o \frac{\Delta p}{\Delta p_o} \frac{T_{go}}{F_g} = (\text{WVT})_o \frac{\Delta H}{\Delta H_o} \frac{T_{go}}{T_g} \tag{10}$$

where: M = mass of vapor migrating through the considered geomembrane when it is subjected to a pressure difference Δp; A = considered geomembrane surface area; t = time (i.e. duration of permeation through the considered geomembrane); WVT = water vapor transmission rate through the considered geomembrane when it is subjected to a pressure difference Δp; $(\text{WVT})_o$ = water vapor transmission rate through the geomembrane specimen used in the test; Δp = vapor pressure difference between the two sides of the considered geomembrane; Δp_o = vapor pressure difference between the two sides of the geomembrane used in the water vapor transmission test; T_{go} = thickness of the geomembrane specimen used in the water vapor transmission test; T_g = thickness of the considered geomembrane; ΔH = relative humidity difference between the two sides of the considered geomembrane; and ΔH_o = relative humidity difference between the two sides of the geomembrane specimen used in the water vapor transmission test. Basic SI units are: M (kg), A (m^2), t (s), WVT ($kg/(m^2 s)$), Δp (Pa), Δp_o (Pa), T_{go} (m) and T_g (m); ΔH and ΔH_o are dimensionless.

It should be pointed out that the use of eqn (10) should be restricted to pressures that are not too different from the pressures typically used to conduct the water vapor transmission test (e.g. pressures of the order of 1–10 kPa (0·15–1·5 psi).

2.2.6 Discussion of Fick's equation

The first expression of Fick's equation (eqn (8)), shows that there is *no vapor transmission* through a geomembrane if there is *no vapor pressure* difference between the two sides of the geomembrane. According to the second expression of Fick's equation (eqn (9)), it is equivalent to say that there is no vapor transmission through a geomembrane if the relative humidity is the same on both sides of the geomembrane. This happens in particular when there is liquid on both sides of the geomembrane (H = 100%). Therefore, if there is liquid on both sides of a geomembrane, there is no vapor transmission through the geomembrane, even if there is a pressure difference between the two sides.

From these facts, some researchers have concluded that there is no liquid migration at all through a geomembrane if there is liquid on both sides of the geomembrane, regardless of the pressure difference; in other words, they have concluded that vapor transmission is the only mechanism

of fluid transport through a geomembrane. However, it seems that another conclusion can be drawn as a result of the following rationale:

- As indicated above, there is no vapor transmission through a geomembrane exposed to liquid on both sides.
- The liquid permeameter tests discussed in Section 2.2.2 show that liquid does migrate through a geomembrane when there is liquid on both sides, with a pressure difference.
- Therefore, vapor transmission is not the only mechanism of water migration through a geomembrane.

The fact that there is water migration through a geomembrane when there is water (in liquid state) on both sides, with a pressure difference, does not necessarily imply that liquid is flowing through small channels in geomembranes as it does in soils. It is more likely that water transport through geomembranes is at the molecular level because spaces between the molecular chains of the polymers used to manufacture geomembranes are extremely narrow. It is even possible that the mechanism of water migration through geomembranes at the molecular level is identical whether the cause of migration is a liquid pressure difference or a vapor pressure difference. Clearly, additional research on flow through geomembranes would be useful to define the transport mechanisms better.

2.2.7 Relationship between liquid and vapor migrations

Two types of tests have been discussed above:

- *Liquid permeameter tests*. In these tests, the driving pressure causing water migration through the geomembrane is liquid pressure difference. For practical reasons, these tests are typically conducted with relatively high pressures.
- *Water vapor transmission tests*. In these tests, the driving pressure causing water migration through the geomembrane is vapor pressure difference. For practical reasons, these tests are typically conducted with relatively low pressures.

Since their pressure ranges are different, these two types of tests are complementary. However, to compare the results from these two types of tests, the results must be expressed in the same way. It is therefore necessary to establish relationships between the coefficients used to express the results of liquid permeameter tests, on the one hand, and water vapor transmission tests, on the other hand. This is achieved by establishing a relationship between Darcy's equation, used to interpret liquid permeameter tests (eqn (4)), and Fick's equation, used to interpret water vapor transmission tests (eqn (8)).

Darcy's equation and Fick's equation are similar. Both equations incorporate coefficients of proportionality (equivalent hydraulic conductivity in Darcy's equation, k_g, and vapor diffusion coefficient in Fick's equation, D_g) relating the same two fundamental physical quantities: the rate of mass transport and the pressure difference. Therefore, a relationship can be established between the two coefficients of proportionality, k_g and D_g. The relationship will correspond to a physical reality if the mechanism of water transport through a geomembrane at the molecular scale is the same regardless of the cause of water migration, liquid pressure or vapor pressure, as suggested in Section 2.2.6. At a minimum, the relationship is a useful tool to compare rates of water mass transport measured using tests where the nature of the driving pressure is different, such as the liquid permeameter test described in Section 2.2.2 and the water vapor transmission test described in Section 2.2.4.

A preliminary step in the establishment of the relationship between k_g and D_g is to rewrite Darcy's equation by: (i) expressing the flow rate as a function of the mass transport rate; and (ii) expressing the liquid head difference as a function of the pressure difference.

The flow rate, Q, in Darcy's equation, is in fact a rate of volume transport. It can be converted into a rate of mass transport using the following equation:

$$Q = (M/t)/\rho \tag{11}$$

where: Q = flow rate; M/t = mass transport rate; M = mass; t = time; and ρ = density of the considered fluid (typically water) in the liquid phase. Basic SI units are: Q (m^3/s), M/t (kg/s), M (kg), t (s), and ρ (kg/m^3).

The liquid head difference, Δh, in Darcy's equation can be converted into a pressure difference using the following equation:

$$\Delta h = \Delta p/(\rho g) \tag{12}$$

where: Δh = liquid head difference across the geomembrane; Δp = pressure difference across the geomembrane; ρ = density of the considered liquid (usually water); and g = acceleration due to gravity. Basic SI units are: Δh (m), Δp (Pa), ρ (kg/m^3), and g (m/s^2).

Substitution of eqns (11) and (12) in eqn (4) (which is the traditional expression of Darcy's equation with flow rate and hydraulic head difference) yields a new expression of Darcy's equation with the mass transport rate and the pressure difference:

$$\frac{M}{t} = k_g \frac{\Delta p}{g T_g} A \tag{13}$$

where: M/t = mass transport rate; k_g = geomembrane equivalent hyd-

raulic conductivity; Δp = pressure difference; A = geomembrane surface area; g = acceleration due to gravity; and T_g = geomembrane thickness. Basis SI units are: M/t (kg/s), k_g (m/s), Δp (Pa), A (m^2), g (m/s^2), and T_g (m).

Comparing Darcy's equation (eqn (13)) and Fick's equation (eqn (8)) yields:

$$k_g = gD_g \tag{14}$$

where: k_g = geomembrane equivalent hydraulic conductivity (from Darcy's equation); g = acceleration due to gravity; and D_g = geomembrane water vapor diffusion coefficient (from Fick's equation). Basic SI units are: k_g (m/s), g (m/s^2), and D_g (s).

From this important relationship, it is possible to derive relationships between WVT (a coefficient more often used than D_g for water vapor transmission tests), on the one hand, and k_g and m_g (coefficients used for liquid permeameter tests), on the other.

By combining eqns (8) and (14):

$$\text{WVT} = \Delta p k_g/(gT_g) \tag{15}$$

By combining eqns (9) and (14):

$$\text{WVT} = p_s \Delta H k_g/(gT_g) \tag{16}$$

By combining eqns (12) and (15):

$$\text{WVT} = \rho k_g \Delta h/T_g \tag{17}$$

By combining eqns (6) and (17):

$$\text{WVT} = \rho m_g/T_g \tag{18}$$

where: k_g = geomembrane equivalent hydraulic conductivity; g = acceleration due to gravity; T_g = geomembrane thickness; WVT = geomembrane water vapor transmission rate; Δp = pressure difference; p_s = vapor pressure at the saturation point (which is a function of temperature and is tabulated in most physics handbooks); ΔH = relative humidity difference; ρ = liquid density; Δh = hydraulic head difference; and m_g = geomembrane coefficient of migration. Basic SI units are: k_g (m/s), g (m/s^2), T_g (m), WVT (kg/(m^2 s)), Δp (Pa), p_s (Pa), ρ (kg/m^3), Δh (m), and m_g (m^2/s); ΔH is dimensionless.

2.2.8 Curves of coefficient of migration

Using the relationships established in Section 2.2.7, it is possible to express the results of the liquid permeameter tests and vapor transmission tests with the same coefficient. Any of the coefficients (k_g, m_g, D_g or WVT) can

be used. The use of m_g is preferred for the reasons already indicated in Section 2.2.3: (i) m_g varies with liquid pressure in a simple way; and (ii) m_g is a new coefficient which has not been associated historically with any fluid transport mechanism, and its neutral meaning does not imply any assumption regarding the transport mechanism. In addition, for interpretation of vapor transmission test results, m_g is not dependent on geomembrane thickness as is WVT.

Using eqn (18), the measured water vapor transmission rate (WVT) values given in Tables 3 and 4 have been converted into values of the coefficient of migration. (Tables 3 and 4 also include values of equivalent hydraulic conductivities obtained using eqn (15).) It is interesting to see in Table 3 that the series of tests on a given product (e.g. the series of four tests on PVC) with various thicknesses give consistent values of the coefficient of migration. However, Tables 2, 3 and 4 contain discrepancies and apparently erratic results due to the difficulty of the tests and the sometimes great differences between geomembranes of the same generic type. For example, the large discrepancy between water vapor transmission rates measured on PVC at a 1·4 kPa (0·2 psi) pressure difference (Table 3) and a 6 kPa (0·9 psi) pressure difference (Table 4) probably results from the fact that the PVC tested at a 1·4 kPa (0·2 psi) pressure difference was a geomembrane made of plasticized PVC and the PVC tested at a 6 kPa (0·9 psi) pressure difference was pure PVC. Plasticizers cause PVC to swell, thereby making plasticized PVC more permeable than pure PVC.

There are insufficient data in Tables 2, 3 and 4 to establish a complete table of values of coefficient of migration, m_g, for geomembranes. Systematic testing should be undertaken to investigate the relationship between the coefficient of migration and the pressure difference. In the meantime, we propose to use available data (presented in Tables 2, 3 and 4) to draw curves such as those in Fig. 3. Since we have shown in Section 2.2.3 that $m_g = 0$ when $\Delta p = 0$, it is possible to interpolate between ($m_g = 0$, $\Delta p = 0$) and known data points to obtain m_g for small values of Δp.

From the curves given in Fig. 3 in logarithmic scale, it is possible to draw the curve given in Fig. 4 which illustrates what seems to be the shape of the coefficient of migration–pressure difference curve as can be established from available results. As shown in Fig. 4, the following equations can be proposed:

$$m_g = C_1 \Delta p^n \quad \text{if } \Delta p < \Delta p_{plateau} \tag{19}$$

$$m_g = m_{gmax} \quad \text{if } \Delta p > \Delta p_{plateau} \tag{20}$$

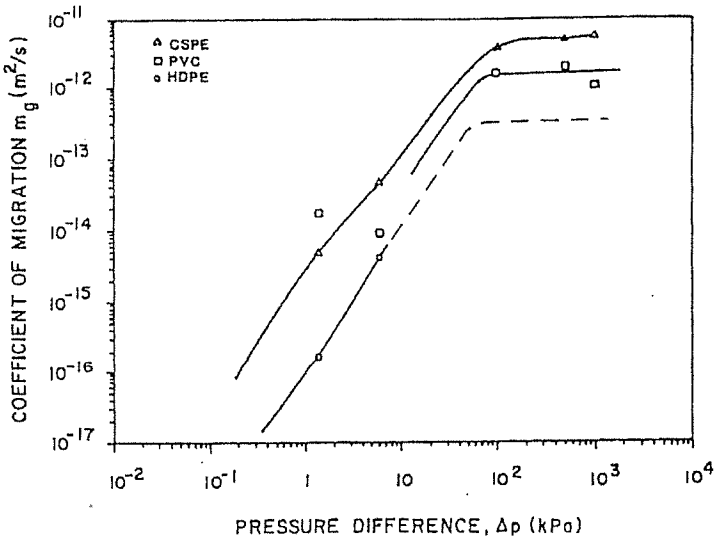


Fig. 3. Coefficients of migration for various geomembranes. The curves show the variation of the coefficient of migration, m_g, as a function of the fluid (vapor or liquid) pressure difference, Δp, across the geomembrane. The data points are from Tables 2, 3 and 4. HDPE geomembranes are generally considered to be less permeable to water than others and this seems to be confirmed by the above curves. The curves also seem to indicate that PVC geomembranes are less permeable to water than CSPE geomembranes. This may not be true in many cases because of the large variety of PVC and CSPE geomembranes: a CSPE geomembrane typically contains 45% CSPE and 55% additives, and a PVC geomembrane typically contains 65% PVC and 35% plasticizers. In contrast, HDPE geomembranes are less variable, because they are essentially made of HDPE with only a very small percentage of additives; therefore, results for HDPE geomembranes are expected to form a smooth curve with no significant scattering. Unfortunately, the database for HDPE geomembranes is limited and the dashed portion of the curve related to HDPE was assumed.

where: m_g = geomembrane coefficient of migration; C_1 = coefficient; Δp = pressure difference; and n = dimensionless coefficient between 1·5 and 2. Basic SI units are: m_g (m²/s), C_1 (m⁴ kg^{-2} s³ if $n = 2$, or m$^{3\cdot5}$ kg$^{-1\cdot5}$ s² if $n = 1\cdot5$), and Δp (Pa). Equation (19) assumes that the first part of the curves in Fig. 3 (logarithmic scale) are straight lines.

It is clear from the above discussions that a lot of work needs to be done before it becomes possible to draw firm conclusions on rates of water permeation through geomembranes.

2.2.9 *Example of leakage rate evaluation*

From Fig. 3, or from eqns (19) and (20), with $C_1 = 1 \times 10^{-22}$ m⁴ kg^{-2} s³, $n = 2$, $\Delta p_{plateau} = 55$ kPa, and $m_{gmax} = 3 \times 10^{-13}$ m²/s, it is possible to

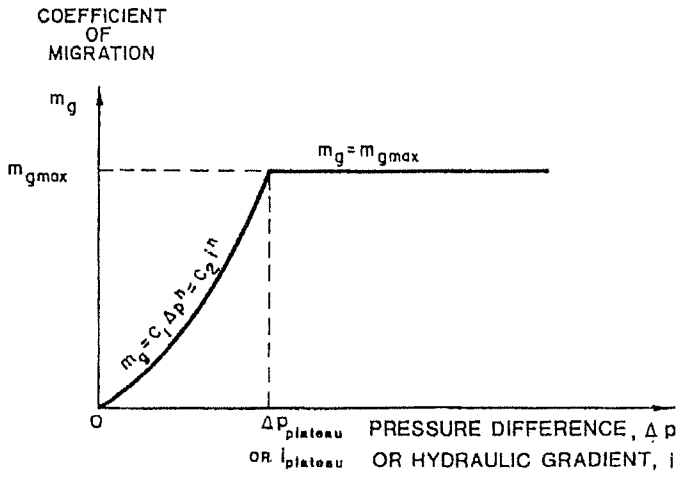


Fig. 4. Schematic shape of the curve giving the coefficient of migration of a geomembrane, m_g, as a function of the pressure difference, Δp. This curve has been established from a limited number of liquid permeameter and water vapor transmission test results and needs to be confirmed by more tests. The exponent n is of the order of 1·5–2; m_{gmax} depends on the geomembrane material; C_1 and C_2 are two constants that depend on the geomembrane material. The value of $\Delta p_{plateau}$ is of the order of 50–100 kPa (7–14 psi), i.e. a hydraulic gradient of the order of 5×10^3 to 1×10^4, if the geomembrane thickness is 1 mm (40 mils), and a hydraulic head of the order of 5–10 m (15–30 ft).

obtain tentative values of the coefficient of migration, m_g, for an HDPE geomembrane, permeated by water. These values are given in the upper part of Table 5. From these coefficients of migration, it is possible to calculate unitized leakage rates due to water permeation through an HDPE geomembrane. This was done using eqn (5) with a geomembrane thickness of 1 mm (40 mils). The tentative unitized leakage rates thus obtained are given in the lower part of Table 5. These tentative unitized leakage rates should only be considered as an example to illustrate the methodology since the coefficient of migration values used for the calculations were assumed (as shown in Fig. 3) from a very limited database.

2.2.10 Migration of chemicals

The liquid permeameter and vapor transmission data in Tables 2, 3 and 4 were from tests using water or water vapor as the permeating fluids. In waste containment applications, the liquid in contact with the geomembrane may be a pure chemical other than water, a mixture of pure chemicals, or a dilute aqueous solution. Most leachates from municipal solid waste landfills and other nonhazardous solid waste containment

TABLE 5
Calculated Unitized Leakage Rates due to Permeation of Water Through an HDPE Geomembrane

	Water depth on top of the geomembrane, h_w					
	0 m (0 ft)	*0·003 m (0·01 ft)*	*0·03 m (0·1 ft)*	*0·3 m (1 ft)*	*3 m (10 ft)*	*>10 m (>30 ft)*
Coefficient of migration, m_g (m^2/s)	0	9×10^{-20}	9×10^{-18}	9×10^{-16}	9×10^{-14}	3×10^{-13}
Unitized leakage rate, q_g						
(m/s)	0	9×10^{-17}	9×10^{-15}	9×10^{-13}	9×10^{-11}	3×10^{-10}
(lphd)	0	8×10^{-5}	0·008	0·8	80	260
(gpad)	0	8×10^{-6}	0·0008	0·08	8	28

Notes: These values of utilized leakage rates were calculated using eqn (5) and assuming a geomembrane thickness of 1 mm (40 mils). The coefficients of migration used to calculate the unitized leakage rates in this table were obtained from eqns (19) and (20), with $C_1 = 1 \times 10^{-22}\ m^4\ kg^{-2}\ s^3$, $n = 2$, and $m_{gmax} = 3 \times 10^{-13}\ m^2/s$. The water depths used here correspond to the typical values defined in Section 1.3.6. (To use eqn (19), it is necessary to know the pressure difference, Δp. According to eqn (1), water depths, h_w, are approximately equal to hydraulic head differences, Δh, which are related by eqn (12) to pressure differences, Δp.)

facilities fall into the latter category with relatively low concentrations of a relatively large number of chemical constituents.

Liquid permeameter tests and vapor transmission tests using either pure chemicals, chemical mixtures or aqueous solutions have been reported by August and Tatzky,[4] Haxo *et al.*,[5] Haxo and Waller,[6] Steffen[7] and Telles *et al.*[8] These test results have shown that permeation rates of some organic chemicals through geomembranes are several orders of magnitude larger than the permeation rate of water. The high permeation rates of these chemicals persist even when the organics are completely dissolved in an aqueous solution. Under these conditions, permeation of the aqueous solvent and organic solute are not coupled and the organic solute may permeate the geomembrane to the exclusion of the aqueous solvent. Notwithstanding the high permeation rates measured in laboratory tests, the total chemical mass transport rate in the field may be relatively low, due to the low chemical concentrations in the liquids and leachates contained by many geomembranes (particularly in those solid waste landfills where the primary source of leachate generation is precipitation) and the decay of the initial chemical gradient that exists across the

geomembrane (due to the absorption of permeating chemicals by the soil underlying the geomembrane).

Just as permeation of geomembranes by water requires additional research, so does permeation of geomembranes by chemicals. Further consideration of this topic, however, is beyond the scope of this paper.

2.3 Leakage due to defects in geomembranes

2.3.1 Introduction

In addition to leakage due to permeation of liquids through geomembranes (discussed in Section 2.2) there is leakage through geomembrane defects: this subject will be discussed in Section 2.3. As shown in Section 2.2, leakage due to permeation of water can be very small, while it will be shown in this section that leakage due to geomembrane defects can be large.

In the first part of this section, calculations for evaluating leakage rates through geomembrane defects, such as pinholes and holes, will be discussed. The remainder of the section will be devoted to an evaluation of the size and frequency of defects that may occur in a geomembrane. This information is necessary for making analytic calculations of leakage rates through liners (geomembranes alone as well as composite liners). Although all types of defects are considered, the primary focus will be on seam defects because forensic analyses have shown that leakage through geomembrane liners is often due to defective seams, and the most complete documentation of geomembrane defects is for seam defects.

At the end of this section, recommendations are presented regarding appropriate assumptions for the size and frequency of geomembrane defects for lining system design calculations.

2.3.2 Leakage due to pinholes in the geomembrane

Definition of pinholes. According to Giroud[3] pinholes should be distinguished from holes and can be defined as openings having a dimension (such as diameter) significantly smaller than the geomembrane thickness. The primary source of pinholes are manufacturing defects. Early manufacturing techniques for geomembranes often resulted in a significant number of pinholes. However, manufacturing processes and polymer formulations have advanced to a degree that pinholes are now relatively rare.

Basic equation. For leakage calculation purposes, pinholes can be considered as pipes and, therefore, according to Giroud,[3] Poiseuille's equation can be used:

$$Q = \pi \rho g h_w d^4/(128 \eta T_g) \tag{21}$$

TABLE 6
Calculated Leakage Rates due to Pinholes and Holes in a Geomembrane

		Water depth on top of the geomembrane, h_w				
	Defect diameter	*0·003 m (0·01 ft)*	*0·03 m (0·1 ft)*	*0·3 m (1 ft)*	*3 m (10 ft)*	*30 m (100 ft)*
Pinholes	0·1 mm (0·004 in)	0·006 (0·0015)	0·06 (0·015)	0·6 (0·15)	6 (1·5)	60 (15)
	0·3 mm (0·012 in)	0·5 (0·1)	5 (1)	50 (13)	500 (130)	5 000 (1 300)
Holes[a]	2 mm (0·08 in)	40 (10)	130 (30)	400 (100)	1 300 (300)	4 000 (1 000)
	11·3 mm (0·445 in)	1 300 (300)	4 000 (1 000)	13 000 (3 000)	40 000 (10 000)	130 000 (30 000)
		Values of leakage rate in liters/day (gallons/day)				

Notes: The geomembrane is assumed to be overlain and underlain by a very pervious medium such as coarse gravel or geonet. The leakage rate calculated for holes would be significantly reduced if the pervious medium in contact with the geomembrane on one or both sides is sand or a less permeable material. In the case of pinholes, a geomembrane thickness of 1 mm (40 mils) was used in the calculations, while in the case of holes, leakage rates are independent of geomembrane thickness. Equation (21) was used for pinholes and eqn (22) for holes. The pinhole calculations were based on water at 20°C. The water depths used here correspond to the typical values defined in Section 1.3.6.

[a]The 2·0 mm diameter circular hole ('small hole') has a surface area of 3·1 mm^2 and the 11·3 mm diameter circular hole ('large hole') has a surface area of 1 cm^2. These are the two holes recommended for design in Section 2.3.9.

where: Q = leakage rate through a pinhole; h_w = liquid depth on top of the geomembrane; T_g = thickness of the geomembrane; d = pinhole diameter; ρ and η = density and dynamic viscosity of the liquid, respectively; and g = acceleration due to gravity. Basic SI units are: Q (m^3/s), h_w (m), T_g (m), d (m), ρ (kg/m^3), η (kg/(m s)), and g (m/s^2). For water at 20°C, ρ = 1000 kg/m^3 and $\eta = 10^{-3}$ kg/(m s).

The above equation is different from the equation used for evaluating leakage through holes (see eqn (22), Section 2.3.3).

Calculations. Equation (21) has been used to calculate leakage rates for two typical pinhole diameters, 0·1 mm (0·004 in) and 0·3 mm (0·012 in), assuming a geomembrane thickness of 1 mm (40 mils). Results are presented in Table 6. The hydraulic heads used in these calculations are equal to the liquid depths defined in Section 1.3.6.

2.3.3 Leakage due to holes in the geomembrane

Definition of holes. According to Giroud[3] holes should be distinguished from pinholes and can be defined as openings having a dimension (e.g. diameter) about as large as, or larger than, the geomembrane thickness.

Assumption regarding underlying material. Leakage rates through geomembrane holes are significantly affected by the material underlying the geomembrane. Two extreme cases can be considered: a high-permeability material such as a granular or synthetic drainage medium, and a low-permeability soil such as a clay layer placed under a geomembrane to form a composite liner. The case of a composite liner is addressed in Section 3.

In this section, the material underlying the geomembrane is assumed to have an infinite hydraulic conductivity. Tests by Brown *et al.*[9] have shown that underlying soils with a hydraulic conductivity higher than 10^{-3} m/s (10^{-1} cm/s) do not significantly affect free flow through a small geomembrane defect. Their results justify the assumption of an infinite hydraulic conductivity for many drainage materials underlying a geomembrane liner.

Assumption regarding overlying material. Leakage rates through geomembrane holes are affected by the material overlying the geomembrane. For this paper, the authors did not investigate the influence of overlying soil permeability on leakage rate. Evaluation of this influence may be important in some cases and additional work in this area is needed. At least, it is clear that the more permeable the overlying material, the higher the leakage rate for a given hydraulic head. In subsequent calculations, the overlying material will conservatively be assumed to be infinitely pervious. This assumption, which is acceptable if the overlying material is very pervious such as coarse gravel or geonet, may lead to a significant overestimate of the leakage rate if the overlying material is sand or a less permeable material.

Basic equation. Assuming that the considered geomembrane is located between two infinitely pervious media, Bernoulli's equation for free flow through an orifice can be used to evaluate the leakage rate through a hole in the geomembrane:

$$Q = C_B a \sqrt{2gh_w} \tag{22}$$

where: Q = leakage rate through a geomembrane hole; a = hole area; g = acceleration due to gravity; and h_w = liquid depth on top of the geomembrane. C_B is a dimensionless coefficient, valid for any Newtonian fluid, and is related to the shape of the edges of the aperture; for sharp edges, $C_B = 0{\cdot}6$. Basic SI units are: Q (m^3/s), a (m^2), g (m/s^2), and h_w (m).

Calculations. Equation (22) has been used to calculate leakage rates for two typical hole sizes:

- a 2·0 mm (0·08 in) diameter hole, assumed to be due to defective seaming (as discussed in Section 2.3.8), that might escape detection by a construction quality assurance program; and
- a 11·3 mm (0·445 in) diameter hole that might result from failure of the geomembrane due to poor design, damage to the geomembrane during placement of overlying materials, etc.

The first hole ('small hole') has an area of 3·1 mm^2 (0·005 in^2) and the second hole ('large hole') has an area of 1 cm^2 (0·16 in^2). Both hole sizes can be considered for design calculations (see Section 2.3.9).

Results from calculations using eqn (22) are given in Table 6. Hydraulic heads considered in these calculations are equal to the liquid depths defined in Section 1.3.6. (Note: When liquid depth on the geomembrane is very small, the flow through an orifice may not be free as a result of surface tensions. The use of eqn (22) for a liquid depth of 0·003 m (0·01 ft) in Table 6 is therefore questionable. However, eqn (22) is used for lack of a better method and to ensure the consistency of comparisons.)

2.3.4 Geomembrane defects

Defects that are likely to occur in geomembranes are numerous and may be caused by a wide variety of factors including improper design, defective manufacturing and defective installation. A number of publications are available which discuss the various types of defects that have been observed in geomembrane-lined units.[2, 10–12]

Typical defects observed in geomembranes include:

- discontinuous or defective seams resulting from fabrication or installation factors including excessive moisture or humidity, improper ambient or seaming temperature, contamination by dust or dirt, and inadequate workmanship or quality assurance;
- seam failures caused by excessive stresses during placement of cover materials or operation of the lined facility;
- damage to geomembranes during construction or facility operation as a result of excessive stresses caused by equipment traffic;
- puncturing of geomembranes by stones in the support or cover material when compressive stresses are applied as a result of equipment traffic or the weight of stored material;
- tensile failure of geomembranes due to excessive stresses generated by the weight of stored material or movements of materials in contact with the lining system;

- brittle failures caused by slow crack growth mechanisms due to constant stresses such as overburden stresses;
- brittle failures caused by fatigue due to repeated stresses such as stresses resulting from thermal expansion–contraction; and
- defective connections between geomembranes and appurtenances, due to inadequate workmanship or quality assurance.

The last type of defect is illustrated by the following case history: after the construction of a lining system for a landfill, and before placement of the waste, the lower portion of the landfill was filled with water to test the lining system; a leakage rate through the geomembrane top liner of 1000 liters/day (250 gallons/day) was observed at the connection between the geomembrane and the sump, with a water depth of only 0·15 m (6 in) above the defective connection. Equation (22) shows that this leakage rate could have resulted from a circular hole with a 4 mm (0·16 in) diameter.

The potential for the above-mentioned defects is small in properly designed and constructed geomembrane-lined facilites. However, even in properly designed and constructed units, there is no guarantee that these defects will not occur. A discussion of the frequency and size of geomembrane defects is presented in Sections 2.3.7 and 2.3.8, on the basis of data presented in Sections 2.3.5 and 2.3.6.

2.3.5 Data on geomembrane defects from quality assurance

Small liquid reservoir. This project, constructed in 1981, is described in detail by Giroud and Stone,[13] and Stone.[14] Information from the project regarding seam defects can be summarized as follows.

The double liner system includes two 2·5 mm (100 mil) thick HDPE geomembranes which were welded using an automated extrusion welder operating in a flat area with good working conditions. Ultrasonic testing, carried out as part of the construction quality assurance program, showed that approximately 0·5% of the seam length was defective. The detected defects were repaired and the reservoir was filled with water. Leakage occurred and an inspection showed that leakage was taking place through approximately 0·015% of the seam length. The ratio 0·5/0·015 shows that, in this project, intensive quality assurance reduced the length of defective seams by a factor of approximately 30.

This project is particularly interesting because it provides an evaluation of the benefit derived from construction quality assurance.

Large landfill with single liner. Kastman[15] indicates that, in a carefully monitored landfill liner installation done in 1983, approximately one defect every 15 m (50 ft) of seam was detected and repaired, as part of the construction quality assurance program. The liner was a 1 mm (40 mil)

thick HDPE geomembrane and seaming was achieved with a fillet extrusion weld done using a hand welder.

Large landfill with double liner. Giroud and Fluet[16] report the results of an analysis conducted on the basis of data collected during the construction quality assurance program for a liner installation in a large landfill lined in 1985 with a 1·5 mm (60 mil) thick HDPE geomembrane. The surface area of the liner is approximately 35 000 m^2 (350 000 ft^2) and the seam length is approximately 5000 m (16 000 ft). During the quality assurance program, an average of approximately one seam defect every 9 m (30 ft) of seam length was detected and repaired.

Large landfill with single liner. The following data were collected during the installation of the lining system in a large landfill, in 1987, as part of the quality control provided by the geomembrane installer and quality assurance provided by an independent firm. The surface area of the liner is approximately 53 000 m^2 (570 000 ft^2) and the seam length is approximately 8000 m (26 000 ft). The liner is a 1·5 mm (60 mil) thick HDPE geomembrane. Half of the seam length was welded using a hand welder which made fillet extrusion welds; the other half was welded using an automated welder which made injection extrusion welds. Seam inspection was performed first by the installer, and then by the independent firm after the installer had completed his inspection. The installer detected approximately one seam defect every 17 m (56 ft) of seam length and the independent firm detected approximately one additional seam defect every 35 m (115 ft) of seam length. Therefore, a total average of approximately one seam defect every 11·5 m (38 ft) of seam length was detected by the geomembrane installer and the independent quality assurance firm. All these defects were repaired.

The defects discovered by the independent firm totaled one third of the total seam defects. The benefits of quality assurance are probably greater than that: it is probable that, without the continuous presence at the site of the independent quality assurance firm, the geomembrane installer would have found fewer defects than he did as part of his quality control effort.

2.3.6 *Data on geomembrane defects from forensic analyses*

Small indoor tank. The following case history is reported by Giroud and Fluet.[16] A power generating station required a small acid holding tank. The tank was constructed of concrete and lined in 1985 with a 2·5 mm (100 mil) thick HDPE geomembrane. The geomembrane installation required approximately 100 m (300 ft) of field seaming. The seams were fillet extrusion welds done with a hand welder. The design and installation included no third party quality assurance, but careful quality control of

seaming was provided by the installer, using visual inspection and vacuum box.

Upon completion of the liner installation, the tank was filled with water to check for leaks. The liner did leak, so the tank was emptied, repairs were made and the tank was filled again. This cycle was repeated several times, with leaks found on every filling. Leaks were found at 15 different locations, i.e. an average of one leak per 7 m (23 ft) of seam. Because of the complex geometry of the tank, this incidence of seam defects was probably larger than the incidence which would be experienced in more typical installations. However, the complex geometry of this tank is probably representative of the difficulties encountered in waste disposal units, dams, or other facilities at the connections between geomembranes and appurtenances such as pipe penetrations, sumps, manholes, intake towers, spillways, etc.

Large surface impoundment. The following case history is reported by Giroud and Fluet.[16] A large reservoir, lined with a single reinforced 1 mm (40 mil) thick chlorosulfonated polyethylene (CSPE-R) geomembrane, had been constructed to contain phosphoric acid. The reservoir was approximately 3 m (10 ft) deep and its surface area was approximately 20 000 m^2 (200 000 ft^2).

One year after the first filling, the reservoir suddenly emptied. The analysis of the failure indicated that phosphoric acid, leaking through several defective seams, attacked the ground, thereby creating cavities. The largest cavity was 1 m (3 ft) in diameter and 0·5 m (20 in) deep. Under the pressure of the impounded liquid, the geomembrane spanning this largest cavity burst, releasing all of the impounded phosphoric acid into the ground.

Quality assurance during installation had consisted of only two one-day visits by an engineer who specialized in roofing membranes. Therefore, it is not surprising that defective seams were not detected prior to filling.

During the forensic analysis, visual observation showed that approximately 0·1% of the seam length (including factory seams and field seams) was defective. It is probable that a higher percentage would have been obtained if a vacuum box had been used instead of visual inspection. It is also probable that a higher percentage would have been obtained if only field seams had been considered to calculate the above percentage.

2.3.7 *Frequency of geomembrane defects*

Consistency of the observations. Sections 2.3.5 and 2.3.6 present data related to frequency of seam defects. Some of these data are expressed as an average seam length exhibiting one defect (e.g. one defect per 7 m (23 ft) of seam), while other data are expressed as a percentage of

defective seam length (e.g. 0·5% of the total seam length was defective).

If an average length of seam defect (prior to quality assurance) of 10 mm (0·4 in) is considered, a percentage of defective seam length of 0·1% is equivalent to one defect every 10 m (30 ft). Therefore, the observations made in the above case studies appear to be consistent.

Conclusion regarding frequency of seam defects. It is not possible to draw general conclusions from only six cases. However, since the observations made in these six cases were consistent, the following tentative conclusions may be drawn for analysis and design purposes:

- An average of one defect per 10 m (30 ft) of field seam can be expected without quality assurance by an independent firm, and without adequate quality control by the geomembrane installer.
- An average of one defect per 300 m (1000 ft) of field seam can be expected with reasonably good installation, adequate quality assurance (which implies adequate quality control), and repair of noted defects. (Quality assurance followed by adequate repair drastically decreases the number of seam defects but does not totally eliminate them.)

The average of one seam defect per 10 m (30 ft) *without or before quality assurance* will probably decrease in the future as a result of the increasing use of new, automated methods of seaming which are now available. However, the number of seam defects *after quality assurance* may not decrease significantly because, in the present state of practice for construction quality assurance, great emphasis is put on finding seam defects and repairing them. Nonetheless, the better seaming methods that are now available are highly beneficial for at least the following reasons: (i) less seam repair is required during installation; (ii) frequency of destructive seam testing may be decreased; (iii) although quality assurance of seaming will always be essential, emphasis in the quality assurance efforts may shift toward other areas where improvement is sorely needed such as connections of geomembranes with appurtenances and placement of drainage materials (which is essential for the functioning of leakage collection layers); and (iv) stronger seams are less likely to fail when subjected to stresses.

As a result of the above discussion, a frequency of one defect per 300 m (1000 ft) of seam will be used as a working assumption for analysis and design purposes. If geomembrane panels 6–10 m (20–30 ft) wide are used, one defect per 300 m (1000 ft) of seam is equivalent to 3–5 seam defects per hectare (1–2 seam defects per acre) of installed geomembrane.

As soon as possible, these assumed defect frequencies must be modified as required by conclusions established on a broader base of well-

documented case histories. In the meantime (and in the absence of better data), a defect frequency of one per 4000 m^2 (acre) will be used in calculations for estimating leakage rates in order to size leakage collection layers. This frequency is assumed to include all types of defects, not only seam defects.

2.3.8 Estimation of size of defects

The seam defect documentation reported above addressed primarily the frequency of seam defects. Extensive documentation of defect size does not exist. On the basis of interviews with quality assurance personnel it appears that the maximum size of defects which may still exist after intensive quality assurance is equivalent to hole diameters of the order of 1–3 mm (0·04–0·12 in) for seam defects and possibly up to 5 mm (0·2 in) for special areas such as connections of geomembranes with appurtenances. (This is consistent with the case history presented in Section 2.3.4.) Finally, larger hole diameters, e.g. 10 mm (0·4 in), can be considered to represent larger defects, such as those due to accidental punctures.

There are also defects that cannot be observed by the quality assurance personnel, such as: (i) puncture of the geomembrane during installation of the protective earth cover or granular drainage layer overlying the geomembrane; and (ii) puncture of the geomembrane as a result of stresses due to the weight of the impounded material or traffic related to the operation of the facility. Defects due to these causes may result in hole sizes larger than those referred to above.

For analysis and design purposes, it is appropriate to consider a range of hole diameters from at least 2 mm (0·08 in), to represent seam defects, to at least 10 mm (0·4 in), to represent accidental punctures.

2.3.9 Hole sizes and frequency recommended for design

Guidance regarding hole size and frequency is useful for engineers designing lining systems. As a result of the discussion presented in Section 2.3.7, a frequency of one hole per 4000 m^2 (acre) should be considered, and, on the basis of the discussion presented in Section 2.3.8, two hole sizes are recommended:

- A hole size of 1 cm^2 (0·16 in^2) is recommended for calculations conducted to size the components of the lining system, and, in particular, the leakage detection, collection, and removal system (i.e. to determine the required hydraulic transmissivity or thickness of the leakage collection layer, to select pipe spacings and diameters, to select the sump size, etc.).
- A hole size of 3·1 mm^2 (0·005 in^2) is recommended for calculations conducted to evaluate the performance of the lining system (i.e.

serviceability calculations, such as flow in the leakage collection layer under typical operating conditions).

In other words, the small hole, which probably exists, is recommended for calculations related to typical operating conditions, and the large hole, which may exist, is recommended for calculations related to maximum flow conditions.

It should be kept in mind that the above hole sizes and frequency have been selected with the assumption that intensive quality assurance monitoring will be performed. A frequency of 25 holes/ha (10 holes/acre) or more is possible when quality assurance is limited to an engineer spot-checking the work done by the geomembrane installer. Also, the above hole sizes and frequency do not take into account cases where design flaws or poor construction practices lead to a greater number of seam defects or a large tear in the geomembrane.

2.4 Conclusions on leakage through geomembrane liners

2.4.1 Summary

In Section 2, the results of permeameter tests and water vapor transmission tests were used to evaluate permeation rates through geomembranes. Equations to evaluate leakage rates through pinholes and holes were also presented. Finally, the following recommendations regarding frequency and size of holes to be assumed for analysis and design were made on the basis of field experience:

- a frequency of one hole per 4000 m^2 (acre); and
- two hole sizes, 1 cm^2 (0·16 in^2) for calculations to size the components of the lining system, and 3·1 mm^2 (0·005 in^2) for performance calculations.

2.4.2 Leakage rates

By combining Tables 5 and 6, it is possible to establish Table 7. This table gives orders of magnitude of unitized leakage rates that may be expected when a geomembrane is used alone as a liner.

It appears that the unitized leakage rates due to only one hole per 4000 m^2 (acre) are large, especially for the large hole, while unitized leakage rates due to permeation and pinholes are small. It must be remembered that the unitized rates given in Table 7 are related to a liner comprised of a geomembrane placed directly on the leakage collection layer or other very permeable layer. As indicated in Section 2.3.3, the equation used to evaluate leakage rates through geomembrane holes is valid if the hydraulic conductivity of the leakage collection layer is larger than 10^{-3} m/s (0·1 cm/s), which will often be the case.

TABLE 7
Calculated Unitized Leakage Rates Through a Geomembrane Liner

	Water depth on top of the geomembrane, h_w				
	0·003 m (0·01 ft)	*0·03 m (0·1 ft)*	*0·3 m (1 ft)*	*3 m (10 ft)*	*30 m (100 ft)*
Permeation	0·000 1 (0·000 01)	0·01 (0·001)	1 (0·1)	100 (10)	300 (30)
Pinhole	0·01 (0·001)	0·1 (0·01)	1 (0·1)	10 (1)	100 (10)
Small hole	100 (10)	300 (30)	1 000 (100)	3 000 (300)	10 000 (1 000)
Large hole	3 000 (300)	10 000 (1 000)	30 000 (3 000)	100 000 (10 000)	300 000 (30 000)
	Values of unitized leakage rate in lphd (gpad)				

Notes: The geomembrane is assumed to be underlain and overlain by a very pervious medium such as coarse gravel or geonet. The leakage rate calculated for holes would be significantly reduced if the pervious medium in contact with the geomembrane on one or both sides is sand or a less permeable material. The geomembrane is assumed to be made from HDPE with a thickness of 1 mm (40 mils). The unitized leakage rates (i.e. leakage rates per unit area of liner) were obtained assuming one pinhole or one hole per 4000 m^2 (acre). This table has been established by combining Tables 5 and 6 and rounding up. The considered pinhole has a diameter of 0·1 mm (0·004 in); the small hole has a surface area of 3·1 mm^2 (0·005 in^2), i.e. a diameter of 2·0 mm (0·08 in); and the large hole has a surface area of 1 cm^2 (0·16 in^2), i.e. a diameter of 11·3 mm (0·445 in). The water depths used here correspond to the typical values defined in Section 1.3.6.

It must also be remembered that the unitized leakage rates in Table 7 assume that the soil layer or other material (such as a synthetic drainage layer) directly overlying the geomembrane does not impede flow. This latter assumption is important and its ramifications have not been investigated by the authors. It is likely that, in some cases, a protective soil layer or granular drainage material placed over a geomembrane impedes flow through geomembrane defects. The influence of the overlying material on the flow rate through a defect in a geomembrane liner requires further investigation.

REFERENCES

1. Giroud, J. P. & Frobel, R. K. Geomembrane products. *Geotechnical Fabrics Report*, IFAI, Minnesota, 1983, pp. 38–42.
2. Giroud, J. P. *Geotextiles and Geomembranes—Definitions, Properties and*

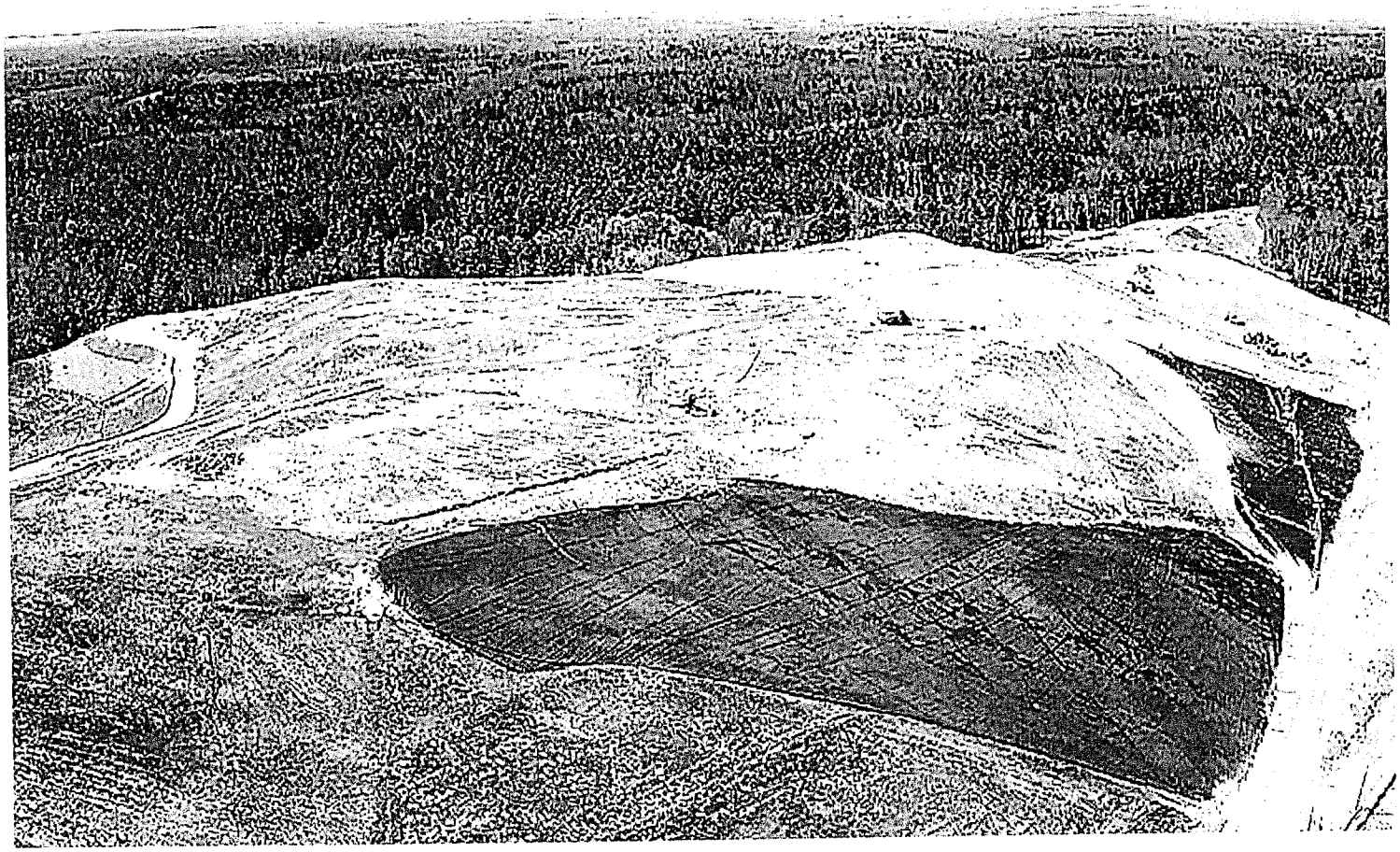
Design. Industrial Fabrics Association International, St Paul, USA, 1984, 325 p.
3. Giroud, J. P. Impermeability: the myth and a rational approach. *Proceedings of the International Conference on Geomembranes*, Vol. 1, Denver, USA, June 1984, IFAI, Minnesota, pp. 157–62.
4. August, H. & Tatzky, R. Permeabilities of commercially available polymeric liners for hazardous landfill leachate organic constituents. *Proceedings of the International Conference on Geomembranes*, Vol. 1, Denver, USA, June 1984, IFAI, Minnesota, pp. 163–8.
5. Haxo, H. E., Jr, Miedema, J. A. & Nelson, N. A. Permeability of polymeric membrane lining materials. *Proceedings of the International Conference on Geomembranes*, Vol. 1, Denver, USA, June 1984, IFAI, Minnesota, pp. 151–6.
6. Haxo, H. & Waller, M. J. Laboratory testing of geosynthetics and plastic pipe for double liner systems. *Proceedings of the Geosynthetics '87 Conference*, New Orleans, USA, Vol. 2, Feb. 1987, pp. 577–94.
7. Steffen, H. *Position Statement on the Effectiveness of a Dual Sealing System With and Without Intermediate Testing System*. Report prepared for the Directors of the Vogelsberg District, Essen, Germany, 1987, 35 p. (in German).
8. Telles, R. W., Unger, S. L. & Lubowitz, H. R. Technical considerations for De Minimis pollutant transport by polymeric liners. Contract No. 68-03-3218, US Environmental Protection Agency, Cincinnati, USA, Sept. 1986, 80 pp.
9. Brown, K. W., Thomas, J. C., Lyhon, R. L., Jayawickrama, P. & Bahrt, S. C. *Quantification of Leak Rates Through Holes in Landfill Liners*. USEPA Report CR 810940, Cincinnati, USA, 1987, 147 p.
10. Bass, J. M., Lyman, W. J. & Tratnyek, J. P. *Assessment of Synthetic Membrane Successes and Failures at Waste Storage and Disposal Sites*. Report to EPA, NTIS No. PB85-245 637/AS, Arthur D. Little Inc., 1985.
11. Giroud, J. P. Geomembrane liners: accidents and preventive measures. *Proceedings of the International RILEM Symposium, on Plastic and Rubber Waterproofing in Civil Engineering*, Liege, Belgium, June 1984, pp. 157–62.
12. Mitchell, D. H. Technology for uranium mill ponds using geomembranes. NUREG/CR-3890, PNL-5164, prepared for US Nuclear Regulatory Commission, Washington, D.C., Dec. 1984.
13. Giroud, J. P. & Stone, J. L. Design of geomembrane liner for the proton decay experiment. *Proceedings of the International Conference on Geomembranes*, Vol. 2, Denver, USA, June 1984, IFAI, Minnesota, pp. 469–74.
14. Stone, J. L. Leakage monitoring of the geomembrane liner for proton decay experiment. *Proceedings of the International Conference on Geomembranes*, Vol. 2, Denver, USA, June 1984, IFAI, Minnesota, pp. 475–80.
15. Kastman, K. H. Hazardous waste landfill geomembrane: design, installation and monitoring. *Proceedings of the International Conference on Geomembranes*, Vol. 1, Denver, USA, June 1984, IFAI, Minnesota, pp. 215–20.
16. Giroud, J. P. & Fluet, J. E., Jr Quality assurance of geosynthetic lining systems. *Geotextiles and Geomembranes*, 3(4) (1986) 249–87.
17. Rogers, C. E. *Engineering Design for Plastics*, ed. E. Baer. Reinhold Publ. Corp., New York, 1964, pp. 609–88.

Part II of this paper, covering Leakage through Composite Liners and Conclusions will follow in *Geotextiles and Geomembranes* 8(2).

All Landfills Leak, and Our Health and Environment Pay the Toxic Price

Despite state and federal regulation, landfills leach harmful chemicals into the ground and water supply

JUL 23, 2018 | KIRSTIE PECCI (/ABOUT/SENIOR-FELLOWS/KIRSTIE-PECCI) | @KIRSTIEPECCI (HTTPS://TWITTER.COM/KIRSTIEPECCI)



Despite leaking a smorgasbord of contaminants for more than a decade, the Southbridge Landfill in Massachusetts received permits to expand in 2008.

Twelve million tons. That's how much waste New Englanders produce every year.

All of that waste has to go somewhere, and a landfill is often the destination. In theory, once the trash is deposited in the landfill, that's where it stays. In reality, that's far from the truth.

All landfills leak – some over time and some from day one of operation – leaching toxic chemicals into the ground and the water supply.

This may be hard to believe. After all, federal *and* state agencies regulate landfills, so, naturally, you would assume that they maintain a high level of oversight over these facilities. What's more, landfill management companies themselves like to stress that they follow all regulations, and they point to a laundry list of actions they are taking and systems that exist to back this up.

If a landfill was leaking, then wouldn't the landfill company and environmental agencies spring into action? Wouldn't the landfill would be closed, the leaking identified and repaired, and the public and environment protected until the landfill was safe to operate again?

Unfortunately, the answer to all of these questions is a resounding, "No."

Safe landfills are a Fairytale.

Add up all of the everyday items people and businesses throw away, from coffee cups to clothes to food scraps to household hazardous waste, and you have municipal solid waste, or "MSW." That waste most likely ends up in a large, regional municipal solid waste incinerator or landfill where it's burned or buried.

The theory behind landfills is that once waste is buried, the contamination remains inert in landfill "cells." To keep the waste dry and contained, landfill cells today are required to have two plastic liners, each backed with synthetic clay, putting a few inches between decomposing trash and the soil beneath it. Once the landfill cell is full, gravel, a flexible plastic cap, and some sod are then built on top of the cell.

This should be a nice, tidy end to that waste, but in reality, it is impossible to keep landfill cells dry. Rain and snow get into them while they're open and accepting waste (which can be for years). And even after the cell is sealed, the plastic caps develop holes over time, letting in more rain and snow.

The water that gets into landfill cells picks up contaminants from the waste and becomes "leachate." What's in the leachate depends on what's in the landfill, but some chemicals can be counted on, such as volatile organic compounds, chloride, nitrogen, solvents, phenols, and heavy metals.

The safeguards intended to prevent leachate from escaping a landfill cell – pipe collection systems in newer landfills and the plastic and clay liners mentioned above – fail over time. This toxic brew of "garbage coffee" leaks out of the landfill and seeps into groundwater – contaminating wells and waterbodies.

Landfill Liners Have Evolved, But You Can't Retrofit an Old One

While even a new system is vulnerable to leaks, a bigger problem is that many of New England's 75 landfills have been operating for decades, and the technology meant to keep our groundwaters safe from contamination was never expected to last.

From the 1950s through the early 1980s, when many of the region's largest facilities were first built, landfills were usually lined with compacted soil and clay. But that technology was ultimately abandoned because it didn't prevent leachate from escaping for long. A clay liner even a foot thick will fail within five years. That means that it's pretty safe to assume that any landfill that began operating with unlined or clay lined cells is leaking toxic contaminants.

By the late 1980s landfills had started to use single plastic liner systems, and eventually, two liner systems were required. But these often rip during installation, and they always develop holes and cracks over time.

The thing is, these landfills with their leaky liners can't be fixed. It's impossible to retrofit old cells with newer technology. And even if you could replace old liners with the plastic ones required today, we are still talking about plastic and synthetic clay. These newer liners too will break down over time, meaning we are merely kicking the contamination can down the road for our kids to suffer the consequences.

The production of leachate cannot be avoided, and despite the attempted collection of leachate in newer landfills, some of it still escapes into the environment. The failure of these double liner systems is not only inevitable, it is also acknowledged by the agency enforcing it. EPA itself has said:

"No liner... can keep all liquids out of the ground for all time. Eventually liners will either degrade, tear, or crack and will allow liquid to migrate out of the unit."

The Canary in the Coal Mine: Groundwater Monitoring

Landfill companies are required to monitor whether leachate is leaking by monitoring groundwater around the cells. When properly implemented, such monitoring programs would be able to identify the leak so that the facility operator could then clean it up as best possible. But this simply does not happen.

Many times, too few monitoring wells surround the landfill, or they aren't installed at different depths, leaving leaks undetected. Even worse, when groundwater monitoring indicates that contaminants are present and should be investigated, the results are often ignored. Local officials, state agencies, and even concerned citizens are either unaware of the leaks, don't have the resources or political will to take action, or believe the unsubstantiated claims of the landfill companies that the origin of the contaminants is anything other than the landfill.

Environmental agencies also let landfills get away with minimizing or ignoring their toxic byproducts. The Southbridge Landfill in Massachusetts had been leaking a smorgasbord of contaminants for more than a decade when Casella Waste applied to expand the facility in 2008. Contamination had even been detected in the drinking wells of neighboring homes. The Massachusetts Department of Environmental Protection, which authorizes landfill expansions, did not raise this contamination at any of the local or state hearings on the proposed expansion, nor did Casella Waste. Residents and local officials were completely unaware of the damning results sitting on the Department's shelves, despite attending months of public hearings themselves. And Casella received their permits to expand.

No Landfill is Safe

There's simply no such thing as a safe landfill. No matter how many barriers, liners, and pipes we install to try to mitigate the risk, landfills will always leak toxic chemicals into the soil and water.

So let's not build anymore. Instead, we should solve our waste problem by instituting Zero Waste programs that save money, protect the public health and environment, and create new jobs. We know the right answer – and it's not more leaking landfills.

Before you go... CLF is working every day to create real, systemic change for New England's environment. And we can't solve these big problems without people like you. Will you be a part of this movement by considering a contribution today? If everyone reading our blog gave just $10, we'd have enough money to fund our legal teams for the next year.

DONATE NOW (https://act.clf.org/page/15148/donate/1?ea.tracking.id=beforeyougo)

Enter your email address **GET UPDATES**

Ban Polluting Plastic

Take Action to Ban Polluting Plastic in Your State

Add Your Name (https://act.clf.org/page/24499/action/1?ea.tracking.id=website-action-box)

Join us

Email

SIGN UP

Follow CLF

(https://www.facebook.com/TheCLF) (https://twitter.com/CLF) (https://www.linkedin.com/company/conservation-law-foundation)

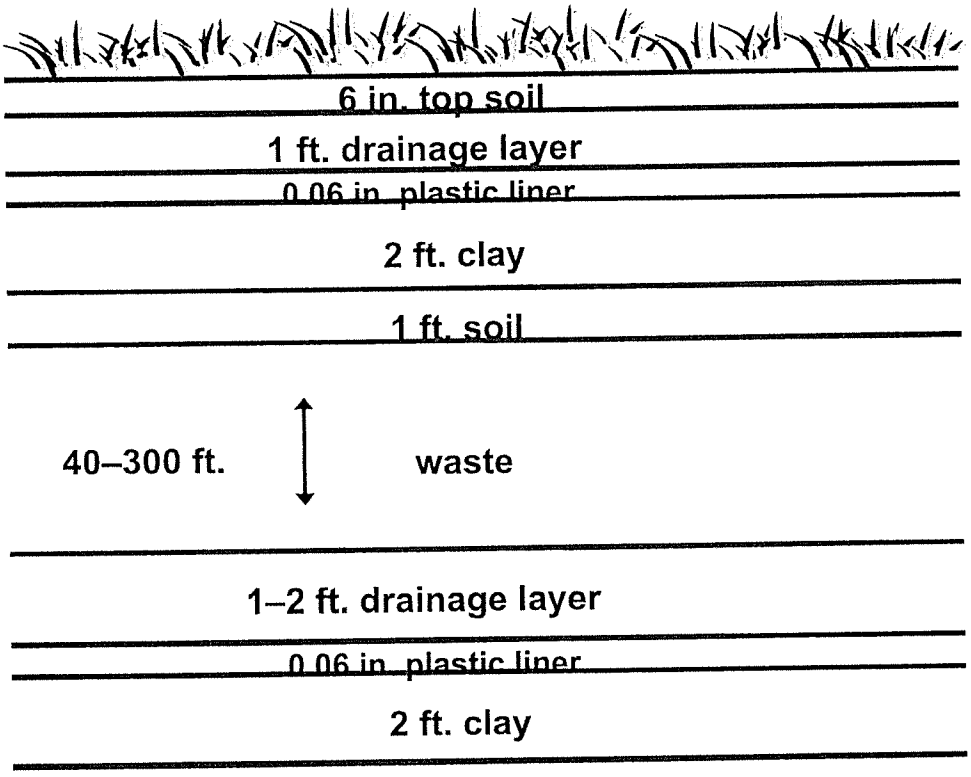
Tags: Casella Waste Systems (https://www.clf.org/blog/tag/casella-waste-systems/), landfill expansion (https://www.clf.org/blog/tag/landfill-expansion/), landfill liners (https://www.clf.org/blog/tag/landfill-liners/), landfill pollution (https://www.clf.org/blog/tag/landfill-pollution/), leachate (https://www.clf.org/blog/tag/leachate/), Southbridge Landfill (https://www.clf.org/blog/tag/southbridge-landfill/), zero waste (https://www.clf.org/blog/tag/zero-waste/)

Landfill Liner and Cover Systems: Design Guidelines

- A liner suggests a single layer, a liner system suggests a series of layers working together
- Leakage from liner systems can be very low with proper engineering and construction
- Design principles versus regulations

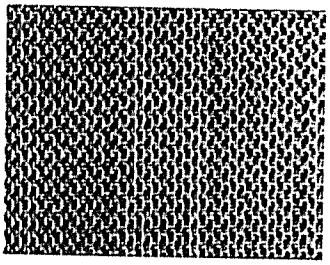
Copyright Morton A. Barlaz, NC State University

Landfill Design



Geosynthetics

- Synthetic polymers
  - Polyethylene and polypropylene most common
    - some PVC
- Geotextiles (relatively permeable)

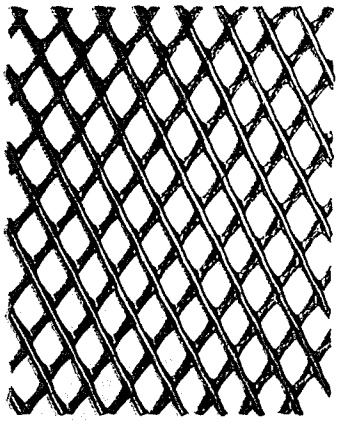


  - Separation and Filtration
    - Retain soil particles
    - Let water pass
    - Do not clog over time ??
  - Typically used to protect a leachate collection system from clogging

Copyright Morton A. Barlaz, NC State University

Geosynthetics

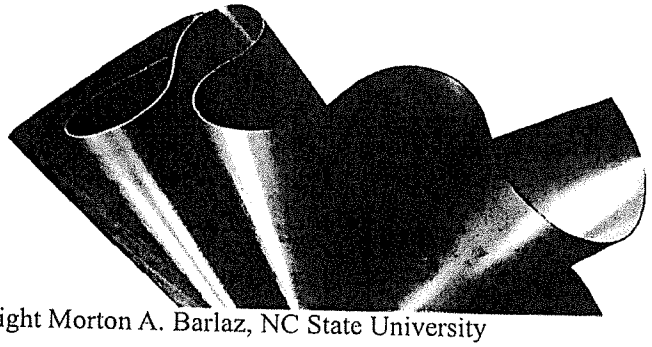
- Geonets
  - Substitute for sand or gravel
  - Very high transmissivity, low storage



Copyright Morton A. Barlaz, NC State University

Geosynthetics

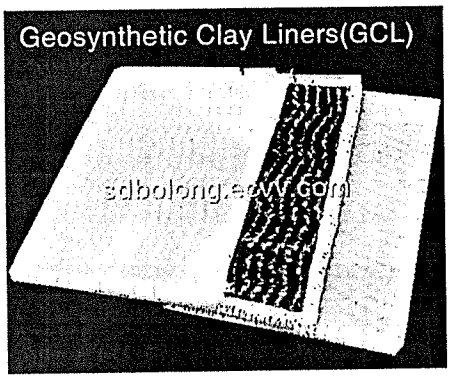
- Geomembrane (low permeability)
  - Vapor and liquid barrier
  - Diffusion may control
- Sheets 23 - 35' wide, 60 - 80 mil thick
- Smooth vs. textured



Copyright Morton A. Barlaz, NC State University

Geocomposites

- A combination of any of the above
- Geobentonite composites:
  - Include a layer of bentonite between two layers of geotextile
  - Geosynthetics may save airspace



Copyright Morton A. Barlaz, NC State University

Typical Design Guidelines

- Subbase
  - 6 - 12" thick
  - Compact to 95% of maximum density
  - $K < 10^{-5}$ cm/sec
  - Slope: 2 - 25% or 1V:4H
  - Soil must be rock free
    - <3/4" if geomembrane in contact
    - <1.5" if clay contact

Copyright Morton A. Barlaz, NC State University

Secondary Liner
Final Protection Between Waste and Environment

- Clay @ $<10^{-7}$ cm/sec compacted in 6" lifts
- Overlain by a geomembrane
- Possibly a geobentonite instead
- Must present and follow a QC/QA program
  - Quality Assurance - 3rd party inspector

Copyright Morton A. Barlaz, NC State University

Leachate Detection Zone

- Must rapidly detect, collect and transmit liquid to a collection system
- Function without clogging
- 12" thick
- $K > 10^{-2}$ cm/sec (gravel or geonet)
- Contain a perforated piping system at least 4" diameter, sch 80
  - Wrapped in a geotextile
- Slope $\geq 2\%$
- Distance for flow $\leq 100'$ (200' on centers)

Copyright Morton A. Barlaz, NC State University

Primary Liner System

Prevent leachate migration and force water into overlying leachate collection system

Options:

1. Compacted clay + geomembrane

   Clay: 2' - 3' compacted in 6" lifts

   geomembrane - 60 mil

2. Geobentonite + geomembrane

Must follow a rigorous QC/QA program

Copyright Morton A. Barlaz, NC State University

Leachate Collection and Removal

- Must cover bottom and sides of landfill
- Function without clogging (biological, chemical, physical)
- Keep head on liner ≤ 12"
- 12 - 18" thick
  - 24" between liner and waste
- $K \geq 10^{-2}$ cm/sec (move towards stone)
- Contain a perforated piping system typically 6" diameter, sch 80 surrounded by non-carbonate stone, wrapped in a geotextile (??)

Copyright Morton A. Barlaz, NC State University

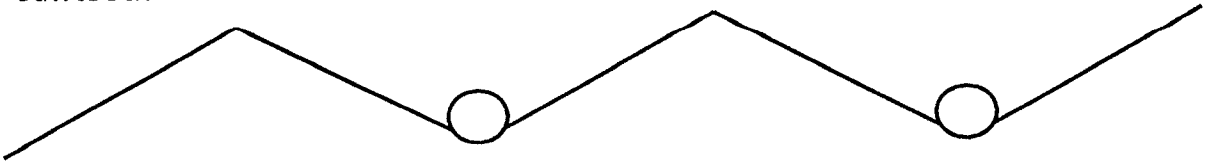
Leachate Collection and Removal

- No stone > 0.25"
- Slope ≥ 2%
  - 8" Headers typically at 1% - 2%, provide cleanouts
- Distance for flow ≤ 100' (200' on center)
- Some protection above the leachate collection system is needed
- Options include:
  - Baled refuse
  - Additional soil
  - Tire chips
  - Layer of uncompacted select refuse

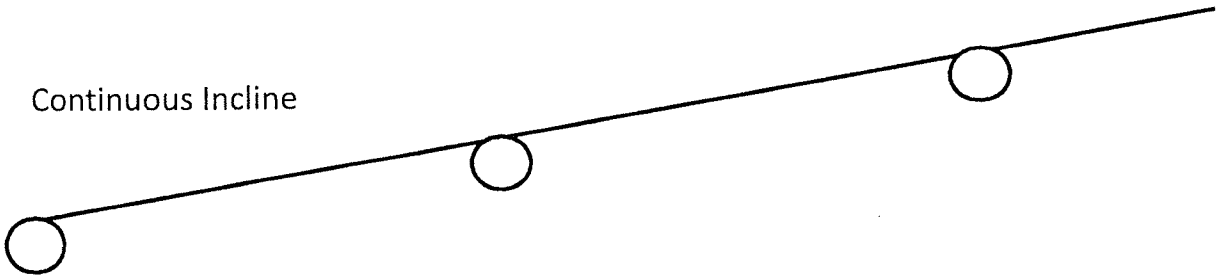
Copyright Morton A. Barlaz, NC State University

Leachate Collection Systems

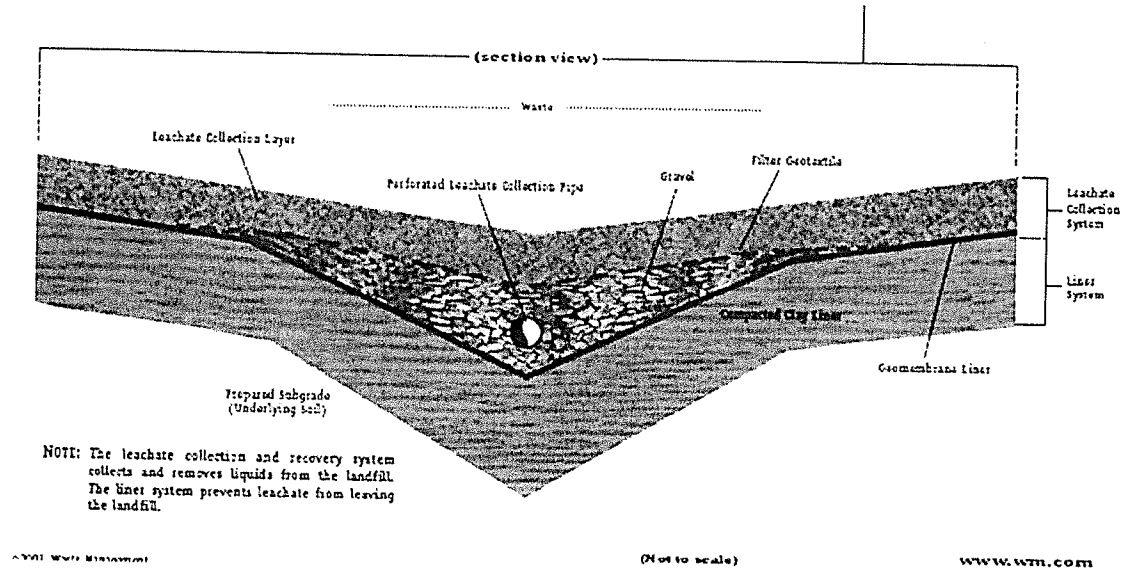
Sawtooth



Continuous Incline

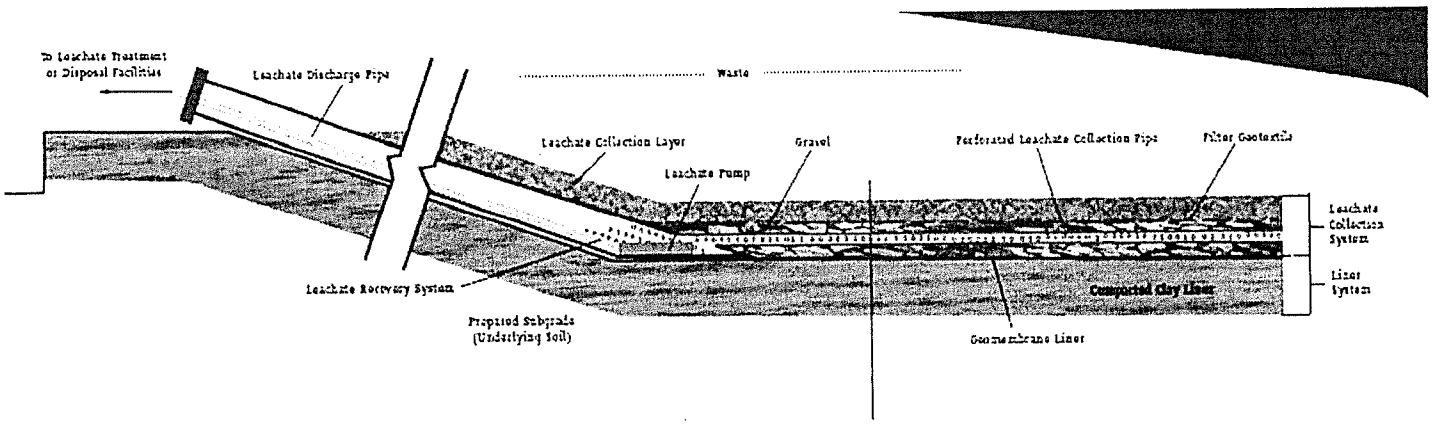


Leachate Collection Systems

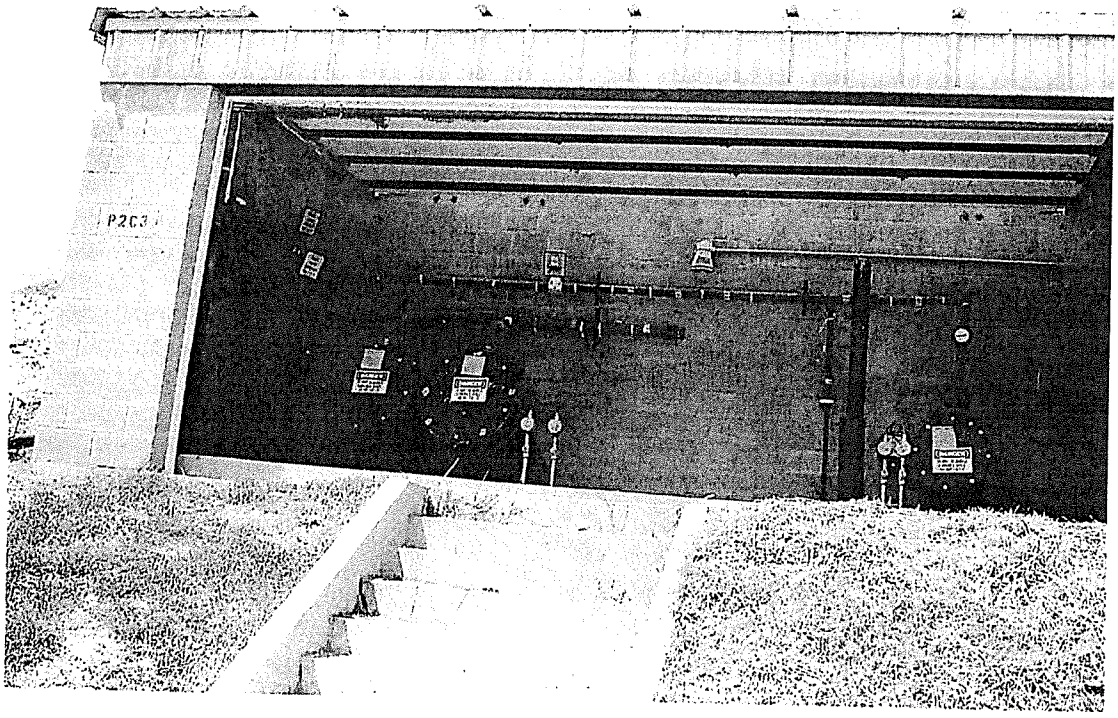


Slide Courtesy of Waste Management

Leachate Collection Systems

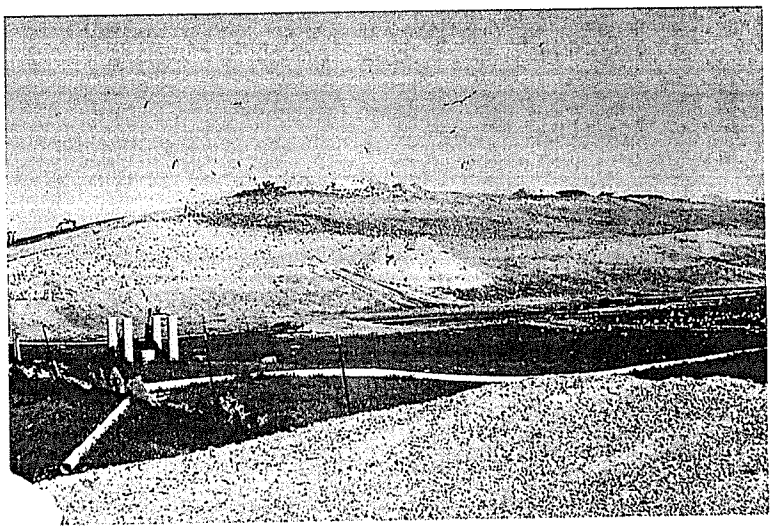


Slide Courtesy of Waste Management



Liner Slopes

- Maximum slope is 3(h):1(v) both above and below grade
- Excavations
  - Sand 2:1
  - Clay 0.5:1
  - Other 1:1



Copyright Morton A. Barlaz, NC State University

Leachate Rates Through Composite Liners

$$Q = 0.21 a^{0.1} h_w^{0.9} K_s^{0.74}$$

Q = leakage rate (m^3/s)

a = area of one hole (m^2)

h_w = head on liner (m)

K_s = hydraulic conductivity (m/s)

For poor contact, use 1.15 in place of 0.21

Poor contact: no control over membrane wrinkling and poor surface preparation

Giroud, J. P.; Badu-Tweneboah, K.; Bonaparte, R. *Geotextiles and Geomembranes* **1992,** *11*, 1.

Copyright Morton A. Barlaz, NC State University

Leaks And Composite Liners

Data for a 0.5" hole, 12" of head

Liner	Release rate
Synthetic	4200 gal/day
Synthetic over sand $K = 10^{-4}$ cm/sec	24.36 gal/day
Synthetic over silt $K = 10^{-5}$ cm/sec	4.43 gal/day
Synthetic over clay $K = 10^{-7}$ cm/sec	0.15 gal/day

Copyright Morton A. Barlaz, NC State University

Geomembrane Leak Testing

- 20% of leaks were in the side slopes at sites tested
- 87% of leaks were at the seams
- 13% in parent material
  - Dropped tools
  - Cigarette burns

Copyright Morton A. Barlaz, NC State University

Geomembrane Leak Testing

- Critical factors:
  - Corners, sumps, penetrations
- Methods are available for leak detection
  - Visual inspection
  - Pressure or vacuum testing of seams
  - electric leak detection

Copyright Morton A. Barlaz, NC State University

Final Cover

Functions:

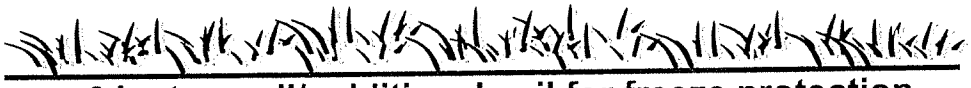
- keep water out
- control runoff
- separate the waste from plants and animals
- gas collection/odor control

Complicating Factors:

- plant root penetration
- freeze/thaw
- vehicle haul roads
- differential settlement

Copyright Morton A. Barlaz, NC State University

Cover Cross Section



6 in. top soil/ additional soil for freeze protection

1 ft. drainage layer

0.06 in. plastic liner

2 ft. clay

1 ft. soil/gas distribution

waste

Copyright Morton A. Barlaz, NC State University

Clays

- Hard to compact over sand or refuse
- Desiccate and shrink from both top and bottom
- Thin layers (even 18") of cover do not prevent desiccation
- Final grade > 3% on top, slopes @ 3:1

Copyright Morton A. Barlaz, NC State University

Vegetation

- Objectives
  - Stabilize soil
  - Minimize erosion
  - Promote evapotranspiration
- Next possible planting season
- > 70% ground cover
- No deep rooted plants or shrubs

Copyright Morton A. Barlaz, NC State University

Additional Considerations

- Practice is to place final cover once site (or cell) is full
- Differential settlement will cause cracks in clay, geomembranes are more resistant and recommended
- Ideal - use an intermediate cover until settlement is complete
  - Financial implications
    - Recover airspace
    - Less maintenance
  - low permeability desirable for gas collection
    - biocover alternatives

Copyright Morton A. Barlaz, NC State University

Alternate (ET) Covers

- Sufficient soil to retain water until it evaporates
- Ongoing research
  - requires regulatory approval

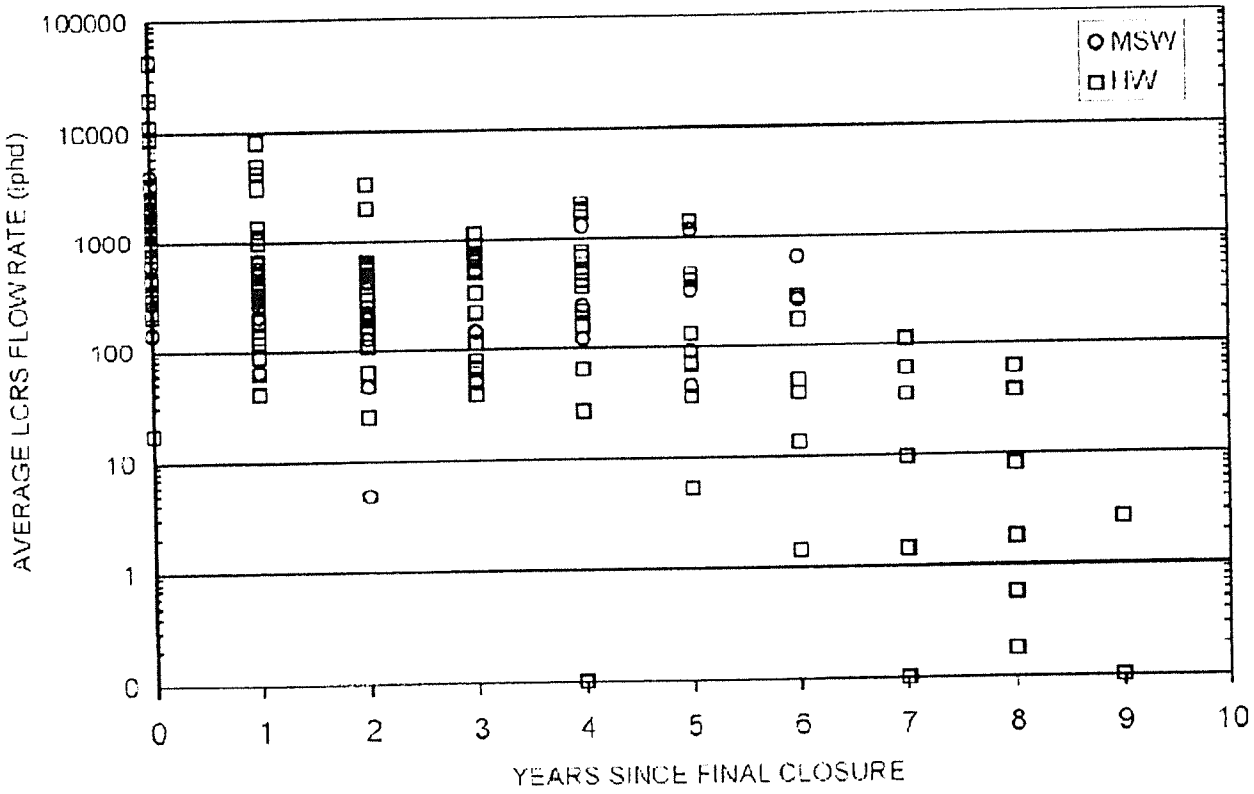
Copyright Morton A. Barlaz, NC State University

Final Use

- Decide during design phase
- Can expect settling of 5 - 15%, more for bioreactors
- Open space / conservancy
- Park - requires more maintenance and cover soil
- Gravel parking lot
- Golf course

Copyright Morton A. Barlaz, NC State University

Liner and Cover Performance



(Source: Fig. 5-5 of U. SEPA, 2002)

Liner and Cover Performance

TABLE 5.9 Flow Rates from the Leachate Detection Systems (LDS's) of Modern Double-Lined Landfills (all flow rates in gallons/acre/day (GPAD) (after Bonaparte et al., 2000)

Liner and LDS Type	Type I (GM-Sand)			Type II (GM-GN)			Type III (GM/CCL-Sand)		
Life Cycle Stage	1	2	3	1	2	3	1	2	3
Average Flow	41	18	6.8	10	11	ND	23	15	6.8
Minimum Flow	0.81	0.00	0.02	0.51	0.15	ND	0.13	2.4	0.00
Maximum Flow	229	158	26	40	38	ND	126	71	29
# of "points"	30	32	8	7	11	ND	31	41	15
# of landfills	11	11	4	4	6	ND	11	11	4

Liner and LDS Type	Type I V (GM/CCL GN)			Type V (GM/GCL Sand)			Type VI (GM/GCL GN)		
Life Cycle Stage	1	2	3	1	2	3	1	2	3
Average Flow	18	8.9	7.0	14	2.38	0.03	0.70	0.28	ND
Minimum Flow	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	ND
Maximum Flow	74	54	14	104	30	0.10	3.6	1.0	ND
# of "points"	21	27	12	19	19	4	6	4	ND
# of landfills	6	9	3	3	3	1	1	2	ND

NOTES: *Life Cycle Stages*
Stage 1 - Initial Life
Stage 2 - Active Life
Stage 3 - Post Closure
ND = No Data

("points" = Number of measuring points i.e., outlets of single or multiple cells)
GM = geomembrane; GN = geonet;
GCL = geosynthetic clay liner;
CCL = compacted clay liner

Liner and Cover Performance

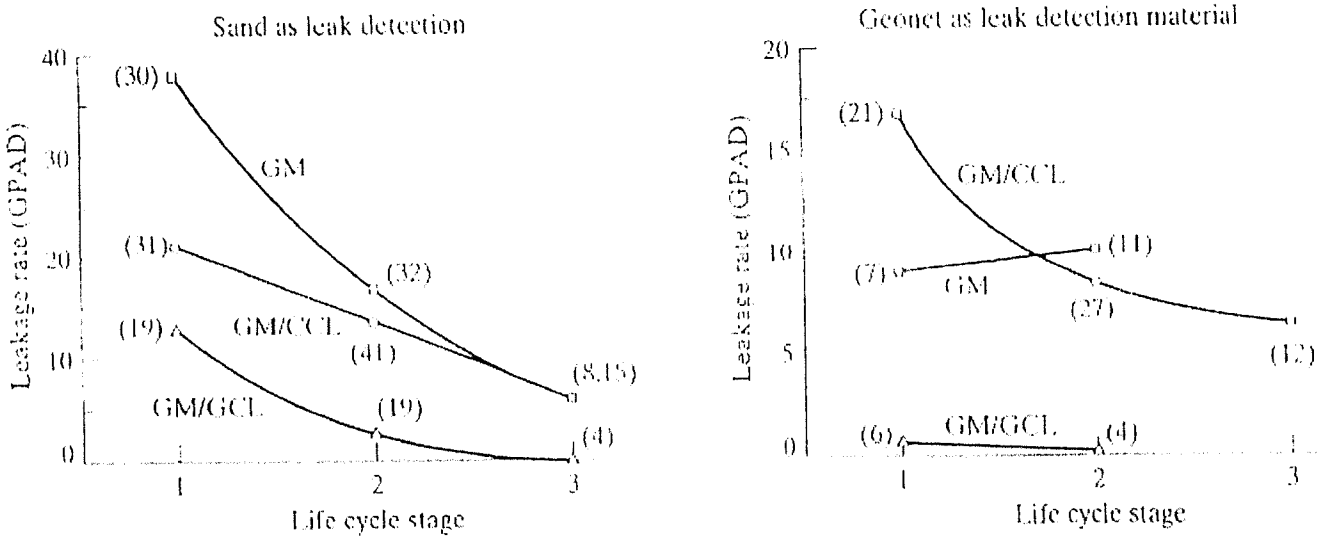


FIGURE 5.28 Average Flow from Leak Detection Layers of Double Lined Landfills (Note that each plotted point represents the average of the number of monitored cells given in parentheses) (from Bonaparte et al., 2000)

From Fundamentals to Applications in Geotechnics
D. Manzanal and A.O. Sfriso (Eds.)
IOS Press, 2015
© 2015 The authors and IOS Press. All rights reserved.
doi:10.3233/978-1-61499-603-3-769

Leakage analysis through composite liners in landfills

Marcos A. MONTORO[a,b,1] Franco M. FRANCISCA[a,b], Manuel A. JUAREZ[a]
[a]*Facultad de Ciencias Exactas, Físicas y Naturales, Universidad Nacional de Córdoba, Argentina*
[b] *Instituto de Estudios Avanzados en Ingeniería y Tecnología (IDIT, UNC-CONICET)*

Abstract. Liner system reliability is of key importance for landfill risk mitigation. There are many design recommendations and standards from several environmental agencies around the world. Among them, single liners and composite liners designs are frequently used. In this article, leakage through single and composite liners was determined in order to evaluate environmental risk. A sensitivity analysis of the governing equation for flow through geomembrane holes was performed and a Monte Carlo simulation for single and composite liner leak was performed. Obtained results allowed confirming that quality control during construction and operation is of key importance for liners performance. Also these findings helped to statistically determinate the equivalency between different alternative liners for the containment of landfill leachate.

Keywords. Composite liner, leakage, landfill

1. Introduction

Liners are engineered layers of low hydraulic conductivity typically thought to isolate solid, semisolid or liquid waste materials from the environment. A liner system is a combination of layers with different functions, such as drainage, separation, leakage prevention, etc. Common liner systems configurations include single liner systems (e.g. geomembranes (GM) or compacted clay liners (CCL)), double liner systems (e.g. two low hydraulic conductivity layers either composed by a GM or CCL separated by a drainage layer), and single composite liner systems, usually composed by a CCL and a GM in intimate contact [1].

Appropriate liner performance is of key importance for landfill and leachate impoundments design. Even most liner leaks, the amount of leakage can be minimized in well designed and constructed liner systems [1-2].

Final selection of liner type will depend on regulatory standards for a specified location and waste material characteristics [3-4]. Typical regulations recommend minimum requirements for liners in order to limit the environmental impact. However, there is not a general agreement about the minimum requirements and it is very common to find great dispersion among regulations. For example, the CCL thickness varies from 0.6 m to 3.6 m in different accepted environmental regulations [4].

[1]Corresponding Author. Email: mmontoro@efn.uncor.edu, Tel. ++54-351-5353800 ext. 837

ResearchGate

See discussions, stats, and author profiles for this publication at: https://www.researchgate.net/publication/298090413

Leakage analysis through composite liners in landfills

Conference Paper · November 2015

DOI: 10.3233/978-1-61499-603-3-769

CITATIONS
0

READS
610

3 authors, including:

Marcos Alexis Montoro
National University of Cordoba, Argentina
24 PUBLICATIONS 96 CITATIONS

SEE PROFILE

Franco M. Francisca
National University of Cordoba, Argentina
114 PUBLICATIONS 1,315 CITATIONS

SEE PROFILE

Some of the authors of this publication are also working on these related projects:

Project Advances in remediation of contaminated soils and groundwater View project

Project Stabilization of loessical silts by adding bentonite for the construction of liners in landfills View project

All content following this page was uploaded by Franco M. Francisca on 14 March 2016.

The user has requested enhancement of the downloaded file.

Liners design methods can be classified as construction–based design, product–based design and performance–based design. It is a common practice to consider product–based design for liners since regulations often prescribe materials properties [5]. Performance–based design considers the surrounding environment characteristics and seems as a more logical way to design landfill liners. Among other information, performance–based design requires the quantification of the amount of leakage of each alternative liner design in order to define the environmental risk.

Regulations also allow engineers to modify liner system configurations if their behavior and performance are equivalent. There are different ways to demonstrate such equivalency, most accepted strategies consider the percolation time [4] and the effect that may have a given contaminant concentration in the aquifers [6].

In Argentina there are no specific regulations about minimum requirements for liner design for municipal solid waste landfills. For many project it is desirable to employ local soil material. Given that the central part of Argentina is covered by loess much effort was applied to study the hydraulic performance of compacted loessical silts for liner construction [7-8].

The main objective of this article is to quantify leakage and its variation through single and single composite liners composed by compacted loessical silts and bentonite - amended compacted silts as CCLs and GM.

2. Leakage trough composite liners

Mass transport through a liner system is governed by different mechanisms depending on liner system configuration [1]. The main transport mechanisms through CCL is due to advection, while the main transport mechanisms for intact GM is diffusion, however if the GM presents defects, holes or wrinkles the main transport mechanisms through defects is also advection.

Leakage through CCL single liners is determined by Darcy`s equation (Eq. 1).

$$Q = k_s A \frac{dH_w}{dl} \tag{1}$$

Where Q is leakage through the liner [m³/s], k_s [m/s] is CCL hydraulic conductivity, A [m²] is the area of the liner, H_w [m] is the leachate height and l [m] is the length of flow paths.

Leakage from composite liner is six orders of magnitude less than leakage from single GM liners and single CCL [5, 9–10]. There are two methods available for determining the amount of leakage through liners: analytical solutions and empirical equations [14 – 15]. Since 1989, several semi – empirical equations were proposed to quantify leakage through composite liners [11]. From those equations, leakage depends on the GM - CCL contact conditions (C_{ql0}), number (n), size (a) and shape of defects, leachate height inside the landfill (H_w), CCL thickness (H_s) and CCL hydraulic conductivity (k_s) [1, 11].

Eq. (2) allows quantifying leakage through composite liner with circular defects in the GM and is one most employed in landfill engineering practice [11 - 12].

$$Q = nC_{ql_0} H_w^b a^c k_s^d \left[1 + 0.1\left(\frac{H_w}{H}\right)^e\right] \tag{2}$$

Where a is the defect area, C_{ql0} is the contact factor and is equal to 1.15, 0.21 or 0.096 for poor, good and excellent contact conditions, respectively, in case of small defects, or 2.60, 0.64 or 0.33 in case of large defects; fitting parameters adopt the following values b= 0.9 for small defects and 0.84 for large defects; c = 0.1 for small defects and 0.18 for large defects, d = 0.74 for small defects and 0.77 for large defects, and e = 0.95 for small defects and 0.027 for large defects. Defects are considered large when their surface area is larger than 7800 mm². Eq. (2) is a semi-empirical equation, therefore has to be evaluated using all dimensions in SI units: Q [m³/s], H_w [m], a [m²], k_s [m/s] and H [m].

3. Methodology

Different models of a single liner of compacted silts or bentonite–silt mixtures and a single composite liner of GM over CCL were developed. This last configuration exploits the advantages of both, GM and CCL. The GM restricts the area through which leakage occurs and the CCL beneath the GM minimizes the leakage through GM imperfections. Flow through GM defects is considered as the main mass transport mechanism.

In order to assess the change in the amount of leakage due to changes in different parameters, a sensitivity analysis was conducted by varying all design parameters in Eq. (2). The baseline situation to which all results will be compared is the leakage obtained for a composite liner, considering 5 defects per hectare, defect size of 100 mm², CCL thickness of 60 cm, leachate height of 30 cm, CCL hydraulic conductivity of 1 $x10^{-9}$ m/s and good contact conditions. It is important to highlight that the empirical nature of this equation is another potential source of deviation between measured and predicted results.

After that, Eqs. (1) and (2) were solved 1000 times by using Monte Carlo simulation. Monte Carlo simulation is a procedure that applies random numbers generation following a determined probability distribution function and solving n times the phenomena governing equation. As a consequence, a distribution of possible results is obtained. According to Eq. (2), the number and size of defects and CCL hydraulic conductivity are considered as random variables while different situations were assumed for contact conditions, leachate height and CCL thickness.

Contact condition depends on installation quality control. Typically, with minimum quality control, good contact conditions can be assumed [11]. For the analysis, each simulation was repeated three times considering poor, good and excellent contact conditions, respectively.

CCL thickness depends on specific site regulations, and type of waste to isolate. Most common CCL thicknesses recommended by regulations ranged from 60 cm to 90 cm [2]. In order to consider the effect of thickness change, three situations were considered in this research, H_s = 0.3 m, H_s = 0.6 m and H_s = 0.9 m.

According to most regulations, landfill liner systems have to be designed considering a leachate height of 0.30 m [3]. However that height considers correct operating conditions, and it is common to find leachate height around 3 m [11], or even as high as 10 m or more when drainage systems of deep landfills do not work properly [16 –17]. Because of that, two different situations were considered in this research, leachate heights H_w = 0.3 m and 3 m.

3.1. Number of defects

Defects in GM may arise from manufacturing, GM rolls handling, on-site placement and seaming, placement of drainage layer material over the GM, or stress cracking as the GM ages. Even with intensive quality assurance, it is reasonable to expect 3 to 5 GM defects per hectare [1]. In [13] there are reported results of number of imperfections from surveys performed in 94 installations sites in Germany. It was found that log (n) can be represented by a normal probability density function (PDF) with a mean $\mu = 1.607$ and a standard deviation $\sigma = 1.89$.

3.2. Size of defects

There is very limited information about the sizes and sizes distribution of defects. For design condition commonly assumed defects are of 1 cm² [1]. However defects of several sizes and different shapes can be found in GMs [9]. In [13] there are reported the sizes of defects surveyed in the German´s installations and in [14] is presented the same data surveyed in some North American sites.

The distribution of defects sizes can be represented by a normal PDF on the log (a) with a mean $\mu = -8.147$ and standard deviation $\sigma = 2.342$.

3.3. CCL hydraulic conductivity

Hydraulic conductivity of compacted loessical silts from the central region of Argentina was reported by several authors. Also the hydraulic conductivity of bentonite – silt mixtures was extensively studied. In [8] it is presented a summary of hydraulic conductivity values for loessical silts and bentonite – silt mixtures determined from laboratory tests. Hydraulic conductivity variability is typically represented by a normal distribution of its logarithm [15]. For compacted loessical silts, the normal PDF has a mean $\mu = -6.31$ and a standard deviation $\sigma = 0.555$ while for bentonite – silts the normal PDF has a mean $\mu = -16.054$ and a standard deviation of $\sigma = 0.994$.

Considering the different liners design, variables and situations involved in this research, 12 simulations for single CCL and 36 simulations for composite liners were performed. With the obtained results, several statistical analysis were conducted: for each simulation the Kolmogorov – Smirnov test was conducted to assess the veracity of the Normal distribution assumption, then Z tests were performed in order to identify some relationships between the mean values of different simulations, and the same but using the Fischer – Snedecor test was performed to study the relationship between variances of different simulations.

4. Results and Analysis

The amount of leakage determined for single liner composed of a 0.6 m thick CCL with a $k_s = 1 \times 10^{-9}$ m/s and a leachate height $h_w = 0.3$ m was $Q = 1{,}296$ l/ha/d while for a composite liner considering the same conditions as before but taking into account 5 holes per hectare, a hole surface of 1 cm² and good contact conditions, the computed leachate was $Q = 2.812 \times 10^{-4}$ l/ha/day. Similar leakage quantities were reported in

literature [5]. The amount of leakage determined for the composite liner, is considered as the base situation in this article for further analyses.

4.1. Sensitivity analysis

Table 1 shows results from a sensitivity analysis of Eq. (2) for composite liners. From this analysis, it is clear that the result is linearly proportional to the number of defects. The influence of variables ordered by importance in % of leakage change due to changes in the variable are: number of defects, leachate height, hydraulic conductivity, defects surface area and CCL thickness. This importance order allows determining variables priority for quality control programs during landfill construction and operation. Table 1 summarizes obtained results.

4.2. Monte Carlo Analysis

Figure 1 shows an example of the obtained results for four different situations: Figure 1a corresponds to a composite liner of GM and 0.6 m thick CCL composed only by compacted silt and 0.3 m leachate height, Figure 1b presents the same conditions but with a CCL of compacted bentonite - silt mixture; Figure 1c and 1d, shows results for leakage from single CCL of compacted silt and compacted bentonite – silt mixtures respectively.

Table 1. Summary of sensitivity analysis performed on Equation 2.

Variable	%Change Variable	Q [l/hs/day]	% Change Q
Base	-	2.812E-04	-
Defect area	-10	2.783E-04	-1.048
	10	2.839E-04	0.958
Number of defects	-20	2.250E-04	-20.00
	20	3.375E-04	-20.00
Leachate height	-10	2.546E-04	-9.473
	10	3.078E-04	9.465
Hydraulic conductivity	-10	2.60E-04	-7.500
	10	3.04E-04	7.307
CCL thickness	-10	2.827 E-04	0.518
	10	2.800E-04	-0.426

From the results, it is clear that there was around one order of magnitude in the change of the mean leakage value from compacted silt CCL respect to compacted bentonite – silt mixture CCL, from values around 5 x 10^4 l/ha/day to values around 5 x 10^3 l/ha/day. The standard deviation also changed, in the first case, results present a wider dispersion respect to the second case.

The mean value of leakage determined for composite liners is around six orders of magnitude less than the one determined for simple CCL liners. Also, there is around one order of magnitude of difference between the amount of leakage determined for composite liner considering compacted silt CCL respect to compacted bentonite – silt CCL. For all cases, resulting dispersion obtained for composite liners is greater respect to the obtained for single liner, because the dispersions of three different random variables influence the results.

Figure 1 also shows the cumulative frequency curve. In every case the Kolmogorov – Smirnov test revealed that the log (Q) can be considered as a variable with normal distribution.

From the statistical analysis of the results it can be affirmed with a 99% confidence that mean value of calculated leakage cannot be considered equal if: poor or excellent contact conditions occur instead of good contact conditions; leachate height in the landfill changes from 0.3 m to 3.00 m; CCL thickness changes from 0.6 m to 0.3 m; CCL material employed is only compacted silt instead compacted bentonite – silt mixtures; composite liner leakage is compared with a single CCL; single CCL leakage are compared between them. However, mean value of leakage can be considered equal when CCL thickness increases from 0.6 m to 0.9 m.

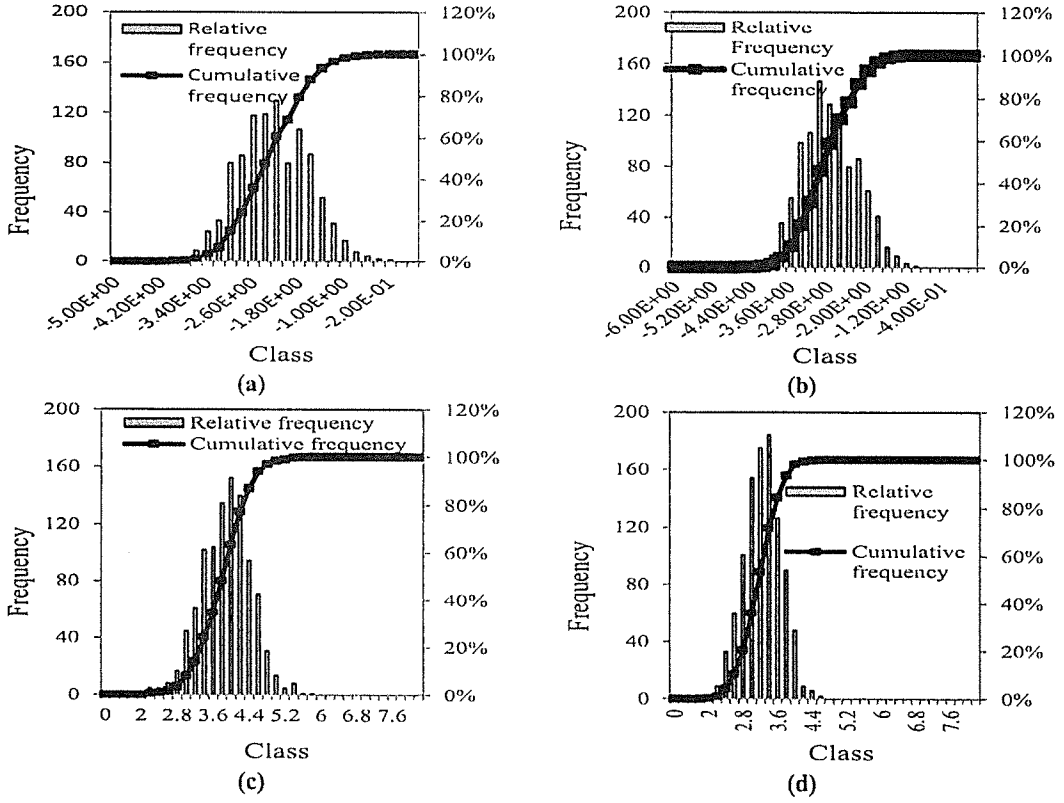


Figure 1. Results frequency distribution for computed leakage for: **(a)** composite liner with poor contact conditions, compacted silt CCL, **(b)** composite liner with poor contact conditions, compacted bentonite - silt CCL, **(c)** single liner, compacted silt CCL, **(d)** single liner, compacted bentonite – silt mixture CCL. In all cases CCL thickness H_s = 0.6m and leachate height H_w = 0.3 m.

The analysis on the variances of obtained results, allow confirming with a 99% confidence that variances of results are independent or statistically equal regarding the prevalent GM contact conditions or when leachate level above liner rises from 0.3 m to 3.0 m. On the other hand, the variance of the amount of leakage is different when CCL thickness increases from 0.6 m to 0.9 m, when the CCL is constructed with compacted silt instead of compacted bentonite – silt mixtures or if the CCL thickness changes and if leakage through single and composite liners are compared.

Figure 2 shows the amount of leakage simulated for different composite liner configurations, considering poor, good and excellent contact conditions, and leakage through single CCL. Dashed line represents the leakage amount of the target situation considered. In the figure, the mean value obtained in each case is represented, and error bars represent three standard deviations more or less indicating that 95% of possible values will lie in the segment shown.

From the analysis, only composite liners with a CCL layer composed of compacted bentonite and silt for thicknesses greater than 0.6 m and at least good GM contact conditions have a probability higher than 50% to present lesser amount of leakage than the target situation. Single CCL have almost no chance to present leakage values close to the target situation. On the other hand, none composite liner built with compacted silt shows a probability lower than 30% to have leakage values lower than the target situation.

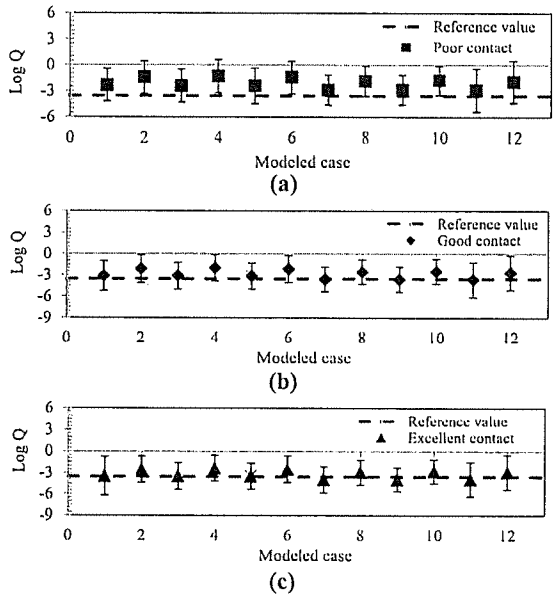


Figure 2. Amount of leakage determined for each situation in comparison to the target value: **(a)** Composite liners with poor contact conditions, **(b)** Composite liners with good contact conditions, **(c)** Composite liners with excellent contact conditions.

5. Conclusions

In this article, leakage through single CCL and composite GM + CCL systems was analyzed. A sensitivity analysis was performed in order to identify the relative importance of each parameter in the amount of leakage due to GM imperfections. Monte Carlo simulations were performed for amount of leakage computation through single CCL and composite GM + CCL systems.

From the analysis of results, it can be stated that the most important factor that impacts in the amount of leakage through composite liners is the GM – CCL contact conditions, and the importance order of the other factors are: number of defects, leachate height, CCL hydraulic conductivity, CCL thickness and defect area.

Results from Monte Carlo simulation allowed determining a mean value, a variance and standard deviation for each simulation. It was found that the log (Q) of the amount of leakage has a normal distribution. The analysis of mean values determined from each situation, reveals that those values can be statistically considered equals for the situation of the increase of CCL thickness of single liners. Variances of results can be assumed statistically equals regarding the GM – CCL contact conditions or when the leachate height rises in the landfill. For the rest of considered parameters variances are different.

Only composite liner with good or excellent contact conditions between GM and CCL and the CCL constructed with compacted bentonite – silt mixtures has a probability of 50% to have less leakage than the target value. From the results, it is extremely clear that quality control during construction and operation are of great importance for leakage control. Analysis conducted in this research allow considering a new way to assess liner systems equivalency by statistical analysis.

6. Acknowledgements

This research was partially financed by SECyT-UNC, Facultad de Ciencias Exactas, Físicas y Naturales, Universidad Nacional de Córdoba (FCEFyN-UNC), Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET) and Secretaría de Ciencia y Tecnología – Ministerio de Industria, Comercio, Minería y Desarrollo Científico y Tecnológico Provincia de Córdoba.

References

[1] J.P. Giroud, R. Bonaparte, Leakage through liners constructed with geomembranes Part II. Composite Liners, *Geotextiles and Geomembranes*, **8** (1989), 71 – 111.

[2] C.H. Benson, D.E. Daniel, G.P. Boutwell, Field performance of compacted clay liners, *ASCE Journal of Geotechnical and Geoenvironmental Engineering*, **125** (1999), 390–403.

[3] R.M. Koerner, *Designing with geosynthetics 6th Ed.*, Xlibris, EEUU, 2012

[4] C.H. Benson, D.E. Daniel, Minimum thickness of compacted liners: I. Stochastic models, *Journal of Geotechnical Engineering*, **120** (1994), 129–152.

[5] T. Katsumi, C.H. Benson, G.J. Foose, M. Kamon, Performance – based design of landfill liners, *Engineering Geology*, **60** (2001), 139–148.

[6] R.K. Rowe, R.W.I. Brachman, Assessment of equivalence of composite liners, *Geosynthetics International*, **11** (2004), 273–286.

[7] F.M. Francisca, D.A. Glatstein, Long term hydraulic conductivity of compacted soils exposed to landfill leachate, *Applied Clay Science*, **49**(2010):187-193.

[8] P.M. Nieva, F.M. Francisca, On the permeability of compacted and stabilized loessical silts in relation to liner system regulations. *International Congress on Development, Environment and Natural Resources: Multi-level and Multi-scale Sustainability* (2007), Cochabamba 11-13 July, Bolivia.

[9] J.P. Giroud, Equations for calculating the rate of liquid migration through composite liners due to geomembrane defects", *Geosynthetics International*, 4(1997), 335–348.

[10] R.K. Rowe, Short and long-term leakage through composite liners. The 7th Arthur Casagrande Lecture. *Canadian Geotechnical Journal*, **49** (2012), 141–169.

[11] N. Touze-Foltz, J. P. Giroud, Empirical equations for calculating the rate of liquid flow through composite liners due to geomembrane defects, *Geosynthetics International*, **10** (2003),215–233.

[12] N. Touze-Foltz, J. P. Giroud, Empirical equations for calculating the rate of liquid flow through composite liners due to large circular defects in the geomembrane, *Geosynthetics International*, **12** (2005),205–207.

[13] V. Nosko (1998) SENSOR DDS technology – modern and high effective way of testing integrity of geomembranes. In: Knipschild FW (ed) Tagungsband der 14 Fachtagung "Die sichereDeponie".SüddeutschesKunststoffzentrum(SKZ), Würzburg, pp N1–N11.

[14] P. Colucci, M.C. Lavagnolo, (1995). Three years field experiencein electrical control of synthetic landfill liners. *In Proceedings of the 5th International Landfill Symposium*, Santa Margherita di Pula, Cagliari, Italy, 1995.

[15] C.H. Benson, Probability distribution for hydraulic conductivity of compacted soil liners, *ASCE Journal of Geotechnical Engineering*, **119** (1993). 471–486.

[16] H.J. Kim, D. Endo, M. Sato, T. Matsuo, T. Matsuto, Estimation of water movement in a closed landfill basedon tracer tests in gas vents and changes in leachate quality, *Waste Management*, **29** (2009), 2308 – 2315.

[17] Y.S. Jang, Y.W. Kim, S.I. Lee, Hydraulic properties and leachate level analysis of Kimpo metropolitan landfill, Korea, *Waste Management*, **22** (2002), 261–267.

PREDICTING LEAKAGE THROUGH COMPOSITE LANDFILL LINERS

By Gary J. Foose,[1] Craig H. Benson,[2] and Tuncer B. Edil,[3] Members, ASCE

ABSTRACT: Leakage through composite landfill liners having various characteristics was analyzed using existing analytical and numerical models developed for the study. Three-dimensional numerical models were used to analyze leakage through circular defects and two-dimensional numerical models were used to analyze leakage from defective seams. Leakage rates predicted with the numerical models were compared to leakage rates predicted using existing equations and analytical models currently being used. These comparisons show that existing equations and analytical models all have limitations and no universal equation or method is available for predicting leakage rates. To overcome some of the deficiencies in the existing equations and models, new equations were developed based on results from the numerical models. Recommendations are made for using the new equations, existing equations, and analytical models to predict leakage rates in thick composite liners having a geomembrane overlaying a compacted soil liner and thin composite liners having a geomembrane overlaying a geosynthetic clay liner.

INTRODUCTION

Composite liners consisting of a geomembrane overlaying a compacted soil liner or a geosynthetic clay liner (GCL), are used in a variety of applications including liquid containment and solid waste landfills. Although the geomembrane component of a composite liner is nearly impervious to liquid flow, defects in the geomembrane occur, even with carefully controlled manufacture and installation (Laine et al. 1988; Giroud and Bonaparte 1989; Brennecke and Corser 1998; Rollin et al. 1999). Defects can range in size from pinholes having a diameter less than the thickness of the geomembrane to defective seams between geomembrane panels that are several meters long.

Several analytical and experimental studies have focused on predicting leakage rates through composite liners having defects in the geomembrane [e.g., Jayawickrama et al. (1988), Giroud et al. (1989, 1992, 1998), Walton and Sagar (1990), Walton et al. (1997), Rowe (1998), and Touze-Foltz et al. (2000)]. The most commonly used equations were presented by Giroud et al. (1989, 1992) based on the methodology developed in Giroud and Bonaparte (1989). These equations are empirical and were developed using a relatively small database of laboratory results reported by several investigators. Other equations have been developed based on theoretical principles [e.g., Walton and Sagar (1990), Walton et al. (1997), Rowe (1998), and Touze-Foltz et al. (2000)].

Although many equations have been proposed, no study to date has compared these equations or assessed their ability to represent the 3D flow regime in a composite liner. The objectives of this study were to (1) assess the efficacy of equations available for predicting leakage rates in composite liners; and (2) make recommendations regarding use of existing equations. The assessment was made using 2D and 3D numerical models.

BACKGROUND

Flow through composite liners is believed to consist of three processes (Fig. 1): (1) flow through the defect in the geomembrane; (2) flow through an interfacial zone between the geomembrane and soil liner; and (3) flow through the soil liner. The rate of leakage and the breadth of flow in the soil liner depend on the ease with which flow can occur in the interfacial zone. All other factors being equal, a greater leakage rate and larger flow area occur when the interfacial zone is more permeable (Foose 1998; Rowe 1998). The interfacial zone is often described using qualitative terms, namely "perfect" contact (no interfacial zone), "excellent" field conditions (Giroud and Bonaparte 1989), "good" contact, and "poor" contact (Giroud 1997). However, little data are available for characterizing properties of the interfacial zone.

Leakage Rates for Perfect Contact

Walton and Sagar (1990) identified Forchheimer's equation (Giroud et al. 1994) as an analytical solution for calculating leakage through a small circular defect Q_c in an infinitely thick composite liner having perfect contact between the geomembrane and soil liner. Forchheimer's equation is

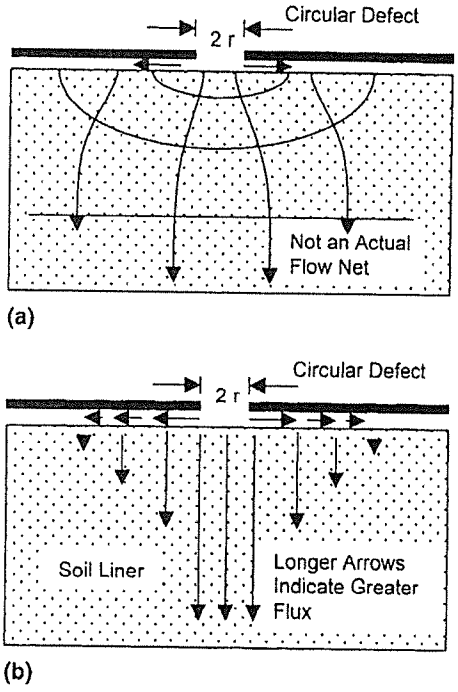


FIG. 1. (a) 3D Flow through Defects in Composite Liners; (b) Conceptualization of Flow through Defects in Composite Liners Used by Rowe (1998)

[1]Asst. Prof., Dept. of Civ. and Envir. Engrg., Univ. of Cincinnati, Cincinnati, OH 45221. E-mail: gary.foose@uc.edu

[2]Prof., Dept. of Civ. and Envir. Engrg., Univ. of Wisconsin–Madison, Madison, WI 53706. E-mail: chbenson@facstaff.wics.edu

[3]Prof., Dept. of Civ. and Envir. Engrg., Univ. of Wisconsin–Madison, Madison, WI 53706. E-mail: chbenson@facstaff.wisc.edu

Note. Discussion open until November 1, 2001. To extend the closing date one month, a written request must be filed with the ASCE Manager of Journals. The manuscript for this paper was submitted for review and possible publication on May 11, 1998; revised January 19, 2001. This paper is part of the *Journal of Geotechnical and Geoenvironmental Engineering*, Vol. 127, No. 6, June, 2001. ©ASCE, ISSN 1090-0241/01/0006-0510–0520/$8.00 + $.50 per page. Paper No. 18323.

ResearchGate

See discussions, stats, and author profiles for this publication at: https://www.researchgate.net/publication/245293988

Predicting Leakage through Composite Landfill Liners

Article *in* Journal of Geotechnical and Geoenvironmental Engineering · June 2001

DOI: 10.1061/(ASCE)1090-0241(2001)127:6(510)

CITATIONS
76

READS
1,255

3 authors:

Gary J. Foose

14 PUBLICATIONS 756 CITATIONS

SEE PROFILE

Craig H Benson
University of Virginia

405 PUBLICATIONS 14,145 CITATIONS

SEE PROFILE

Tuncer B. Edil
University of Wisconsin–Madison

369 PUBLICATIONS 10,031 CITATIONS

SEE PROFILE

Some of the authors of this publication are also working on these related projects:

Project sustainability of highway construction View project

Project Multi-sorbent Barrier View project

All content following this page was uploaded by Craig H Benson on 06 May 2018.

The user has requested enhancement of the downloaded file.

$$Q_c = 4K_s h_t r \tag{1}$$

where K_s = saturated hydraulic conductivity of the soil liner; h_t = total head drop across the composite liner; and r = radius of the defect. Laboratory tests by Walton et al. (1997) and numerical evaluations by Walton and Sagar (1990); Walton et al. (1997), and Foose (1997) show that (1) provides accurate predictions of leakage rates provided the radius of defect is <1/75 of the thickness of the soil liner and the flaws are widely spaced.

The distribution of total head near a defect in a composite liner having a thick soil liner and perfect contact between the geomembrane and soil liner can also be obtained from the analogous heat conduction problem described by Carslaw and Jaeger (1959). The solution is (Foose 1997)

$$h_R(R_r, z) = \frac{2h_t}{\pi} \sin^{-1}\left\{\frac{2r}{[(R_r - r)^2 + z^2]^{1/2} + [(R_r + r)^2 + z^2]^{1/2}}\right\} \tag{2}$$

where h_R = total head at radial distance R_r from the axis of the defect; and z = vertical distance from the base of the defect.

An analysis conducted by Foose (1997) using (1) shows that the error in leakage rate is <1% when the radius of defect is <1/75 of the thickness of the soil liner and the flaws are widely spaced. The error in predicted leakage rate is <10% provided that the radius of defect is <1/8 the thickness of the soil liner. Hence, for composite liners having a 6 mm thick GCL and perfect contact, (1) can be used for defects is having a radius <0.75 mm with the error in predicted leakage rate remaining <10%. Giroud and Bonaparte (1989) recommended that defects having a radius of 5.6 mm (area = 1 cm^2) be used to size components of liner systems and defects having a radius of 1 mm (area = 3.1 mm^2) be used to evaluate the performance of liner systems. Consequently, leakage rates for GCL composite liners can be in error by as much as 40% when (1) is used to analyze the size of defects recommended by Giroud and Bonaparte (1989).

Walton et al. (1997) developed graphical and empirical solutions for leakage rate through a composite liner having perfect contact and circular defects in the geomembrane having a radius as large as 1/10 the thickness of the soil liner. For a 6 mm-thick GCL, the graphical and empirical solutions developed by Walton et al. (1997) are valid for defects having a radius <0.6 mm, but not for defects having the sizes recommended by Giroud and Bonaparte (1989). The graphical solution for defective seams or tears with perfect contact proposed by Walton and Sagar (1990) also is limited to defects having a width <1/10 the thickness of the soil liner.

Walton and Seitz (1992) described an equation for predicting fluid flow through fractures in concrete vaults in intimate contact with soil, a situation analogous to leakage through composite liners having defective seams or tears and perfect contact. The solution is based on a Neumann boundary condition (specified flux) representing the defect (Yates 1988). The leakage rate per unit length of defective seam Q_l can be simplified to

$$Q_l = K_s h_t \varepsilon \tag{3}$$

where ε is

$$\varepsilon = -\left\{\left[\sum_{n=1}^{\infty}\left(\frac{(8L_s)(p_{1j} + p_{1j}^2 p_{2j})}{w[\pi(2n-1)]^2[p_{1j}(1 + p_{2j}^2) + p_{2j}(1 + p_{1j}^2)]\cosh\left(\frac{w\pi(2n-1)}{4L_s}\right)}\right)\right] - \frac{L_s}{w}\right\}^{-1} \tag{4}$$

The variables p_{1j} and p_{2j} are defined as

$$p_{1j} = \tanh\left[\frac{w\pi(2n-1)}{4L_s}\left(\frac{2R_o}{w} - 1\right)\right] \tag{5a}$$

$$p_{2j} = \tanh\left(\frac{w\pi(2n-1)}{4L_s}\right) \tag{5b}$$

where w = width of defect; R_o = distance between defects; and L_s = thickness of the soil liner.

Harr (1962) presented an analytical solution for a seepage problem analogous to flow through a composite liner having a defective seam or tear, perfect contact, and a Dirichlet boundary (specified head) at the defect. The equation from Harr (1962) is

$$Q_l = \frac{2K_s h_t}{\Phi} \tag{6}$$

The dimensionless form factor Φ is defined as

$$\Phi = \frac{K'}{K} \tag{7}$$

where K′ and K = complete elliptic integrals of first kind with a modulus of m and complementary modulus of m', respectively. The modulus is

$$m = \lambda \operatorname{sn}\left(\frac{w}{R_o}\Lambda, \lambda\right) \tag{8}$$

where Λ = complete elliptic integral of first kind of modulus λ. The ratio between the elliptic integral of first kind of modulus λ and the complete elliptical integral of first kind of complementary modulus λ' is defined as

$$\frac{\Lambda}{\Lambda'} = \frac{R_o}{2L_s} \tag{9}$$

where Λ' = complete elliptical integral of first kind of complementary modulus λ'.

A table of elliptic integrals, an approximate function, or a numerical solution is used to determine λ and Λ from the ratio Λ/Λ'. The parameters λ and Λ are substituted in (8) to compute m. The dimensionless form factor Φ (which is K′/K) is determined from m using a table of elliptic integrals, an approximate function, or a numerical solution.

Leakage Rates for Imperfect Contact

Imperfect contact has often been used as a hypothesis to explain why measured leakage rates in the laboratory and field are often greater than those predicted using equations for perfect contact [e.g., Giroud and Bonaparte (1989), and Rowe (1998)]. Imperfect contact between the geomembrane and soil liner may exist due to the soil particles, rutting and undulations occurring during construction of the liner, and wrinkles in the geomembrane (Giroud and Bonaparte 1989; Rowe 1998).

The most commonly used equations for calculating the leakage rate in composite liners when imperfect contact exists were presented by Giroud et al. (1989, 1992). Giroud (1997) adapted these empirical equations to apply to a variety of cases. These equations are referred to herein as Giroud's (1997) equations. Giroud's (1997) equation for leakage through circular defects is

$$Q_{c,G} = \beta_c \left[1 + 0.1 \left(\frac{h_w}{L_s} \right)^{0.95} \right] a^{0.1} h_w^{0.9} K_s^{0.74} \quad (10)$$

where h_w = depth of leachate above the geomembrane; and a = area of defect. The units for h_w, L_s, a, and K_s are m, m, m^2, and m/s, respectively. Giroud's (1997) equation for long defects (tears or defective seams) is

$$Q_{l,G} = \beta_l \left[1 + 0.2 \left(\frac{h_w}{L_s} \right)^{0.95} \right] w^{0.1} h_w^{0.45} K_s^{0.87} \quad (11)$$

where w = width of defect in m.

The coefficients β_c and β_l in (10) and (11) are 0.21 and 0.52, respectively, for good contact, and 1.15 and 1.22, respectively, for poor contact. Good and poor contact are descriptive of field conditions. The limitations of (10) and (11) and definitions of good and poor contact are discussed in Giroud (1997).

For circular defects in composite liners having good contact, the radius of wetting R_c is (Giroud et al. 1992)

$$R_c = 0.26 a^{0.05} h_w^{0.45} K_s^{-0.13} \quad (12)$$

For long defects in composite liners having good contact, the width of wetting W_l is (Giroud et al. 1992)

$$W_l = 0.26 w^{0.1} h_w^{0.45} K_s^{-0.13} \quad (13)$$

The coefficient 0.26 used in (12) and (13) for good contact is increased to 0.61 for poor contact.

Rowe (1998) developed an analytical equation for leakage through circular defects in composite liners based on the approach formulated by Jayawickrama et al. (1988). Multidimensional flow in the soil liner [Fig. 1(a)] is conceptualized as radial flow along the interface between the soil and geomembrane and then vertical flow in the soil liner [Fig. 1(b)]. This solution, herein referred to as Rowe's (1998) solution, is the only available analytical method in which the transmissivity of the interface between the geomembrane and soil liner is explicitly included and provides a direct method to evaluate how the interface between the geomembrane and soil liner affects the leakage rate. However, the assumptions regarding flow in the interface and soil liner have not been verified numerically or experimentally.

For a composite liner having a total head of zero at the base of the liner, Rowe's (1998) solution is

$$Q_{c,R} = \pi K_s \left(r^2 \frac{h_t}{L_s} + 2 \frac{h_t}{L_s} \Delta_1 + 2 \frac{h_t}{L_s} \Delta_2 - \frac{2 h_w}{L_s} \Delta_2 \right) \quad (14)$$

where Δ_1 and Δ_2 = expressions involving Bessel functions (see Appendix), the radius of the defect r, and the wetted radius R_c. Transmissivity T of the interface is embedded in the method to obtain R as shown in the Appendix.

Rowe (1998) proposed another equation for calculating leakage through circular defects occurring at the crest of a wave or "wrinkle" in the geomembrane in which flow is controlled by the soil liner and the lateral spreading of flow is not restricted. Rowe's (1998) wrinkle equation is

$$Q_{w,R} = 2SK_s \left[\sqrt{\frac{B}{2} + \left(\frac{L_s T}{K_s} \right)} \right] \frac{h_t}{L_s} \quad (15)$$

where S = length of the wrinkle; B = width of the wrinkle; T = transmissivity of the interface; and other terms are as defined previously. Eq. (15) is also based on the assumption that flow in the soil liner is 1D. Rowe (1998) and Touze-Foltz et al. (2000) also presented solutions for predicting leakage rates through circular defects that occur in wrinkles or waves in which resistance to flow through the defect is considered, as well as the effects of flow from defects in closely spaced wrinkles.

The absolute maximum leakage rate through circular defects $Q_{c,m}$ can be computed using Bernoulli's equation for free flow through an orifice having sharp edges (Giroud and Bonaparte 1989)

$$Q_{c,\max} = 0.6a\sqrt{2gh_w} \quad (16)$$

where g = gravitational constant.

Interface Properties

Jayawickrama et al. (1988) applied Newton's viscosity law for flow between two smooth parallel plates to back-calculate the interface thickness between a geomembrane and soil liner using flow rates measured in a laboratory test of a composite liner. The calculated interface thickness ranged from 0.02 mm for a soil liner having a hydraulic conductivity of 1×10^{-7} cm/s to 0.15 mm for a soil liner having a hydraulic conductivity of 1×10^{-4} cm/s. The model used to back-calculate the thickness is based on the assumption that flow in the soil liner is unidirectional, as shown in Fig. 1(b).

Rowe (1998) used his model to back-calculate the transmissivity of the interface between the geomembrane and compacted soil liner necessary to yield leakage rates through defects comparable to those obtained from Giroud's (1997) equations. For a 60 cm thick composite liner having good contact, Rowe (1998) found that the transmissivity of the interface is approximately 1.6×10^{-8} m^2/s. For a 60 cm-thick composite liner having poor contact, Rowe (1998) found that transmissivity of the interface is approximately 1×10^{-7} m^2/s.

An important limitation of these results for interface properties is that they have not been measured directly. Values for transmissivity of the interface have been back-calculated using analytical models that are based on the assumption of unidirectional flow in the soil liner. This assumption has not been verified experimentally, analytically, or numerically. No direct measurements of an interfacial gap or interfacial flow have been made in the laboratory or in the field for leakage through defects in composite liners having a compacted soil liner. Inferences regarding properties of the interface in composite liners have been made based solely on observed flow rates [e.g., Jayawickrama et al. (1988), Giroud and Bonaparte (1989), and Rowe (1998)]. Nevertheless, these are the best estimates of interface conditions that can be made presently.

Harpur et al. (1993) analyzed the interface between a geomembrane and a GCL where the bentonite was encased between two geotextiles. A GCL with the bentonite glued to a geomembrane was also tested, although an interface did not exist for this GCL. A radial transmissivity device was used in which flow passed through a circular defect in the geomembrane and along the interface between the GCL and geomembrane. Flow was collected along the perimeter of the specimen and did not pass through the soil liner as would be the case for flow in a composite liner. For the GCL with bentonite encased in geotextiles, the range for transmissivity of the interface was calculated to be 6×10^{-12} m^2/s to 2×10^{-10} m^2/s.

LEAKAGE MODEL

The equations available for calculating leakage rates for composite liners have been obtained empirically from a limited number of laboratory tests or are analytical solutions based on assumptions such as perfect contact, thick soil liners, or unidirectional flow in the soil liner. The best method to assess the validity of these equations would be to use data from carefully controlled experiments. The experience of Brown et al. (1987) as well as attempts made by the writers have demonstrated that laboratory experiments of this type are often plagued by

difficulties caused by the boundaries of the testing device and consolidation water from the soil liner. These difficulties confound the observed flow rates and the resulting errors are as large or larger than the leakage rates attempting to be measured. Walton et al. (1997) was able to overcome some of these difficulties by using sand as a soil liner for the purpose of verifying (1). However, the surface characteristics of sands are very different from those for clay liners.

Field data could also be used for comparison, but they are plagued by inadequate knowledge of the size, shape, and number of defects in the geomembrane, unknown hydraulic conductivity of the soil liner or GCL, unknown depth of leachate on the liner, and confounding effects such as consolidation water. In lieu of experimental or field data, the next best approach is to use an established and verified multidimensional numerical model, based on minimal assumptions, that can be used to represent conditions likely to exist in a composite liner as accurately as possible. This latter approach was used in this study.

3D and 2D numerical models were developed to analyze leakage through defects in composite liners having perfect and imperfect contact between the geomembrane and soil liner. Results obtained with these models were then compared to the leakage rates computed using the equations by Harr (1962), Walton and Seitz (1992), Giroud (1997), and Rowe (1998).

The finite-difference flow model MODFLOW (McDonald and Harbaugh 1988) was used to develop a model for leakage through composite liners. MODFLOW was used because it is a well recognized and verified 3D model and there are several preprocessors available to build models. MODFLOW solves the governing equation for 3D flow of water through porous media

$$\frac{\partial}{\partial x}\left(K_{xx}\frac{\partial h_1}{\partial x}\right)+\frac{\partial}{\partial y}\left(K_{yy}\frac{\partial h_1}{\partial y}\right)+\frac{\partial}{\partial z}\left(K_{zz}\frac{\partial h_1}{\partial z}\right)-W=S_s\frac{\partial h_1}{\partial t} \tag{17}$$

where K_{xx}, K_{yy}, and K_{zz} = hydraulic conductivity along the x-, y-, and z-axes parallel to the major axes of hydraulic conductivity; W = flow rate of sinks and sources; S_s = specific storage; and t = time. For this study, (17) was solved for the steady-state condition using the strongly implicit solver in MODFLOW. Mass balance errors for all simulations were <1% (Foose 1997).

Leakage through circular defects was modeled as a radially symmetric system using only one quadrant. The area around a circular defect was modeled as a block of soil with the axes of the defect lying on the edge of the cube (Fig. 2). A layer of no-flow cells was used to simulate the geomembrane and constant head cells were used to simulate a defect in the geomembrane. For the conditions modeled, head loss that occurs in the layer above the geomembrane or through the defect was found to be negligible because the soil liner has much lower hydraulic conductivity than the layer generally placed above the geomembrane.

The defect was modeled using rectangular cells. Circular defects were approximated using a fine mesh of rectangular cells. The bottom boundary was modeled as a freely draining boundary having a constant head of zero. The soil liner was assumed to be saturated, homogeneous, and isotropic.

Composite liners having defective seams and tears in the geomembrane were modeled in two dimensions with the dimension in the y-direction having unit length. To determine the total quantity of flow from a defective seam, results from a circular defect can be added to the solution for the defective seam to account for flow from the ends (Foose 1997).

The interface between the geomembrane and soil liner was modeled as a thin layer (up to 0.030 mm-thick) having a transmissivity and thickness representative of the interface contact ranging from perfect contact (no interface layer) to varying degrees of imperfect contact. Thickness of the interface t_i was calculated using Newton's viscosity law for flow between two smooth parallel plates

$$t_i=\left(\frac{12\eta T}{\rho g}\right)^{1/3} \tag{18}$$

where η = kinematic viscosity of water; T = transmissivity of the interface; and ρ = density of water (Giroud and Bonaparte 1989). The transmissivity is

$$T=K_i t_i \tag{19}$$

where K_i = hydraulic conductivity of the interface. The transmissivity in terms of the hydraulic conductivity of the interface can be solved for by cubing both sides of (18), substituting (19) into the resulting equation, solving for t, multiplying both sides of the resulting equation by K_i, and substituting in (19), which leads to

$$T=K_i^{3/2}\sqrt{\frac{12\eta}{\rho g}} \tag{20}$$

Near the defect the grid spacing was 0.001 mm in all directions. The grid was expanded by a factor of 1.1 for distances within 1 mm of the center of the defect, 1.2 for distances 1–5 mm from the center of the defect, and 1.4 at distances >5 mm from the center of the defect. The largest model had 518,400 finite-difference cells. An exceptionally small grid spacing was required near the defect because of the

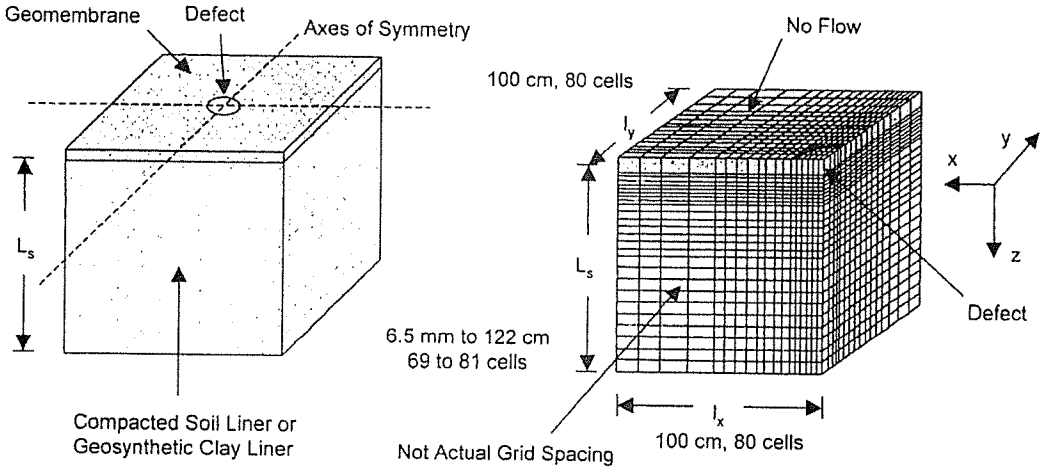


FIG. 2. Conceptual Model for Flow through Defects in Composite Liners

high rate of change of the gradient near the defect (Foose et al. 1998).

ANALYSIS OF LEAKAGE RATE PREDICTIONS

Two composite liners were analyzed to assess leakage through defects in composite liners: (1) a 6.5 mm thick GCL overlain with a geomembrane (a popular alternative liner system); and (2) a 61 cm thick compacted clay liner overlain with a geomembrane (the liner prescribed in Subtitle D of the Resource Conservation and Recovery Act). The hydraulic conductivity of the soil liner in the Subtitle D liner was assumed to be 1×10^{-7} cm/s, which is the commonly regulatory standard for compacted soil liners. The hydraulic conductivity of the GCL was assumed to be 1×10^{-9} cm/s, which is representative of values reported in the literature for water [e.g., Ruhl and Daniel (1997)]. However, the hydraulic conductivity of the GCL was varied up to 2×10^{-6} cm/s corresponding to the scenario in which the hydraulic conductivity of the GCL is increased as a result of chemical interactions with leachate [e.g., Petrov and Rowe (1997) and Quaranta et al. (1997)]. The depth of leachate was assumed to be 30 cm, which is the common regulatory standard.

Leakage through Circular Defects—Perfect Contact

Leakage rates for the two liners analyzed with perfect contact between the geomembrane and soil liner are shown in Fig. 3, along with leakage rates predicted using Forchheimer's equation for circular defects of various sizes [(1)]. For the Subtitle D liner, results from the 3D finite-difference model replicate results from (1), which serves to verify the numerical model. This also indicates that the discretization error resulting from approximating a circular defect using small rectangular cells is small. As shown in Fig. 3(b), total heads in the Subtitle D liner predicted using the numerical model and total heads determined from the analytical equation [(2)] also compare favorably.

The leakage rate from the GCL composite liner ($K_s = 1 \times 10^{-9}$ cm/s) is about two orders of magnitude less than that for the Subtitle D liner. Eq. 1 tends to underpredict leakage from the GCL composite liner because (1) is based on the assumption of a semiinfinite permeable medium, which does not correspond to a thin GCL. For small defects (radius ~1 mm), (1) underestimates the leakage rate by 11%. For larger defects (radius ~6 mm), (1) underestimates the leakage rate by 44%.

Leakage through Defective Seams or Tears—Perfect Contact

Leakage rates per unit length of defect for a GCL composite liner and a Subtitle D liner are shown in Fig. 4. For both liners, the geomembrane and soil liner are in perfect contact. The leakage rates shown in Fig. 4 do not include flow from the ends of the defect. For a leachate depth of 30 cm, the leakage

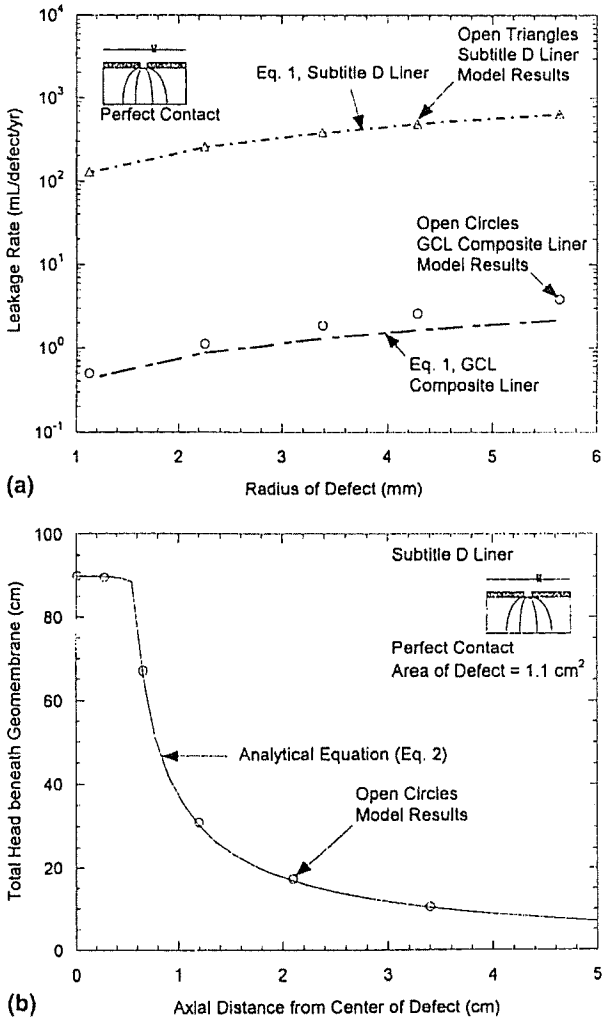


FIG. 3. (a) Leakage Rates through Circular Defects in Composite Liners Having Perfect Contact; (b) Total Head versus Axial Distance from Center of Defect for Subtitle D Liner

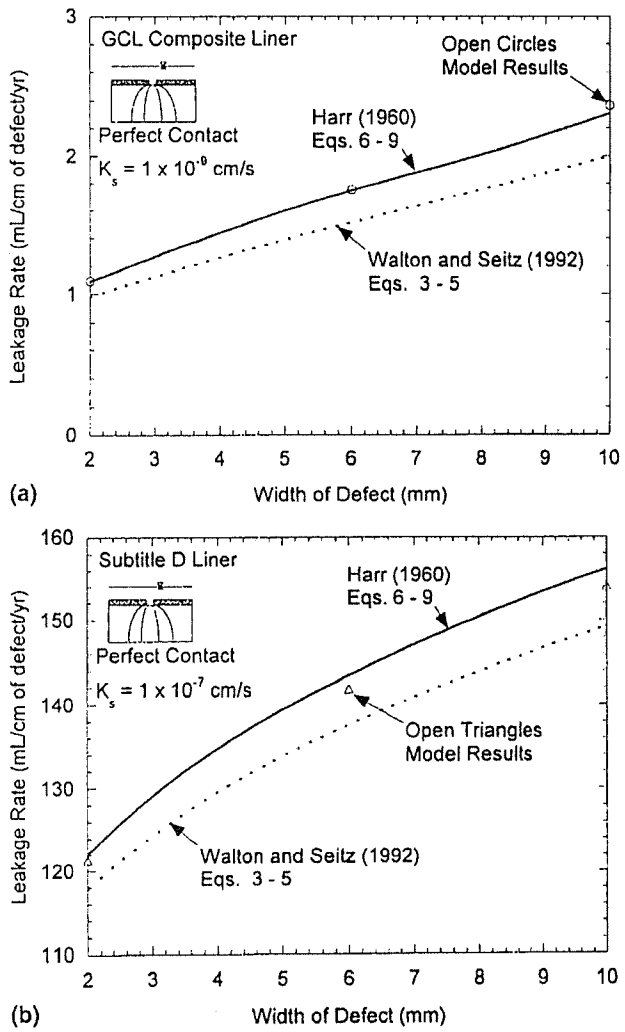


FIG. 4. Leakage Rates through Defective Seams in Composite Liners Having Perfect Contact: (a) GCL Composite Liner; (b) Subtitle D Liner

rate for the GCL composite liner having a hydraulic conductivity of 1×10^{-9} cm/s is two orders of magnitude less than that for the Subtitle D liner. The ratio of leakage rates equals the ratio of the hydraulic conductivity of the soil liner and the GCL.

Also shown in Fig. 4 are leakage rates predicted using the solution by Walton and Seitz (1992) [(3)–(5)] and the analytical solution from Harr (1962) [(6)–(9)]. Leakage rates from the analytical solution by Walton and Seitz (1992), which uses a specified flux boundary condition for the defect, are lower than those from the numerical model for both liners. The numerical model is expected to be more realistic because a specified head boundary condition for the defect is likely to be representative of field conditions.

Leakage rates from the solution in Harr (1962) are close (within 2%) to those obtained with the numerical model. Asymptotic expansion series were used to compute values of λ and Λ from the ratio Λ/Λ' because values for the modulus m that were used were near the asymptotes of tabulated values (Abramowitz and Stegun 1972). The discrepancy in the calculated leakage rates is due to truncation errors in the asymptotic expansion series used in computing the elliptic integrals.

Leakage rates through defective seams can be much greater than that through a circular defect in the geomembrane panel. For a defect 1 m long and 2 mm wide in a Subtitle D liner, the leakage rate is approximately 12,000 mL/year. In contrast, the leakage rate for a single circular defect having a diameter of 2 mm is 115 mL/year. Thus, leakage from a small portion of defective seam or tear can far outweigh leakage from numerous widely spaced small defects. Given that most leaks occur in field seams (Darilek et al. 1989; Rollin et al. 1999), construction quality-assurance programs should focus on the quality of the seams and estimates of leakage rates made during design should consider the likelihood of seam failures.

Leakage through Circular Defects—Imperfect Contact

Leakage rates for composite liners with imperfect contact and circular defects having an area of 1 cm^2 were analyzed with the numerical model. For the GCL composite liner, transmissivity of the interface between the geomembrane and GCL was varied from perfect contact to 2×10^{-10} m^2/s, based on measurements made by Harpur et al. (1993). For the Subtitle D liner, the transmissivity of the interface was varied from perfect contact to 2×10^{-12} m^2/s.

GCL Composite Liner

Leakage rates for a GCL composite liner having a hydraulic conductivity of 2×10^{-8} cm/s are shown in Fig. 5 along with leakage rates computed using Rowe's (1998) solution for circular defects [(14)] and Giroud's (1997) equation for circular defects [(10)]. The shaded box near the bottom of the graph depicts the range of interface transmissivities reported by Harpur et al. (1993) for the geotextile-encased GCL. The leakage rate increases as the transmissivity of the interface increases and is particularly sensitive for transmissivities $>10^{-12}$ m^2/s. Rowe's (1998) solution underestimates the leakage range for transmissivities $<2 \times 10^{-12}$ m^2/s, with the maximum error being about a factor of 2 in the limiting case of perfect contact. For transmissivities $>2 \times 10^{-12}$ m^2/s, leakage rates predicted using Rowe's (1998) solution are essentially the same as those obtained from the numerical model.

Rowe's (1998) solution underestimates the leakage rate at transmissivities $<2 \times 10^{-12}$ m^2/s because flow in the GCL is multidimensional rather than 1D, as assumed by Rowe (1998). This effect is shown in Fig. 6 where streamlines obtained from the numerical model are shown for a GCL composite liner

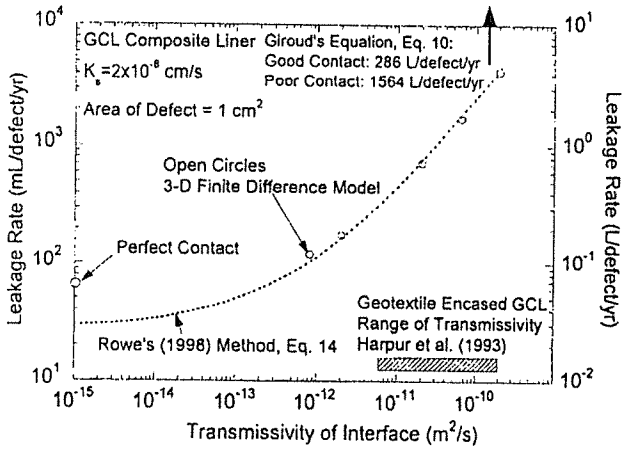


FIG. 5. Leakage Rate through Circular Defect in GCL Composite Liner Having Imperfect Contact

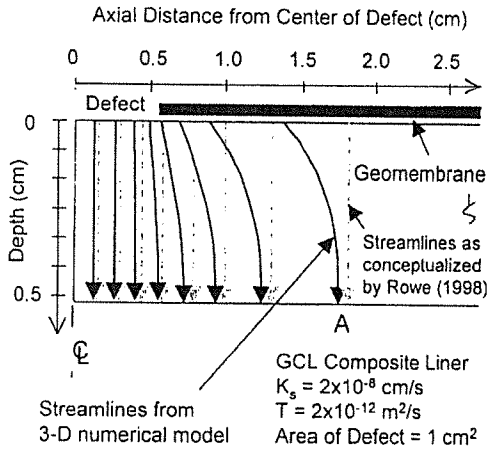


FIG. 6. Streamlines for Flow through Circular Defect in GCL Composite Liner Having Imperfect Contact

having a hydraulic conductivity of 2×10^{-8} cm/s and an interface transmissivity of 2×10^{-12} m^2/s along with streamlines as conceptualized by Rowe (1998).

Rowe's (1998) solution underpredicts leakage rates for transmissivities $<2 \times 10^{-12}$ m^2/s because the gradient along a given streamline is underestimated. Consider the streamlines that exit at location A shown in Fig. 6. The streamline for fluid particles that exit at location A following the path assumed by Rowe's (1998) solution is longer than the streamline for 3D flow. Since the drop in total head along the streamlines must be the same, the gradients along streamlines obtained from Rowe's (1998) solution will be smaller than those based on 3D flow. Thus, Rowe's (1998) solution will tend to underpredict the leakage rate. For greater interface transmissivities, more lateral spreading of flow occurs in the interface, streamlines in the soil liner tend to become more undirectional, and leakage rates predicted using Rowe's (1998) solution approach those from the numerical model.

Giroud's (1997) equation [(10)] predicts a leakage rate of 286 L/defect/year for good contact and a leakage rate of 1,564 L/defect/year for poor contact (Fig. 5). The leakage rates obtained using Giroud's (1997) equation are substantially greater than those from the numerical model and Rowe's (1998) solution for the values of transmissivity of the interface measured by Harpur et al. (1993). One possible reason for this is that the values of transmissivity measured in the laboratory may not be representative of good and poor contact, defined by Giroud (1997), which are for field conditions.

The area of the liner conducting flow beneath the defect in a GCL composite liner was also analyzed. For a GCL composite liner having a hydraulic conductivity of 2×10^{-8} cm/s and a transmissivity of the interface of 2×10^{-11} m^2/s, 98% of the flow was conducted within 10 cm of the center of the defect. For the same properties, the wetted radius predicted using Rowe's (1998) solution is 9 cm, which is comparable to the wetted radius obtained from the numerical model. The wetted radius predicted using Giroud's (1997) equation for good contact [(12)] is 1.7 m, which is much greater than that obtained from the numerical model or Rowe's (1998) solution, and is consistent with the higher leakage rates predicted with Giroud's (1997) equation [(10)].

A comparison of leakage rates predicted using Rowe's (1998) solution and results from the numerical model is shown in Fig. 7 for various hydraulic conductivities of the GCL. The abscissa is the ratio of hydraulic conductivity of the interface and hydraulic conductivity of the GCL (K_i/K_s). Leakage rates from Rowe's (1998) solution $Q_{c,R}$ and the numerical model $Q_{c,m}$ differ by <10% provided that K_i/K_s is $>10^4$. Therefore, flow in the GCL can be approximated as unidirectional when the hydraulic contrast between the interface and soil liner is $>10^4$.

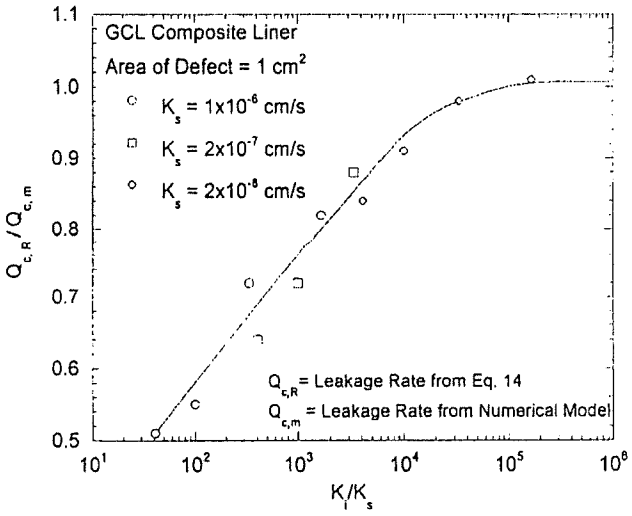


FIG. 7. Ratio of Leakage Rates Predicted Using Rowe (1998) to Leakage Rates from Numerical Model for Circular Defects in GCL Composite Liner

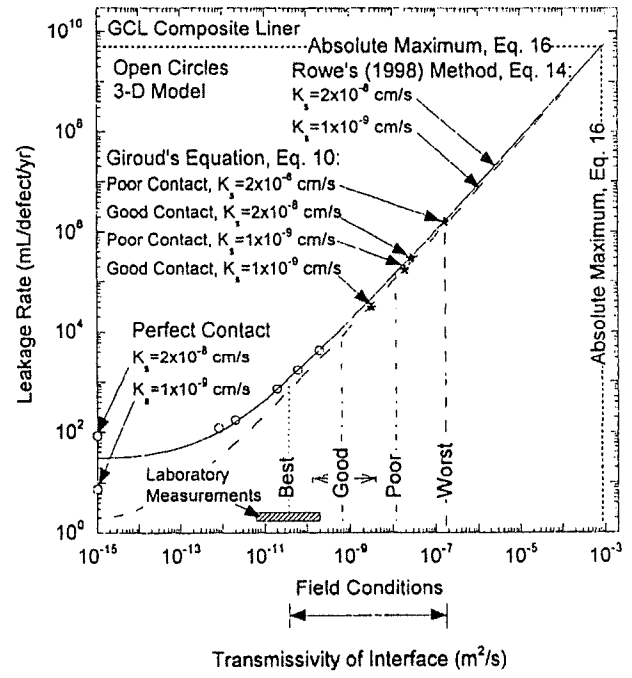


FIG. 8. Leakage Rate through Circular Defect in GCL Composite Liner for Field Conditions

The transmissivity of the interface for a GCL composite liner for field conditions can be estimated using the approach that Giroud and Bonaparte (1989) used for composite liners having a compacted soil liner and leakage rates computed using Rowe (1998). The "best" field case is assumed to correspond to the middle of the range of transmissivities of the interface measured in the laboratory by Harpur et al. (1993). Following the approach used by Giroud and Bonaparte (1989), the transmissivity for the "worst" field condition is assumed to be halfway between the best field case and the transmissivity corresponding to the absolute maximum leakage rate [(16)]. The range of transmissivity between the best and worst field conditions is arbitrarily divided into thirds (Fig. 8) and the values of transmissivity corresponding to good and poor conditions for a GCL composite liner are 6×10^{-10} m^2/s and 1×10^{-8} m^2/s, respectively. Based on the range of laboratory measurements of the transmissivity of the interface between a GCL and geomembrane reported by Harpur et al. (1993), the transmissivity corresponding to good field conditions may range between 1×10^{-10} and 4×10^{-9} m^2/s (Fig. 8).

Subtitle D Liner

Leakage through a Subtitle D liner having imperfect contact between the geomembrane and soil liner was also investigated. Rowe (1998) found that the transmissivity of the interface is 1.6×10^{-8} m^2/s for good contact conditions, as defined by Giroud (1997). Convergence problems with the 3D numerical model for the Subtitle D liner prevented simulations with transmissivities $>2 \times 10^{-12}$ m^2/s. Results of simulations for the two transmissivities evaluated are shown in Table 1. For interface transmissivities $<2 \times 10^{-12}$ m^2/s, Rowe's (1998) solution underpredicts the leakage rate. This occurs because for these cases, flow is 3D rather than undirectional, as conceptualized by Rowe (1998).

Provided that the Subtitle D liner behaves similarly to the GCL composite liner, flow in the soil liner of the Subtitle D liner can be approximated as unidirectional when $K_i/K_s > 10^4$, which corresponds to a transmissivity of 3.5×10^{-11} m^2/s when $K_s = 1 \times 10^{-7}$ cm/s. Therefore, for transmissivities representative of good contact (1.6×10^{-8} m^2/s), as back-calculated by Rowe (1998), Rowe's (1998) solution and Giroud's (1997) equation should provide reasonable estimates of the leakage rate for the Subtitle D liner. Similar results were found from a more complete analysis of flow through defective seams in a Subtitle D liner, and are discussed in a subsequent section.

TABLE 1. Comparison of Leakage Rates Predicted Using Numerical Model and Rowe's (1998) Solution for Subtitle D Liner

Interface transmissivity (m²/s)	Leakage rate numerical model $Q_{c,m}$ (mL/year)	Leakage rate Rowe's (1998) solution $Q_{c,R}$ (mL/year)	Ratio $Q_{c,m}/Q_{c,R}$
Perfect contact	648	—	—
2×10^{-14}	657	9	73
2×10^{-12}	894	99	9

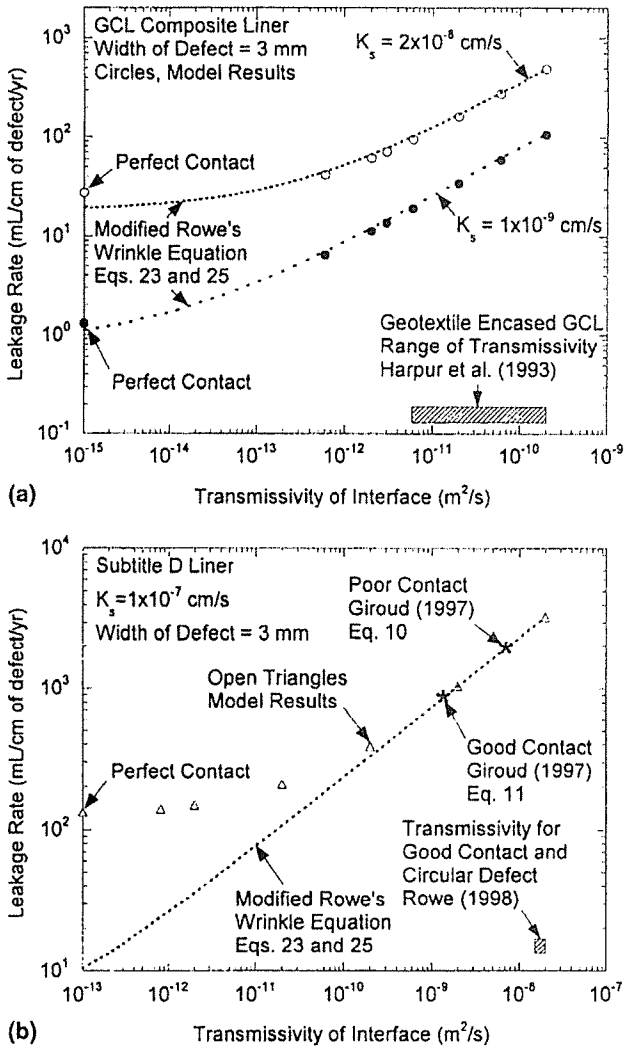


FIG. 9. Leakage Rates through Defective Seams in Composite Liners Having Imperfect Contact: (a) GCL Composite Liner; (b) Subtitle D Liner

Leakage through Long Defects—Imperfect Contact

GCL Composite Liner

Analyses for leakage from long defects employed the same properties of the interface as those for circular defects. Leakage rates for a 3 mm wide defective seam or tear in the geomembrane of a GCL composite liner are shown in Fig. 9(a) in terms of leakage rate per unit length of defect. If perfect contact exists between the geomembrane and GCL, an increase in the hydraulic conductivity of the GCL by a factor of 20 results in an increase in the leakage rate by a factor of 20. For cases in which imperfect contact exists and the transmissivity of the interface between the geomembrane and GCL is $\geq 3 \times 10^{-12}$ m^2/s, a 20-fold increase in hydraulic conductivity results in the leakage rate increasing by a factor of 5. Leakage rate is more sensitive to hydraulic conductivity of the GCL when the interface is less transmissive because the contrast between the hydraulic conductivity of the interface and the GCL is greater. As a result, lateral flow along the interface becomes more significant. Similar results were found for circular defects.

Leakage through defective seams can also be analyzed using a modified version of Rowe's (1998) solution for analyzing leakage from a circular defect in a composite liner located at the crest of a wrinkle in the geomembrane [(15)], herein referred to as the modified Rowe's (1998) wrinkle equation. The modification consists of using the width of the defective seam or tear w in place of the width of the wrinkle B and redefining S to be equal to the length of the defect. As shown in Fig. 9(a), the modified Rowe's (1998) wrinkle equation yields leakage rates that are nearly the same as those from the numerical model for all interface transmissivities.

Giroud's (1997) equation for defective seams was also used to calculate the leakage rate through a 3 mm wide defective seam or tear in a GCL composite liner. For a GCL having a hydraulic conductivity of 1×10^{-9} cm/s and good contact, the leakage rate predicted using Giroud's (1997) equation is 124 mL/year/cm, which is slightly greater than the upper bound of 107 mL/year/cm from the numerical model for the GCL having a hydraulic conductivity of 1×10^{-9} cm/s. For a GCL having a hydraulic conductivity of 2×10^{-8} cm/s and good contact, Giroud's (1997) equation yields 1,679 mL/year/cm, which is more than three times greater than the upper bound obtained from the numerical model for a GGL having a hydraulic conductivity of 2×10^{-8} cm/s and interface transmissivity of 2×10^{-10} m^2/s. This occurs because the transmissivity of the interface representative of good contact is $>2 \times 10^{-10}$ m^2/s.

Subtitle D Liner

Leakage rates through a 3 mm wide defect in a Subtitle D liner are shown in Fig. 9(b) in terms of leakage per unit length of defect as a function of transmissivity. The leakage rates were obtained from the numerical model, Giroud's (1997) equation for long defects, and the modified Rowe's (1998) wrinkle equation. The leakage rates predicted with Giroud's (1997) equation are plotted along the trend for results from the numerical model to identify interface transmissivities that correspond to the predicted leakage rates.

For good contact, the numerical model and Giroud's (1997) equation coincide at a transmissivity of approximately 1×10^{-9} m^2/s. In comparison, Rowe (1998) found that the transmissivity for good contact was 1.6×10^{-8} m^2/s based on leakage rates from Giroud's (1997) equation for circular defects. A similar result for the transmissivity for poor contact is also shown in Fig. 9(b). The numerical model for long defects suggests that the transmissivity for poor contact should be 7×10^{-9} m^2/s, whereas Rowe's (1998) analysis of circular defects yielded a transmissivity of 1×10^{-7} m^2/s. The transmissivities representative of good and poor contact should not depend on the geometry of the defect. This inconsistency may be due to approximations used by Giroud et al. (1992) to extrapolate the empirical equations for circular defects to long defects.

Leakage rates predicted using the modified version of Rowe's (1998) wrinkle equation are similar to results from the numerical model for cases in which the transmissivity of the interface is $>2 \times 10^{-10}$ m^2/s. This transmissivity correspond to a ratio of $K_i/K_s = 3 \times 10^4$, which is similar to the ratio of K_i/K_s yielding good agreement for the GCL composite liner having circular defects (Fig. 5). The leakage rates compare favorably for transmissivities $>2 \times 10^{-10}$ m^2/s because flow in the soil liner of the Subtitle D liner can be approximated as unidirectional for transmissivities $>2 \times 10^{-10}$ m^2/s.

RECOMMENDED EQUATIONS FOR PREDICTING LEAKAGE RATES

Perfect Contact

Comparison of leakage rates from the numerical model and those from the analytical equation for perfect contact [(1)] shows that the analytical equation can be used to accurately predict leakage rates through thick composite liners. For thin composite lines employing GCLs, (1) tends to underpredict

leakage rates. Analysis of results from the numerical simulations showed that an equation similar to (1) can be used to predict leakage rates for GCL composite liners. This equation is

$$Q_c = F_c K_s h_t r \tag{21}$$

where F_c = nondimensional flow factor for circular defects. The product of F_c and r is analogous to the inverse of the form factor, which represents the geometric characteristics of the flow net for a composite liner, in the method of fragments described by Harr (1962).

An expression for F_c was back-calculated from results of the numerical model, as shown in Fig. 10(a) in terms of r/L_s. The flow factor is a linear function of r/L_s

$$F_c = 4 + 3.35\,\frac{r}{L_s} \tag{22}$$

The intercept is $F_c = 4$ for $r/L_s = 0$, which corresponds to the semiinfinite composite liner described in (1).

A similar equation was obtained for the leakage rate per unit length Q_l for long defects

$$Q_l = F_l K_s h_t \tag{23}$$

where F_l = nondimensional flow factor for long defects. An expression for F_l was back-calculated from results of the numerical model shown in Fig. 10(b).

$$F_l = \frac{1}{0.52 - 0.76 \log\left(\frac{w}{L_s}\right)} \tag{24}$$

Eqs. (21)–(24) are easier to use than previously published equations for calculating leakage through defects in composite liners of finite thickness having perfect contact because the solution does not include infinite series, elliptic integrals, or elliptic functions. These equations can also be used for GCL composite liners whereas previously developed equations can only be used for thicker liners [e.g., Walton and Sagar (1990) and Walton et al. (1997)].

Imperfect Contact

For thick composite liners having circular defects and a more permeable interface ($K_i/K_s > 3 \times 10^4$, which corresponds to $T = 1.8 \times 10^{-10}$ m^2/s for $K_s = 1 \times 10^{-7}$ cm/s), Rowe's (1998) solution is recommended. Alternatively, Giroud's (1997) equation can be used for circular defects in thick composite liners, e.g., Subtitle D liner or thicker. Rowe's (1998) solution is also recommended for composite liners employing a GCL having a more permeable interface ($K_i/K_s > 10^4$). The transmissivity for good contact for a composite liner having a GCL should be approximately 6×10^{-10} m^2/s. A drawback of using Rowe's (1998) solution is its complexity. However, the solution can be programmed in a commercial spreadsheet and then used repeatedly thereafter. A spreadsheet of the solution can be obtained from the writers.

For composite liners having defective seams or tears and a more permeable interface ($K_i/K_s > 10^4$ for composite liners employing a GCL and $K_i/K_s > 3 \times 10^4$ for thicker composite liners) a modified version of Rowe's (1998) wrinkle equation can be used to compute F_l

$$F_l = \frac{2}{L_s}\left[\frac{w}{2} + \sqrt{\frac{L_s T}{K_s}}\right] \tag{25}$$

The nondimensional flow factor F_l is then substituted into (23) to compute the leakage rate.

Rowe's (1998) solution for circular defects and (23) and (25) for defective seams or tears tend to underestimate leakage rates for less permeable interfaces, i.e., when $K_i/K_s < 10^4$ for

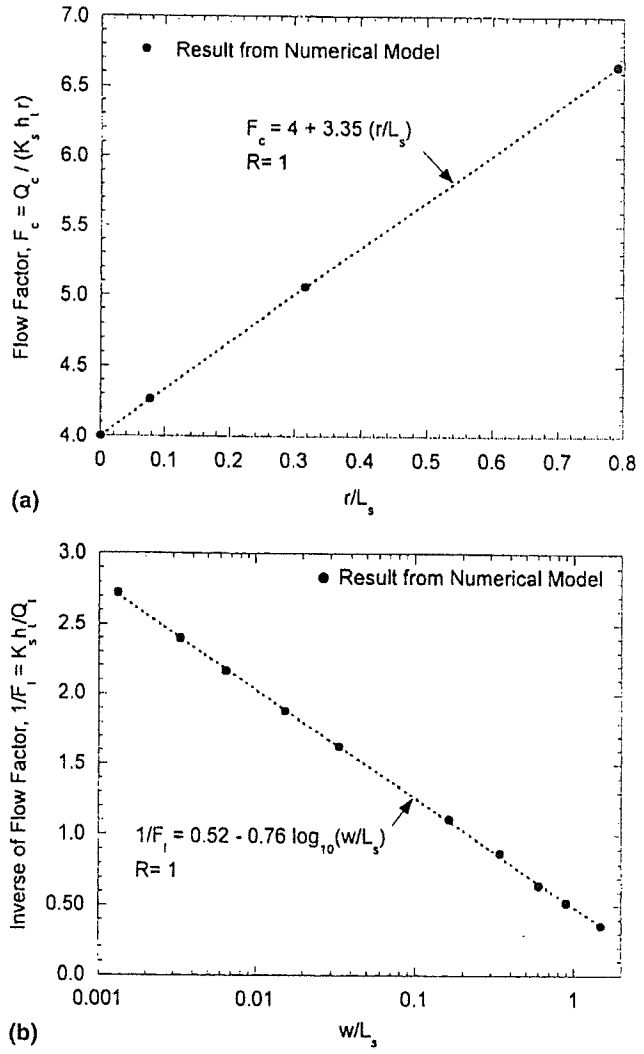


FIG. 10. Nondimensional Flow Factors for Circular Defects in Composite Liners Having Perfect Contact: (a) Circular Defects; (b) Long Defects

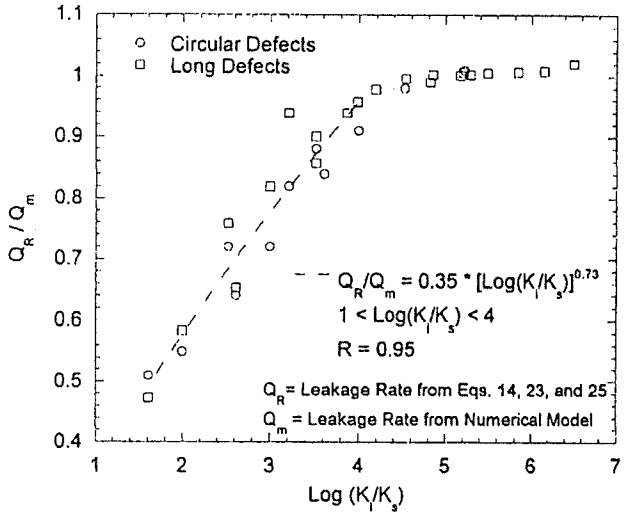


FIG. 11. Ratio of Leakage Rates Predicted Using Rowe (1998) to Leakage Rates from Numerical Model for Defects in GCL Composite Liner

composite liners employing a GCL and $K_i/K_s < 3 \times 10^4$ for thicker composite liners. As shown in Fig. 11, the discrepancy is consistent for circular defects and defective seams or tears in the GCL composite liner. Using the results shown in Fig. 11, the leakage rate for a GCL composite liner using Rowe's (1998) solution or (23) and (25) Q_R can be adjusted using the following relationship:

$$Q_a = 2.85 Q_R \left[\log \left(\frac{K_i}{K_s} \right) \right]^{-0.73} \tag{26}$$

where Q_a = leakage rate in a GCL composite liner adjusted for the discrepancy resulting from approximating the streamlines as 1D; and Q_R = leakage rate predicted using Rowe's (1998) solution or (23) and (25). Eq. (26) is limited to values of K_i/K_s between 1 and 4. The error in predicted leakage rate associated with this adjustment is <10%. For thick composite liners (e.g., Subtitle D liner or thicker) having a less permeable interface (i.e., when $K_i/K_s < 3 \times 10^4$), a numerical model can be used to estimate the leakage rate.

A summary of the recommended methods for computing leakage rates in composite liners is listed in Table 2. In Table 2, thick composite liners are liners in which a geomembrane overlays a compacted soil liner having a thickness ≥61 cm. GCL composite liners consist of a geomembrane overlaying a GCL. Table 2 lists methods for circular or long defects (tears or failed seams) for various interface conditions that range from perfect contact to cases in which the interface has a hydraulic conductivity much greater than the hydraulic conductivity of the underlying soil liner.

SUMMARY AND CONCLUSIONS

The results and analyses presented in this paper provide a fundamental analysis of leakage through defects in composite liners. 3D and 2D numerical models were used to simulate flow from circular and long defects in composite liners having either imperfect or perfect contact between the geomembrane and soil liner. Results obtained with the models were used to assess the efficacy of various equations used for predicting leakage rates. Numerical models were used as the basis of comparison instead of experimental data because of the difficulties inherent in measuring the small leakage rates from composite liners and uncertainties in existing field data.

TABLE 2. Recommended Equations and Methods for Calculating Leakage Rates

	Interface condition $[\log(K_i/K_s)]$[a]	Recommended equations and methods
Circular defects		
Perfect contact	1	Eqs. (21) and (22)
Thick composite liner[b]	>4.5	Rowe (1998) or Giroud (1997)
Thick composite liner	<4.5	Numerical model
GCL composite liner	>4	Rowe (1998)
GCL composite liner	<4	Rowe (1998), adjust $Q_{c,R}$ using Eq. (26)
Long defects		
Perfect contact	1	Eqs. (23) and (24)
Thick composite liner	>4.5	Eqs. (23) and (25)
Thick composite liner	<4.5	Numerical model
GCL composite liner	>4	Eqs. (23) and (25)
GCL composite liner	<4	Eqs. (23) and (25), adjust Q_l using Eq. (26)

[a] K_i = hydraulic conductivity of interface; K_s = hydraulic conductivity of soil liner or GCL.
[b] Thick composite liner has soil liner thickness ≥61 cm.

Comparison of leakage rates from the numerical models and those from existing analytical and empirical models shows that all of the existing models and equations have limitations on their applicability. Therefore, no universal equation or model exists for predicting leakage rates in composite liners. Results from the comparison show which models are appropriate and under what conditions. Based on the comparison, recommendations have been made regarding the appropriate methods for predicting leakage rates in composite liners. Analytical equations and equations based on results from the numerical models are presented for calculating leakage rates in composite liners having perfect contact. For composite liners having imperfect contact, the appropriate method for calculating leakage rates should be selected based on the thickness of the soil liner and the ratio between the hydraulic conductivity of the interface and the hydraulic conductivity of the soil liner. A summary of the recommendations is listed in Table 2.

APPENDIX. ROWE'S (1998) SOLUTION

The term Δ_1 is defined as

$$\Delta_1 = -[R\lambda_1(r, R)K_1(\alpha R) + R\lambda_2(r, R)I_1(\alpha R)] /\alpha + r\lambda_1(r, R)K_1(\alpha r)/\alpha + r\lambda_2(r, R)I_1(\alpha r)/\alpha \tag{27a}$$

and Δ_2 is defined as

$$\Delta_2 = [-R\lambda_1(R, r)K_1(\alpha R) - R\lambda_2(R, r)I_1(\alpha R)] /\alpha + [r\lambda_1(R, r)K_1(\alpha r) + r\lambda_2(R, r)I_1(\alpha r)]/\alpha \tag{27b}$$

where K_1 and I_1 are modified Bessel functions of order 1. The term $\lambda_1(X, Y)$ is defined as

$$\lambda_1(X, Y) = \frac{I_o(\alpha Y)}{K_o(\alpha X)I_o(\alpha Y) - K_o(\alpha Y)I_o(\alpha X)} \tag{28a}$$

and $\lambda_2(X, Y)$ is defined as

$$\lambda_2(X, Y) = \frac{K_o(\alpha Y)}{K_o(\alpha X)I_o(\alpha Y) - K_o(\alpha Y)I_o(\alpha X)} \tag{28b}$$

where K_o and I_o are modified Bessel functions of zero order. The wetted radius R is computed by solving the following equation:

$$(-h_w - L_s)\Lambda_1 - (L_s)\Lambda_2 = 0 \tag{29}$$

where

$$\Lambda_1 = \frac{-\alpha K_1(\alpha R)I_o(\alpha R) - \alpha K_o(\alpha R)I_1(\alpha R)}{K_o(\alpha r)I_o(\alpha R) - K_o(\alpha R)I_o(\alpha r)} \tag{30a}$$

$$\Lambda_2 = \frac{-\alpha K_1(\alpha R)I_o(\alpha r) - \alpha K_o(\alpha r)I_1(\alpha R)}{K_o(\alpha R)I_o(\alpha r) - K_o(\alpha r)I_o(\alpha R)} \tag{30b}$$

and α is defined by

$$\alpha^2 = \frac{K_s}{L_s T} \tag{31}$$

ACKNOWLEDGMENTS

Support for this study has been provided by the State of Wisconsin's Ground-Water Research Advisory Council, which is administered through the University of Wisconsin System. The writers appreciate the efforts of the three anonymous reviewers who provided constructive criticism of the manuscript.

REFERENCES

Abramowitz, M., and Stegun, I. A. (1972). *Handbook of mathematical functions*, Dover, New York.

Brennecke, D., and Corser, P. (1998). "Performance issues related to geosynthetic liners at Monticello, Utah." *Proc., Tailings and Mine Waste '98*, Balkema, Rotterdam, The Netherlands, 351–360.
Brown, K. W., Thomas, J. C., Lytton, R. L., Jayawickrama, P., and Bahrt, S. (1987). "Quantification of leak rates through holes in landfill lines." *Rep. No. EPA/600/2-87/062*, U.S. EPA, Cincinnati.
Carslaw, H. S., and Jaeger, J. C. (1959). *Conduction of heat in solids*, Clarendon, Oxford, England, 214–215.
Darilek, G. T., Laine, D. L., and Parra, J. O. (1989). "The electrical leak location method for geomembrane lines: Development and applications." *Proc., Geosynthetics '89*, Industrial Fabrics Association International, Minneapolis, 456–466.
Foose, G. J. (1997). "Leakage rates and chemical transport through composite lines." PhD dissertation, Dept. of Civ. and Envir. Engrg., University of Wisconsin–Madison, Wis.
Foose, G. J., Tachavises, C., Benson, C. H., and Edil, T. B. (1998). "Using MODFLOW to analyze geoenvironmental engineering problems." *Proc., MODFLOW '98*, International Groundwater Modeling Center, Golden, Colo., 81–88.
Giroud, J. P. (1997). "Equations for calculating the rate of liquid migration through composite liners due to geomembrane defects." *Geosynthetics Int.*, Industrial Fabrics Association International, Minneapolis, 4(3–4), 335–348.
Giroud, J. P., Badu-Tweneboah, K., and Bonaparte, R. (1992). "Rate of leakage through a composite liner due to geomembrane defects." *Geotextiles and Geomembranes*, 11(1), 1–28.
Giroud, J. P., Badu-Tweneboah, K., and Soderman, K. L. (1994). "Evaluation of landfill liners." *Proc., 5th Int. Conf. on Geotextiles, Geomembranes, and Related Products*, International Geosynthetics Society, Minneapolis, 981–986.
Giroud, J. P., and Bonaparte, R. (1989). "Leakage through liners constructed with geomembranes—Parts I and II." *Geotextiles and Geomembranes*, 8, 27–67 and 71–111.
Giroud, J. P., Khatami, A., and Badu-Tweneboah, K. (1989). "Evaluation of the rate of leakage through composite liners." *Geotextiles and Geomembranes*, 8, 241–271.
Giroud, J. P., Soderman, K. L., Khire, M. V., and Badu-Tweneboah, K. (1998). "New developments in landfill liner leakage evaluation." *Proc., 6th Int. Conf. on Geosynthetics*, International Geosynthetics Society, Minneapolis, 261–268.
Harpur, W. A., Wilson-Fahmy, R. F., and Koerner, R. M. (1993). "Evaluation of the contact between geosynthetic clay lines and geomembranes in terms of transmissivity." *Proc., GRI Seminar on Geosynthetic Liner Sys.*, R. M. Koerner and R. F. Wilson-Fahmy, eds., Geosynthetics Research Institute, Philadelphia, 143–154.
Harr, M. E. (1962). *Ground water and seepage*, McGraw-Hill, New York.
Jayawickrama, P. W., Brown, K. W., Thomas, J. C., and Lytton, R. L. (1988). "Leakage rates through flaws in membrane liners." *J. Envir. Engrg.*, ASCE, 114(6), 1401–1420.
Laine, D. L., Miklas, M. P., and Parr, C. H. (1988). "Loading point puncturability analysis of geosynthetic liner materials." *EPA/600/S2-88/040*, Environmental Protection Agency, Washington, D.C.
McDonald, M. G., and Harbaugh, A. W. (1988). "A modular three-dimensional finite-difference ground-water flow model." *Techniques of water-resources investigations of the United States Geological Survey*, U.S. Government Printing Office, Washington, D.C.
Petrov, R., and Rowe, R. (1997). "Geosynthetic clay liner (GCL)-chemical compatibility by hydraulic conductivity test and factors impacting its performance." *Can Geotech. J.*, Ottawa, 34, 863–885.
Quaranta, J., Gabr, M., and Bowders, J. (1997). "First-exposure performance of the bentonite component of a GCL in a low-pH, calcium-enriched environment." *Testing and acceptance criteria for geosynthetic clay liners, STP 1308*, L. Well, ed., ASTM, West Conshohocken, Pa., 162–180.
Rollin, A. L., Marcotte, M., Jacquelin, T., and Chaput, L. (1999). "Leak location in exposed geomembrane liners using an electrical leak detection techniques." *Proc., Geosynthetics '99*, Industrial Fabrics Association International, Minneapolis, 615–626.
Rowe, R. K. (1998). "Geosynthetics and the minimization of contaminant migration through barrier systems beneath solid waste." *Proc., 6th Int. Conf. on Geosynthetics*, International Geosynthetics Society, Minneapolis, 27–102.
Ruhl, J. L., and Daniel, D. E. (1997). "Geosynthetic clay liners permeated with chemical solutions and leachates." *J. Geotech. and Geoenvir. Engrg.*, ASCE, 123(4), 369–381.
Touze-Foltz, N., Rowe, R. K., and Duquennoi, C. (2000). "Liquid flow through composite liners due to geomembrane defects: Analytical solutions for axi-symmetric and two-dimensional problems." *Geosynthetics Int.*, Industrial Fabrics Association International, Minneapolis, 6(6), 455–479.
Walton, J., Rahman, M., Casey, D., Picornell, M., and Johnson, F. (1997). "Leakage through flaws in geomembrane liners." *J. Geotech. and Geoenvir. Engrg.*, ASCE, 123(6), 534–539.
Walton, J. C., and Sagar, B. (1990). "Aspects of fluid flow through flaws in membrane liners." *Envir. Sci. and Technol.*, 24(6), 920–924.
Walton, J. C., and Seitz, R. R. (1992). "Fluid flow through fractures in below ground concrete vaults." *Waste Mgmt. and Res.*, London, 12, 179–187.
Yates, S. R. (1988). "Seepage in a saturated-stratified aquifer with recharge." *Soil Sci. Soc. Am. J.*, 52, 356–363.

NOTATION

The following symbols are used in this paper:

a = area of defect;
B = width of wrinkle;
F_c = nondimensional flow factor for circular defects;
F_l = nondimensional flow factor for long defects;
g = gravitational constant;
h_R = total head at radial distance R_r;
h_t = total head drop across composite liner;
h_w = depth of leachate above geomembrane;
K_i = saturated hydraulic conductivity of interface;
K_s = saturated hydraulic conductivity of soil liner;
K_{xx}, K_{yy}, K_{zz} = hydraulic conductivity along x-, y-, and z-axes, respectively;
L_s = thickness of soil liner;
Q_a = adjusted leakage rate for low transmissivity interface;
Q_c = leakage through circular defect in composite liner;
$Q_{c,G}$ = leakage rate through circular defect using Giroud's (1997) equation;
$Q_{c,m}$ = leakage rate through circular defect from numerical model;
$Q_{c,\max}$ = absolute maximum leakage rate through circular defect;
$Q_{c,R}$ = leakage rate through circular defect using Rowe's (1998) equation;
Q_l = leakage rate per unit length of long defect;
$Q_{l,G}$ = leakage rate through long defect using Giroud's (1997) equation;
Q_m = leakage rate from numerical model;
Q_R = leakage rate predicted using Rowe's (1998) solution or Eqs. (23) and (25);
$Q_{w,R}$ = leakage rate through a circular defect Rowe's (1998) "wrinkle" equation;
R_c = radius of wetting for circular defects;
R_o = distance between long defects;
R_r = radial distance from axis of defect;
r = radius of defect;
S = length of wrinkle;
S_s = specific storage;
T = transmissivity;
t_i = thickness of interface;
W = flow rate of sinks and sources;
W_l = width of wetting for long defects;
w = width of defect;
z = vertical distance from defect;
β_c = contact factor for circular defects;
β_l = contact factor for long defects;
Φ = dimensionless form factor;
η = kinematic viscosity of water;
K = complete elliptical integral of first kind with modulus m';
K' = complete elliptical integral of first kind with modulus m;
Λ = complete elliptical integral of first kind of modulus λ;
Λ' = complete elliptical integral of first kind of complementary modulus λ'; and
ρ = density of water.

US EPA ARCHIVE DOCUMENT

Deficiencies in Subtitle D Landfill Liner Failure and Groundwater Pollution Monitoring

G. Fred Lee, PhD, PE, DEE, President Anne Jones-Lee, PhD, Vice President

G. Fred Lee & Associates

El Macero, CA 95618

Abstract

The US EPA (1991) MSW Subtitle D landfill regulations require a groundwater monitoring system based on vertical monitoring wells located at a point of compliance for monitoring that is no more than 150 meters from the down groundwater gradient edge of the landfill. The regulations specify that a detection monitoring program be implemented which has a high reliability of determining when leachate-polluted groundwaters reach the point of compliance. A critical review of the implementation of the Subtitle D landfill liner failure detection approach using the typical current groundwater monitoring approach shows that minimum Subtitle D landfills are being permitted with monitoring wells spaced one hundred to one thousand feet apart. The 1990 work of Dr. J. Cherry showed that plastic sheeting lined landfills such as a minimum Subtitle D landfill, will initially produce narrow plumes of groundwater pollution that arise through leachate leakage through the plastic sheeting liner that could readily pass by the typical point of compliance groundwater monitoring well array without being detected by the monitoring wells. This paper reviews the deficiencies in the Subtitle D groundwater monitoring approach in detecting groundwater pollution associated with the inevitable liner failure before widespread, off-site pollution occurs. Also presented is information on alternative monitoring approaches that have a high reliability of detecting liner failure before significant groundwater pollution occurs. The recommended monitoring system involves the use of a double composite liner with a leak detection system between the two liners where the lower composite liner functions as a pan lysimeter for the upper composite liner.

Introduction

In 1988, the US EPA-proposed RCRA Subtitle D municipal solid waste landfilling regulations recognized that a single composite liner for a landfill would not prevent groundwater pollution by landfill leachate for as long as the wastes in the landfill would be a threat. The US EPA Solid Waste Disposal Criteria (August 30, 1988a) stated,

> *"First, even the best liner and leachate collection system will ultimately fail due to natural deterioration, and recent improvements in MSWLF (municipal solid waste landfill) containment technologies suggest that releases may be delayed by many decades at some landfills."*

The US EPA Criteria for Municipal Solid Waste Landfills (July 1988b) stated,

> *"Once the unit is closed, the bottom layer of the landfill will deteriorate over time and, consequently, will not prevent leachate transport out of the unit."*

While in 1988, the US EPA developed the conclusion that a single composite liner would not protect groundwaters from impaired use for as long as the wastes in the landfill represent a threat, the general understanding by professionals of the significant shortcomings associated with the use of high density polyethylene liners or, for that matter, other plastic liner (flexible membrane liner–FML) systems were just beginning to be understood. Today, these deficiencies are well understood. Lee and Jones-Lee (1997,1998) have published a comprehensive review of the fundamentally flawed nature of minimum Subtitle D landfill containment systems to prevent groundwater pollution for as long as the wastes in a "dry tomb" type landfill will be a threat.

The wastes in a Subtitle D "dry tomb" type landfill will be a threat to pollute groundwaters, effectively forever. The flexible membrane layer in the composite liner has a finite period of time when it can be expected to function effectively to collect leachate. While no one can predict the length of this time before groundwater pollution will occur associated with a minimum Subtitle D single composite landfill liner system, there is increasing evidence that it could be as short as a few decades, even if high quality liner construction occurs and the placement of wastes in the landfill is done in such a way as to prevent penetrating the liner by waste constituents. This situation has been understood in

the landfill field for a number of years. There are eight states or parts of states that will not allow the construction of a single composite lined municipal solid waste (MSW) landfill.

US EPA ARCHIVE DOCUMENT

Detection of Liner Failure

The US EPA, as part of developing Subtitle D landfill regulations, established monitoring requirements which were, in principle, designed to detect at the point of compliance for monitoring, the pollution of groundwaters by landfill leachate before off-site pollution occurs. The point of compliance for groundwater monitoring for Subtitle D landfills must be on the landfill owner's property and be no more than 150 meters from the downgradient edge of the waste management unit. It was the Agency's position at the time of the adoption of Subtitle D regulations that the inevitable failure of the single composite liner in preventing leachate from passing through it while the wastes in the landfill are still a threat would be detected by the groundwater monitoring system before off-site pollution occurred.

The Subtitle D monitoring approach requires that the landfill owner implement an extensive groundwater monitoring program once leachate-polluted groundwaters are detected at the point of compliance. Further, Subtitle D regulations require that once the extent of groundwater pollution has been defined, the landfill owner must initiate a groundwater remediation program to stop the spread of the pollution and start to clean up the polluted aquifer to the extent that it is possible. It is understood, however, that it will never be possible to clean up an MSW leachate-polluted aquifer system so the groundwaters associated with such a system would ever be considered safe for domestic consumption and many other purposes.

Reliability of Groundwater Monitoring Under Subtitle D

The US EPA in developing its groundwater monitoring system for Subtitle D landfills did not critically analyze the ability of groundwater monitoring wells of the type that are typically used to monitor groundwater pollution at classical unlined sanitary landfills to be able to detect the leachate-polluted groundwaters that would occur when the flexible membrane liner in a composite liner for a Subtitle D landfill first starts to degrade/deteriorate. The classical unlined sanitary landfill can be reliably monitored by placing groundwater monitoring wells at about any location down groundwater gradient from the landfill since the classical sanitary landfills produce large plumes of polluted groundwaters. However, the plastic sheeting-lined landfills, such as the minimum Subtitle D landfills, will first start to leak leachate through the liner system in small areas compared to the total area of the landfill.

The US EPA (1991) in Subtitle D groundwater monitoring system requirements stated:

> *"The design must ensure that the concentration values listed in Table 1 of this section will not be exceeded in the uppermost aquifer at the relevant point of compliance..."*

and specify that

"(a) A ground-water monitoring system must be installed that consists of a sufficient number of wells, installed at appropriate locations and depths, to yield ground-water samples from the uppermost aquifer (as defined in §258.2) that: (2) Represent the quality of ground water passing the relevant point of compliance..."

"(c) The sampling procedures and frequency must be protective of human health and the environment."

Further, the State of California Water Resources Control Board Chapter 15 regulations governing the landfilling of municipal solid wastes require that a sufficient number of monitoring wells be located so that they *"...provide for the best assurance of the* ***earliest possible*** *detection of a release from a waste management unit."* (emphasis added).

The Agency did not anticipate that the implementation of this requirement at the state and regional regulatory agency level would be based on mechanical application of the approach that had been used to monitor classical unlined sanitary landfills, i.e. a few downgradient monitoring wells spaced hundreds to a thousand or more feet apart. Dr. John Cherry (1990) was the first to point out that the approaches that were being adopted for monitoring plastic sheeting-lined landfills had a low probability of detecting landfill leachate-polluted groundwaters at the point of compliance before off-site pollution occurs. Cherry and his associates at the University of Waterloo, Ontario, Canada conducted a number of field experiments in which dyes were injected into a sand aquifer system at a specific source and the lateral spread of the dyed groundwater was assessed. It was found that the lateral spread of groundwater pollution plumes were limited near the source of pollution.

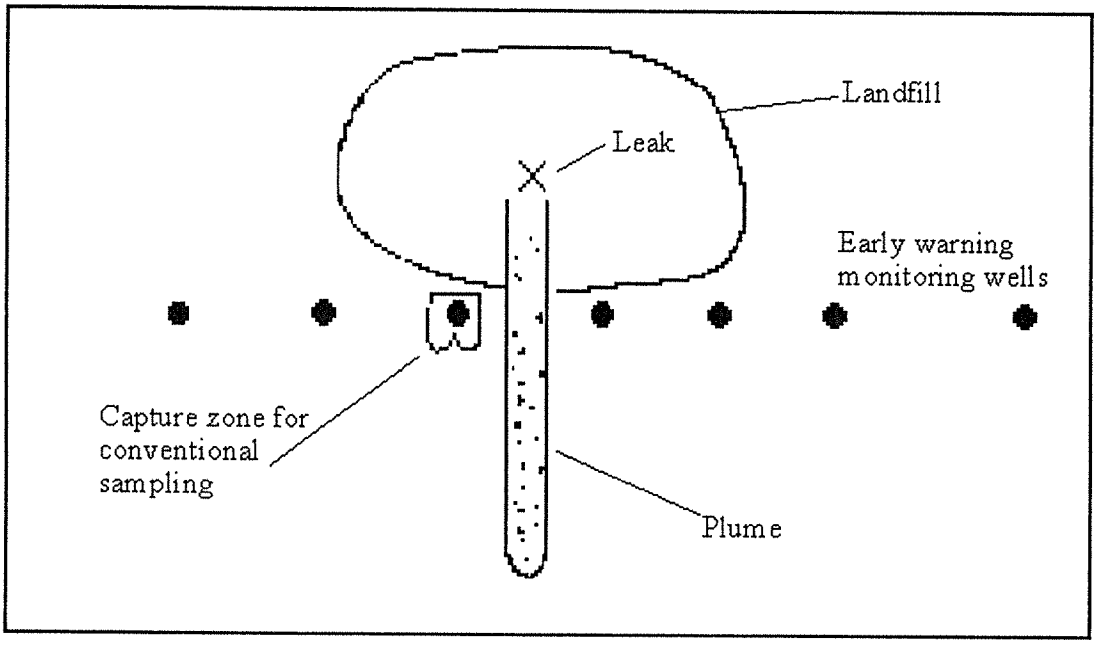
While Cherry's original publication on this topic was in a conference proceedings that was not widely read by hydrogeologists who work in the landfill field, he discussed these issues at the American Society for Testing and Materials symposium, Current Practices in Ground Water and Vadose Zone Investigations, held in San Diego, CA in January 1991 where he indicated that the typical groundwater monitoring systems that are being used for lined landfills involving vertical monitoring wells spaced hundreds to a thousand or more feet apart at the point of compliance for groundwater monitoring have a low probability of detecting leachate-polluted groundwaters at this point before widespread, off-site groundwater pollution occurs by landfill leachate. Based on the work of Cherry and his associates, a two-foot long line source of leachate, such as would occur from a rip, tear or point of deterioration in an FML, would be expected in a sand aquifer system to spread laterally to about ten feet within 150 meters of the source.

[CLI wells are approximately 150 meters from the center of the LF, probabilistically between 50 and 100 meters horizontally and 7 meters below a leak. A 2 foot rip would produce a leachate plume 2-5 feet across if the plume moved in sand. However, it does not. Moving through clay the same leak would produce an irregular plume consisting of small veinlets and disseminations. The leak would take much longer to move the 50-100 meters laterally and the 7 meters vertically. Its geometric configuration would be unpredictable and would follow construction layering and natural fissure cracking. Upon entering a monitored sand body such as the Lower Radnor Till Sand, the leading edges of the veinlet-based plume would tend to coalesce and disperse into the sand body assuming a more conventional plume configuration but would not be detectable unless some part of it passes within the area of influence (about a foot) of the existing 200-300 foot wide-spaced well-point array.smj]

The typical leachate-polluted groundwater plumes developed initially from an FML-lined landfill liner failure would be finger-like with limited lateral spread near the landfill. This means that since the typical groundwater monitoring well used for monitoring groundwater pollution by landfill leachate where three borehole volumes are purged prior to sampling, that the monitoring well samples groundwater only within about a foot of the well. If the monitoring wells are spaced 200 feet apart, which is close for many groundwater monitoring systems for Subtitle D landfills, there are 198 feet between each well where leachate plumes generated by initial leakage through the landfill liner system can pass without being detected by the wells. Cherry developed Figure 1 to show this relationship.

US EPA ARCHIVE DOCUMENT

US EPA ARCHIVE DOCUMENT



After Cherry 1990

Figure 1

US EPA ARCHIVE DOCUMENT

Therefore, the basic premise of the US EPA Subtitle D regulations that the inevitable failure of the single composite liner from preventing leachate from passing through it for as long as the wastes represent a threat would be detected with a high degree of reliability before widespread off-site groundwater pollution occurs is fundamentally flawed. The groundwater monitoring systems that are used today at Subtitle D landfills with monitoring wells spaced hundreds or more feet apart are highly unreliable in detecting the pollution of groundwaters by landfill leachate at off-site properties where there is an inadequate landfill owner-owned bufferland between the edge of the waste management unit and adjacent properties.

The US EPA in developing Subtitle D and most state landfilling regulations allow landfilling of waste essentially up to the property line. This means there is no bufferland space between where the initial leakage of leachate through the liner system occurs and off-site/adjacent property groundwaters are located that can be polluted by landfill leachate. The authors are involved in several classical sanitary landfill investigations where small area sources of constituents, such as the dumping of chloroform into the landfill for waste disposal, has occurred. These landfills have produced chloroform plumes that extend over a mile from the landfill. These plumes exist in sand and gravel aquifer systems which are not atypical of many aquifers where Subtitle D landfills are located.

The situation could be much worse in a fractured rock aquifer system, where as described by Haitjema (1991)

> *"An extreme example of Equation (1) (aquifer heterogeneity) is flow through fractured rock. The design of monitoring well systems in such an environment is a nightmare and usually not more than a blind gamble."*

* * *

> *"Monitoring wells in the regional aquifer are unreliable detectors of local leaks in a landfill."*

While the initial work of Cherry, pointing out the deficiencies in groundwater monitoring of lined landfills was not widely recognized, today, as a result of subsequent publications by a number of individuals such as Parsons and Davis (1991), Lee and Jones-Lee (1994a) and others, the highly significant deficiencies in the typical groundwater monitoring approach that is proposed by landfill applicants and allowed by regulatory agencies is well understood. It has been the authors' experience that typically the regulatory agency personnel and boards have chosen to ignore this situation and proceed as though flexible membrane lined-landfills leachate leakage occurs throughout the entire bottom area of the landfill and a few groundwater monitoring wells spaced hundreds to a thousand or more feet apart can be expected to comply with Subtitle D requirements of ensuring that the concentrations of constituents in the US EPA "Table 1" are not exceeded in the uppermost aquifer at the point of compliance.

Adequacy of Landfill Permit Review

The current landfill groundwater monitoring program development approach is basically the ostrich approach in which the professional consultants who recommend this type of monitoring and the regulatory agencies who approve such monitoring are carrying out their responsibilities in a technically inadequate manner. Both consultants to landfill applicants and regulatory agency staff are required to use high-quality science and engineering in carrying out the responsibilities with respect to the development of a landfill. To ignore, as is typically done, the grossly inadequate groundwater monitoring that is occurring at Subtitle D landfills will ultimately represent significant liabilities to the consultants and to the regulatory agencies. This consultant liability arises from the fact that the consultant is signing off on the landfill projects as complying with regulations when they only meet minimum prescriptive standards for design, but obviously do not conform to the US EPA Subtitle D requirements of protecting groundwaters from impaired use for as long as the wastes in municipal solid waste "dry tomb" landfills will be a threat–effectively, forever. The liner, cover and groundwater monitoring systems will not prevent leachate from

US EPA ARCHIVE DOCUMENT

being generated in the landfill and leaving the landfill and detected at the point of compliance for groundwater monitoring for as long as the wastes will be a threat.

While some consultants for landfill applicants indicate that *"...groundwater monitoring programs are routinely designed to reflect the specific subsurface conditions and probable mechanisms of contaminant migration at each site,"* the authors have been involved in review of over 50 landfills located in various parts of the US and have yet to find a single case where the groundwater monitoring system that is used reflects the issues raised by Cherry (1990) that the initial leakage through a plastic sheeting-lined landfill will produce finger plumes of leachate of limited dimension at the point of compliance where groundwater monitoring occurs. Further, we have yet to find a single case where the fact that the groundwater monitoring wells at the point of compliance often have zones of capture of a foot or so around each well is considered in developing well spacing at the point of compliance. With monitoring wells spaced hundreds of feet apart, it is obvious that the groundwater monitoring systems being used for many Subtitle D landfills is a fundamentally flawed approach for assessing the inevitable groundwater pollution that will occur at essentially all minimum Subtitle D landfills sited at geologically unsuitable sites, i.e., lacking natural protection, when the flexible membrane liner systems being used fail to prevent leachate from passing through them for as long as the wastes in the landfill represent a threat.

Landfill applicants, through their consultants, should be required to conduct a site-specific evaluation of the potential characteristics of the leachate plumes generated through initial leakage through the FML when it reaches the point of compliance for groundwater monitoring. This requires a site-specific statistical/hydrogeological assessment of the dimensions of the leachate-polluted groundwater plume at the point of compliance relative to the zones of capture of the monitoring wells and the well spacing, for a failure of the landfill liner system that could occur at any location under the landfill footprint. This information should be part of the standard landfill design documentation that is made available to the regulatory agency and the public as part of reviewing the appropriateness of developing a particular landfill at a particular location.

Some landfill applicant consultants assert, in defense of their somewhat arbitrary approach for developing a groundwater monitoring system based on the typical approach that is being used today, that there has been no documentation that this approach has failed to detect landfill-liner leakage that results in groundwater pollution. Such assertions, however, fail to provide a discussion of the situation that exists today with respect to failure of minimum Subtitle D landfill liner systems and groundwater monitoring systems to function as required in Subtitle D requirements for as long as the wastes represent a threat. Lee and Jones-Lee (1996) have developed a review of this topic where they point out that minimum Subtitle D landfills have only been required since 1993. It would be highly unusual in this short period of time to have demonstrated proof that eventually during the infinite period of time that the wastes would be a threat at a minimum Subtitle D landfill, that the liner will fail and that the groundwater monitoring systems with monitoring wells spaced hundreds to a thousand or so feet apart at the point of compliance have failed to detected the liner failure.

In most cases, liner failure that would have occurred in the past four years would be due to grossly inadequate construction and waste placement. Further, the transport rates of leachate and leachate-polluted groundwaters are such that it would be unlikely that leachate that had passed through the failed liner system would have reached the point of compliance at this time, which can be located, under Subtitle D requirements, at 150 meters from the edge of the waste management unit. Because of the fundamentally flawed nature of the groundwater monitoring approach, involving the use of monitoring wells with limited zones of capture compared to well spacing, it would be a pure fluke that the initial liner leakage groundwater pollution plumes would be detected by a groundwater monitoring well at the point of compliance as required by US EPA and Chapter 15 requirements of detecting leachate-polluted groundwaters at the earliest possible time. Some have characterized minimum Subtitle D landfills as a "time bomb." If the approach advocated by some landfill applicant consultants is followed, there would be need to wait until the bomb goes off before action can be taken to address the obvious issues that the groundwater monitoring approach as being implemented today is fundamentally flawed and does not consider the issues raised by Cherry and others on the inadequacies of groundwater monitoring to detect pollution at minimum Subtitle D landfills.

It is reasonable to expect that a groundwater monitoring system would have a high probability of detecting leachate-polluted groundwaters at the point of compliance, for any plausible landfill liner leak that could occur for as long as

the wastes in the landfill will be a threat that could lead to the pollution of off-site groundwaters impairing their use for domestic or other purposes. Certainly, a situation where a substantial part of the leachate associated with liner leakage can pass by the point of compliance for groundwater monitoring without being detected by the monitoring wells does not comply with either Subtitle D or Chapter 15 requirements of adequate and reliable groundwater monitoring.

The current approach for development and implementation of groundwater monitoring systems for minimum Subtitle D landfills focuses considerable resources on collection and analysis of chemicals in vertical monitoring wells at the point of compliance as well as upgradient from the landfill. Comprehensive statistical procedures have been developed to determine when an increase in a waste-derived constituent above background has occurred. While such approaches are appropriate, they fail to address the fundamental issue of the overall reliability of the groundwater monitoring system being used. The issue that should be first addressed is whether the groundwater monitoring well array is a reliable array for a particular site to detect leachate-polluted groundwaters at the point of compliance with a high degree of reliability when the leachate pollution of groundwaters at this point first occurs. The approach that is used today of ignoring this essential step in developing groundwater monitoring programs for lined landfills is highly inadequate and technically invalid.

The problems with landfill applicants and their consultants failing to provide adequate and reliable information on the ability of a proposed landfill groundwater monitoring system to comply with regulatory requirements is part of a significant problem than exists today in the regulation/permitting of landfills. Typically, landfill applicants and their consultants follow the approach of doing the least possible in order to get the landfill permitted. Lee and Jones-Lee (1995a) have discussed the significant, well-known problems that exist today where landfill applicants and their consultants fail to provide full disclosure of the potential problems associated with a proposed landfill in protecting public health, groundwater resources, the environment and the interest of those within the sphere of influence of the landfill for as long as the wastes in the landfill will be a threat.

The codes of ethics for the National Society for Professional Engineers and the American Society of Civil Engineers require that any registered engineer provide full disclosure with respect to public health and environmental protection of their proposed projects. The typical approach used today by landfill applicants and their consultants follows the legal-adversary system used in the courts, where only the merits of a proposed project are discussed, without informing the public or regulatory agencies of the significant deficiencies in the proposed project in complying with Subtitle D requirements of protecting groundwaters from pollution by landfill leachate for as long as the waste in the landfill will be a threat. It is well known that many consultants who work for landfill applicants and, for that matter, many other project proponents that have the potential to be adverse to the environment, must, if they want to continue to obtain business, only report on the positive aspects of a particular project and fail to report on the well-known significant negative aspects. It is also well known in the field that any consultants who normally work with landfill applicants who fully discuss in a public arena, such as a landfill permitting hearing, the long-term problems associated with the proposed landfill will do this only once, since they will not obtain further work with landfill applicants.

Lee and Jones-Lee (1995a) recommend that an independent, interactive full public peer review of technical issues, such as the adequacy of a groundwater monitoring system for a proposed landfill be conducted in which the landfill applicants and their consultants are required to provide detailed information/documentation on their evaluation of the reliability of the groundwater monitoring system that they propose to use in detecting, at the earliest possible time, leachate polluted groundwater at the point of compliance. Adoption of this peer review process would eventually lead to a situation where engineering consultants would not have to violate the NSPE and ASCE codes of ethics for protection of public health and the environment in order to gain additional work with landfill applicants.

Recommended Approach

There is need to immediately terminate the facade that exists today in the permitting of Subtitle D landfills with respect to the reliability of the groundwater monitoring systems that are being allowed in detecting leachate-polluted

US EPA ARCHIVE DOCUMENT

US EPA ARCHIVE DOCUMENT

groundwaters before they cause off-site groundwater pollution. It will be necessary to immediately change how groundwater monitoring programs are developed for lined landfills. The current seat-of-the-pants approach for designing monitoring systems in which a few monitoring wells are arbitrarily installed along the point of compliance must be terminated. Regulatory agencies must start requiring that landfill applicants, through their consultants, develop an estimate of the reliability of the groundwater monitoring system proposed for a landfill in detecting leachate-polluted groundwaters at the point of compliance. These estimates should be based on a site-specific evaluation of the initial size and lateral spread of the leachate pollution plumes that could be produced from leaks at any location through the landfill liner system, including near the downgradient edge of the waste management unit. Development of this type of information will show that the typical groundwater monitoring system being permitted today for minimum Subtitle D landfills cannot comply with Subtitle D groundwater monitoring requirements.

The state of Michigan addressed this problem several years ago and adopted a double composite liner for municipal solid waste landfills in which there is a leak detection system between the two composite liners. The lower composite liner is not a containment liner, but is the base of the leak detection system for the upper composite liner. As discussed by Lee and Jones-Lee (a), this approach can be an effective approach for preventing groundwater pollution by Subtitle D landfills provided that the landfill owner is required to take the necessary action to stop leachate leaking through the upper composite liner when it occurs. Because of the impossibility of repairing the liner, this action would likely involve repairing the landfill cover. Since Subtitle D landfill covers are not designed to prevent moisture from entering the wastes and since their ability to control moisture input to the landfill will deteriorate significantly over time where this deterioration cannot be observed through visual inspection of the landfill surface, the approach that should be followed is to install a leak detectible cover over the landfill that the landfill owner operates and maintains in perpetuity, i.e. for as long as the wastes in the landfill will be a threat. Lee and Jones-Lee (1995b) have discussed the issue that should be considered in developing long term protection of groundwater quality associated with the closure of a Subtitle D landfill. The key to developing groundwater quality protection associated with the use of a leak detectible cover is the development, from disposal fees, of a dedicated trust fund of sufficient magnitude to operate and maintain the leak detectible cover for as long as the wastes represent a threat to groundwater quality. Lee and Jones-Lee (1994a,b) recommend that if a landfill owner is unable or unwilling to stop leachate from occurring in the leak detection layer between the two composite liners, then the landfill owner must exhume (mine) the wastes and properly manage them at a geologically suitable site where there are either no groundwaters or natural protection of the groundwaters that could be polluted by landfill leachate is present.

The additional costs of these systems compared to the conventional minimum Subtitle D MSW landfilling is estimated to be from 10 to 20 cents per person per day more for solid waste management than is being paid under minimum Subtitle D landfilling. This is a small cost compared to the large Superfund-like costs that will ultimately have to be borne by future generations in groundwater clean-up at minimum Subtitle D landfills, potential damage to public health of those within the sphere of influence of the landfill and the lost groundwater resources that will occur because of leachate pollution.

Summary

Today's minimum Subtitle D groundwater monitoring systems are fundamentally flawed in complying with Subtitle D requirements of protecting groundwaters from impaired use by MSW landfill leachate for as long as the wastes in a "dry tomb" landfill will be a threat. The typical groundwater monitoring well array being allowed at Subtitle D landfills today has a low probability of detecting landfill leachate-polluted groundwaters at the point of compliance before trespass of leachate-polluted groundwaters occurs under adjacent properties. There is immediate need to require, as part of permitting a Subtitle D landfill, that the landfill applicant critically analyze the expected reliability of the groundwater monitoring system in complying with regulatory requirements of preventing groundwater pollution beyond the point of compliance. Such an analysis would show, for many Subtitle D landfills, that vertical monitoring wells spaced more than about ten feet apart for most hydrogeologic settings at the point of compliance cannot comply with Subtitle D groundwater monitoring requirements.

Alternative, more reliable groundwater monitoring approaches are available, such as those adopted by the state of Michigan, in which a double composite liner is used where the lower composite liner is a leak detection system for the upper composite liner. This approach, if properly funded and implemented in perpetuity, could significantly improve the monitoring of landfill liner failure over that being achieved today. The cost of this approach is from 10 to 20 cents per person per day more for waste disposal than is being paid now for minimum Subtitle D landfilling. Payment of these costs now will be highly cost-effective in terms of protecting groundwater resources for use by future generations and preventing Subtitle D Superfund site clean-up costs that will evolve from most of the Subtitle D landfills that are being developed today.

Additional Information

Additional information on these topic areas is available from the authors' web site (http://members.aol.com/gfredlee/gfl.htm). The papers by the authors listed in the Literature Cited, are available from this web site.

Acknowledgment

This paper is adapted from a review of these topics by the authors that was published in the California Groundwater Resources Association newsletter, HydroVisions.

Literature Cited

Cherry, J. 1990. "Groundwater Monitoring: Some Deficiencies and Opportunities," In: Hazardous Waste Site Investigations: Towards Better Decisions, Proc. 10th ORNL Life Sciences Symposium, Gatlinburg, TN, May 1990, Lewis Publishers.

Haitjema, H. 1991. "Ground Water Hydraulics Considerations Regarding Landfills," Water Res. Bull. 27(5):791-796.

Lee, G.F. and Jones-Lee, A. 1993. "Groundwater Quality Monitoring at Lined Landfills: Adequacy of Subtitle D Approaches," Report of G. Fred Lee & Associates, El Macero, CA, 28pp.

Lee, G.F. and Jones-Lee, A. 1994a. "A Groundwater Protection Strategy for Lined Landfills," Environmental Science & Technology, 28:584-5.

Lee, G.F. and Jones-Lee, A. April, 1994b. "Landfilling of Solid & Hazardous Waste: Facing Long-Term Liability," In: Proc. 1994 Federal Environmental Restoration III & Waste Minimization II Conference, Hazardous Materials Control Resources Institute, Rockville, MD, pp. 1610-1618.

Lee, G.F. and Jones-Lee, A. 1995a. "Practical Environmental Ethics: Is There an Obligation to Tell the Whole Truth?," Published in condensed form "Environmental Ethics: The Whole Truth" Civil Engineering, Forum, 65:6.

Lee, G.F. and Jones-Lee, A. October,1995b. "Overview of Landfill Post Closure Issues," Presented at American Society of Civil Engineers Convention session devoted to "Landfill Closures - Environmental Protection and Land Recovery," San Diego, CA.

US EPA ARCHIVE DOCUMENT

Lee, G.F. and Jones-Lee, A. 1996. "Detection of the Failure of Landfill Liner Systems," Report of G. Fred Lee & Associates, El Macero, CA, 13pp.

Lee, G.F. and Jones-Lee, A. 1997. "Deficiencies in US EPA Subtitle D Landfills in Protecting Groundwater Quality for as Long as MSW is a Threat: Recommended Alternative Approaches," Report of G. Fred Lee & Associates, El Macero, CA.

Lee, G.F. and Jones-Lee, A. June, 1998a. "Assessing the Potential of Minimum Subtitle D Lined Landfills to Pollute: Alternative Landfilling Approaches," Proc. of Air and Waste Management Association national meeting, San Diego, CA.

Parsons, A. and Davis, P. 1992. "A Proposed Strategy for Assessing Compliance with the RCRA Groundwater Monitoring Regulations," In: Current Practices in Ground Water and Vadose Zone Investigations, STP 1118, pp. 39-56, ASTM, Philadelphia, PA.

US EPA. August 30, 1988a. "Solid Waste Disposal Facility Criteria; Proposed Rule," Federal Register 53(168):33314-33422, 40 CFR Parts 257 and 258, US EPA, Washington, D.C.

US EPA. July, 1988b. "Criteria for Municipal Solid Waste Landfills," US EPA Washington D.C.

US EPA. October 9, 1991. "Solid Waste Disposal Facility Criteria; Final Rule," 40 CFR Parts 257 and 258, Federal Register 56(196):50978-51119.

US EPA ARCHIVE DOCUMENT

Melissa Schmidt

From: PUBCOMMENT-OCC
Sent: Monday, October 4, 2021 1:04 PM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406
Attachments: Landfill SHNF TCEQ Comments II 20211.docx

H

From: brandt_mannchen@comcast.net <brandt_mannchen@comcast.net>
Sent: Monday, October 4, 2021 11:15 AM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: MR Brandt Mannchen

E-MAIL: brandt_mannchen@comcast.net

COMPANY: Lone Star Chapter of the Sierra Club

ADDRESS: 20923 KINGS CLOVER CT
HUMBLE TX 77346-1326

PHONE: 2815707212

FAX:

COMMENTS: Dear TCEQ, Please see the attached comments. I have sent them to you in hard copy with the attachments which are not in electronic format. But here you have the comments in electronic format. Thank you. Brandt Mannchen Lone Star Chapter of the Sierra Club 281-570-7212 brandt_mannchen@comcast.net

October 4, 2021

Office of Chief Clerk
MC 105
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

Dear Chief Clerk of the Texas Commission on Environmental Quality,

The Houston Regional Group and Lone Star Chapter of the Sierra Club (Sierra Club) provide additional comments and request that the Texas Commission on Environmental Quality (TCEQ) amend Permit #2406 (635-acre Peach Creek Landfill (PCL)) to include how this proposed facility will be accessed by garbage trucks and other vehicles, address all environmental issues, and conduct a contested case hearing.

This comment letter provides a summary for TCEQ of some of the most important comments that the Sierra Club heard during the September 28, 2021 public meeting as well as additional comments that were prepared after that meeting.

1) The Sierra Club was appalled that the applicant made misleading statements (perhaps false) about leaks in its' presentation on September 28, 2021. The applicant's suggestion that there have been no landfill leaks from the composite liner technology in permitted Texas landfills for the past 30 years is inaccurate and wrong.

The applicant cannot possibly know the condition of each landfill and liner system that is in Texas. The Sierra Club believes even TCEQ does not know the status of each landfill with regard to leaks because leaks are not easy to find, many are created at the very beginning of a landfill's life during design and construction, and often they are undiscovered for years.

All landfills leak, which the U.S. EPA and others have acknowledged for years. This is documented in an article included with these comments, **"Leakage Through Liners Constructed with Geomembranes - Part I, Geomembrane Liners".** The beginning of the abstract for this article states, "How impermeable are impermeable liners? All liners leak, including geomembranes ...". That statement was made in 1989 and holds true today! **See attachment 1.**

Leaks are not just possible, but a way of life for landfills. The Sierra Club believes that TCEQ should ensure that applicants do not make statements that are misleading or false to the public, particularly during public meetings. This is a form of aid to the applicant that must be prevented. TCEQ should call out the applicant publicly when misleading information is provided during a public meeting.

2) The articles provided with these comments and listed below discuss leaks and landfills in general and document that leaks are a normal occurrence in landfill design, construction, and operation. These articles are provided to TCEQ as technical information that the Sierra Club believes will help TCEQ in its decision-making process for this application.

The Sierra Club opposes this proposal and urges TCEQ to deny Permit #2406, Peach Creek Landfill, because it is not sufficiently protective of Sam Houston National Forest (SHNF), residents, ground and surface waters, farms, and other environmental reasons, to be allowed to operate.

1. **"The Basics of Landfills",** March 26, 2003, http://ejnet.org/landfills/.

2. **"Geosynthetic Fundamentals in Landfill Design",** Gregory N. Richardson and Aigen Zhao, Proceedings of the International Symposium on Geoenvironmental Engineering, ISGE2009, September 8-10, 2009, Hangzhou, China.

3. **"Landfill Leaks",** Dennis E. Williams, Ph.D., January 2001.

4. **"A Groundwater Protection Strategy for Lined Landfills",** G. Fred Lee and Anne Jones-Lee, G. Fred Lee & Associates, El Macero, California, undated but after 1994.

5. **"Detection of the Failure of Landfill Liner Systems,"** G. Fred Lee, Ph.D., P.E., DEE. And Anne Jones-Lee, Ph.D., G. Fred Lee & Associates, El Macero, California, April 1996.

6. **"Leakage Through Lines Constructed with Geomembranes – Part I. Geomembrane Liners",** J. P. Giroud & R. Bonaparte, Geotextiles and Membranes, Volume 8, Pages 27-67, 1989.

7. **"All Landfills Leak, and Our Health and Environment Pay the Toxic Price",** Kirstie Pecci, July 23, 2018.

8. **"Landfill Liner and Cover Systems: Design Guidelines",** Morton A. Barlaz, North Carolina State University, undated.

9. **"Leakage analysis through composite liners in landfills",** Marcos A. Montoro, Franco M. Francisca, and Manuel A. Juarez, Fundamentals to Applications in Geotechnics, IOS Press, 2015.

10. **"Predicting Leakage Through Composite Landfill Liners",** Gary J. Foose, Craig H. Benson, and Tuncer B. Edil, Journal of Geotechnical and Geoenvironmental Engineering, June 2001.

11. **"Deficiencies in Subtitle D Landfill Liner Failure and Groundwater Pollution Monitoring",** G. Fred Lee, Ph.D. P.E., DEE. President, Anne Jones-Lee, Ph.D., Vice President, G. Fred Lee & Associates, El Mecero, California, undated but after 1998.

3) TCEQ should take into account that this proposal will create a structure that initially is about 185 feet tall and cover 124 acres. If Phase 2 is approved, then the landfill will be about 400 acres and probably taller in height. This would comprise an almost 200-foot-tall structure that will contain a dozen or more Minute Made Park Stadium volumes of municipal garbage and toxic materials.

This structure will dominate the landscape aesthetically (Mount Trash-more) and from an odor standpoint and will provide a large obstacle to drainage of overland flow and stream flood waters from the area. This will probably extend flooding or the level of flooding to other properties and acres in the area. This type of environmental impact should be analyzed and mitigated fully by the applicant.

4) The Bayou City Waterkeeper representative, stated that an anti-degradation assessment should be conducted for this proposal with reference to stream water quality. The Sierra Club supports such an assessment and urges TCEQ to coordinate with its' own water quality standards, TMDL, and WPP programs to ensure that all appropriate analysis and mitigation measures are required.

5) Several residents brought up that they enjoy and value quiet for their neighborhoods. Noise causes health problems and should be fully regulated as part of permit conditions.

6) Wood Duck Farm, others, and the Sierra Club believe that birds (like gulls), vectors of disease (rats and mice), and feral hogs are a significant problem that this proposal will exacerbate. The permit should analyze and provide mitigation measures to prevent these biological animals from causing problems at residents, farms, and SHNF.

7) Quality of Life was mentioned by some residents. They want their neighborhoods to remain places where they can raise their children and live with comfort and security. The idea that a proposed landfill will allow them to continue their Quality of Life is not likely if TCEQ does not take their concerns seriously.

At least one speaker, stated that she wants a positive looking area. The proposed landfill will detract from the beautification of the neighborhoods and area. Scenic quality in SHNF will not benefit positively from the construction and operation of this proposed landfill.

8) Local water well contamination was mentioned by several speakers. Since this is the only way people can get water in their neighborhoods, contamination is a permanent and serious threat. TCEQ should not just monitor the proposed landfill but also private wells surrounding the landfill within a mile to ensure that no contamination occurs and if it does

that it is discovered as soon as possible. Monitoring wells around landfills can miss leaks of contaminants so a wider well monitoring system is needed.

9) A resident mentioned that people, children, and pets walking in the neighborhood are in danger due to the large truck traffic increase that this proposal will bring. TCEQ should require that the applicant work with all road agencies to provide safe driving conditions from wherever garbage trucks approach this proposed landfill.

10) This proposed landfill will be a nuisance for its' neighbors. It is inappropriate that TCEQ did not have the employee from the local TCEQ Office talk about compliance and enforcement programs for landfills and how people can report and follow-through on compliance, enforcement, and other issues that these structures cause.

11) A speaker brought up concerns about side slope erosion. This has been a problem that other landfills have had. The Sierra Club supports the most stringent side slope erosion control measures possible including complete vegetation coverage.

12) TCEQ did not explain what special waste could be approved for the proposed landfill and what types of waste could be stored, not treated, in the landfill. The public should be provided with this information so that a "worst-case" scenario is provided.

A private landfill company wants to make money. That is its' purpose. It will store whatever waste it can in a landfill if that makes it money. A private landfill company is not concerned whether this is what is best for groundwater, neighborhoods, stream water quality, or any other factors. TCEQ should let the public know what long-term contamination problems could result from this proposal.

13) Once groundwater is polluted there is an expensive 'forever pollution problem" for the public, neighborhoods, State of Texas, and the Federal Government. The private entity and the people who run the private entity are off the hook due to closure and bankruptcy laws. This is another reason TCEQ should make sure that people who want to construct a landfill are responsible for its' total costs, including long-term (forever) contamination problems.

14) TCEQ and the applicant did not talk about expansion, even though Phase 2 is being planned. The ultimate capacity of the facility and how this affects traffic and other environmental issues must be revealed and analyzed by TCEQ as long-term cumulative effects that will impact the citizens of Texas.

15) At the public meeting, the applicant documented that no economic study had been done when it could not name one company that it had talked to about possible use of the proposed landfill (potential customers). In addition, competition is guaranteed with at least four other landfills located close by. The applicant apparently has also has not

considered the negative economic impacts on SHNF and how the positive economic benefits of SHNF will be degraded by the proposal. For the public meeting, there was no, there, there!

16) Wood Duck Farms revealed at the public meeting, and it's important that TCEQ understands this, that Mississippi Investors want to sell this permit for 10-20 million dollars and then "get out of Dodge". They have no commitment to SHNF or local communities. It's all about the money!

17) TCEQ knows landfills create methane gas which generates 80 times the climate change potential as carbon dioxide (CO2). Standard methane collection systems that are required by TCEQ do not make-up a climate change reduction plan.

Vehicular air pollution from garbage trucks and other vehicles release additional climate change gases that should be reduced. TCEQ should require that the applicant prepare a climate change reduction plan to protect SHNF and local communities from more flooding and intense rainfalls and other effects of climate change.

18) It was startling to hear TCEQ may not use the newest FEMA floodplain information because FEMA is behind updating its' maps. TCEQ should use the best information, available about rainfall and flooding, whether formally published or not to supplement what is currently available.

19) TCEQ should, as social and human environmental impacts, require the applicant to prepare an analysis of how devaluation of surrounding properties will affect the area. This is a concern for the State of Texas or at least it should be.

20) It was obvious from the public meeting that TCEQ doesn't know about local road conditions and applicant has mislead it on what these road conditions are. Coordination with TxDOT does not include county or local roads and those roads are in poor shape. The wear and tear these roads will take from 80,000 pound vehicles many times a day is an important issue that must be part of this permit's analysis for TCEQ.

21) Performance bonds are never enough to take care of long-term landfill contamination risk. Although there are closure requirements, companies get a pass from "forever contamination risk" that is caused by limited degradation of waste and toxins and guaranteed failure of liners over decades and centuries and limited liability.

The public has to clean-up company externalities from landfills because landfill companies and the people that run them are allowed to walk away from "forever monitoring" needed to protect water from long-term contamination. TCEQ should not allow this to occur.

22) Despite what was stated at the public meeting, all air pollution is not all taken up by methane gas system, treated, and destroyed. Much evaporation occurs at the working face of the landfill and over time air pollution gases migrate through the soil to the surface of the landfill and are released.

TCEQ and applicant did not state at the public meeting how the methane collection system would operate. Will there be a pipeline to take the methane to a clean-up facility and will it then be burned as natural gas? Will there be a flare onsite to burn-off the methane and create more CO2 climate change air pollution? What are the impacts of these systems on the environment, SHNF, and neighborhoods?

These environmental concerns were not brought up or answered at the public meeting. They should be addressed publicly, and the analysis provided to the public.

23) Truck leachate was not mentioned by the applicant and TCEQ as an environmental a problem. This leachate occurs when garbage trucks are not water-tight and spill or leak leachate while driving to and from landfills. The TCEQ should require that the landfill is responsible for such leaks along with the operator and owner of the trucks so that this type of hazardous waste pollution is not brought into neighborhoods and along routes to the landfill and leaks out to contaminate them.

24) The public meeting did not address security as an issue. Since the proposed landfill will be the tallest point in San Jacinto County, trespassers with off-road vehicles, bicycles, and other vehicles will be tempted to turn the landfill into a private off-road playland.

There must be security lights and a fence. The lights must be shielded so that they do not shine unnecessarily on SHNF and other properties and affect night-flying bats, insects, owls, other birds, nocturnal or crepuscular animals of all types, and human neighbors.

The Sierra Club appreciates this opportunity to comment. Please keep the Sierra Club informed about the status of this proposal. Thank you.

Sincerely,

Brandt Mannchen
Forest Management Issue Chair
Lone Star Chapter of the Sierra Club
Chair, Forestry Subcommittee
Houston Regional Group of the Sierra Club
20923 Kings Clover Court
Humble, Texas 77346
281-570-7212
brandt_mannchen@comcast.net

Attachment 1

Articles About Landfills and Landfill Leaks

1. "The Basics of Landfills", March 26, 2003, http://ejnet.org/landfills/.

2. "Geosynthetic Fundamentals in Landfill Design", Gregory N. Richardson and Aigen Zhao, Proceedings of the International Symposium on Geoenvironmental Engineering, ISGE2009, September 8-10, 2009, Hangzhou, China.

3. "Landfill Leaks", Dennis E. Williams, Ph.D., January 2001.

4. "A Groundwater Protection Strategy for Lined Landfills", G. Fred Lee and Anne Jones-Lee, G. Fred Lee & Associates, El Macero, California, undated but after 1994.

5. "Detection of the Failure of Landfill Liner Systems", G. Fred Lee, Ph.D., P.E., DEE. And Anne Jones-Lee, Ph.D., G. Fred Lee & Associates, El Macero, California, April 1996.

6. "Leakage Through Lines Constructed with Geomembranes – Part I. Geomembrane Liners", J. P. Giroud & r. Bonaparte, Geotextiles and Membranes, Volume 8, Pages 27-67, 1989.

7. "All Landfills Leak, and Our Health and Environment Pay the Toxic Price", Kirstie Pecci, July 23, 2018.

8. "Landfill Liner and Cover Systems: Design Guidelines", Morton A. Barlaz, North Carolina State University, undated.

9. "Leakage analysis through composite liners in landfills", Marcos A. Montoro, Franco M. Francisca, and Manuel A. Juarez, Fundamentals to Applications in Geotechnics, IOS Press, 2015.

10. "Predicting Leakage Through Composite Landfill Liners", Gary J. Foose, Craig H. Benson, and Tuncer B. Edil, Journal of Geotechnical and Geoenvironmental Engineering, June 2001.

11. "Deficiencies in Subtitle D Landfill Liner Failure and Groundwater Pollution Monitoring", G. Fred Lee, Ph.D. P.E., DEE. President, Anne Jones-Lee, Ph.D., Vice President, G. Fred Lee & Associates, El Mecero, California, undated but after 1998.

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Monday, September 27, 2021 10:57 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406
Attachments: Landfill SHNF TCEQ Public Meeting Comments 2021.docx

H

From: brandt_mannchen@comcast.net <brandt_mannchen@comcast.net>
Sent: Monday, September 27, 2021 10:34 AM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: MR Brandt Mannchen

E-MAIL: brandt_mannchen@comcast.net

COMPANY:

ADDRESS: 20923 KINGS CLOVER CT
HUMBLE TX 77346-1326

PHONE: 2815707212

FAX:

COMMENTS: Testimony of the Lone Star Chapter and Houston Regional Group of the Sierra Club About the Proposed Peach Creek Landfill Next to Sam Houston National Forest 1. The FS and TCEQ have much in common and should be working together to prevent this proposed landfill and to restore, maintain, enhance, and protect the water quality of the East Fork of the San Jacinto River and its tributaries. These commonalities include: 2. The FS was created in the late

1890's/early 1900's with the responsibility to protect forests and stream headwaters for water quality and quantity purposes and for wood. This was after many Texans complained to the Texas Legislature that their clean water supply was being destroyed by "cut and run" logging and its' terrible aftermath. Texas' U.S. Representatives along with the rest of the U.S. Congress created Sam Houston National Forest and three other Texas national forests due to these problems. Their existence is a testimony to the "will of the people". 3. TCEQ has a similar responsibility via water quality standard responsibilities under the U.S. Clean Water Act (CWA) with U.S. EPA oversight. This occurred due to terrible water pollution problems that citizens from Texas and all over our country complained about. As a result, the U.S. Congress created the CWA. 4. SHNF acts as a giant recharge zone (sponge) and overland flow buffer for water quality, water quantity, and the reduction in flooding for streams, groundwater areas, and wetlands. A landfill disrupts these important functions and makes clean water a difficult if not impossible goal. 5. All landfills leak. Nothing lasts forever. Liners of all types give way over decades and centuries. Water quality problems are fated as a part of landfills but are pushed off to the future via the subsidy of a state permit. This socializes the costs for Mississippi investors and minimizes their risk, as landfill owners and or permit holders. All protective mitigation measures like clay liners, plastic liners, monitoring wells, methane collection systems, etc., are for water quality purposes and they all fail eventually. Time and age overrule mitigation measures to protect surface, ground, and cojoined waters. This is not acceptable. 6. There are certain places that should never be developed and should never have landfills. TCEQ and the FS should work together to restore, maintain, enhance, and protect streams, recharge zones, their adjacent areas in SHNF to make sure that abundant clean water continues to be our standard and not some memory of the past.

September 22, 2021

Office of Chief Clerk
MC 105
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

Dear Chief Clerk of the Texas Commission on Environmental Quality,

The Houston Regional Group and Lone Star Chapter of the Sierra Club (Sierra Club) submit these additional comments for our request that the Texas Commission on Environmental Quality (TCEQ) amend Permit #2406, 635-acre Peach Creek Landfill (PCL), to include how this proposed facility will be accessed by garbage trucks and other vehicles, all other environmental issues, and hold a contested case hearing.

The Sierra Club has walked Compartments 122, 123, 124, and 125, about 4,000 acres in Sam Houston National Forest (SHNF), which are adjacent to the proposed landfill site or just south or west of it. **Attachment 1.**

This area is described in a report to the U.S. Forest Service, National Forests and Grasslands in Texas (NFGT), Stephen F. Austin State University and The Nature Conservancy, **"Ecological Classification System for the National Forests and Adjacent Areas of the West Gulf Coastal Plain, 2nd Approximation,"** February 2007. **Attachment 2.**

The southeastern and southern part of SHNF are in the San Jacinto Flatwoods Landtype Association. This Landtype Association is made up of three landtype phases:

1. **Sandy/Loamy Uplands Landtype,** contains the **Willow Oak-Loblolly Pine/Justicia/Bignonia Loamy Seasonally Wet Flatwoods Landtype Phase.**

2. **Mesic Slopes and Terraces Landtype,** contains the **White Oak-Loblolly Pine/Callicarpa Loamy Mesic Lower Slopes, Mounds, and Terraces Landtype Phase.**

3. **Minor Stream Bottoms Landtype,** contains the **Water Oak-Southern Magnolia/Bignonia Loamy Wet-Mesic Stream Bottoms Landtype Phase.**

The San Jacinto Flatwoods Landtype Association in SHNF expresses significant groundwater and surface water connections. It's sandy or loamy and acts as a recharge area for streams and aquifers. Streams and aquifers recharge each other via stream flow, extensive overland flow during heavy rains and floods, and gravelly groundwater tables (old gravel pits are found in this area) that are close to the surface and express

connection via run-off and rising water tables during seasonally rainy periods. San Jacinto County has been noted for its' abundant groundwater for decades. **Attachment 3.**

The topography for much of the area is almost level (flatwoods). Elevation starts at about 230 feet in the northern parts of Compartments 123 and 124, and quickly slopes to 165 feet in the south at Compartment 125, Lee Turner Road, and State Highway 105. **Attachment 4.**

Water runs off in barely defined or narrow stream channels that are quick to flood but slow to drain. Much woody and vegetative debris blocks flow which allows water to sit and sink into the porous and sandy soil.

The extent of these groundwater/surface water connections are shown, in part, by the uneven topography (with many swales) and the type of vegetation that is found in this area and exists on the proposed landfill site.

This vegetation includes Sweetbay Magnolia, Red Maple, Black Gum, Sebastian Bush, American Holly, Cardinal Flower, Swamp Chestnut Oak, Sweetleaf, Dwarf Palmetto, Royal Fern, Netted Chain Fern, and Lizard's-tail.

Bottomland hardwood forested wetlands, hardwood-pine flatwoods, hardwood upland depression swamps, Loblolly Pine-White Oak Claypan Slopes and Uplands, and Shortleaf Pine Gravelly Uplands are found here. Forest Types include Forest Type 31, Loblolly Pine; Forest Type 32, Shortleaf Pine; and Forest Type 62, Sweetgum-Oak.

Soils that are found on or near the proposed landfill site and on SHNF include:

1. **Conroe Soil Series (CrB),** this is a deep, moderately well drained, slowly permeable soil on uplands. Slopes are 0-12 % but usually 1-4%. The soil is formed in unconsolidated acid sandy clays and sands in the Willis Formation of the Pleistocene age. The A and E horizons are loamy fine sand, loamy sand, gravelly, or very gravelly. Internal drainage has runoff that is slow on 0-1% slopes, medium on 1-5% slopes, and high on 5-12% slopes. Native forest vegetation is shortleaf, longleaf, and loblolly pines with hardwoods like sweetgum, post, oak, red oak and hickory trees. Understory is yaupon, wax-myrtle, American beautyberry, Red Bay, and viburnum. Many areas of Conroe soil have been surface mined for ironstone modules. There is a perched water table at 2-3.5 feet during winter and spring.

2. **Otanya Soil Series (OtA),** this is a very deep, well drained, soil on nearly level to gently sloping surface of the Lissie Formation of the early to mid-Pleistocene age. Slopes are from 1-5%. Permeability is moderately slow, and runoff is very low to medium on slopes less than 5% and high on slopes greater than 5%. A perched water able can occur on

the surface in normal years from January to March on slopes up to 3%. For slopes greater than 3%, the perched water table can occur following heavy rainfall from January to March. Native forest vegetation is loblolly, shortleaf, and longleaf pines, sweetgum, red oak, and hickory trees. Erosion hazard is slight.

3. **Pinetucky Soil Series (PfB),** this is a deep, fine sandy loam, moderately well drained, moderately slowly permeable soil formed in the Pleistocene age. This is a gently sloping to sloping soil on uplands with slopes that range from 1-8%. Runoff is slow to medium. Native forest vegetation consists of loblolly, shortleaf, and longleaf pines, sweetgum, and red oak trees with an understory of grasses and shrubs. Erosion hazard is moderate.

4. **Pinetucky and Conroe Soil Series (PGB),** this is a deep, fine sandy loam and gravelly loamy fine sand, moderately well drained, moderately slowly permeable soil formed in the Pleistocene age. This is a gently sloping to sloping soil on uplands with slopes that range from 1-8%. Runoff is slow to medium. Native forest vegetation consists of loblolly, shortleaf, and longleaf pines, sweetgum, and red oak trees with an understory of grasses and shrubs. This soil has been altered by removal of ironstone gravel and has about 50% Pinetucky soil, 25% Conroe soil, and 25% other soils. Erosion hazard is severe.

5. **Sorter Soil Series (SoA),** this is a very deep, poorly drained, silty loam soil on nearly level to very gently sloping deposits of the Lissie Formation of the early to mid-Pleistocene age. Slopes are from 0-1%. This soil has high runoff and slow permeability. This soil remains saturated for long periods, particularly during the winter and spring months. Native forest vegetation includes loblolly and shortleaf pines, water oak, willow oak, red oak, and sweetgum trees. Understory includes blackgum, post oak, yaupon, persimmon, wax-myrtle, American elm, and American beautyberry. A perched water table is within 2.5 feet of the surface during late fall, winter, and spring. Erosion hazard is slight.

6. **Splendora Soil Series (SpA),** this is a very deep, fine sandy loam, moderately well to somewhat poorly drained soil, formed by loamy deposits of the Pleistocene age. Slopes are 0-2%. Runoff is medium to high and permeability is slow. A perched water table is 15-28 inches deep and lasts from December to April. A water table starts at 70 inches and lasts from December to April in normal years. Native forest vegetation includes loblolly, shortleaf, and longleaf pines, water oak, willow oak, southern red oak, and sweetgum trees. Understory is yaupon, wax-myrtle, Pinehill bluestem, longleaf uniola, and sedges. This is part of the Western Gulf Coast Flatwoods of southeast Texas. Erosion hazard is slight.

7. **Waller Soil Series (WaA),** this is a very deep, fine, silt loam, poorly drained soil, that is nearly level and formed by loamy deposits of the Lissie Formation of the Pleistocene age. The slopes are from 0-1% but most slopes are 0.5%. Permeability is slow and runoff is high on slopes of 0-1%. This soil remains saturated throughout from December to April in normal years due to a high water table. Native forest vegetation is a mix of hardwoods

and pine including water and willow oak, sweetgum, common persimmon, and loblolly pine trees. This is part of the Western Gulf Coast Flatwoods. This soil is found in nearly level shallow concave depressions and poorly defined drainageways. Erosion hazard is slight.

This soil information is from the Natural Resources Conservation Service (NRCS) website, https://soilseries.sc.egov.usda.gov, and the NRCS document, "Soil Survey of Polk and San Jacinto Counties, Texas," 1983. **Attachment 5.**

H.C. Clark's August 13, 2021 email comment, submitted to the TCEQ, further documents the importance of groundwater in the proposed landfill area when it states, "... the gravel controls the hydrogeology of the uppermost aquifer at the site. This gravel forms a pervasive layer at the base of Stratum II that daylights at Peach Creek ... The aquifer is apparently unconfined and the potentiometric surface, or water table seems to join the creeks, and the aquifer is the creek's baseflow".

"The application implicitly recognizes the gravel location restriction ... Will the permit explicitly state that Class I waste may not be and never will be accepted here because of this hydrogeologic limitation?"

"The potentiometric surface will be aggressively altered by dewatering of the uppermost aquifer in order to maintain a negative hydrostatic condition ... This is not sidewall dewatering for construction purposes but a long term alteration of the uppermost aquifer that serves as the monitoring system for the landfill. The sink created by pumping will draw water into the landfill rather than allowing it to pass beneath the liner and detect a leak as that groundwater moves through the point of compliance".

"Water will move through the gravel at orders of magnitude greater velocities than the application anticipates ... the problem of monitoring a gravel that moves potential contamination quickly and directly along a limited streamline". **Attachment 6.**

Not only does the analysis of this permit document the importance of groundwater in the area and surface water discharge, this analysis suggests, along with the native forest vegetation and soils information mentioned above that if the groundwater aquifer for the system of streams that exist on the 635 acre site or nearby is altered or dewatered significantly, this may have ecological, botanical, and biological effects on streams as well as water quality contaminant, monitoring, and water quantity impacts.

This landfill proposal could alter surface water and a water aquifer's water quality and quantity and influence whether streams are fishable, swimmable, and maintain the normal aquatic life and streamside vegetation (bottomland hardwood forested wetlands or riparian woodlands) that currently exist and are protected via TCEQ's Section 401, water

quality standard regulations under the federal Clean Water Act, and the U.S. Army Corps of Engineers and U.S. Environmental Protection Agency's Section 404 program.

This information and these additional water quality programs and their implementation goals should be analyzed and taken into account by TCEQ when it considers whether to permit this proposed landfill and a regulatory analysis should be part of the public information provided by TCEQ for this proposed permit.

As mentioned in the Sierra Club's previous comments, this proposal will allow a landfill to operate which contains household, commercial, industrial, and special wastes in the PCL (1,300 tons/day, 474 garbage trucks/day, and 371,000 tons/year of waste). This **Municipal Solid Waste Landfill** could accept garbage, rubbish, ashes, street cleanings, dead animals, slaughterhouse waste, contaminated soil, asbestos-containing material, sludge, brush, construction waste, demolition waste, grease trap waste, grit trap waste, municipal source liquid waste, empty pesticide containers, oil/gas/geothermal waste, medical waste, nonindustrial solid waste, electronic waste, X-ray/other radiation-producing equipment, and waste generated outside of Texas that contains industrial waste, waste associated with oil/gas/geothermal exploration production/development activities.

This proposed landfill may act as a magnet to draw feral hogs to the site and to the area around the site which includes SHNF, Wood Duck Farm, and residential properties. These land uses could suffer from feral hog effects as well as an increased population of these non-native invasive animal species.

The wallowing, rooting, and riparian focused behaviors (fecal contamination of ground and surface waters) of feral hogs all point to more water quality impacts for streams and groundwater in the area. Since there is already a bacteria problem in this area, in part due to feral hogs found within the East Fork of the San Jacinto River Watershed (which includes the proposed landfill site and the streams that flow through or near it), this could exacerbate an existing water quality problem in our area.

The **Houston-Galveston Council (HGAC)** has a **Bacteria Implementation Group (BIG)** and an **Animals and Agriculture Work Group** that have and are analyzing the effects of feral hogs on non-point source water pollution and stream water quality. The BIG and the Work Group have and are considering mitigation measures that could be used to reduce these effects. TCEQ should contact and work with the HGAC BIG and Work Group to determine what effects the proposed landfill could have on the East Fork of the San Jacinto River Watershed and implement appropriate mitigation measures.

HGAC also has a **Watershed Protection Plan (WPP)** and a **Total Maximum Daily Load (TMDL) Implementation Plan (I-Plan) for the East Fork of the San Jacinto River Watershed.** The TCEQ should coordinate and collaborate with its' other divisions and

analyze the potential impacts that this proposed landfill will have on water quality via the WPP and TMDL for the East Fork of the San Jacinto River and its' tributaries.

The Sierra Club appreciates this opportunity to provide additional comments on the Peach Creek Landfill, Permit #2406. The Sierra Club opposes the proposed Peach Creek Landfill and urges TCEQ to deny this permit request. Please keep the Sierra Club informed about the status of this proposal. Thank you.

Sincerely,

Brandt Mannchen
Forest Management Issue Chair
Lone Star Chapter of the Sierra Club
Chair, Forestry Subcommittee
Houston Regional Group of the Sierra Club
20923 Kings Clover Court
Humble, Texas 77346
281-570-7212
brandt_mannchen@comcast.net

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Wednesday, September 29, 2021 7:52 AM
To: PUBCOMMENT-WPD; PUBCOMMENT-ELD; PUBCOMMENT-OCC2; PUBCOMMENT-OPIC
Subject: CORRECTION: Public comment on Permit Number 2406
Attachments: Landfill SHNF TCEQ Public Meeting Comments 2021.docx

eComment = comment
Attachment = H

From: PUBCOMMENT-OCC
Sent: Monday, September 27, 2021 10:57 AM
To: PUBCOMMENT-OCC2 <pubcomment-occ2@tceq.texas.gov>; PUBCOMMENT-OPIC <pubcomment-opic@tceq.texas.gov>; PUBCOMMENT-ELD <pubcomment-eld@tceq.texas.gov>; PUBCOMMENT-WPD <pubcomment-wpd@tceq.texas.gov>
Subject: FW: Public comment on Permit Number 2406

H

From: brandt_mannchen@comcast.net <brandt_mannchen@comcast.net>
Sent: Monday, September 27, 2021 10:34 AM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: MR Brandt Mannchen

E-MAIL: brandt_mannchen@comcast.net

COMPANY:

ADDRESS: 20923 KINGS CLOVER CT
HUMBLE TX 77346-1326

PHONE: 2815707212

FAX:

COMMENTS: Testimony of the Lone Star Chapter and Houston Regional Group of the Sierra Club About the Proposed Peach Creek Landfill Next to Sam Houston National Forest 1. The FS and TCEQ have much in common and should be working together to prevent this proposed landfill and to restore, maintain, enhance, and protect the water quality of the East Fork of the San Jacinto River and its tributaries. These commonalities include: 2. The FS was created in the late 1890's/early 1900's with the responsibility to protect forests and stream headwaters for water quality and quantity purposes and for wood. This was after many Texans complained to the Texas Legislature that their clean water supply was being destroyed by "cut and run" logging and its' terrible aftermath. Texas' U.S. Representatives along with the rest of the U.S. Congress created Sam Houston National Forest and three other Texas national forests due to these problems. Their existence is a testimony to the "will of the people". 3. TCEQ has a similar responsibility via water quality standard responsibilities under the U.S. Clean Water Act (CWA) with U.S. EPA oversight. This occurred due to terrible water pollution problems that citizens from Texas and all over our country complained about. As a result, the U.S. Congress created the CWA. 4. SHNF acts as a giant recharge zone (sponge) and overland flow buffer for water quality, water quantity, and the reduction in flooding for streams, groundwater areas, and wetlands. A landfill disrupts these important functions and makes clean water a difficult if not impossible goal. 5. All landfills leak. Nothing lasts forever. Liners of all types give way over decades and centuries. Water quality problems are fated as a part of landfills but are pushed off to the future via the subsidy of a state permit. This socializes the costs for Mississippi investors and minimizes their risk, as landfill owners and or permit holders. All protective mitigation measures like clay liners, plastic liners, monitoring wells, methane collection systems, etc., are for water quality purposes and they all fail eventually. Time and age overrule mitigation measures to protect surface, ground, and cojoined waters. This is not acceptable. 6. There are certain places that should never be developed and should never have landfills. TCEQ and the FS should work together to restore, maintain, enhance, and protect streams, recharge zones, their adjacent areas in SHNF to make sure that abundant clean water continues to be our standard and not some memory of the past.

September 22, 2021

Office of Chief Clerk
MC 105
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

Dear Chief Clerk of the Texas Commission on Environmental Quality,

The Houston Regional Group and Lone Star Chapter of the Sierra Club (Sierra Club) submit these additional comments for our request that the Texas Commission on Environmental Quality (TCEQ) amend Permit #2406, 635-acre Peach Creek Landfill (PCL), to include how this proposed facility will be accessed by garbage trucks and other vehicles, all other environmental issues, and hold a contested case hearing.

The Sierra Club has walked Compartments 122, 123, 124, and 125, about 4,000 acres in Sam Houston National Forest (SHNF), which are adjacent to the proposed landfill site or just south or west of it. **Attachment 1.**

This area is described in a report to the U.S. Forest Service, National Forests and Grasslands in Texas (NFGT), Stephen F. Austin State University and The Nature Conservancy, **"Ecological Classification System for the National Forests and Adjacent Areas of the West Gulf Coastal Plain, 2nd Approximation,"** February 2007. **Attachment 2.**

The southeastern and southern part of SHNF are in the San Jacinto Flatwoods Landtype Association. This Landtype Association is made up of three landtype phases:

1. **Sandy/Loamy Uplands Landtype,** contains the **Willow Oak-Loblolly Pine/Justicia/Bignonia Loamy Seasonally Wet Flatwoods Landtype Phase.**

2. **Mesic Slopes and Terraces Landtype,** contains the **White Oak-Loblolly Pine/Callicarpa Loamy Mesic Lower Slopes, Mounds, and Terraces Landtype Phase.**

3. **Minor Stream Bottoms Landtype,** contains the **Water Oak-Southern Magnolia/Bignonia Loamy Wet-Mesic Stream Bottoms Landtype Phase.**

The San Jacinto Flatwoods Landtype Association in SHNF expresses significant groundwater and surface water connections. It's sandy or loamy and acts as a recharge area for streams and aquifers. Streams and aquifers recharge each other via stream flow, extensive overland flow during heavy rains and floods, and gravelly groundwater tables (old gravel pits are found in this area) that are close to the surface and express

connection via run-off and rising water tables during seasonally rainy periods. San Jacinto County has been noted for its' abundant groundwater for decades. **Attachment 3.**

The topography for much of the area is almost level (flatwoods). Elevation starts at about 230 feet in the northern parts of Compartments 123 and 124, and quickly slopes to 165 feet in the south at Compartment 125, Lee Turner Road, and State Highway 105. **Attachment 4.**

Water runs off in barely defined or narrow stream channels that are quick to flood but slow to drain. Much woody and vegetative debris blocks flow which allows water to sit and sink into the porous and sandy soil.

The extent of these groundwater/surface water connections are shown, in part, by the uneven topography (with many swales) and the type of vegetation that is found in this area and exists on the proposed landfill site.

This vegetation includes Sweetbay Magnolia, Red Maple, Black Gum, Sebastian Bush, American Holly, Cardinal Flower, Swamp Chestnut Oak, Sweetleaf, Dwarf Palmetto, Royal Fern, Netted Chain Fern, and Lizard's-tail.

Bottomland hardwood forested wetlands, hardwood-pine flatwoods, hardwood upland depression swamps, Loblolly Pine-White Oak Claypan Slopes and Uplands, and Shortleaf Pine Gravelly Uplands are found here. Forest Types include Forest Type 31, Loblolly Pine; Forest Type 32, Shortleaf Pine; and Forest Type 62, Sweetgum-Oak.

Soils that are found on or near the proposed landfill site and on SHNF include:

1. **Conroe Soil Series (CrB),** this is a deep, moderately well drained, slowly permeable soil on uplands. Slopes are 0-12 % but usually 1-4%. The soil is formed in unconsolidated acid sandy clays and sands in the Willis Formation of the Pleistocene age. The A and E horizons are loamy fine sand, loamy sand, gravelly, or very gravelly. Internal drainage has runoff that is slow on 0-1% slopes, medium on 1-5% slopes, and high on 5-12% slopes. Native forest vegetation is shortleaf, longleaf, and loblolly pines with hardwoods like sweetgum, post, oak, red oak and hickory trees. Understory is yaupon, wax-myrtle, American beautyberry, Red Bay, and viburnum. Many areas of Conroe soil have been surface mined for ironstone modules. There is a perched water table at 2-3.5 feet during winter and spring.

2. **Otanya Soil Series (OtA),** this is a very deep, well drained, soil on nearly level to gently sloping surface of the Lissie Formation of the early to mid-Pleistocene age. Slopes are from 1-5%. Permeability is moderately slow, and runoff is very low to medium on slopes less than 5% and high on slopes greater than 5%. A perched water able can occur on

the surface in normal years from January to March on slopes up to 3%. For slopes greater than 3%, the perched water table can occur following heavy rainfall from January to March. Native forest vegetation is loblolly, shortleaf, and longleaf pines, sweetgum, red oak, and hickory trees. Erosion hazard is slight.

3. **Pinetucky Soil Series (PfB),** this is a deep, fine sandy loam, moderately well drained, moderately slowly permeable soil formed in the Pleistocene age. This is a gently sloping to sloping soil on uplands with slopes that range from 1-8%. Runoff is slow to medium. Native forest vegetation consists of loblolly, shortleaf, and longleaf pines, sweetgum, and red oak trees with an understory of grasses and shrubs. Erosion hazard is moderate.

4. **Pinetucky and Conroe Soil Series (PGB),** this is a deep, fine sandy loam and gravelly loamy fine sand, moderately well drained, moderately slowly permeable soil formed in the Pleistocene age. This is a gently sloping to sloping soil on uplands with slopes that range from 1-8%. Runoff is slow to medium. Native forest vegetation consists of loblolly, shortleaf, and longleaf pines, sweetgum, and red oak trees with an understory of grasses and shrubs. This soil has been altered by removal of ironstone gravel and has about 50% Pinetucky soil, 25% Conroe soil, and 25% other soils. Erosion hazard is severe.

5. **Sorter Soil Series (SoA),** this is a very deep, poorly drained, silty loam soil on nearly level to very gently sloping deposits of the Lissie Formation of the early to mid-Pleistocene age. Slopes are from 0-1%. This soil has high runoff and slow permeability. This soil remains saturated for long periods, particularly during the winter and spring months. Native forest vegetation includes loblolly and shortleaf pines, water oak, willow oak, red oak, and sweetgum trees. Understory includes blackgum, post oak, yaupon, persimmon, wax-myrtle, American elm, and American beautyberry. A perched water table is within 2.5 feet of the surface during late fall, winter, and spring. Erosion hazard is slight.

6. **Splendora Soil Series (SpA),** this is a very deep, fine sandy loam, moderately well to somewhat poorly drained soil, formed by loamy deposits of the Pleistocene age. Slopes are 0-2%. Runoff is medium to high and permeability is slow. A perched water table is 15-28 inches deep and lasts from December to April. A water table starts at 70 inches and lasts from December to April in normal years. Native forest vegetation includes loblolly, shortleaf, and longleaf pines, water oak, willow oak, southern red oak, and sweetgum trees. Understory is yaupon, wax-myrtle, Pinehill bluestem, longleaf uniola, and sedges. This is part of the Western Gulf Coast Flatwoods of southeast Texas. Erosion hazard is slight.

7. **Waller Soil Series (WaA),** this is a very deep, fine, silt loam, poorly drained soil, that is nearly level and formed by loamy deposits of the Lissie Formation of the Pleistocene age. The slopes are from 0-1% but most slopes are 0.5%. Permeability is slow and runoff is high on slopes of 0-1%. This soil remains saturated throughout from December to April in normal years due to a high water table. Native forest vegetation is a mix of hardwoods

and pine including water and willow oak, sweetgum, common persimmon, and loblolly pine trees. This is part of the Western Gulf Coast Flatwoods. This soil is found in nearly level shallow concave depressions and poorly defined drainageways. Erosion hazard is slight.

This soil information is from the Natural Resources Conservation Service (NRCS) website, https://soilseries.sc.egov.usda.gov, and the NRCS document, "Soil Survey of Polk and San Jacinto Counties, Texas," 1983. **Attachment 5.**

H.C. Clark's August 13, 2021 email comment, submitted to the TCEQ, further documents the importance of groundwater in the proposed landfill area when it states, "... the gravel controls the hydrogeology of the uppermost aquifer at the site. This gravel forms a pervasive layer at the base of Stratum II that daylights at Peach Creek ... The aquifer is apparently unconfined and the potentiometric surface, or water table seems to join the creeks, and the aquifer is the creek's baseflow".

"The application implicitly recognizes the gravel location restriction ... Will the permit explicitly state that Class I waste may not be and never will be accepted here because of this hydrogeologic limitation?"

"The potentiometric surface will be aggressively altered by dewatering of the uppermost aquifer in order to maintain a negative hydrostatic condition ... This is not sidewall dewatering for construction purposes but a long term alteration of the uppermost aquifer that serves as the monitoring system for the landfill. The sink created by pumping will draw water into the landfill rather than allowing it to pass beneath the liner and detect a leak as that groundwater moves through the point of compliance".

"Water will move through the gravel at orders of magnitude greater velocities than the application anticipates ... the problem of monitoring a gravel that moves potential contamination quickly and directly along a limited streamline". **Attachment 6.**

Not only does the analysis of this permit document the importance of groundwater in the area and surface water discharge, this analysis suggests, along with the native forest vegetation and soils information mentioned above that if the groundwater aquifer for the system of streams that exist on the 635 acre site or nearby is altered or dewatered significantly, this may have ecological, botanical, and biological effects on streams as well as water quality contaminant, monitoring, and water quantity impacts.

This landfill proposal could alter surface water and a water aquifer's water quality and quantity and influence whether streams are fishable, swimmable, and maintain the normal aquatic life and streamside vegetation (bottomland hardwood forested wetlands or riparian woodlands) that currently exist and are protected via TCEQ's Section 401, water

quality standard regulations under the federal Clean Water Act, and the U.S. Army Corps of Engineers and U.S. Environmental Protection Agency's Section 404 program.

This information and these additional water quality programs and their implementation goals should be analyzed and taken into account by TCEQ when it considers whether to permit this proposed landfill and a regulatory analysis should be part of the public information provided by TCEQ for this proposed permit.

As mentioned in the Sierra Club's previous comments, this proposal will allow a landfill to operate which contains household, commercial, industrial, and special wastes in the PCL (1,300 tons/day, 474 garbage trucks/day, and 371,000 tons/year of waste). This **Municipal Solid Waste Landfill** could accept garbage, rubbish, ashes, street cleanings, dead animals, slaughterhouse waste, contaminated soil, asbestos-containing material, sludge, brush, construction waste, demolition waste, grease trap waste, grit trap waste, municipal source liquid waste, empty pesticide containers, oil/gas/geothermal waste, medical waste, nonindustrial solid waste, electronic waste, X-ray/other radiation-producing equipment, and waste generated outside of Texas that contains industrial waste, waste associated with oil/gas/geothermal exploration production/development activities.

This proposed landfill may act as a magnet to draw feral hogs to the site and to the area around the site which includes SHNF, Wood Duck Farm, and residential properties. These land uses could suffer from feral hog effects as well as an increased population of these non-native invasive animal species.

The wallowing, rooting, and riparian focused behaviors (fecal contamination of ground and surface waters) of feral hogs all point to more water quality impacts for streams and groundwater in the area. Since there is already a bacteria problem in this area, in part due to feral hogs found within the East Fork of the San Jacinto River Watershed (which includes the proposed landfill site and the streams that flow through or near it), this could exacerbate an existing water quality problem in our area.

The **Houston-Galveston Council (HGAC)** has a **Bacteria Implementation Group (BIG)** and an **Animals and Agriculture Work Group** that have and are analyzing the effects of feral hogs on non-point source water pollution and stream water quality. The BIG and the Work Group have and are considering mitigation measures that could be used to reduce these effects. TCEQ should contact and work with the HGAC BIG and Work Group to determine what effects the proposed landfill could have on the East Fork of the San Jacinto River Watershed and implement appropriate mitigation measures.

HGAC also has a **Watershed Protection Plan (WPP)** and a **Total Maximum Daily Load (TMDL) Implementation Plan (I-Plan) for the East Fork of the San Jacinto River Watershed.** The TCEQ should coordinate and collaborate with its' other divisions and

analyze the potential impacts that this proposed landfill will have on water quality via the WPP and TMDL for the East Fork of the San Jacinto River and its' tributaries.

The Sierra Club appreciates this opportunity to provide additional comments on the Peach Creek Landfill, Permit #2406. The Sierra Club opposes the proposed Peach Creek Landfill and urges TCEQ to deny this permit request. Please keep the Sierra Club informed about the status of this proposal. Thank you.

Sincerely,

Brandt Mannchen
Forest Management Issue Chair
Lone Star Chapter of the Sierra Club
Chair, Forestry Subcommittee
Houston Regional Group of the Sierra Club
20923 Kings Clover Court
Humble, Texas 77346
281-570-7212
brandt_mannchen@comcast.net

REVIEWED
SEP 24 2021
By GCW
TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
2021 SEP 24 PM 2:59
CHIEF CLERKS OFFICE

MSW
117709

September 22, 2021

Office of Chief Clerk
MC 105
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

Dear Chief Clerk of the Texas Commission on Environmental Quality,

The Houston Regional Group and Lone Star Chapter of the Sierra Club (Sierra Club) submit these additional comments for our request that the Texas Commission on Environmental Quality (TCEQ) amend Permit #2406, 635-acre Peach Creek Landfill (PCL), to include how this proposed facility will be accessed by garbage trucks and other vehicles, all other environmental issues, and hold a contested case hearing.

The Sierra Club has walked Compartments 122, 123, 124, and 125, about 4,000 acres in Sam Houston National Forest (SHNF), which are adjacent to the proposed landfill site or just south or west of it. **Attachment 1.**

This area is described in a report to the U.S. Forest Service, National Forests and Grasslands in Texas (NFGT), Stephen F. Austin State University and The Nature Conservancy, **"Ecological Classification System for the National Forests and Adjacent Areas of the West Gulf Coastal Plain, 2nd Approximation,"** February 2007. **Attachment 2.**

The southeastern and southern part of SHNF are in the San Jacinto Flatwoods Landtype Association. This Landtype Association is made up of three landtype phases:

1. **Sandy/Loamy Uplands Landtype,** contains the **Willow Oak-Loblolly Pine/Justicia/Bignonia Loamy Seasonally Wet Flatwoods Landtype Phase.**

2. **Mesic Slopes and Terraces Landtype,** contains the **White Oak-Loblolly Pine/Callicarpa Loamy Mesic Lower Slopes, Mounds, and Terraces Landtype Phase.**

3. **Minor Stream Bottoms Landtype,** contains the **Water Oak-Southern Magnolia/Bignonia Loamy Wet-Mesic Stream Bottoms Landtype Phase.**

The San Jacinto Flatwoods Landtype Association in SHNF expresses significant groundwater and surface water connections. It's sandy or loamy and acts as a recharge area for streams and aquifers. Streams and aquifers recharge each other via stream flow, extensive overland flow during heavy rains and floods, and gravelly groundwater tables (old gravel pits are found in this area) that are close to the surface and express

connection via run-off and rising water tables during seasonally rainy periods. San Jacinto County has been noted for its' abundant groundwater for decades. **Attachment 3.**

The topography for much of the area is almost level (flatwoods). Elevation starts at about 230 feet in the northern parts of Compartments 123 and 124, and quickly slopes to 165 feet in the south at Compartment 125, Lee Turner Road, and State Highway 105. **Attachment 4.**

Water runs off in barely defined or narrow stream channels that are quick to flood but slow to drain. Much woody and vegetative debris blocks flow which allows water to sit and sink into the porous and sandy soil.

The extent of these groundwater/surface water connections are shown, in part, by the uneven topography (with many swales) and the type of vegetation that is found in this area and exists on the proposed landfill site.

This vegetation includes Sweetbay Magnolia, Red Maple, Black Gum, Sebastian Bush, American Holly, Cardinal Flower, Swamp Chestnut Oak, Sweetleaf, Dwarf Palmetto, Royal Fern, Netted Chain Fern, and Lizard's-tail.

Bottomland hardwood forested wetlands, hardwood-pine flatwoods, hardwood upland depression swamps, Loblolly Pine-White Oak Claypan Slopes and Uplands, and Shortleaf Pine Gravelly Uplands are found here. Forest Types include Forest Type 31, Loblolly Pine; Forest Type 32, Shortleaf Pine; and Forest Type 62, Sweetgum-Oak.

Soils that are found on or near the proposed landfill site and on SHNF include:

1. **Conroe Soil Series (CrB),** this is a deep, moderately well drained, slowly permeable soil on uplands. Slopes are 0-12 % but usually 1-4%. The soil is formed in unconsolidated acid sandy clays and sands in the Willis Formation of the Pleistocene age. The A and E horizons are loamy fine sand, loamy sand, gravelly, or very gravelly. Internal drainage has runoff that is slow on 0-1% slopes, medium on 1-5% slopes, and high on 5-12% slopes. Native forest vegetation is shortleaf, longleaf, and loblolly pines with hardwoods like sweetgum, post, oak, red oak and hickory trees. Understory is yaupon, wax-myrtle, American beautyberry, Red Bay, and viburnum. Many areas of Conroe soil have been surface mined for ironstone modules. There is a perched water table at 2-3.5 feet during winter and spring.

2. **Otanya Soil Series (OtA),** this is a very deep, well drained, soil on nearly level to gently sloping surface of the Lissie Formation of the early to mid-Pleistocene age. Slopes are from 1-5%. Permeability is moderately slow, and runoff is very low to medium on slopes less than 5% and high on slopes greater than 5%. A perched water able can occur on

the surface in normal years from January to March on slopes up to 3%. For slopes greater than 3%, the perched water table can occur following heavy rainfall from January to March. Native forest vegetation is loblolly, shortleaf, and longleaf pines, sweetgum, red oak, and hickory trees. Erosion hazard is slight.

3. **Pinetucky Soil Series (PfB),** this is a deep, fine sandy loam, moderately well drained, moderately slowly permeable soil formed in the Pleistocene age. This is a gently sloping to sloping soil on uplands with slopes that range from 1-8%. Runoff is slow to medium. Native forest vegetation consists of loblolly, shortleaf, and longleaf pines, sweetgum, and red oak trees with an understory of grasses and shrubs. Erosion hazard is moderate.

4. **Pinetucky and Conroe Soil Series (PGB),** this is a deep, fine sandy loam and gravelly loamy fine sand, moderately well drained, moderately slowly permeable soil formed in the Pleistocene age. This is a gently sloping to sloping soil on uplands with slopes that range from 1-8%. Runoff is slow to medium. Native forest vegetation consists of loblolly, shortleaf, and longleaf pines, sweetgum, and red oak trees with an understory of grasses and shrubs. This soil has been altered by removal of ironstone gravel and has about 50% Pinetucky soil, 25% Conroe soil, and 25% other soils. Erosion hazard is severe.

5. **Sorter Soil Series (SoA),** this is a very deep, poorly drained, silty loam soil on nearly level to very gently sloping deposits of the Lissie Formation of the early to mid-Pleistocene age. Slopes are from 0-1%. This soil has high runoff and slow permeability. This soil remains saturated for long periods, particularly during the winter and spring months. Native forest vegetation includes loblolly and shortleaf pines, water oak, willow oak, red oak, and sweetgum trees. Understory includes blackgum, post oak, yaupon, persimmon, wax-myrtle, American elm, and American beautyberry. A perched water table is within 2.5 feet of the surface during late fall, winter, and spring. Erosion hazard is slight.

6. **Splendora Soil Series (SpA),** this is a very deep, fine sandy loam, moderately well to somewhat poorly drained soil, formed by loamy deposits of the Pleistocene age. Slopes are 0-2%. Runoff is medium to high and permeability is slow. A perched water table is 15-28 inches deep and lasts from December to April. A water table starts at 70 inches and lasts from December to April in normal years. Native forest vegetation includes loblolly, shortleaf, and longleaf pines, water oak, willow oak, southern red oak, and sweetgum trees. Understory is yaupon, wax-myrtle, Pinehill bluestem, longleaf uniola, and sedges. This is part of the Western Gulf Coast Flatwoods of southeast Texas. Erosion hazard is slight.

7. **Waller Soil Series (WaA),** this is a very deep, fine, silt loam, poorly drained soil, that is nearly level and formed by loamy deposits of the Lissie Formation of the Pleistocene age. The slopes are from 0-1% but most slopes are 0.5%. Permeability is slow and runoff is high on slopes of 0-1%. This soil remains saturated throughout from December to April in normal years due to a high water table. Native forest vegetation is a mix of hardwoods

and pine including water and willow oak, sweetgum, common persimmon, and loblolly pine trees. This is part of the Western Gulf Coast Flatwoods. This soil is found in nearly level shallow concave depressions and poorly defined drainageways. Erosion hazard is slight.

This soil information is from the Natural Resources Conservation Service (NRCS) website, https://soilseries.sc.egov.usda.gov, and the NRCS document, "Soil Survey of Polk and San Jacinto Counties, Texas," 1983. **Attachment 5.**

H.C. Clark's August 13, 2021 email comment, submitted to the TCEQ, further documents the importance of groundwater in the proposed landfill area when it states, "... the gravel controls the hydrogeology of the uppermost aquifer at the site. This gravel forms a pervasive layer at the base of Stratum II that daylights at Peach Creek ... The aquifer is apparently unconfined and the potentiometric surface, or water table seems to join the creeks, and the aquifer is the creek's baseflow".

"The application implicitly recognizes the gravel location restriction ... Will the permit explicitly state that Class I waste may not be and never will be accepted here because of this hydrogeologic limitation?"

"The potentiometric surface will be aggressively altered by dewatering of the uppermost aquifer in order to maintain a negative hydrostatic condition ... This is not sidewall dewatering for construction purposes but a long term alteration of the uppermost aquifer that serves as the monitoring system for the landfill. The sink created by pumping will draw water into the landfill rather than allowing it to pass beneath the liner and detect a leak as that groundwater moves through the point of compliance".

"Water will move through the gravel at orders of magnitude greater velocities than the application anticipates ... the problem of monitoring a gravel that moves potential contamination quickly and directly along a limited streamline". **Attachment 6.**

Not only does the analysis of this permit document the importance of groundwater in the area and surface water discharge, this analysis suggests, along with the native forest vegetation and soils information mentioned above that if the groundwater aquifer for the system of streams that exist on the 635 acre site or nearby is altered or dewatered significantly, this may have ecological, botanical, and biological effects on streams as well as water quality contaminant, monitoring, and water quantity impacts.

This landfill proposal could alter surface water and a water aquifer's water quality and quantity and influence whether streams are fishable, swimmable, and maintain the normal aquatic life and streamside vegetation (bottomland hardwood forested wetlands or riparian woodlands) that currently exist and are protected via TCEQ's Section 401, water

quality standard regulations under the federal Clean Water Act, and the U.S. Army Corps of Engineers and U.S. Environmental Protection Agency's Section 404 program.

This information and these additional water quality programs and their implementation goals should be analyzed and taken into account by TCEQ when it considers whether to permit this proposed landfill and a regulatory analysis should be part of the public information provided by TCEQ for this proposed permit.

As mentioned in the Sierra Club's previous comments, this proposal will allow a landfill to operate which contains household, commercial, industrial, and special wastes in the PCL (1,300 tons/day, 474 garbage trucks/day, and 371,000 tons/year of waste). This **Municipal Solid Waste Landfill** could accept garbage, rubbish, ashes, street cleanings, dead animals, slaughterhouse waste, contaminated soil, asbestos-containing material, sludge, brush, construction waste, demolition waste, grease trap waste, grit trap waste, municipal source liquid waste, empty pesticide containers, oil/gas/geothermal waste, medical waste, nonindustrial solid waste, electronic waste, X-ray/other radiation-producing equipment, and waste generated outside of Texas that contains industrial waste, waste associated with oil/gas/geothermal exploration production/development activities.

This proposed landfill may act as a magnet to draw feral hogs to the site and to the area around the site which includes SHNF, Wood Duck Farm, and residential properties. These land uses could suffer from feral hog effects as well as an increased population of these non-native invasive animal species.

The wallowing, rooting, and riparian focused behaviors (fecal contamination of ground and surface waters) of feral hogs all point to more water quality impacts for streams and groundwater in the area. Since there is already a bacteria problem in this area, in part due to feral hogs found within the East Fork of the San Jacinto River Watershed (which includes the proposed landfill site and the streams that flow through or near it), this could exacerbate an existing water quality problem in our area.

The **Houston-Galveston Council (HGAC)** has a **Bacteria Implementation Group (BIG)** and an **Animals and Agriculture Work Group** that have and are analyzing the effects of feral hogs on non-point source water pollution and stream water quality. The BIG and the Work Group have and are considering mitigation measures that could be used to reduce these effects. TCEQ should contact and work with the HGAC BIG and Work Group to determine what effects the proposed landfill could have on the East Fork of the San Jacinto River Watershed and implement appropriate mitigation measures.

HGAC also has a **Watershed Protection Plan (WPP)** and a **Total Maximum Daily Load (TMDL) Implementation Plan (I-Plan) for the East Fork of the San Jacinto River Watershed.** The TCEQ should coordinate and collaborate with its' other divisions and

analyze the potential impacts that this proposed landfill will have on water quality via the WPP and TMDL for the East Fork of the San Jacinto River and its' tributaries.

The Sierra Club appreciates this opportunity to provide additional comments on the Peach Creek Landfill, Permit #2406. The Sierra Club opposes the proposed Peach Creek Landfill and urges TCEQ to deny this permit request. Please keep the Sierra Club informed about the status of this proposal. Thank you.

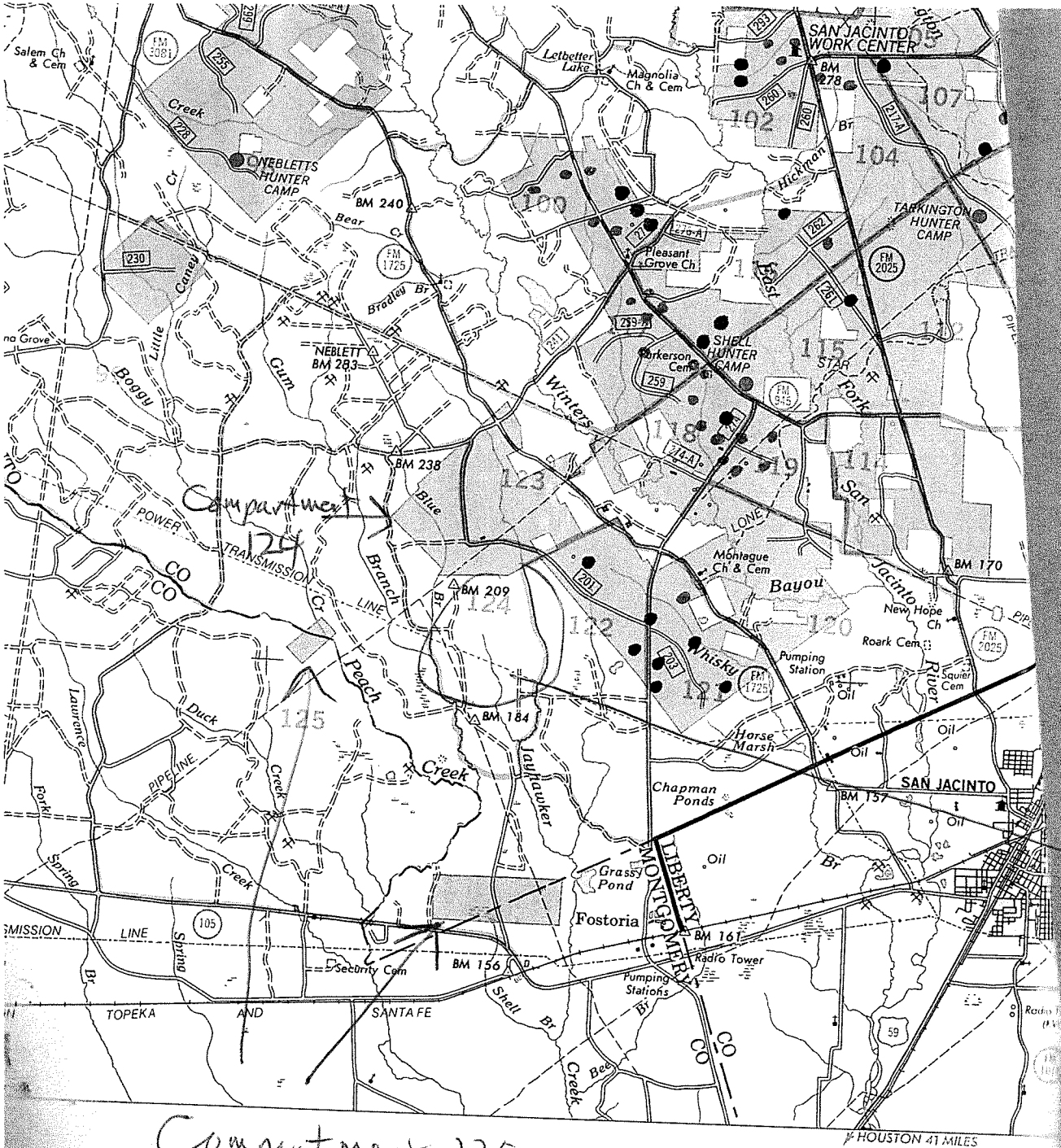
Sincerely,

Brandt Mannchen

Brandt Mannchen
Forest Management Issue Chair
Lone Star Chapter of the Sierra Club
Chair, Forestry Subcommittee
Houston Regional Group of the Sierra Club
20923 Kings Clover Court
Humble, Texas 77346
281-570-7212
brandt_mannchen@comcast.net

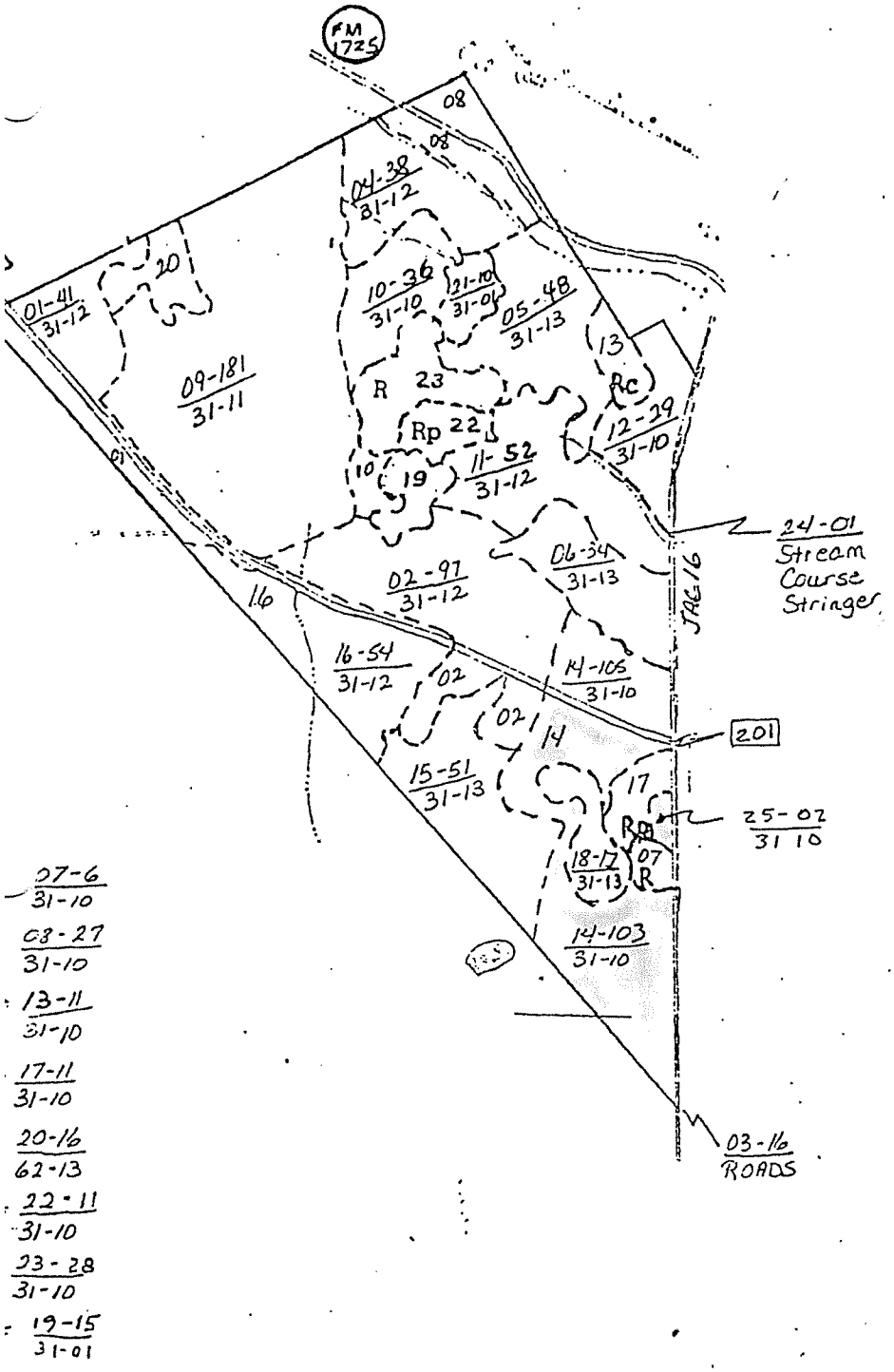
Attachment 1

Sam Houston National Forest Maps and Stand Prescription Summaries of Compartments Adjacent or Near to the Proposed Peach Creek Landfill



Landfill site

Compartment 125



07-6 31-10

08-27 31-10

13-11 31-10

17-11 31-10

20-16 62-13

22-11 31-10

23-28 31-10

19-15 31-01

"Original" 122

STAND MAP

COMPARTMENT NO. 122

SAM HOUSTON NATIONAL FOREST

SAN JACINTO DISTRICT

SCALE 1 24 000

2.64" = 1 MILE

PJD 12/88

TAD 5/89

CMW 01/92

Stand Number - Acres / For. Type - Cond. Class	= 01-41 / 31-12
RCW Colony	R
Recuritment Stand	Rc
Replacement Stand	Rp

STAND PRESCRIPTION SUMMARY 2400_36 (Short)

NF: 13 - Texas DISTRICT: 4 - Raven COMPARTMENT: 122 COUNTY: 407 DOR: JAN-18-1996

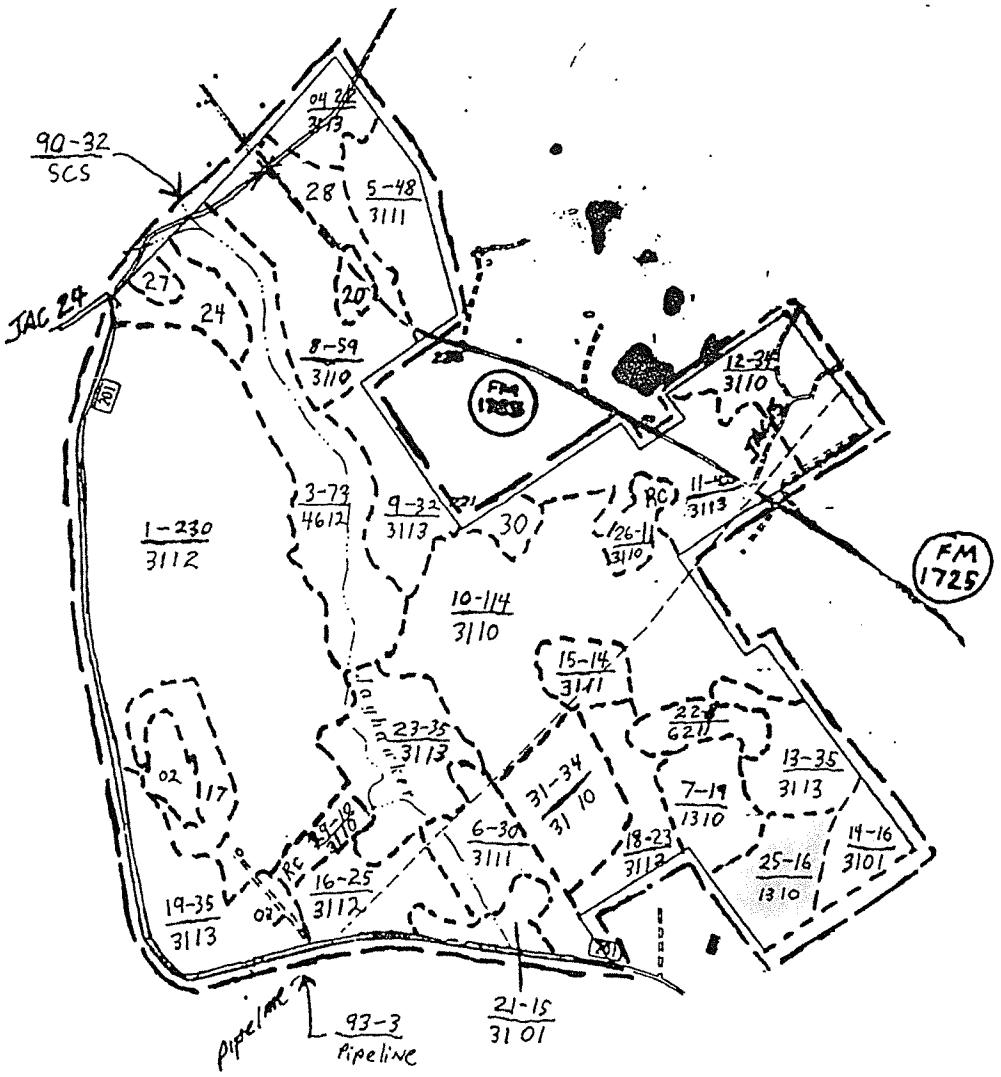
Stand	Land Class	For Type	Cond Clas	For Site	Stnd Orig	Mgt Type	Mgt Site	Prod	Stand Acres	Inclusion AC	Inclusion Code	Age Year	BA Year	Basal Area	Treatment Type	Treatment Sched	Treatment Type	Treatment Sched	Treatment Type	Treatment Sched	Treatment Type Sched
1	500	31	12	90		31	90	3	41	0	0	1930	0	0	740	1992	740	1994	740	1997	
2	590	31	12	90		31	90	3	97	0	0	1930	0	0	740	1992	740	1994	740	1997	
4	590	31	12	90		31	90	3	38	0	0	1930	0	0	740	1992	740	1994	740	1997	
5	592	31	13	90		31	90	3	48	0	0	1977	0	0	510	0					
6	500	31	13	90		31	90	3	34	0	0	1977	0	0	510	0					
7	800	31	10	90		31	90	3	6	0	0	1905	0	0	740	1992	740	1994	740	1996	
8	592	31	10	90		31	90	3	27	0	0	1915	0	0	740	1992	740	1994	740	1997	
9	500	31	11	90		31	90	3	181	6	0	1970	1992	119	740	1993	740	1997	220	0	
10	590	31	10	90		31	90	3	36	0	0	1920	0	0	740	1992	740	1994	740	1997	
11	592	31	12	80		31	80	4	52	0	0	1930	0	0	740	1992	740	1994	740	1997	
12	592	31	10	80		31	80	4	29	0	0	1920	0	0	740	1992	740	1994	740	1997	
13	802	31	10	80		31	80	4	11	0	0	1920	0	0	610	1992	740	1992	740	1994	
14	590	31	10	90		31	90	3	103	0	0	1905	0	0	740	1992	740	1994	740	1997	
15	500	31	13	90		31	90	3	51	0	0	1982	0	0	501	0					
16	500	31	12	90		31	90	3	54	0	0	1930	0	0	740	1992	740	1994	740	1997	
17	803	31	10	90		31	90	3	11	0	0	1905	0	0	610	1992	740	1992	740	1994	
18	500	31	13	90		31	90	3	17	0	0	1986	0	0	510	0					
19	500	31	13	90		31	90	3	15	6	0	1987	0	0	501	0					
20	500	62	13	80		62	80	5	16	0	0	1975	0	0	none						
21	500	31	1	90		31	90	3	10	0	0	0	0	0	650	1992	501	1992	420	1992	531 1993 more
22	803	31	10	90		31	90	3	11	0	0	1920	0	0	740	1992	740	1994			
23	800	31	10	90		31	90	3	28	0	0	1905	0	0	740	1992	740	1994			
25	590	31	10	90		31	90	3	2	0	0	1905	0	0	740	1992	740	1994	740	1997	
90	820	31	12	80		31	80	4	1	0	0	1930	0	0	740	1992	740	1994	740	1997	
91	230	0	0	0		0	0	9	16	0	0	0	0	0	none						

AREA CLASSIFICATION SUMMARY

NF: 13 - Texas DISTRICT: 4 Raven COUNTY: 407 COMPARTMENT: 122 DOR: JAN-18-1996

WATER AREA	0	LACK OF TECHNOLOGY	0	STANDARD FOREST	851	UNINVENTORIED	0
NON-FOREST LAND	16	NOT-APPROPRIATE	68	SPECIAL MANAGEMENT	0	TOTAL COMPARTMENT	935
WITHDRAWN RESERVED	0	UNPRODUCTIVE	0	TOTAL SUITABLE	851	ACRES OF RECORD	935
WITHDRAWN DEFERRED	0	TOTAL UNSUITABLE	68				---
						DIFFERENCE OF	+0

02 = 2-10 / 6113
17 = 17-24 / 3111
20 = 20-6 / 3110
24 = 24-16 / 3101
27 = 27-7 / 3112
28 = 28-11 / 3110
30 = 30-11 / 3101



Stand Map

-230 / 3112 = Stand# – Acres / For. Type – Cond. Class

----- Stand Boundary

—— Compartment Boundary

NORTH
RSP
07/92

COMPARTMENT NO. 123
SAM HOUSTON NATIONAL FOREST
SAN JACINTO DISTRICT
SCALE 1 24 000

2 64" = 1 MILE

STAND PRESCRIPTION SUMMARY 2400_36 (Short)

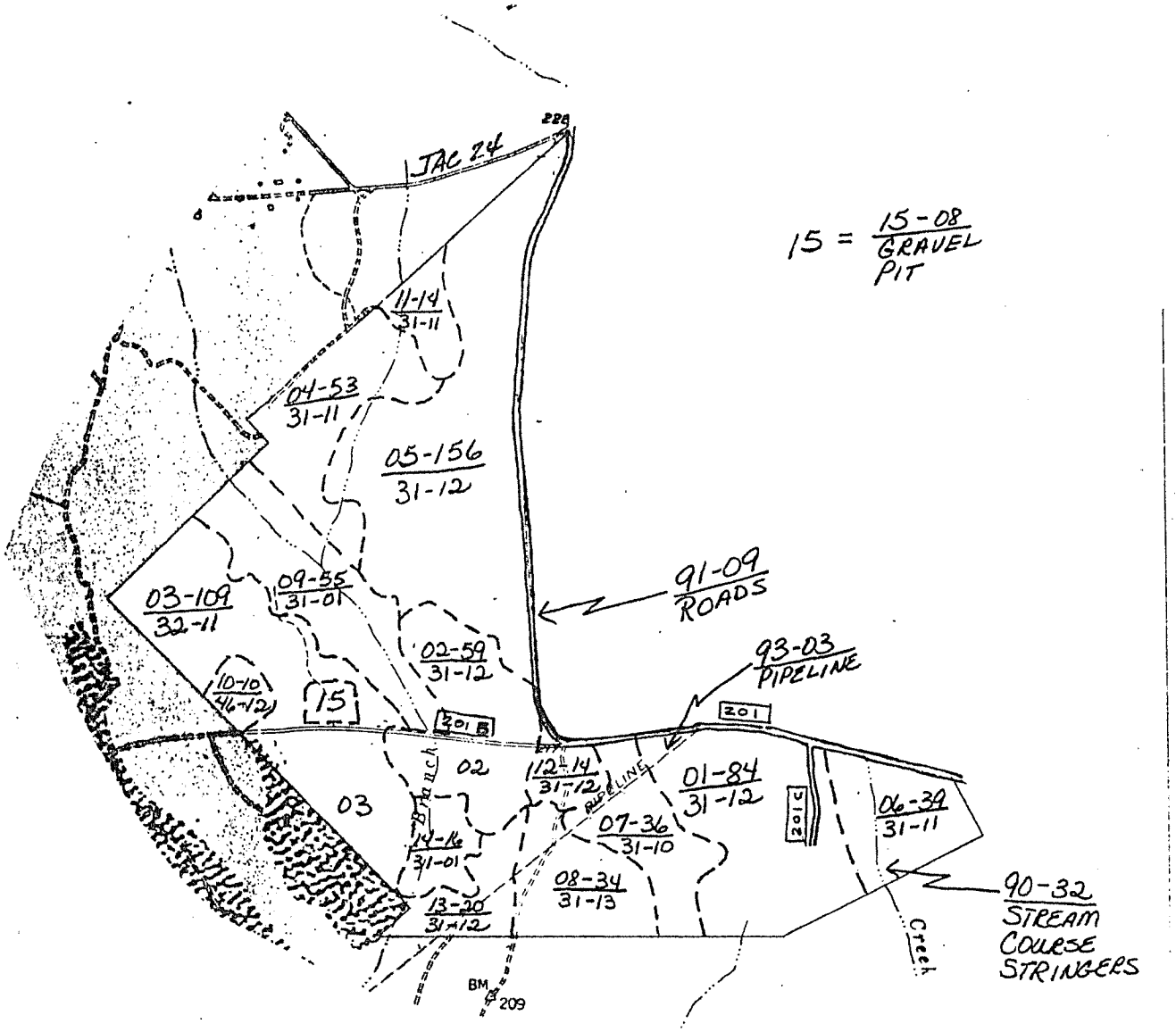
NF: 13 - Texas DISTRICT: 4 - Raven COMPARTMENT: 123 COUNTY: 407 DOR: JAN-18-1996

Stand	Land Class	For Type	Cond Clas	For Site	Stnd Orig	Mgt Type	Mgt Site	Prod	Stand Acres	Inclusion AC	Inclusion Code	Age Year	BA Year	Basal Area	Treatment Type	Treatment Sched	Treatment Type	Treatment Sched	Treatment Type	Treatment Sched
1	592	31	12	90		31	90	3	230	15	0	1930	1992	72	740	1902	740	1905	740	1994
2	510	61	13	80		61	80	5	10	0	0	1969	0	0	510	0				
3	500	46	12	90		64	90	5	73	0	0	1963	1991	80	none					
4	590	31	13	100		31	100	1	22	0	0	1979	0	0	501	0				
5	590	31	11	90		31	90	3	48	0	0	1967	1991	108	740	1993	740	1995	220	0
6	500	31	11	80		31	80	4	30	2	0	1968	1992	114	740	1902	740	1905	740	1999	220	0
7	500	13	10	80		61	80	5	19	3	0	1910	1992	165	none					
8	590	31	10	100		31	100	1	66	0	0	1910	1991	151	740	1993				
9	590	31	13	100		31	100	1	32	5	0	1980	1991	90	510	0				
10	592	31	10	100		31	100	2	114	5	0	1910	0	73	740	1902	740	1905	740	1999
11	500	31	13	90		31	90	3	42	0	0	1977	1991	70	510	0				
12	500	31	10	90		31	90	3	34	0	0	1915	1991	75	740	1993				
13	500	31	13	90		64	90	5	35	0	0	1980	0	0	510	0				
14	500	31	1	90		31	90	3	16	0	0	0	0	0	650	1992	501	1992	420	1992	531	1993 more
15	500	31	11	70		64	70	5	14	0	0	1945	1992	67	740	1902	740	1905	740	1999		
16	592	31	12	100		31	100	2	25	0	0	1934	1992	102	740	1902	740	1905	740	1999	220	0
17	500	31	11	100		31	100	2	24	5	0	1969	1992	101	740	1902	740	1905	740	1999	220	0
18	500	31	12	90		31	90	3	23	2	0	1937	1992	81	740	1902	740	1905	740	1999	113	0
19	500	31	13	90		31	90	3	35	0	0	1980	0	0	501	0				
20	800	31	10	90		31	90	3	6	0	0	1910	1991	144	740	1993	610	1993	220	0
21	500	31	1	90		31	90	3	15	0	0	0	0	0	531	1993	650	1995		
22	500	62	11	80		62	80	5	8	0	0	1948	0	21	none					
23	500	31	13	100		31	100	1	35	0	0	1988	0	0	501	0				
24	500	31	1	90		31	90	3	16	0	0	0	0	0	531	1993	650	1995		
25	500	13	10	80		64	80	5	16	0	0	1906	1992	80	740	1902	740	1906	740	1999	113	0
26	802	31	10	90		31	90	3	11	0	0	1910	0	0	610	1993	711	1993	113	0		
27	500	31	12	90		31	90	3	7	0	0	1930	1991	70	740	1993				
28	803	31	10	90		31	90	3	11	0	0	1910	1991	103	740	1993	711	1995	220	0
29	802	31	10	100		31	100	2	10	0	0	1910	0	108	740	1902	740	1905	740	1994	610	1999 more
30	500	31	1	90		31	90	3	11	0	0	0	0	0	440	1992	420	1992	501	1993	420	1993 more
31	592	31	10	90		31	90	3	34	0	0	1910	0	90	531	0	650	1902	510	1999	440	1999 more
90	820	46	12	90		64	90	5	32	0	0	1963	0	0	none					
91	230	0	0	0		0	0	9	13	0	0	0	0	0	none					
93	220	0	0	0		0	0	9	3	0	0	0	0	0	none					

AREA CLASSIFICATION SUMMARY

NF: 13 - Texas DISTRICT: 4 Raven COUNTY:407 COMPARTMENT: 123 DOR: JAN-18-1996

WATER AREA	0	LACK OF TECHNOLOGY	0	STANDARD FOREST	1034	UNINVENTORIED	0
NON-FOREST LAND	16	NOT-APPROPRIATE	70	SPECIAL MANAGEMENT	0	TOTAL COMPARTMENT	1120
WITHDRAWN RESERVED	0	UNPRODUCTIVE	0	TOTAL SUITABLE	1034	ACRES OF RECORD	1120
WITHDRAWN DEFERRED	0	TOTAL UNSUITABLE	70				
						DIFFERENCE OF	+0



31 = Loblolly Pine

46 = Bottomland Hardwood - Yellow Pine

LEGEND

Stand Number-Acres
For.Type-Cond.Class – 01-84 / 31-12

Stand Boundary – - - - - -

COMPARTMENT NO. 124

SAM HOUSTON NATIONAL FOREST

SAN JACINTO DISTRICT

T 04/90

NORTH

SCALE 1:24 000

2.64" = 1 MILE

STAND PRESCRIPTION SUMMARY 2400_36 (Short)

NF: 13 - Texas DISTRICT: 4 - Raven COMPARTMENT: 124 COUNTY: 407 DOR: JAN-18-1996

Stand	Land Class	For Type	Cond Clas	For Site	Stnd Orig	Mgt Type	Mgt Site	Prod	Stand Acres	Inclusion AC	Inclusion Code	Age Year	BA Year	Basal Area	Treatment Type	Treatment Sched	Treatment Type	Treatment Sched	Treatment Type	Treatment Sched	Treatment Type	Treatment Sched
1	520	31	10	90		31	90	3	34	10	0	1927	0	81	740	1902	740	1905	740	1999		
2	500	31	12	80		31	80	4	59	0	0	1949	1992	93	740	1902	740	1905	740	1999	220	0
3	500	32	11	90		32	90	2	109	0	0	1970	1992	92	740	1902	740	1905	740	1999	220	0
4	500	31	11	80		31	80	4	53	5	0	1969	1992	111	740	1902	740	1905	740	1999	220	0
5	520	31	12	80		31	80	4	156	5	0	1930	1992	68	740	1902	740	1905	740	1999		
6	500	31	11	90		31	90	3	39	7	0	1968	1992	113	740	1902	740	1905	740	1999	220	0
7	500	31	10	80		31	80	4	36	5	0	1922	1992	90	740	1902	740	1905	740	1999	113	0
8	500	31	13	80		31	80	4	34	0	0	1980	0	0	501	0						
9	520	31	13	90		31	90	3	55	3	0	1988	0	0	501	0						
10	510	46	12	80		64	80	5	10	0	0	1910	1992	66	740	1902	740	1905	740	1999		
11	500	31	11	60		31	60	5	14	0	0	1959	1992	55	740	1902	740	1905	740	1999		
12	500	31	12	90		31	90	3	14	0	0	1934	1992	81	740	1902	740	1905	740	1999		
13	500	31	10	80		31	80	4	20	0	0	1923	0	94	740	1902	740	1905	740	1999		
14	500	31	1	90		31	90	3	16	0	0	1990	0	0	650	1992	501	1992	420	1992	531	1993 more
15	250	31	13	0		0	0	9	8	0	0	0	1992	0	740	1902	740	1905	740	1999		
16	520	31	10	90		31	90	3	50	5	0	1927	0	96	531	0	650	1903	510	1999	440	1999 more
90	820	31	12	80		31	80	4	32	0	0	1949	0	0	740	1992						
91	230	0	0	0		0	0	9	9	0	0	0	0	0	none							
93	220	0	0	0		0	0	9	3	0	0	0	0	0	none							

AREA CLASSIFICATION SUMMARY

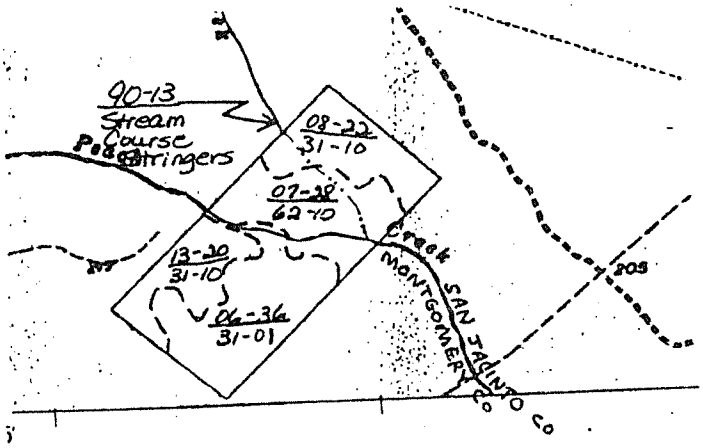
NF: 13 - Texas DISTRICT: 4 Raven COUNTY:407 COMPARTMENT: 124 DOR: JAN-18-1996

WATER AREA	0	LACK OF TECHNOLOGY	0	STANDARD FOREST	699	UNINVENTORIED	0
NON-FOREST LAND	20	NOT-APPROPRIATE	32	SPECIAL MANAGEMENT	0	TOTAL COMPARTMENT	751
WITHDRAWN RESERVED	0	UNPRODUCTIVE	0	TOTAL SUITABLE	699	ACRES OF RECORD	751
WITHDRAWN DEFERRED	0	TOTAL UNSUITABLE	32				
						DIFFERENCE OF	+0

31 = Loblolly Pine

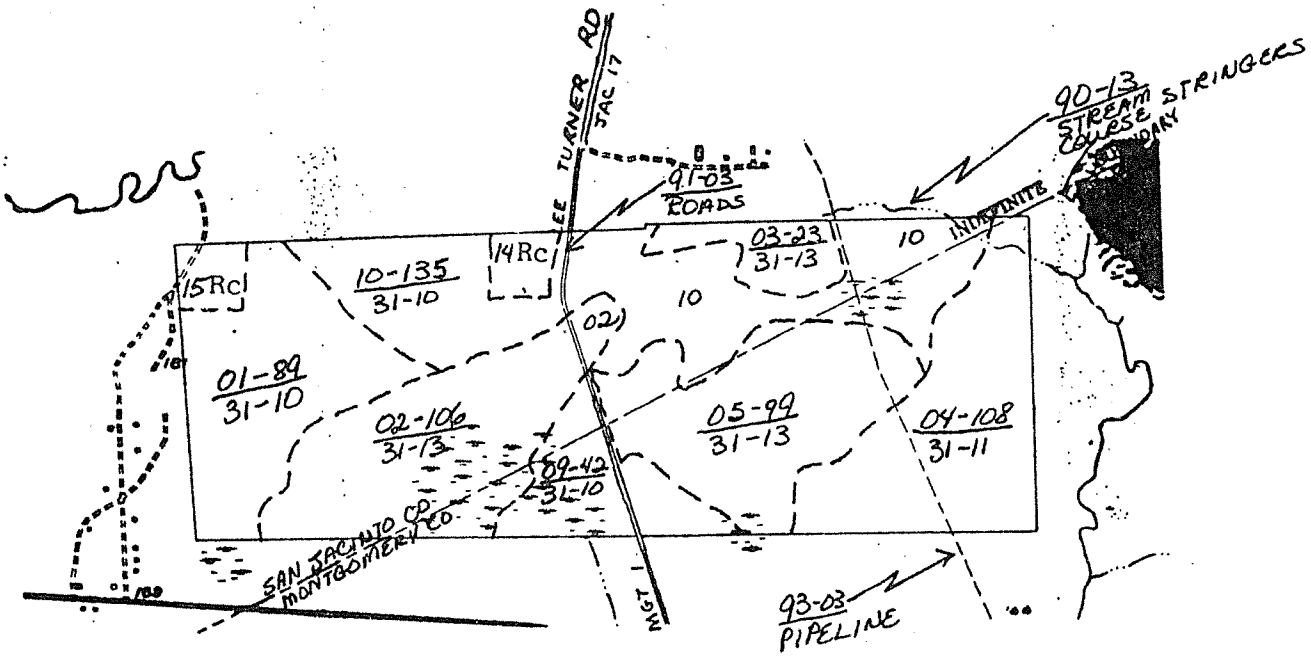
90 = stream Course Stringer

62 = Sweet Gum - Nuttall Oak - Willow



$14\,Rc = \frac{14-10}{31-10}$

$15\,Rc = \frac{15-10}{31-10}$



LEGEND

Stand Number-Acres / For.Type-Cond.Class — 01-89 / 31-10

Stand Boundary - - - - - -

RCW Colony - R

Replacement Stand - Rp

Recruitment Stand - Rc

NORTH

04/90

COMPARTMENT NO. 125

SAM HOUSTON NATIONAL FOREST

SAN JACINTO DISTRICT

SCALE 1:24 000

2.64" = 1 MILE

STAND PRESCRIPTION SUMMARY 2400_36 (Short)

NF: 13 - Texas DISTRICT: 4 - Raven COMPARTMENT: 125 COUNTY: 407 DOR: JAN-18-1996

Stand	Land Class	For Type	Cond Clas	For Site	Stnd Orig	Mgt Type	Mgt Site	Prod	Stand Acres	Inclusion AC	Inclusion Code	Age Year	BA Year	Basal Area	Treatment Type	Treatment Sched	Treatment Type	Treatment Sched	Treatment Type	Treatment Sched	Treatment Type	Treatment Sched
1	520	31	10	100		31	100	1	129	9	0	1918	1992	102	none							
2	520	31	13	90		31	90	3	62	11	0	1979	0	0	510	0						
3	500	31	13	90		31	90	3	18	0	0	1979	0	0	510	0						
4	520	31	10	100		31	100	1	48	23	0	1925	1992	121	none							
5	520	31	13	90		31	90	3	86	0	0	1979	0	0	601	1993	721	1993	510	0		
6	500	31	1	100		31	90	3	23	5	0	0	0	0	531	1993	650	1995				
7	660	46	12	90		61	90	5	15	0	0	1927	1992	72	none							
8	520	31	10	100		31	100	1	21	9	0	1914	1992	78	none							
9	520	31	10	100		31	100	1	73	6	0	1921	1992	110	none							
10	500	31	10	90		31	90	3	39	0	0	1925	1992	117	none							
11	500	31	13	90		31	90	3	21	0	0	1985	0	0	510	0						
12	500	31	13	80		31	80	4	19	0	0	1987	0	0	721	1993	510	0				
13	500	31	13	90		31	90	3	13	0	0	1981	0	0	601	1993	510	0				
14	500	31	13	90		31	90	3	13	3	0	1982	0	0	601	1993	510	0				
15	500	31	10	100		31	100	1	24	19	0	1923	1992	93	440	1993	420	1993	502	1994	113	0
16	500	31	10	100		31	100	1	27	15	0	1927	1992	127	440	1993	420	1993	502	1994	113	0
17	820	98	6	0		64	70	5	31	0	0	1906	0	48	none							
18	500	31	13	90		31	90	3	20	0	0	1982	0	0	601	1993	510	0				
19	500	31	1	90		31	90	3	10	0	0	0	0	0	440	1993	420	1993	502	1994	531	1995 more
20	500	31	13	100		31	100	1	14	2	0	1986	0	0	510	0						
21	500	31	12	100		31	100	1	16	0	0	1932	1992	102	none							
90	820	46	12	90		61	90	5	19	0	0	1927	0	72	none							
91	230	0	0	0		0	0	9	3	0	0	0	0	0	none							
93	220	0	0	0		0	0	9	3	0	0	0	0	0	none							

AREA CLASSIFICATION SUMMARY

NF: 13 - Texas DISTRICT: 4 Raven. COUNTY:407 COMPARTMENT: 125 DOR: JAN-18-1996

WATER AREA	0	LACK OF TECHNOLOGY	0	STANDARD FOREST	676	UNINVENTORIED	0
NON-FOREST LAND	6	NOT-APPROPRIATE	50	SPECIAL MANAGEMENT	15	TOTAL COMPARTMENT	747
WITHDRAWN RESERVED	0	UNPRODUCTIVE	0	TOTAL SUITABLE	691	ACRES OF RECORD	747
WITHDRAWN DEFERRED	0	TOTAL UNSUITABLE	50				
						DIFFERENCE OF	+0

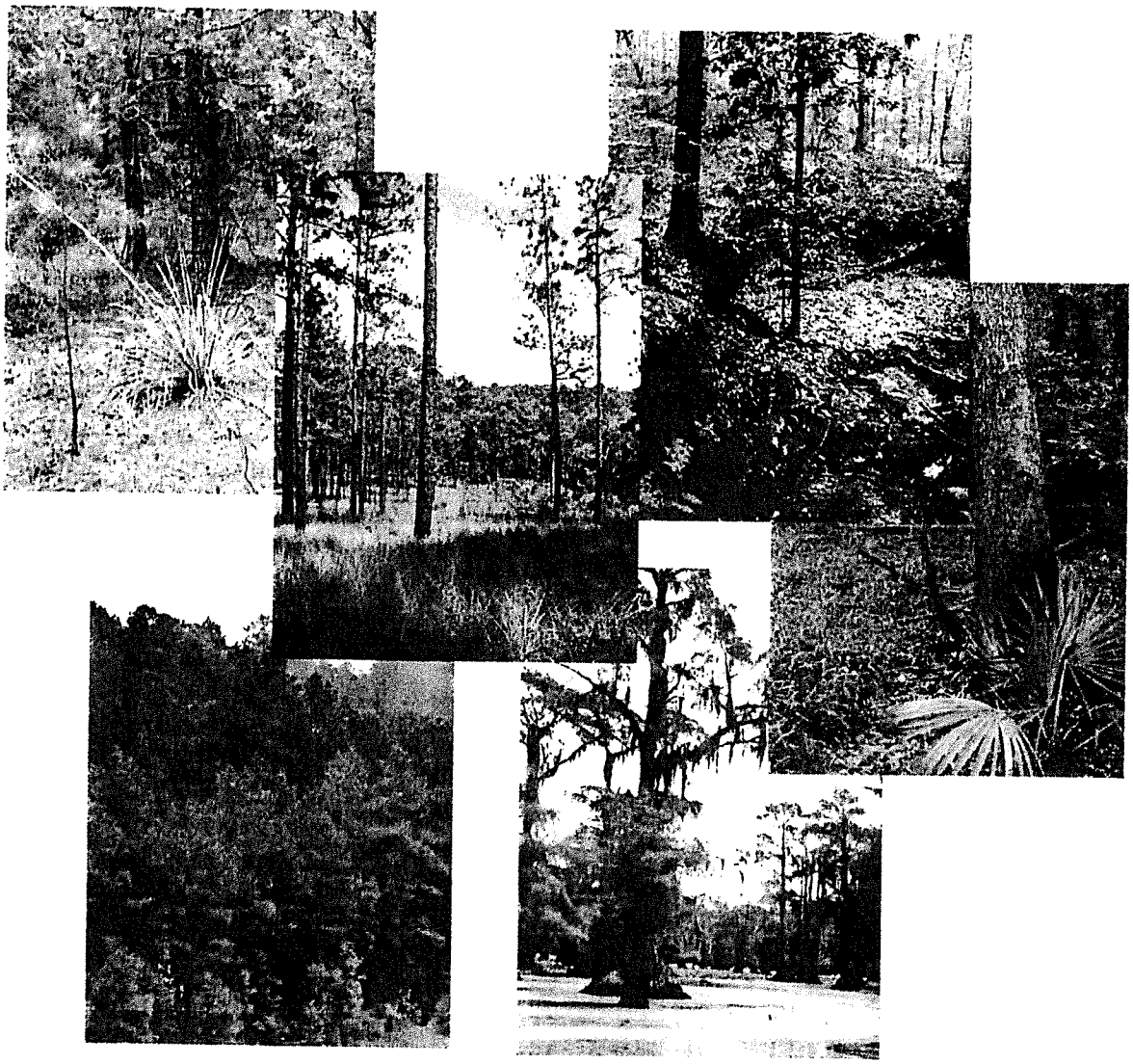
Attachment 2

Ecological Classification System for the National Forests and Adjacent Areas of the West Gulf Coastal Plain, 2nd Approximation, February 2007, San Jacinto Flatwoods Landtype Phases

FIELD GUIDE

ECOLOGICAL CLASSIFICATION SYSTEM

FOR THE NATIONAL FORESTS AND ADJACENT AREAS OF THE WEST GULF COASTAL PLAIN: 2nd APPROXIMATION



STEPHEN F. AUSTIN STATE UNIVERSITY 1923

The Nature Conservancy of Texas

ECOLOGICAL CLASSIFICATION SYSTEM FOR THE NATIONAL FORESTS AND ADJACENT AREAS OF THE WEST GULF COASTAL PLAIN

2nd Approximation

Report submitted in fulfillment of an agreement between Stephen F. Austin State University, The Nature Conservancy, Kisatchie National Forest, and the National Forests and Grasslands in Texas,

Prepared by:

Stephen F. Austin State University
Nacogdoches, Texas

and

The Nature Conservancy
Nacogdoches, Texas

February, 2007

PREFACE

It has been nearly seven years since the release of the first version of the ecological classification system for the national forests and adjacent areas of the West Gulf Coastal Plain. During this time ecological classification has begun to be used as a tool in forest planning and management and pilot studies mapping landtype phases have occurred on limited portions of Kisatchie National Forest. We have indeed taken the first steps toward using a common language —that of ecological units, the LTA and the LTP-- for describing, managing, and protecting the forest resources of the West Gulf Coastal Plain. In our current world of global warming, catastrophic storms and the setbacks and opportunities for forest management that result from them, where we are beginning to recognize that major cities can be threatened by the loss of the fragile wetlands that protect them, the central idea of ecological classification--that land management must take into account the intrinsic ecological characteristics of the particular area being used---is more pertinent than ever. As with the previous edition, a primary goal of this document is to focus the attention of as many natural resource professionals as possible on the ecosystems and natural processes on which we and all other species depend.

The field guide has undergone a number of revisions since its first release in 1999. Additional fieldwork and data collection has enabled us to extend geographic coverage to include both the area of the Caney Ranger District of Kisatchie National Forest in northern Louisiana and the Red River Alluvial Plain--which makes a great swath through the pine forests of western Louisiana where Kisatchie National Forest lies. Numerous photographs now provide examples of ecological units and important plant species. The text throughout the document has been thoroughly checked and extensively revised. Highlights of some of the changes include: Increased recognition in the descriptions of upland ecological units within the historic range of longleaf pine that an alternative mixed-forest plant community--dominant on many modern landscapes--develops on these sites in the absence of fire; incorporation of standard terminology derived from the US Army Corps of Engineers Wetland Delineation Manual to describe the hydrologic regime of all ecological units that experience any type of flooding or saturation of the soil; Changes in the names of certain wetland ecological units, for example "Regularly-Flooded Swamps", to reflect the standardized hydrologic terminology; and the addition of new landtype phases for the Kisatchie Sandstone Hills and the Alluvial Floodplains and Terraces. We also attempted to relate the Texas Landtype Associations with those across the Sabine River in Louisiana, and to map the occurence of Landtype Associations in Louisiana outside of Kisatchie National Forest lands. The results of this effort yielded some surprises; at least two Texas landtype associations, the Lignitic Uplands and the Clayey Uplands, extend across the Sabine River into Louisiana. The product, Figure 3-5, shows the LTAs in their geographic context and will hopefully serve as a starting point for refined description and mapping of Landtype Associations.

Although revised, this fieldguide is by no means final. As was the case with the first draft, it is intended to be a working document. Future changes may include expanding coverage to areas of the West Gulf Coastal Plain not near national forests, developing landtype phase-level maps, and continuing to refine the descriptions of landtype phases and other ecological units. As was the case with the first edition, we hope that this document will provide planners, foresters, and scientists with enhanced understanding of the local ecosystems with which they work and that they be able to use this information to improve their planning, management, or research and to better protect the health and integrity of our forests.

James Van Kley
Stephen F. Austin State University
February 2007

PREFACE TO THE FIRST EDITION

The development of the Ecological Classification System for the national forests of the West Gulf Coastal Plain marks a fundamental shift in the way we think about and manage our forest resources. In the past, different aspects of the forest, such as vegetation, wildlife, water, and soil, were often considered independently of each other. However, planning for multiple uses and management in an ecosystem context requires that we recognize the complexity and interconnectedness of all components that make up a forest. Our actions upon one component will have an effect on all the others. But identifying and describing ecosystems is an extremely difficult task, as we are attempting to mentally reduce intricate, multi-dimensional systems that we do not--and may never--completely comprehend, into simple, understandable categories. The Ecological Classification System is a first attempt to form one common language for describing, managing, and protecting the forest resources across the West Gulf Coastal Plain.

This field guide is designed to be a working document to aid resource planners, foresters, and biologists to better understand the ecosystems occurring on national forest lands and to integrate ecological information into their planning, management, and research activities. Many features are included in this field guide to assist in identifying and mapping lower level ecological land units, including a dichotomous key and descriptions of ecological types, descriptions of key plant species, a summary account of historical vegetation in the region, and regional maps showing geographic locations of higher level ecological units.

We are only just beginning to comprehend the web of interrelationships that make up an ecosystem. As future research brings additional knowledge to light, the Ecological Classification System will be modified and refined to reflect our increased understanding of these natural systems. It is hoped that this document will motivate all that are interested in protecting the health and biological diversity of our forests to focus attention, not just on one or a few species, but on the ecosystems and natural processes upon which these species, and we, depend.

Rick Turner
The Nature Conservancy
July 1999

AUTHORS AND ACKNOWLEDGMENTS

Researchers from Stephen F. Austin State University and The Nature Conservancy in cooperation with the U.S. Department of Agriculture, Forest Service prepared this field guide to the Ecological Classification System for the national forests and adjacent areas of the West Gulf Coastal Plain. Authors who have contributed directly to this field guide include:

James E. Van Kley, Professor,
Department of Biology
Stephen F. Austin State University
Nacogdoches, Texas

Rick L. Turner, Ecologist,
The Nature Conservancy
Nacogdoches, Texas

Latimore S. Smith, Ecologist,
Louisiana Natural Heritage Program
Louisiana Department of Wildlife and Fisheries
Baton Rouge, Louisiana

Robert E. Evans, Botanist,
National Forests and Grasslands in Texas
Lufkin, Texas

Assistance with the development of this publication was provided by staff from The Nature Conservancy, National Forests and Grasslands in Texas, Kisatchie National Forest, and other agencies. Ike McWhorter of The Nature Conservancy and Bill Bartush of the National Forests and Grasslands in Texas assisted with defining the scope of this project and provided administrative support. Philip Hyatt, John Novosad, Susan Carr, David Moore, and Calvin Baker assisted field crews with logistics, site selection, and data collection on Kisatchie National Forest. Guy Nesom of the Texas Regional Institute for Environmental Studies, Sam Houston State University, assisted with site selection and collection of field data on Sam Houston National Forest in Texas. Kevin Mundorff, Mike Dehnisch, and Matt Welch collected field data and assisted with data analysis while pursuing graduate studies at Stephen F. Austin State University.

The authors wish to acknowledge Larry Brown of Houston Community College for assistance in plant identification. The assistance of Raymond Dolezel in classifying soils was greatly appreciated. We would like to thank Scott Beasley of the College of Forestry, Stephen F. Austin State University, for use of the Geographic Information Systems Laboratory. The helpful suggestions of Paul Harcombe of Rice University, Alan Weakley of the Southeast Regional Office of The Nature Conservancy, and Jim Keys and Susan Hooks of the USDA Forest Service Southern Regional Office were also appreciated. Finally, we acknowledge Forest Supervisors Alan Newman, Danny Britt, Ronnie Raum, Lynn Neff, Fred Salinas, and Gretta Boley for their support of the Ecological Classification System.

Citation:

Van Kley J.E., R.L. Turner, L.S. Smith, and R.E. Evans. 2007. Ecological classification system for the national forests and adjacent areas of the West Gulf Coastal Plain: 2nd approximation. The Nature Conservancy and Stephen F. Austin State University, Nacogdoches, Texas, USA. 379pp.

TABLE OF CONTENTS

Page

CHAPTER 1: INTRODUCTION
- Purpose 1-1
- Legislative Background 1-1
- Geographic Applicability 1-2

CHAPTER 2: OVERVIEW OF ECOLOGICAL CLASSIFICATION
- Introduction 2-1
- Habitat Typing 2-2
- Multiple-Factor Ecological Classification Systems 2-2
- Vegetation Studies on the West Gulf Coastal Plain 2-3

CHAPTER 3: CLASSIFICATION HIERARCHY
- Introduction 3-1
- Provinces 3-3
- Sections 3-3
- Subsections 3-5
- Landtype Associations 3-8

CHAPTER 4: HISTORICAL VEGETATION OF THE WEST GULF COASTAL PLAIN
- Introduction 4-1
- Historical Vegetation Patterns 4-1
- Historical Disturbance Patterns 4-8

CHAPTER 5: METHODS
- Introduction 5-1
- Field Reconnaissance 5-1
- Field Sampling 5-1
- Data Analysis 5-3
- Example of Multivariate Analysis and Interpretation 5-3
- Description of Ecological Types 5-4

CHAPTER 6: GENERAL ECOLOGICAL TYPES OF THE WEST GULF COASTAL PLAIN
- Purpose 6-1
- The Three Principal West Gulf Coastal Plain Landscapes 6-1
- Ecological Type Descriptions 6-2

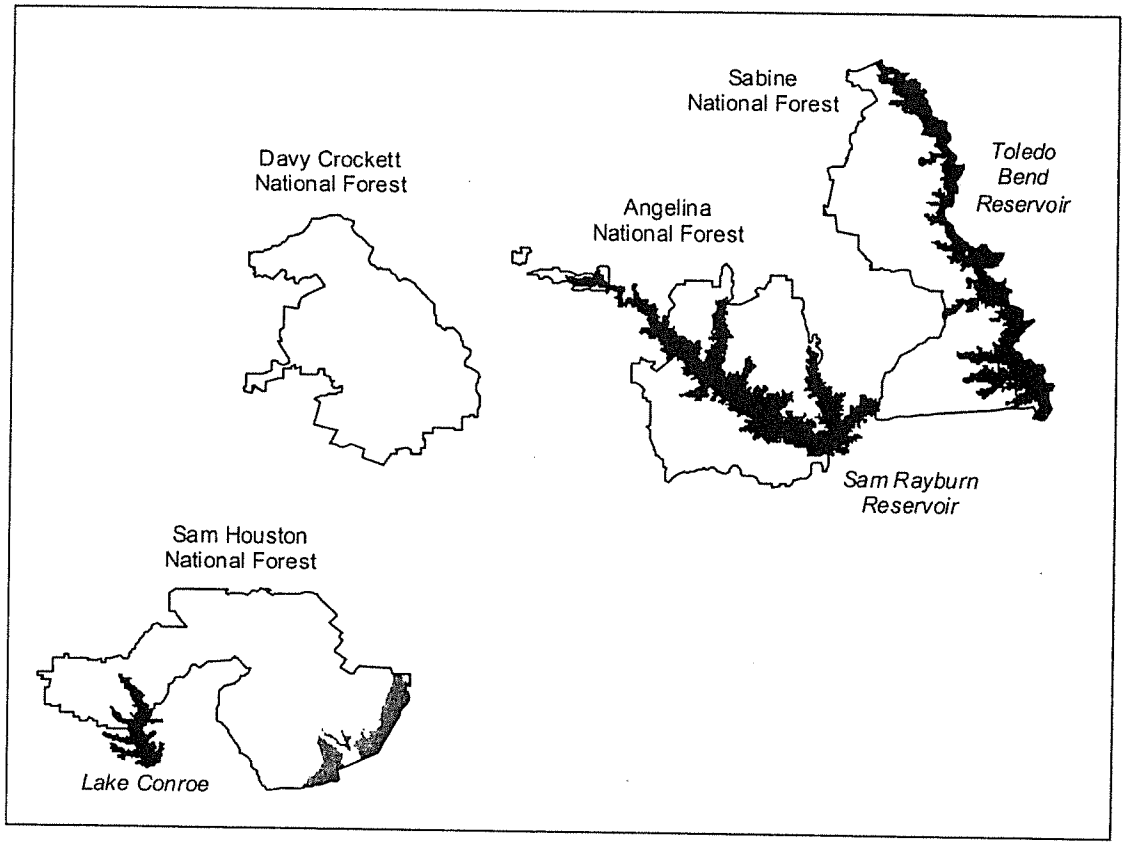
CHAPTER 7: KEYS FOR THE IDENTIFICATION OF ECOLOGICAL UNITS
- Purpose 7-1
- The Ecological Units 7-1
- Required Equipment 7-1
- Using the Keys 7-1
- Terminology Used in the Keys and Descriptions 7-2
- Key to Landtype Associations on the West Gulf Coastal Plain 7-6

CHAPTER 8: 231Ea.8 CANEY LAKES LOAMY UPLANDS LANDTYPE ASSOCIATION
- Photographs of selected Landtype Phases 8-3
- Key to Landtype Phases 8-4
- Landtype Phase Descriptions 8-6

CHAPTER 9: 231Ea.9 NORTH LOUISIANA CLAYEY HILLS LANDTYPE ASSOCIATION
- Photographs of selected Landtype Phases 9-3
- Key to Landtype Phases 9-4
- Landtype Phase Descriptions 9-6

CHAPTER 15

231Ei.18 SAN JACINTO FLATWOODS LANDTYPE ASSOCIATION



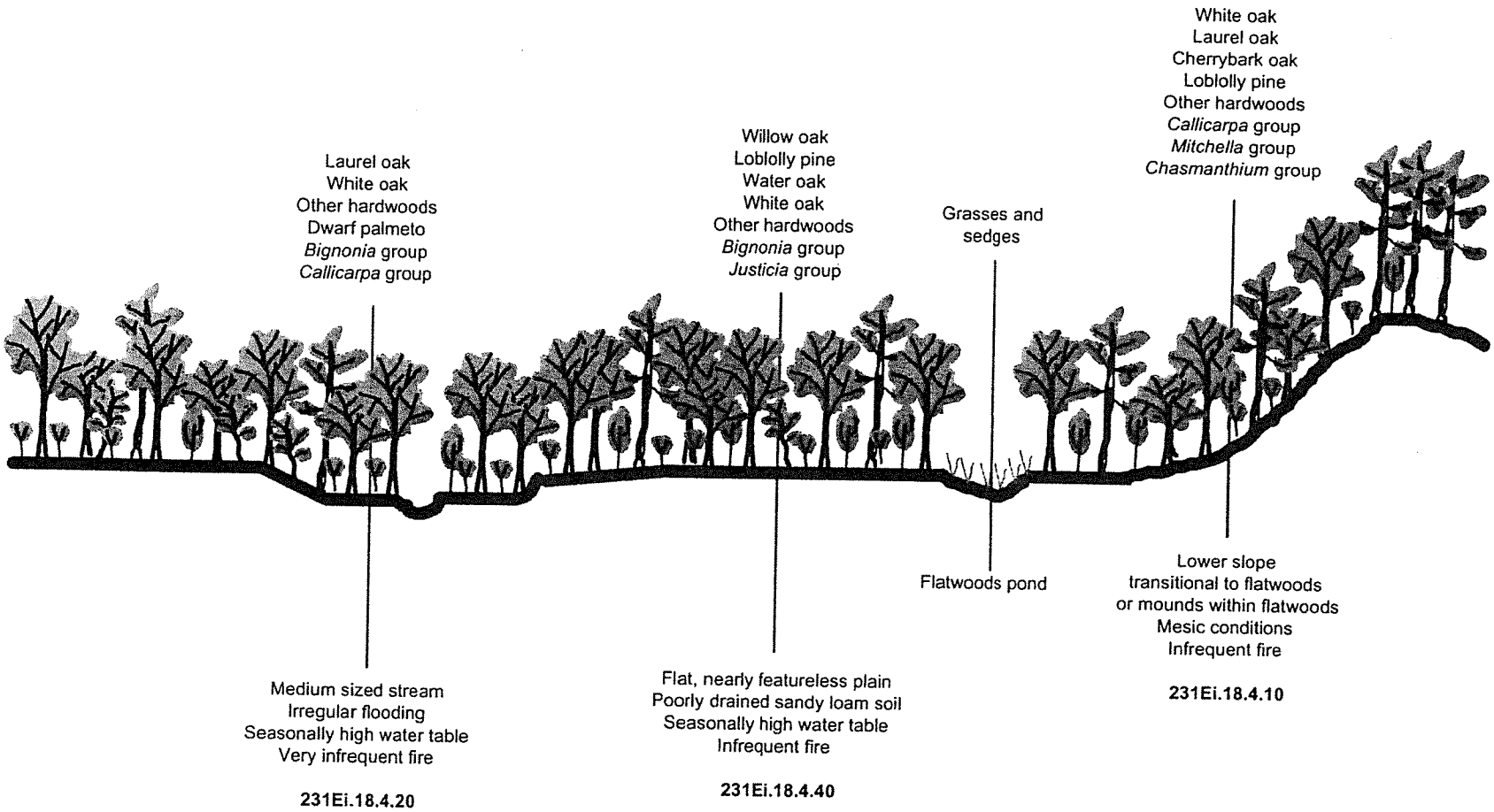
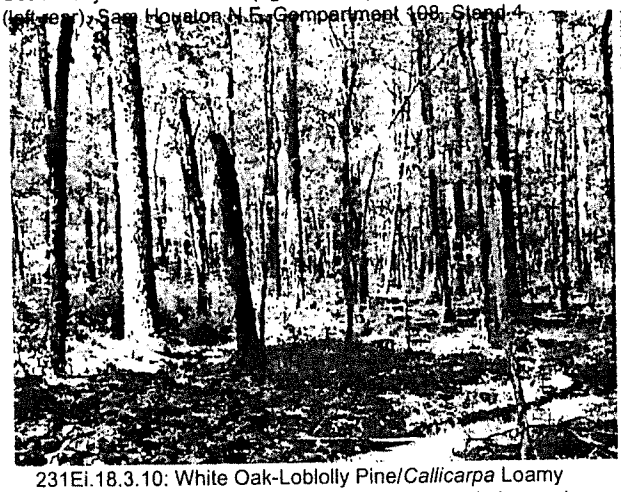


Figure 15.1 Landscape profile of ecosystems on the San Jacinto Flatwoods Landtype Association.

231Ei.18 SAN JACINTO FLATWOODS LANDTYPE ASSOCIATION

231Ei.18.4.40: Willow Oak-Loblolly Pine/*Justicia-Bignonia* Loamy Seasonally Wet Flatwoods (right & front), with pimple mound area (left rear), Sam Houston N.F. Compartment 108, Stand 4



231Ei.18.3.10: White Oak-Loblolly Pine/*Callicarpa* Loamy Mesic Lower Slopes, Mounds, & Terraces, Gentle lower slope, (Sam Houston N.F. Compartment 108, Stand 4)

231Ei.18.3.10: White Oak-Loblolly Pine/*Callicarpa* Loamy Mesic Lower Slopes, mounds, and Terraces, Pimple mound in flatwoods area, (Sam Houston N.F., Compartment 108, Stand 4)

231Ei.18.4.40: Willow Oak-Loblolly Pine/*Justicia-Bignonia* Loamy Seasonally Wet Flatwoods, (Both photos: Sam Houston N.F. Compartment 108, Stand 4)

KEY TO LANDTYPE PHASES

1a. Nearly level, almost featureless plains (flatwoods) with poorly-defined drainage patterns. Soils are deep, poorly drained sandy loams to sandy clay loams. Drainage mottles are present in the subsoil. Soils are saturated or ponded in winter and spring, but tend to become droughty in summer. Soils Include Kirbyville and Pluck. Natural overstory includes willow oak, loblolly pine, swamp chestnut oak, red maple, sweetbay magnolia, and swamp tupelo. The *Justicia* and *Bignonia* groups are common. ..... 231Ei.18.1.50 Willow Oak-Loblolly Pine/*Justicia-Bignonia* Loamy Seasonally Wet Flatwoods

1b. Sites are **either** irregularly flooded stream floodplains **or** slopes, terraces, and pimple mounds that occur on or adjacent to nearly level, flatwoods plains. 2

2a. Loamy slopes, terraces, and pimple mounds that occur on or adjacent to nearly level, almost featureless plains (flatwoods),or adjacent to bottoms of minor streams. Soils are variable, ranging from loamy sand to silt loam over loamy or clayey subsoil. Soils Include Dallardsville, Kirbyville, and Pinetucky. Flooding is absent or intermittent due to the slightly higher elevation above the flatwoods. Natural overstory contains a diverse mixture of hardwoods mixed with pine, including white oak, laurel oak, American beech, southern magnolia, loblolly pine, and shortleaf pine. The *Callicarpa* group is common and the *Mitchella* group may be present..... 231Ei.18.3.10 White Oak-Loblolly Pine/*Callicarpa* Loamy Mesic Lower Slopes, Mounds and Terraces

2a. Nearly level to gently sloping, moderately wide floodplains of intermediate-sized streams. Irregular flooding occurs, and old stream channels and depressions may be nearly permanently saturated. Soils are loamy sand to sandy loam over heterogeneous parent material. Drainage mottles are common throughout the soil profile. Soils Include Hatliff, Pluck, and Kian. Natural overstory includes water oak, cherrybark oak, southern magnolia, and sweetgum. The *Bignonia* group is common; the *Mitchella* group is present on slightly elevated areas; the *Justicia* group is present in wet depressions. ..... 231Ei.18.4.20 Water Oak-Southern Magnolia/*Bignonia* Loamy Wet-Mesic Stream Bottoms

DESCRIPTIONS OF LANDTYPE PHASES

231Ei.1.1 Sandy/Loamy Uplands Landtype

231Ei.18.1.50 Willow Oak-Loblolly Pine/*Justicia-Bignonia* Loamy Seasonally Wet Flatwoods Landtype Phase

Geographic Range: Located in the southwestern corner of the east Texas Pineywoods Including the extreme southeastern portion of Sam Houston National Forest, south and east of a line from State Highway 105 at Peach Creek northeast to the confluence of Winters Bayou and the East Fork of the San Jacinto River, then north-northeast to the Trinity River at Livingston Dam.

Geology: Occurs on the Lissie formation, which is characterized by fine-textured sands, nearly featureless plains, and streams with broad, shallow valleys. Terrain is level to very gently undulating.

Landform: Occurs on nearly level to very gently sloping, broad plains with poorly-defined drainage patterns. Flatwoods may cover extensive acreages. Much of the landscape exhibits undulating microtopography, indicated by the presence of flatwoods ponds and pimple mounds.

Soil Characteristics: Soils have a deep, somewhat poorly drained, moderately permeable sandy loam surface soil over sandy clay loam subsoil. Drainage mottles occur in the subsoil. A seasonal water table occurs near the surface in winter and spring, but soils may become droughty during the summer and fall. Surface soil reaction is neutral to strongly acid, and nutrient content is moderate. Soils include the Kirbyville and Pluck series.

Hydrology: The nearly level topography and lack of well-defined drainages results in soils that are seasonally saturated, with areas of ponding especially in winter and spring. However, during the summer and fall, the moderately permeable surface soils tend to become droughty. Prolonged saturation of soils creates anoxic conditions that favor obligate wetland species. Slight elevation differences (<1m) associated with the undulating microtopgraphy greatly influence plant species composition.

Natural Disturbances and Processes: Seasonally high water tables alternating with periods of drought are the primary influences on this landtype phase. Windstorms may uproot or damage overstory trees. Succession occurs mainly through individual tree mortality and gap-phase dynamics. The historical importance of fire on this landscape has not been fully determined although fire occurred frequently on longleaf pine-dominated flatwoods to the east in southeast Texas and southwest Louisiana.

Ground Layer Species: Species from the *Justicia* and *Bignonia* groups are common with the *Justicia* group dominant in moist depressions and around the edges of flatwoods ponds, and the *Bignonia* group occupying areas with slightly better drainage.

Overstory Tree Species: The overstory is dominated by willow oak, laurel oak, and loblolly pine, with water oak, white oak, green ash, and Swamp chestnut oak as associates. Red maple, sweetbay magnolia, and swamp tupelo are abundant in wetter depressions.

Understory Tree Species: Common species include green ash saplings and American holly.

Shrub Species: Common buttonbush, southern arrowwood, yaupon, wax-myrtle, and Gulf sebastiana are common species.

Site Inclusions: Within this landtype phase, a range of microsite types may be found, including herb-dominated flatwoods ponds and pimple mounds with mesic hardwood-pine communities. Larger mounds are classified as 231Ei.18.3.10.

Similar LTPs: 231Ei.18.4.20 floods irregularly and occurs on small stream bottoms, and the *Callicarpa* group is common. Mesic site inclusions (small mounds) within the flatwoods may resemble 231Ei.18.3.10.

Special Conditions: Large areas of flatwoods in southeastern Texas were once supported longleaf pine communities, although it is not known how far west of the Trinity River that these communities extended.

231Ei.18.3 Mesic Slopes and Terraces Landtype

Am. Beauty berry

231Ei.18.3.10 White Oak-Loblolly Pine/*Callicarpa* Loamy Mesic Lower Slopes, Mounds, and Terraces Landtype Phase

Geographic Range: Located in the southwestern corner of the east Texas Pineywoods Including the extreme southeastern portion of Sam Houston National Forest, south and east of a line from State Highway 105 at Peach Creek northeast to the confluence of Winters Bayou and the East Fork of the San Jacinto River, then north-northeast to the Trinity River at Livingston Dam.

Geology: Occurs on the Lissie formation which is characterized by fine-textured sands, nearly featureless plains, and streams with broad, shallow valleys. Terrain is level to gently undulating.

Landform: Occurs on gentle slopes and terraces and on pimple mounds that occur in or adjacent to flatwoods. Slope shape is concave to linear, except for pimple mounds, which are convex. Slope gradients are nearly level to gentle.

Soil Characteristics: Soils are variable. Textures range from loamy sand to sandy loam, loam, to silt loam over a loamy or clayey subsoil. Surface soils have very low to moderate nutrient content. Surface soil reaction is neutral to medium acid. Drainage mottles are present in the subsoil. Soils include Dallardsville, Kirbyville, Pinetucky, and similar soils.

Hydrology: Due to the low relief and proximity to flatwoods and streams, soils tend to remain moist, moderating the effects of droughts. The slightly higher elevation, often only a few meters, above the surrounding plain reduces the effects of flooding. As a result, species that are adapted to mesic site conditions dominate.

Natural Disturbances and Processes: Fire is infrequent. Most succession occurs through individual tree mortality and gap-phase dynamics.

Ground Layer Species: Species from the *Callicarpa* and *Chasmanthium* groups are common. The *Mitchella* group is an important indicator for these sites. On sites with a mature, closed overstory canopy, the herbaceous cover may be sparse.

Overstory Tree Species: The overstory contains a diverse mixture of hardwoods and pines. Important overstory trees include white oak, laurel oak, southern red oak, cherrybark oak, water oak, sweetgum, white ash, red maple, blackgum, mockernut hickory, and bitternut hickory. Loblolly pine and shortleaf pine are also important trees. American beech and southern magnolia occur on some sites and these species may have been more common historically.

Understory Tree Species: Common species include American holly, winged elm, American hornbeam, eastern hophornbeam, and flowering dogwood.

Shrub Species: Southern arrowwood, farkleberry, common sweetleaf, and yaupon are common.

Similar LTPs: 231Ei.18.4.20 occurs on stream bottoms and has wetter soils.

231Ei.18.4 Minor Stream Bottoms Landtype

231Ei.18.4.20 Water Oak-Southern Magnolia/*Bignonia* Loamy Wet-Mesic Stream Bottoms Landtype Phase

Geographic Range: Located in the southwestern corner of the east Texas Pineywoods Including the extreme southeastern portion of Sam Houston National Forest, south and east of a line from State Highway 105 at Peach Creek northeast to the confluence of Winters Bayou and the East Fork of the San Jacinto River, then north-northeast to the Trinity River at Livingston Dam.

Geology: Occurs on recent (Holocene) alluvial sands, silts, and loams associated with the floodplains of second- and third-order perennial streams.

Landform: Occurs on level, moderately wide floodplains of intermediate-sized perennial streams. Slope shape is concave to linear, and slope gradients are nearly level to very gentle. Microtopography on some sites consists of numerous small depressions, drainage channels, and mounds.

Soil Characteristics: Soils are developed from loamy alluvial material washed from the upstream Willis and Fleming formations. They are generally moderately well drained to poorly drained, and permeability is moderate to moderately rapid. Surface soil reaction is neutral to strongly acid. A seasonal water table is near the surface in winter and spring. Drainage mottles occur throughout the soil profile. Soils include Hatliff, Pluck, and Kian series.

Hydrology: The streams associated with this landtype phase drain a moderately large watershed, so irregular flooding can occur. In addition, a seasonally high water table can develop near the surface during the winter and spring.

Natural Disturbances and Processes: Fire is very infrequent on stream floodplains. Erosion and deposition constantly change the course of stream channels and can undercut banks and cause trees to fall. At the same time, new deposits of alluvial material are colonized by vegetation.

Ground Layer Species: Species from the *Bignonia* group are common. Species from the *Callicarpa* and *Mitchella* groups may be present on some sites.

Overstory Tree Species: The overstory contains a diverse mixture of hardwoods along with pine. Important overstory trees include laurel oak and white oak, southern red oak, cherrybark oak, water oak, sweetgum, white ash, blackgum, mockernut hickory, and bitternut hickory. Loblolly pine is also an important component of the overstory. American beech and southern magnolia occur on some sites, and these species may have been more common historically.

Understory Tree Species: Common species include Carolina laurelcherry, American hornbeam, and winged elm.

Shrub Species: Shrubs include dwarf palmetto, American beautyberry, two-wing silverbell, and yaupon.

Site Inclusions: Slight differences in elevation, less than 1 meter, may have a profound influence on species composition. Small ridges and mounds may contain species more characteristic of mesic lower slopes while wet depressions and channels provide habitat for obligate wetland species.

Similar LTPs: 231Ei.18.1.50 may also experience wet soils or flooding but occurs on broad, nearly level plains (flatwoods), and the *Justicia* group is more common.

Attachment 3

Ground-Water Resources of San Jacinto County, Texas, February 1947

TEXAS BOARD OF WATER ENGINEERS

C. S. Clark, Chairman
John W. Pritchett, Member
E. V. Spence, Member

GROUND-WATER RESOURCES OF SAN JACINTO COUNTY, TEXAS

By W. H. Alexander, Jr.

Prepared in cooperation with the United States Department of the Interior, Geological Survey

February 1947

CONTENTS

	Page
Introduction	1
Location and extent of area	1
Economic development	1
Precipitation	2
Acknowledgments	4
Occurrence and movement of ground water	4
General principles	4
Geologic formations and their water-bearing properties	5
Miocene and Pliocene series	6
Catahoula sandstone	6
Oakville sandstone and Lagarto clay	6
Willis sand (and Goliad sand?)	6
Pleistocene and Recent series	7
Lissie formation	7
Beaumont clay	7
Alluvial deposits	7
Present development of water supplies from wells	7a
Northern part of the county, Staley (Embryfield), Oakhurst, and Pointblank areas	7a
Central and southwestern parts of county, Coldspring, Camilla, Evergreen, and Everitt areas	7b
Extreme southwestern part of county	7b
Southeastern part of county, Shepherd and Urbana areas	7b
Well records	8
Drillers' logs	20
Analyses	26

ILLUSTRATIONS

Plate 1. Map of San Jacinto County, Texas showing locations of water wells and springs

Figure 1. Geologic map of San Jacinto County, Texas.
2. Geologic cross-section A-A' San Jacinto County, Texas.

Precipitation

According to records of the United States Weather Bureau the average annual precipitation at Huntsville, the nearest station with a long-time record, during 63 years was 44.31 inches. Among the wettest years were 1891 with 58.22 inches; 1900 with 69.79 inches; 1923 with 58.22 inches; 1929 with 58.50 inches; 1935 with 56.62 inches; 1940 with 59.24 inches; and 1941 with 60.18 inches. The driest years include 1859 with 23.93 inches; 1901 with 28.62 inches; 1906 with 29.25 inches; 1917 with 17.93 inches; 1924 with 31.30 inches; and 1928 with 32.00 inches. The following table gives the U. S. Weather Bureau records of precipitation at Huntsville, Walker County, Texas, by months.

Precipitation in inches 1859 to 1945, at Huntsville, Walker County, Texas,

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
1859	2.20	.54	2.35	.82	1.22	4.18	2.40	.72	4.43	1.67	.53	2.87	23.93
1882	-	-	-	3.04	5.42	1.39	.99	3.13	5.12	8.62	-	-	27.71
1883	-	-	-	1.72	2.35	4.24	1.55	.95	2.00	2.23	-	-	15.04
1884	-	-	-	2.50	13.35	1.51	.0	.03	2.81	-	-	-	20.60
1885	-	3.01	4.51	7.45	6.33	.71	3.10	3.02	5.37	.33	2.26	3.88	39.97
1886	2.31	3.05	3.89	3.62	.60	3.36	1.13	2.18	3.37	0	-	-	23.51
1887	-	-	-	-	2.67	2.88	1.24	1.71	3.33	4.57	-	-	16.40
1888	-	-	-	3.54	7.50	7.40	2.94	1.05	1.16	2.59	-	-	26.18
1889	7.49	2.14	3.41	3.37	2.30	7.64	2.32	1.96	2.67	.02	6.49	.40	40.21
1890	10.46	3.92	4.38	8.32	2.86	3.24	3.02	4.85	3.11	3.62	3.52	1.73	53.03
1891	10.06	3.56	2.07	13.74	1.69	1.59	3.61	4.09	4.64	.10	4.49	8.58	58.22
1892	5.25	2.00	2.49	2.91	2.97	10.82	2.70	7.35	.33	2.19	7.22	5.96	52.19
1893	1.20	.75	1.20	2.15	4.74	9.93	1.00	4.40	.23	.30	5.60	1.15	32.65
1894	3.54	2.64	4.35	2.45	1.60	3.82	1.19	6.13	6.35	.46	.65	3.11	36.29
1895	3.00	4.75	3.49	2.40	13.06	7.74	1.25	.89	1.10	5.41	2.60	2.70	48.45
1896	6.94	6.77	2.08	2.00	2.35	.45	1.42	.92	4.85	4.64	2.42	1.50	36.34
1897	4.55	.18	3.90	1.73	1.50	2.17	.30	2.98	3.44	5.86	1.78	4.25	32.64
1898	4.43	5.15	3.53	5.00	5.65	6.82	3.26	4.19	.98	6.60	4.14	3.47	53.22
1899	3.08	1.83	2.35	2.23	1.20	9.42	4.05	.33	2.48	3.35	1.55	8.06	39.93
1900	5.19	4.38	9.15	6.30	6.69	3.22	7.12	8.87	6.84	1.91	8.45	1.67	69.79
1901	1.15	3.96	4.08	3.08	3.85	2.34	2.35	1.11	1.40	.93	1.82	2.55	28.62
1902	1.68	2.52	3.14	2.95	4.31	3.27	11.90	.33	6.76	8.53	6.35	2.15	53.89
1903	5.00	7.47	5.67	1.31	2.44	4.11	5.42	1.12	1.40	4.39	1.44	3.83	43.60
1904	1.63	1.92	.58	2.30	6.46	3.91	7.80	1.87	1.34	1.54	1.34	6.45	37.14
1905	2.29	5.34	10.58	8.73	3.29	5.58	3.02	.10	.47	1.72	6.11	4.72	51.95
1906	3.45	2.53	.69	.82	2.08	3.71	6.05	1.79	1.55	2.26	1.15	3.17	29.25
1907	1.72	3.30	2.46	5.69	13.28	T	1.11	1.00	1.81	7.94	11.25	3.70	53.26
1908	1.83	5.26	1.95	7.71	10.92	1.58	.73	1.31	4.37	2.35	4 23	.47	42.71
1909	.55	2.03	2.81	3.02	10.06	2.25	1.38	.64	.18	3.07	2.11	4.90	33.00
1910	1.02	4.41	.83	6.48	4.35	4.66	5.77	.65	2.09	2.05	2.39	7.11	41.81
1911	T	3.04	4.08	11.33	2.49	3.26	3.87	.95	3.83	1.78	2.74	11.19	48.56
1912	2.08	3.04	6.14	4.14	1.88	4.68	2.22	2.32	.48	1.47	1.94	6.10	36.49
1913	1.90	4.99	3.37	3.34	2.90	2.00	T	1.01	7.16	7.81	2.44	3.82	46.80
1914	.72	5.65	6.20	9.54	4.82	.37	1.12	7.14	2.08	1.34	6.90	7.92	53.80
1915	5.04	2.62	1.55	8.51	.82	2.18	3.33	6.94	.84	.28	2.86	4.03	39.00
1916	4.23	T	.40	3.00	11.05	2.90	7.19	1.35	3.08	.58	2.68	1.55	38.01
1917	3.60	2.88	.94	3.22	1.55	.90	1.05	.45	1.57	.60	1.17	T	17.93
1918	.67	3.65	1.60	5.41	2.30	2.55	3.00	5.10	1.90	6.17	8.03	2.43	43.21
1919	2.70	5.15	2.73	2.55	10.58	8.36	1.95	8.10	2.65	8.35	1.50	1.15	55.77
1920	8.90	2.55	1.65	1.15	5.12	5.80	3.18	5.15	1.35	3.53	3.45	3.55	45.38
1921	2.50	3.95	4.35	10.85	1.30	12.75	5.20	2.65	1.50	.08	1.52	3.91	50.56
1922	5.94	4.01	8.16	8.65	8.10	4.70	1.20	3.60	.60	1.00	6.72	1.20	53.88
1923	2.50	7.04	4.20	5.95	6.35	2.95	.70	2.83	7.45	1.70	5.60	10.65	58.22

GROUND-WATER RESOURCES OF SAN JACINTO COUNTY, TEXAS

By

W. H. Alexander, Jr.

February 1947

INTRODUCTION

Location and extent of area

San Jacinto County is a part of the Gulf Coastal Plain in southeastern Texas and the south boundary of the county is about 70 miles from the Gulf Coast. It is bounded on the north and east by Trinity and Polk Counties, the Trinity River being the boundary line; on the south by Liberty County; and on the west by Walker and Montgomery Counties. The land surface is gently rolling to hilly except along the Trinity River where there are extensive areas of flat floodplain and terraces. The minimum elevation is about 90 feet above sea level on the floodplain of the Trinity River at the southeastern corner of the county and the maximum elevation is about 400 feet in the western portion of the county. The county has an area of 619 square miles and in 1940, according to the U. S. Bureau of the Census, had a population of 9,056, an average of 15 persons per square mile. The three most important towns and their population in 1940 are as follows: Coldspring (county seat), 500; Shepherd, 500; and Oakhurst, 500.

Economic development

Lumbering and the production of timber for pulpwood are the main industries of San Jacinto County. A portion of the county, about 100 square miles, is now included in the Sam Houston National Forest. The production of oil is also important, the total production for the county having been 3,241,801 barrels in 1945 and 1,021,787 barrels from 41 wells in 1946, according to the "Oil Weekly". Other mineral resources are natural gas, sand, and gravel. Agriculture is diversified, the most important crops being cotton, feed, and fresh vegetables. Beef cattle and hogs are the major livestock products. Dairying is also an important industry.

Precipitation in inches, 1859 to 1945, at Huntsville, Walker County--Continued

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
1924	2.80	3.80	3.60	7.20	5.30	2.30	0	T	2.60	0	1.20	2.50	31.30
1925	2.20	T	.60	1.05	2.20	1.00	3.80	1.30	2.70	16.30	12.50	2.20	45.85
1926	6.20	.40	8.80	8.90	4.00	4.20	5.10	2.40	.50	2.10	2.60	8.40	53.60
1927	.80	3.70	7.90	4.90	3 50	7.40	2.00	0	.50	7.70	2.60	4.30	45.30
1928	1.00	3.50	4.50	3.70	1.30	3.40	4.40	.30	.20	2.40	4.80	3.30	32.00
1929	5.10	3.80	3.70	5.20	19.00	1.00	7.00	1.00	1.00	4.90	5.10	1.70	58.50
1930	5.90	2.70	4.40	.20	4.80	1.30	.90	2.20	2.70	7.10	6.20	3.60	42.00
1931	3.80	7.30	4.70	3.50	4.80	2.90	1.90	1.10	.40	2.40	3.70	6.60	43.10
1932	9.50	6.64	5.00	1.90	1.30	1.77	.70	2.47	.40	.40	1.50	6.75	38.33
1933	2.79	5.05	2.90	2.50	2.60	1.01	2.88	3.70	3.28	2.45	1.40	4.31	34.87
1934	7.25	4.68	3.89	5.75	1.80	.70	2.20	.60	5.10	0	7.00	4.30	43.27
1935	2.20	2.95	3.21	6.41	13.85	4.41	4.16	4.91	3.38	1.17	4.09	5.88	56.62
1936	.42	2.47	.87	2.70	7.97	3.29	13.05	2.35	1.36	4.13	2.38	2.58	43.87
1937	6.40	T	4.26	2.88	.34	2.73	2.05	3.70	4.36	4.37	5.38	3.61	40.08
1938	3.95	1.90	4.64	2.65	4.90	4.32	3.23	1.26	4.45	.33	7.96	3.29	42.88
1939	6.50	6.85	1.04	1.53	3.55	11.98	1.38	.75	2.89	2.83	3.23	4.73	47.26
1940	1.37	3.91	.73	3.95	3.92	11.24	.75	3.19	1.55	3.86	16.61	8.96	59.24
1941	2.98	5.92	3.53	6.01	5.50	9.25	4.99	1.45	7.40	8.67	3.14	1.34	60.18
1942	1.17	1.96	1.45	7.11	4.00	5.61	4.87	7.98	6.31	2.09	2.31	5.48	50.34
1943	3.92	.23	2.70	1.15	4.95	2.96	11.80	.63	4.64	2.96	2.92	4.84	43.70
1944	8.44	3.00	3.41	1.58	8.73	2.13	.32	5.09	.94	0	7.62	5.81	47.07
1945	4.40	5.32	4.90	8.59	3.73	4.38	5.37	9.40	1.96	4.39	1.79	2.46	56.60

Acknowledgments

The writer is indebted to many persons who have contributed information for this report. The representatives of several oil companies, city and county officials, and water-well drilling contractors furnished well logs and other important data.

The work was done under the general direction of W. N. White, district engineer in charge of ground-water investigations in Texas.

The water analyses were made under the supervision of W. W. Hastings, district chemist of the Quality of Water Division of the U. S. Geological Survey. The results of the analyses, which relate to the mineral constituents in the water and not to its sanitary character, are tabulated in parts per million on pages 26 to 29.

OCCURRENCE AND MOVEMENT OF GROUND WATER

General principles

For discussion of the fundamental principles of the occurrence and movement of ground water the reader is referred to papers by Meinzer and Wenzel 1/.

1/ Meinzer, O. E., The occurrence of ground water in the United States: U. S. Geol. Survey Water-Supply Paper 489, 1923; Outline of methods for estimating ground-water supplies: U. S. Geol. Survey Water-Supply Paper 638-C, pp. 99-145, 1931.
Wenzel, L. K., Methods for determining permeability of water-bearing materials: U. S. Geol. Survey Water-Supply Paper 887, 1942.
Meinzer, O. E., and Wenzel, L. K., Physics of the Earth, vol. 9, Hydrology, pp. 385-478, McGraw-Hill, New York, 1942.

Ground water is derived chiefly from water that falls as rain and snow. A part of the water from precipitation runs off in streams; a part is returned to the atmosphere by evaporation and transpiration of trees and other plants; and a part sinks to the zone of saturation, in which all the interstitial openings of the rocks are filled with water.

In most places ground water is slowly but steadily moving under the influence of gravity from areas of intake to areas of discharge. In the more permeable rocks, such as coarse sand, gravel, and cavernous limestone, the water moves with comparative freedom although the movement generally is very slow as compared to the flow of a stream. Such rocks are capable of yielding abundant supplies of water to wells. In less permeable rocks, such as shale or clay, molecular attraction retards the movement of the water, which may be almost infinitely slow. Such rocks yield little or no water to wells.

In the outcrop areas of water-bearing beds, the water is usually unconfined and does not rise in wells above the water table, which is the upper surface of the zone of saturation and the level at which water is first encountered.

The water table is not a level surface, but it usually slopes in about the same direction as the slope of the land surface. It is generally high under areas of ground-water intake and low under areas of ground-water discharge. The land surface in places is lower than the water table in adjacent areas and in such localities some of the ground water emerges as springs. In some localities perched water accumulates above the main zone of saturation, supported by local bodies of relatively impermeable material, especially during the winter and spring when the rates of evaporation and transpiration are low. Such supplies are usually small and are not dependable.

In areas down the dip of the water-bearing beds where the rocks are under cover and inclined between relatively impermeable strata, the water usually is under artesian pressure and will rise in wells above the level at which it is first enccuntered. If the altitude to which the water will rise is greater than the altitude of the land surface, flowing wells may be obtained.

The rocks underlying San Jacinto County tc depths of at least 2,000 feet consist chiefly of clays and shales interbedded with sands. The beds are inclined, the dip being toward the scutheast in the direction of the Gulf. The general slope of the land surface is also toward the southeast. Hence, artesian conditions occur in all parts of the county and in lowland areas wells of adequate depth have a flow. The valley of the Trinity River is well known for its flowing wells, which range from about 100 tc 830 feet in depth.

Most wells are subject to water-level fluctuations of varying magnitude. These fluctuations are due to many different causes, but most of them are a manifestation of a change in the ratio between the rate of groundwater intake or recharge and the rate of loss or discharge. Most water-table wells are supplied in part from intake areas close at hand and respond with a moderate lag to changes in rainfall. In very shallow wells the water level may rise several feet after heavy rains and decline until the wells go dry during prolonged droughts. Artesian wells that draw from sand or sandstone at considerable distances from the outcrops of the water-bearing beds seldom are affected by seasonal or yearly changes in rainfall, although if not too far from the outcrop they may respond to the effect of a series of wet or dry years. Usually, however, the major fluctuations in pressure in artesian wells and accompanying rise and fall in water levels are due to withdrawals of ground water from the well itself or from other wells that tap the same water-bearing beds.

When a well is pumped the water level in the well drops and a hydraulic gradient is developed toward the well from all directions. It is this hydraulic gradient that causes water to flow toward the well. Within limits the amount of water that will enter a well varies directly with the amount the water level is lowered. For example, if a pumped well in fairly permeable material will yield 50 gallons a minute when the water level is lowered 10 feet, it will yield about 100 gallons a minute when the water level is lowered 20 feet. This ratio between the drawdown and the yield of the well is called the specific capacity and is generally expressed as the yield in gallons a minute per foot of drawdown. The ratio is a very useful gage of the productivity of a well.

Large withdrawals of ground water are sure to be accompanied by a general lowering of the water table or artesian pressure, a cone of depression gradually spreading out in all directions from the center of pumping until large areas may be effected. However, this is usually considered not very serious unless the rate of decline persists without a corresponding increase in the rate of pumping or the trend is such as to indicate that the pumping lift may eventually exceed the economic limit. In some areas beds that carry fresh water contain salty water downdip or are overlain by beds carrying salty water, and excessive pumping may lead to the invasion of salt water into the wells.

GEOLOGIC FORMATIONS AND THEIR WATER-BEARING PROPERTIES

With the exception of the alluvial deposits along the Trinity River, the rocks that crop out in San Jacinto County are of Miocene, Pliocene, and Pleistocene age and belong to the Catahoula sandstone, Oakville sandstone, Lagarto clay, Willis sand, Lissie formation and Beaumont clay (see geologic map, fig. 1). These rocks are underlain in downward succession by the Jackson and Yegua formations of Eocene age, and by still older rocks. The Oakville sandstone and Lagarto clay have not been differentiated east of the Brazos River on the U. S. Geological Survey map of Texas and are considered in this report as though they were one unit. The rocks of the Jackson and Yegua formations crop out in Walker, Trinity, and Polk Counties, and a

part of the outcrop area is shown on the geologic map. The Goliad sand has not been identified in outcrop in this part of Texas, but it may be present and hidden by overlap of younger formation.

The information given below is based in part on Bulletin 3232 of the Texas Bureau of Economic Geology 2/, in part on recent articles in the Bulletin of the

2/ Sellards, E. H., Adkins, W. S., and Plummer, F. B., The geology of Texas, Vol. 1, Stratigraphy: Texas Univ. Bull. 3232, pp. 710-795, 1932.

American Association of Petroleum Geologists, and in part on well logs obtained by the writer.

Beginning with the Catahoula sandstone the rocks are listed in the order in which they were deposited, or in age from oldest to youngest. This is the order in which the outcrops are successively crossed in traveling over the area from northwest to southeast.

Miocene and Pliocene series

Catahoula sandstone.- The beds of the Catahoula sandstone (Miocene) which crop out in Walker, northern San Jacinto, southern Trinity, and northern Polk Counties, dip southeastward toward the Gulf at the rate of about 100 feet to the mile (see fig. 2). The lower part of this formation is characterized by beds of coarse, cross-bedded sandstone, in places cemented with white porcelaneous opaline silica. The upper portion is characterized by beds of volcanic ash, fuller's earth and tuffaceous clays 3/. Data obtained from oil tests indicate

3/ Sellards, E. H., op. cit., pp. 710-727.

that the Catahoula has a total thickness of about 1,200 feet in northern San Jacinto County 4/.

4/ Ellisor, Alva C., Anahuac formation: Am. Assoc. Pet. Geologists Bull. Vol. 28, pp. 1355-1375, 1944.

Oakville sandstone and Lagarto clay.- The Oakville sandstone (Miocene) and Lagarto clay (Miocene?) crop out in a belt more than 15 miles wide, paralleling and just south of the outcrop of the Catahoula sandstone, and comprising about half of San Jacinto County. These beds also dip southeastward toward the Gulf, but at a rate which appears to range from about 100 feet to the mile in the northern part of the county to 50 or 60 feet to the mile in the southern part. They consist predominantly of clay, usually containing calcareous layers, but include important beds of water-bearing sandstones and sands. They are believed to have a total thickness of about 1,200 feet. In San Jacinto County wells supplied by sands of these formations all yield water of good quality. Water from well 66, which was 977 feet deep, was reported to be suitable for boiler use without treatment. At Cleveland, in the northwest corner of Liberty County, deep wells in sands of these formations yield water of good quality.

Willis sand (and Goliad sand?).- The Willis sand of Pliocene (?) age and possibly the Goliad sand of Pliocene age crop out in a belt 10 to 15 miles wide, paralleling and just south of the outcrop of the Oakville sandstone and Lagarto clay. The Willis sand has been described 5/ in general as a red sand, coarse and

5/ Doering, John, Post-Fleming surface formations of Coastal Southeast Texas and South Louisiana: Am. Assoc. Pet. Geologists Bull., Vol. 19, pp. 660-668, 1935.

gravelly in part and slightly indurated, having a total thickness of about 85 feet. This formation caps the ridges in the central and southern parts of San Jacinto County 6/ and is extensively developed as a source of water for domestic

6/ Dumble, E. T., The geology of East Texas: Texas Univ. Bull. 1869, pp. 242-260, 1918.

and stock use. The water is very soft but locally the presence of unstable iron compounds makes it unsatisfactory for domestic use.

Pleistocene and Recent series

Lissie formation.- The Lissie formation of Pleistocene age overlies the Willis sand (and Goliad sand?) and crops out just south of the Willis sand in the southern and southeastern portions of the county. The Lissie formation has been described by Meyer 7/ as a sequence of sands, gravels, sandy clays, and

7/ Meyer, Willis G., Stratigraphy and historical geology of Gulf Coastal Plain in vicinity of Harris County, Texas: Am. Assoc. Pet. Geologists Bull., Vol 23, pp. 188-190, 1939.

clays which are distinguished from the underlying Willis sand by a generally finer texture. However, in drillers' logs and electrical logs it is not possible to differentiate between beds of the Willis sand, Goliad sand (if present), and the Lissie formation, and for convenience in this report the combination will be called the Lissie formation. In San Jacinto County the thickness of the Lissie formation, as thus designated, ranges from a feather edge at the northern edge of the outcrop to about 300 feet in the southern part of the county. Southward in Liberty County this formation increases to about 1,400 feet in thickness and is an important aquifer.

In the Trinity Valley north of Urbana the Lissie formation is believed to be represented by a high stream terrace. In this relatively narrow area the principal source of water for domestic and stock use is shallow wells in the terrace material.

Beaumont clay.- The Beaumont clay of Pleistocene age overlies the Lissie formation, and in San Jacinto County it is believed to be represented by a narrow, low stream terrace intermediate in position between the Lissie outcrop and the alluvial deposits of Recent age which border the Trinity River.

Alluvial deposits.- Deposits of Recent alluvial sand, clay, and gravel, having a thickness ranging from a few feet to about 30 feet, are reported in drillers' logs of shallow water wells drilled in the floodplain of the Trinity River. Shallow wells in the alluvial deposits are the chief source of domestic water supply in this relatively wide area.

PRESENT DEVELOPMENT OF WATER SUPPLIES FROM WELLS

All the domestic and municipal water supplies in San Jacinto County are derived from wells or springs. Wells and spring-fed streams supply most of the water for livestock and industrial use. Only one small irrigation project was found in the county, a fruit orchard and nursery near Shepherd supplied by surface water from Big Creek. The Southern Pacific Railroad obtains water at Shepherd from the same source. Most of the wells in the rural areas are less than 50 feet in depth and furnish small supplies of water for domestic use and stock.

The development of ground water in different parts of the county is briefly discussed below:

Northern part of the county, Staley (Embryfield), Oakhurst, and Pointblank areas

Well 1, drilled to 300 feet in 1906 to supply water for boilers at the Columbia Lumber Company's sawmill at Oakhurst, is now used for domestic supply by about 30 families. The water level is 114 feet below the surface of the ground. Well 4, also in Oakhurst, is 500 feet deep and the water level is reported to be about 175 feet below the surface. The water supply for Oakhurst Public School is obtained from Well 2, which was drilled to a depth of about 600 feet and cased to 250 feet. The water level is reported to be about 175 feet below the surface. These three wells draw from sands in the basal part of the Oakville-Lagarto sequence or the upper portion of the Catahoula sandstone The water is relatively low in dissolved minerals and is somewhat harder in well 2 than in wells 1 and 4.

A shallow dug well in Oakhurst (no. 6) yields soft water but the iron content, 17 parts per million, is so high that the water is unsatisfactory for domestic use. The well is 23 feet deep, and during rainy weather it flows. South of Oakhurst two springs, nos. 20 and 21, and a shallow bored well, no. 22, yield very soft water.

In the belt of clay land, or blackland, between Oakhurst and Staley (Embryfield) the water from shallow wells is usually so hard that it is not satisfactory for domestic use and rainwater is collected in cisterns, the wells being used only during periods of low rainfall.

In the Embryfield area and farther north water of good quality is reported from sands and sandstones of the Catahoula sandstone. Several springs occur in this area. The best known are the Carolina Springs (no. 10) near the junction of Carolina Creek and the Trinity River.

In the Pointblank area are two relatively deep water wells, no. 16, 645 feet deep, and no. 19, 411 feet deep. Both wells draw from sands in the basal part of the Oakville-Lagarto sequence or the upper portion of the Catahoula sandstone. Well 16 is in Pointblank, on the upland west of the Trinity River, and the water level was reported to be about 50 feet below the surface. The well supplies water for several families and a cotton gin. Well 19 is on the floodplain of the Trinity River and had an artesian head of 50 feet above the surface and flow of 10 gallons a minute in November 1946. The water from both wells is soft and comparatively low in dissolved minerals.

Central and southwestern parts of county, Coldspring, Camilla, Evergreen, and Everitt areas

The public water supply of Coldspring is obtained from a spring (no. 42) which appears at the base of the Willis sand, a short distance north of the town. The water is extremely soft and corrosive which has become a serious problem in the distribution system. Several private wells in Coldspring also draw water from the Willis sand. About 2 miles southeast of Coldspring, well 93 was drilled to about 600 feet and supplied water for 125 men at the camp of the Civilian Conservation Corps.

During the summer of 1946 seven water wells 223 to 535 feet in depth were drilled in the Camilla area. Six of the wells are used only for stock; the other, No. 100, is used for both domestic supply and stock. All draw from the Lagarto-Oakville sequence. Four of the wells are in the Trinity valley and have artesian flows ranging from 1 to 4 gallons a minute. All yield water of good chemical quality. Domestic supplies in the town of Camilla, located on the upland west of the river, are obtained from shallow wells less than 50 feet deep in the Willis sand.

In the Evergreen area seven wells ranging from 97 to 586 feet in depth draw from sands in the Lagarto-Oakville sequence. The water levels in these wells range from 36 to 85 feet below the surface. The water is extremely hard but otherwise is of satisfactory chemical quality.

In the central part of the county the presence of thick and extensive beds of clay and shale in the middle and upper portions of the Oakville-Lagarto sequence makes the search for adequate supplies of ground water particularly difficult. During the drilling of two wells north of Evergreen, the drill stems became stuck in clay at 470 feet and 500 feet, respectively, and the wells were abandoned. North of Coldspring well 66 was drilled to 977 feet before sufficient water to supply the drilling of an oil test was obtained. In the town of Coldspring well 44 was drilled to about 900 feet and abandoned because of insufficient water and the public water supply system then was developed from the spring (no. 42).

Extreme southwestern part of county

The extreme southwestern part of the county is sparsely populated and domestic and stock water supplies are obtained from shallow drilled or dug wells.

Southeastern part of county, Shepherd and Urbana areas

The lower lands in this portion of the Trinity Valley are well known for their flowing water wells. Records were obtained of 16 flowing wells, ranging in depth from 80 feet to 830 feet and with yields ranging from 1 gallon a minute to about 100 gallons a minute. The wells draw from sands in the basal part of the Lissie formation and in the Lagarto clay, and the water is of good chemical quality. Shut-in pressures measured in the wells showed artesian heads ranging from 8 to 44 feet above the land surface. Most of the water is used for stock.

No flowing wells have been reported in the upland area in this part of the county. In the vicinity of Shepherd, for example, the water levels in wells ranging from 465 to 710 feet in depth were 11 to 40 feet below the land surface. These wells are also supplied by sands in the Lissie formation or the upper portion of the Lagarto clay, and the water is of good quality although moderately hard.

Records of wells and springs in San Jacinto County, Texas
All wells are drilled unless otherwise noted in the remarks column

Well	Distance from Oakhurst	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Height of measuring point above ground (ft.)[a]
1	In Oakhurst	Columbia Lumber Co.	Layne-Bowler Co.	1906	300	6	0.0
2	do.	Oakhurst Public School	--	1932	600	6	0.0
3	do.	D. D. Dolive	E. T. Evans and Son	1934	40	36	0.0
4	do.	Alton Adon	Otis Knight	1931	500	4	0.0
5	do.	E. J. Niederhofer	E. T. Evans and Son	1937	25	36	0.0
6	do.	R. W. Loving	-- Evans	1939	33	36	0.0
7	3½ miles north	Albert Knight	Henry Dolive	1918	60	8	0.0
8	4¼ miles north	C. D. Cowart	--	1942	47	8	2.5
9	7 miles north	T. F. Toole	--	1920	20	36	0.0
10	8 miles north	Gibbs Bros. and Co.	--	--	--	--	--
11	8¾ miles north	do.	--	1944	90	4	0.0
12	10 miles northeast	do.	Barnett and Emory	1916	400	6	0.0
13	do.	do.	-- Sprague	1926	3,004	10	--
14	10¼ miles northeast	do.	--	--	--	--	--
15	7¾ miles northeast	do.	Coastal Drilling Co.	1940	5,510	--	--
16	7¾ miles east	W. W. Butler	--	1934	645	4	0.0
17	8 miles east	I. J. Owen	Porter Hines	1945	35	6	0.0
18	do.	J. L. Capers	do.	1945	34	6	0.0
19	10 miles east	A. R Shearer	Baggett Drilling Co.	1946	411	4	0.0
20	7½ miles southeast	G. A. Williamson	--	--	--	--	--
21	4¾ miles southeast	J. E. Street	--	--	--	--	--
22	4½ miles southeast	J. W. Johnson	-- Ellis	1939	36	8	2.5

a/ Measuring point was usually top of casing, top of pipe clamp, or top of pump base or foundation.

b/ Method of lift: C, cylinder; E, electric; G, gasoline, natural gas, butane or oil engine; W, windmill; Cf, centrifugal; A, air lift; J, jet; B, rope and bucket; H, hand. Number indicates horsepower.

Partial analyses of water from most of these wells and springs are shown in the table of analyses

Well	WATER LEVEL: Below land surface (ft.)	WATER LEVEL: Date of measurement	Method of lift b/	Use of water c/	Remarks
1	d/114	1940	C,G,	P	Cased to 290 feet. Reported yield 30 gallons a minute. Supplies 30 customers. Se log
2	d/175	1940	J,T, 3	P	Cased to 250 feet. Pump set at 225 feet. Supplies Oakhurst Public School.
3	29.5	Jan. 10, 1947	C,E, 1/3	D	Dug.
4	d/175	1931	C,E, 1½	D	
5	4.5	Jan. 10, 1947	B,H	D,S	Dug.
6	0.0	Aug. 31, 1945	Cf,E, ¼	D	Do.
7	22.6	do.	B,H	D,S	Bored, no casing.
8	40.6	do.	B,H	D,S	Bored, tile curb but no casing.
9	13.0	do.	B,H	D,S	Dug in sandstone, no casing.
10	—	—	Flows	—	"Carolina Springs". Strong flow reported.
11	—	—	Flows	S	Seismograph shot hole, no casing.
12	—	—	Flows	N	Strong flow of sulphur water with natural gas reported when drilled.
13	—	—	Flows	N	Strong flow of sulphur water with natural gas reported. Drilled as oil test; 10-inch casing set at 378 feet.
14	—	—	Flows	S	"Skinner Spring". See partial log.
15	—	—	—	—	Oil test. See electrical log, figure 2.
16	d/ 50	1934	A,G, 4	D,Ind	Cased to 645 feet. Supplies cotton gin and several families.
17	33.0	Jan. 10, 1947	B,H	D	Bored, wooden casing.
18	30.4	do.	B,H	D	Do.
19	+ 50.0	Nov. 4, 1946	Flows	S	Screen from 396 to 411 feet. Measured flow 10 gallons a minute on November 4, 1946. Temperature 73° F.
20	—	—	Flows	D,S	"Williamson Spring". Estimated flow one gallon a minute on Sept. 5, 1945. Temperature 73° F.
21	—	—	Flows	D,S	"Willow Spring". Estimated flow one gallon a minute on Sept. 5, 1945.
22	19.4	Sept. 5, 1945	B,H	D,S	Bored, wooden curb but no casing. Temperature 73° F

c/ Use of water: P, public supply; D, domestic; S, stock; Ind, industrial; N, not used.

d/ Water level reported by driller or owner.

Records of wells and springs in San Jacinto County -- Continued

Well	Distance from Oakhurst	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Height of measuring point above ground (ft.) a/
23	3½ miles south	Raven Hill Ranch	--	--	20	36	0.5
24	2 miles south	S. Knight	--	--	139	36	2.8
	Distance from Evergreen						
25	In Evergreen	J. L. Hoot	E. Turner	1932	15	8	0.0
26	do.	do.	Baggett Drilling Co.	1946	585	2	0.0
27	do.	W. T. Carter	do.	1946	586	2	0.0
28	2¼ miles north	C. T. Caldwell	T. C. Murphy	1945	97	2	0.0
29	2½ miles north	C. A. Caldwell	Geo. Crooke	1937	197	4	0.0
30	2¾ miles north	H. R. McAdams	A. Cooper	1943	60	30	3.0
31	do.	A. J. McAdams	J. Kennedy	1942	500	4	0.0
32	2¼ miles north	C. T. Caldwell	T. C. Murphy	1945	473	4	0.0
33	1 mile south	Mrs. Nannie Randolph	--	1936	523	4	0.0
34	1 mile west	C. A. Caldwell	Baggett Drilling Co.	1945	106	2	0.0
35	do.	do.	do.	1946	241	2	1.2
36	1¾ miles west	do.	-- Adams	1941	201	4	0.0
37	4½ miles southwest	A. W. Ellisor	Kike and Scott	1936	21	24	4.5
38	6½ miles west	H. E. Lewis	--	--	--	--	--
39	6¾ miles west	F. S. Browder	W. Cotton	1937	50	48	0.0
40	5¼ miles west	W. W. Cook	-- Lowere	1944	165	4	1.0
41	5 miles northwest	Delto Land and Timber Co.	Geo. L. Pace et al.	1932	4,042	--	--

Well	WATER LEVEL: Below land surface (ft.)	WATER LEVEL: Date of measurement	Method of lift	Use of water	Remarks
23	14.2	Sept. 5, 1945	C,W	D,S	Dug.
24	125.9	do.	B,H	N	Dug; cement plaster walls.
25	1.9	Jan. 11, 1947	B,H	N	Bored, tile casing. Water reported unsuitable for domestic use.
26	d/ 85	Apr. 1946	J,E, 3/4	D	Screen from 573 to 585 feet.
27	d/ 85	Mar. 1946	J,E, 3/4	D	Screen from 574 to 586 feet.
28	d/ 36	Nov. 1945	J,E, 1/2	D	Screen from 81 to 97 feet.
29	d/ 36	Nov. 1937	C,E, 3/4	D,S	Screen from 175 to 197 feet. Supplies dairy.
30	46.5	Nov. 28, 1946	B,H	D	Dug, cement plaster walls.
31	--	--	--	N	Reported insufficient water for domestic use; well abandoned.
32	--	--	--	N	Do.
33	d/ 25	--	--	--	Cased to 523 feet. Formerly supplied water for drilling oil test. (Frazier and Deering, Randolph, No. 1).
34	d/ 36	1945	C,H	S	Cased to 106 feet.
35	43.5	Nov. 7, 1946	C,H	S	Screen from 231 to 241 feet.
36	d/ 40	Sept. 1941	C,H	S	Screen from 181 to 199 feet.
37	17.9	Nov. 7, 1946	B,H	D	Dug, concrete tile casing.
38	--	--	Flows	D,S	"Lewis Spring". Estimated flow 50 gallons a minute on January 11, 1947. Formerly supplied boilers at cotton gin and sawmill. Temperature 68° F.
39	31.0	Jan. 11, 1947	J,E, 1/4	D	Dug. Water level reported about 43 feet below surface in summer.
40	46.9	Nov. 7, 1946	C,G, 2	D,S	Screen from 148 to 163 feet.
41	--	--	--	--	Oil test. See partial log.

Records of wells and springs in San Jacinto County -- Continued

Well	Distance from Coldspring	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Height of measuring point above ground (ft.) a/
42	In Coldspring	San Jacinto County	--	--	--	--	--
43	do.	Baptist Church	--	--	--	--	--
44	do.	San Jacinto County	J. Kennedy	--	900	6,4	--
45	do.	J. C. Hogue, Jr.	-- Guthrie	1918	85	8	1.0
46	do.	do.	--	--	--	--	--
47	do.	do.	A. Hayman	1944	60	8	2.0
48	do.	Sam McMurrey	Joe Parker	1934	76	48,2	0.0
49	do.	Guy Lilley	J. B. Hayman	1929	65	8	0.0
50	1 mile southwest	W. S. Childress	Baggett Drilling Co.	1946	275	4	0.0
51	1½ miles southeast	R. E. Ham	J. Hayman	1943	67	6	0.0
52	2 miles southeast	Civilian Conservation Corps	--	1935	550	4	--
53	3½ miles east	Mrs. Ella McMurrey	Baggett Drilling Co.	1946	223	2	0.0
54	4¼ miles east	Hale Bros.	--	--	--	--	--
55	do.	J. A. Jordan	A. Hayman	1946	29	8	0.0
56	do.	O. L. Jordan	--	--	42	24	1.0
57	5½ miles east	Mrs. Ella McMurrey	Baggett Drilling Co.	1946	425	4	0.0
58	5¼ miles east	C. L. McGowen	do.	1946	318	4	0.0
59	5¼ miles northeast	Hale Bros.	do.	1946	535	4	0.0
60	6½ miles northeast	Mrs. Ella McMurrey	do.	1946	427	4	0.0
61	6 miles northeast	do.	do.	1946	459	4	0.0
62	4¾ miles northeast	do.	do.	1946	468	4	0.0
63	5 miles northeast	do.	Arkansas Fuel Oil Co.	1931	4,050	--	--

Well	WATER LEVEL: Below land surface (ft.)	WATER LEVEL: Date of measurement	Method of lift b/	Use of water c/	Remarks
42	--	--	Flows	P	"Cold Spring". Estimated flow 30 gallons a minute on January 17, 1947. Supplies town of Coldspring. Temperature 68° F.
43	--	--	Flows	D,S	"Baptist Spring". Estimated flow 3 gallons a minute on December 17, 1946. Temperature 71° F.
44	--	--	--	--	Yield reported insufficient for municipal supply; well abandoned.
45	61.6	Jan. 13, 1947	B,H	D,S	Bored, tile casing.
46	--	--	Flows	S	"Harris Springs". Estimated total flow 100 gallons a minute on December 17, 1946. Temperature 69° F.
47	44.7	Dec. 17, 1946	B,H	D	Bored, wooden casing.
48	d/ 70	Nov. 20, 1946	C,E, 1/3	D	Dug to 70 feet, 2-inch screen from 70 to 76 feet.
49	d/ 50.5	Nov. 1946	J,E, $\frac{1}{2}$	D	Bored, tile casing.
50	d/ 42	Apr. 1946	A,G, $5\frac{3}{4}$	D,S	Cased to 270 feet; screen from 70 to 85 feet. See log.
51	d/ 50	Dec. 1946	C,E, $\frac{1}{4}$	D	Bored, wooden casing.
52	--	--	--	N	Formerly supplied water for 125 men at camp.
53	d/110	Mar. 1946	C,G, --	S	Screen from 213 to 223 feet.
54	--	--	Flows	D,S	"Thornton Spring". Estimated flow 12 gallons a minute on January 11, 1947.
55	0.0	Jan. 11, 1947	J,E, $\frac{1}{4}$	D	Bored, concrete tile casing. Temperature $68\frac{1}{2}$° F.
56	25.7	do.	B,H	D	Dug, concrete tile casing.
57	d/ 30	May 1946	C,W	S	Screen from 415 to 425 feet.
58	d/ 17	June 1946	C,G	S	Screen from 303 to 318 feet.
59	+ 10	Nov. 12, 1946	Flows	S	Screen from 510 to 535 feet. Measured flow one gallon a minute on November 12, 1946.
60	+ 24	Jan. 14, 1947	Flows	S	Screen from 412 to 427 feet. Measured flow $2\frac{1}{2}$ gallons a minute on January 14, 1947. Temperature 74° F.
61	+ 27	do.	Flows	S	Screen from 444 to 459 feet. Measured flow 4 gallons a minute on January 14, 1947. Temperature 74° F.
62	+ 18	Jan. 13, 1947	Flows	S	Screen from 453 to 468 feet. Measured flow 2 gallons a minute on January 13, 1947. Temperature 73° F.
63	--	--	--	--	Oil test. See partial log.

Records of wells and springs in San Jacinto County -- Continued

Well	Distance from Coldspring	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Height of measuring point above ground (ft.) a/
64	1½ miles northeast	Woodruff Heirs	--	--	--	--	--
65	4½ miles north	Mrs. Ella McMurrey	Baggett Drilling Co.	1946	430	4	--
66	5½ miles northwest	Foster Lumber Co.	L. Patterson	1944	977	4	0.0
67	do.	do.	Pitre Water Well Drilling Co.	1944	628	4	0.0
68	4 miles west	David Jackson	Gay and Sons	1946	142	4	0.0
69	3¼ miles south	U. S. Forest Service	W. Cotton	1938	28	36	0.0
70	3½ miles south	Foster Lumber Co.	Navarro Oil Co.	1945	9,738	10	--
71	5 miles south	do.	Piedmont Oil Co.	1933	4,474	10	--
72	4 miles south	do.	--	1944	500	4	0.0
73	4¾ miles south	E. R. Dabney	-- Angel	1938	60	8	3.5
74	15 miles south	Lobritsky and Vick	Proletarian Diamond Oil Co.	1925	4,209	10	--
75	14½ miles south	F. Yanoushek	Gay and Sons	1946	155	2	0.0
76	14¼ miles south	H. C. Rabe	-- Brown	1934	135	2½	0.0
77	11½ miles south	Shell Oil Co., Inc.	L. Patterson	1944	583	4	0.0
78	12¼ miles south	Atlantic Pipe Line Co.	do.	1943	196	4	0.0
79	13½ miles south	Dr. Allen McMurrey	--	1932	40	24	0.0
80	do.	do.	Gay and Sons	1946	115	2	0.0
81	13 miles south	Lee Stringer	do.	1946	139	4	0.0
82	12¾ miles south	Shell Oil Co., Inc.	L. Patterson	1944	552	4	0.0
83	13 miles south	do.	do.	1943	550	4	0.0
84	13½ miles south	Wright Drilling Co.	Gay and Sons	1946	154	4	0.0

Well	WATER LEVEL: Below land surface (ft.)	WATER LEVEL: Date of measurement	Method of lift b/	Use of water c/	Remarks
64	--	--	Flows	D,S	"Woodruff Spring". Estimated flow 5 gallons a minute on December 17, 1947.
65	--	--	Flows	S	Screen from 415 to 430 feet. Reported flow 25 gallons a minute. Temperature 70° F.
66	d/ 75	June 1944	A,G	Ind	Screen from 957 to 977 feet. Reported yield 140 gallons a minute. Formerly supplied water for drilling oil test. See log.
67	d/ 75	June 1944	A,G	Ind	Screen from 279 to 302 feet. Reported yield 20 gallons a minute. Formerly supplied water for drilling oil test.
68	d/ 45	Nov. 1946	C,H	D,S	Screen from 125 to 135 feet. See log. See log.
69	d/ 20	June 1938	C,G	P	Dug.
70	--	--	--	--	Oil test; 10-inch casing set at 2,167 feet. See electrical log,
71	--	--	--	--	Oil test; 10-inch casing set at 916 feet. See partial driller's figure 2.
72	d/ 75	1944	A,G	Ind	Formerly supplied water for drilling oil test. log.
73	51.1	Sept. 14, 1945	B,H	D,S	Bored, concrete tile casing.
74	--	--	--	--	Oil test. Sand and gravel reported from 0 to 428 feet; 10-inch casing set
75	d/ 50	Sept. 1946	J,E, 1/3	D	Screen at 428 feet. See partial log. from 133 to 153 feet. See log.
76	d/ 12	Sept. 1934	A,E, 1/2	D,S	Screen from 123 to 135 feet. Supplies dairy.
77	d/ 50	July 1944	C,G, 2	D	Screen from 560 to 582 feet. Supplies camp. See log.
78	d/ 20	June 1943	C,E, 2	D	Screen from 176 to 196 feet. Supplies pipe line pump station.
79	d/ 24	Dec. 20, 1946	C,H	D,S	Dug.
80	d/ 55	do.	C,E, 1/4	D,S	Screen from 95 to 105 feet. See log.
81	d/ 32	Dec. 15, 1946	C,H	D,S	Screen from 123 to 133 feet. See log.
82	d/ 50	July 24, 1944	C,G, 2	D	Screen from 530 to 550 feet. Domestic supply for employee. See log.
83	d/ 50	Oct. 23, 1943	A,G, --	Ind	Screen from 496 to 517 feet. Formerly supplied water for drilling oil test. (Central Coal and Coke Co. No. 11).
84	d/ 22	Oct. 14, 1946	C,G, --	Ind	Screen from 134 to 154 feet. See log. Formerly supplied water for drilling oil test. See log.

Records of wells and springs in San Jacinto County -- Continued

Well	Distance from Shepherd	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well	Height of measuring point above ground (ft.) a/
85	½ mile south	R. L. Bledsoe	Jones and Tarbett	1924	2,900	10	--
86	In Shepherd	Shepherd Public School	--	1938	465	3	0.0
87	do.	Shepherd Ice Plant	J. Parker	1934	40	2	0.0
88	do.	B. Finger	O. D. Adams	1940	100	4,2	0.0
89	1 mile southwest	C. O. Ford	do.	1941	469	4	0.0
90	In Shepherd	J. R. Elmore	Baggett Drilling Co.	1946	685	2	0.0
91	do.	A. R. Cronin	-- Angel	1937	72	8	0.0
92	1 mile southwest	J. R. Elmore	A. E. Fawcett, Sr.	1945	710	4	0.0
93	3¼ miles south	J. S. Abercrombie Co.	--	1940	180	4	0.0
94	6½ miles southwest	Joe E. Gay	Gay and Sons	1946	80	4	0.0
95	7½ miles southwest	W. R. Stephens	-- Angel	1942	30	8	0.0
96	7¼ miles southwest	Hinchliff-Sims	Magnolia Petroleum Co.	1945	11,078	16,10	--
97	8¼ miles southwest	Whitton Estate	Cockburn Oil Co.	1937	5,602	--	--
98	5 miles west	R. I. Smith	Gay and Sons	1946	150	4	0.0
99	3¾ miles northwest	San Jacinto County Road	--	1940	70	4	0.0
100	4½ miles northwest	John P. Shirley	Baggett Drilling Co.	1946	520	2	0.0
101	1½ miles north	-- Tribe	Tarbett Oil Co.	1928	1,447	--	--
102	1½ miles northeast	W. H. Worshan	--	1941	36	4	0.0
103	2½ miles northeast	Texas Long Leaf Lumber Co.	J. E. Blair	1930	164	2½	0.0
104	5¼ miles north	Miss E. Langham	Baggett Drilling Co.	1946	273	4	0.0
105	5 miles north	do.	--	1937	300	2	0.0
106	5¼ miles north	do.	O. D. Adams	1941	265	2	0.0

Well	WATER LEVEL: Below land surface (ft.)	WATER LEVEL: Date of measurement	Method of lift b/	Use of water c/	Remarks
85	--	--	--	--	Oil test; 10-inch casing set at 140 feet. See partial log.
86	d/ 11	1938	C,E, --	P	Screen from 453 to 465 feet. Supplies Shepherd Public School.
87	d/ 15	1934	C,E, 1/6	Ind	Bored. Supplies ice plant.
88	d/ 45	Dec. 1940	J,E, 1/2	D	Screen from 90 to 100 feet.
89	d/ 49	Jan. 7, 1941	J,E, 1/2	D	Screen from 430 to 438 feet. See log.
90	d/ 40	Oct. 1946	J,E, 3/4	D	Screen from 670 to 685 feet.
91	d/ 41	June 1943	J,E, 1/3	D	
92	d/ 40	Aug. 1945	--	--	Screen from 680 to 710 feet. Formerly supplied water for drilling oil test.
93	d/ 55	Dec. 15, 1946	J,E, 1	D	Screen from 160 to 180 feet. Domestic supply for employee; formerly supplied
94	d/ 21	Apr. 1946	J,E, 1/3	D	Screen water for drilling oil test. from 66 to 76 feet. See log.
95	d/ 25	Aug. 1942	J,E, 1/4	D	Bored, concrete tile casing.
96	--	--	--	--	Oil test; 10-inch casing set at 2,485 feet. See electrical log, figure 2.
97	--	--	--	--	Oil test. See electrical log, figure 2.
98	d/ 50	May 1946	C,H	D,S	Screen from 50 to 60 feet.
99	--	--	Flows	S	Seismograph shot hole; no casing. Estimated flow 3 gallons a minute on
100	d/ 56	Sept. 1946	C,W	D,S	Screen from 499 November 15, 1946. to 520 feet.
101	--	--	--	--	Oil test. See log.
102	d/ 23	Apr. 1941	C,E, 1/2	D	Screen from 30 to 36 feet.
103	d/+10	1930	Flows	D,S	Screen from 144 to 164 feet. Measured flow 7 gallons a minute on November 8, 1946. Formerly supplied boilers at sawmill. Temperature 69° F.
104	+ 20	Nov. 25, 1946	Flows	S	Screen from 258 to 273 feet. Measured flow 8 gallons a minute on November 25,
105	+ 15	Jan. 6, 1947	Flows	S	Cased to 1946. Temperature 71½° F. 300 feet. Measured flow 10 gallons a minute on January 6, 1947. Temperature
106	+ 9	Nov. 25, 1946	Flows	D,S	Screen from 255 to 265 feet. 70° F. Measured flow 5 gallons a minute on November 25, 1946. Temperature 71° F.

Records of wells and springs in San Jacinto County -- Continued

Well	Distance from Shepherd	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Height of measuring point above ground (ft.) a/
107	5½ miles northeast	J. E. Blair	J. E. Blair	1929	121	2½	0.9
108	5 miles northeast	Mrs. D. M. Filler	--	1929	29	1½	0.0
109	4½ miles northeast	Urbana Sand and Gravel Co.	--	1907	120	1½	0.0
110	5 miles northeast	do.	--	1915	120	3	0.0
111	7½ miles northeast	Ty Parker	--	1934	15	1¼	0.0
112	8 miles east	Obie Sels	J. B. Hayman	1939	27	8	3.0
113	8½ miles east	West Lumber Co.	--	--	150	4	0.0
114	9¾ miles east	Lucy B. Modesett	--	1903	400	6	0.0
115	8 miles east	J. G. Greathouse	J. G. Greathouse	1946	457	2	0.0
116	7½ miles east	do.	--	1943	830	4	0.0
117	5¾ miles east	J. R. Elmore	Baggett Drilling Co.	1946	240	4	0.0
118	5½ miles east	Cochran and James	--	--	200	6	0.0
119	do.	do.	--	--	600	10	0.0
120	4½ miles east	Jess Schrader	Gay and Sons	1946	334	2	0.0
121	4 miles east	San Jacinto County Road	--	1939	80	4	0.0
122	2 miles east	G. W. Parker	G. W. Parker	1942	21	1¼	0.0
123	9¼ miles southwest	Cochran and Falvey	Gay and Sons	1946	180	4	0.0

a/ Measuring point was usually top of casing, top of pipe clamp, or top of pump base or foundation.

b/ Method of lift: C, cylinder; E, electric; G, gasoline natural gas, butane or oil engine; W, windmill; Cf, centrifugal; A, air lift; J, jet; B, rope and bucket; H, hand. Number indicates horsepower.

Well	WATER LEVEL: Below land surface (ft.)	WATER LEVEL: Date of measurement	Method of lift b/	Use of water c/	Remarks
107	+ 8	Nov. 8, 1946	Flows	D	Screen from 101 to 121 feet. Measured flow one gallon a minute on November 8, 1946. Temperature 69° F.
108	d/ 15	1929	C,E, 1/3	D	Driven.
109	--	--	Flows	S	Measured flow 3 gallons a minute on January 6, 1947. Temperature 70° F.
110	d/ +10	1929	Flows	D	Do.
111	d/ 10	1934	C,H	D	Driven.
112	9.5	Nov. 26, 1946	C,H	D,S	Bored, concrete tile casing.
113	--	--	Flows	D,S	Estimated flow 25 gallons a minute on November 26, 1946. Temperature 70½° F.
114	--	--	Flows	S	Estimated flow 100 gallons a minute on November 21, 1946. Temperature 72° F.
115	+ 27	Nov. 25, 1946	Flows	S	Cased to 300 feet. Measured flow 9 gallons a minute on November 25, 1946. Temperature 72½° F.
116	+ 44	do.	Flows	D	Reported flow 75 gallons a minute. Temperature 77½° F.
117	+ 18	Nov. 26, 1946	Flows	S	Screen from 225 to 240 feet. Measured flow 25 gallons a minute on November 26, 1946. Temperature 69° F.
118	--	--	Flows	S	Estimated flow 75 gallons a minute on November 21, 1946. Temperature 71° F.
119	--	--	Flows	S	Estimated flow 75 gallons a minute on November 21, 1946. Temperature 75° F.
120	+ 10	Nov. 18, 1946	Flows	D,S	Screen from 210 to 230 feet. Measured flow 4 gallons a minute on November 18, 1946. Temperature 70° F. See log.
121	--	--	Flows	D,S	Seismograph shot hole; no casing.
122	d/ 13	June 1942	C,H	D,S	Bored. Estimated flow one gallon a minute on November 18, 1946.
123	d/ 2	July 1946	J,E, ¾	D	Screen from 165 to 175 feet. See log. (Well is in Liberty County.)

c/ Use of water: P, public supply; D, domestic; S, stock; Ind, industrial; N, not used.

d/ Water level reported by driller or owner.

Table of drillers' logs, San Jacinto County, Texas

	Thickness (feet)	Depth (feet)
Well 1		
Columbia Lumber Company, in Oakhurst		
Soil	15	15
Sand	105	120
Clay	150	270
Sand	20	290
Clay	10	300
Well 13, partial log		
Gibbs Brothers and Company, Sprague et al., No. 1, Embry, 10 miles north of Oakhurst, (from files of Texas Railroad Commission).		
Surface	20	20
Gumbo	5	25
Blue shale	15	40
Shale	120	160
Gumbo	53	213
Hard rock	2	215
Sand	104	319
Gumbo	37	356
Sand	8	364
Gumbo	54	418
Hard shale and sand	17	435
Gumbo	52	487
Gumbo and sand	7	494
Gumbo	77	571
Packsand and boulders	37	608
Gumbo	34	642
Packsand	2	644
Gumbo	57	701
Sand	7	708
Gumbo	9	717
Sand	20	737
Gumbo	41	778
Sand	14	792
Gumbo	32	824
Sand, rock	8	832
Gumbo	4	836
Sand, rock	6	842
Gumbo	8	850
Black shale	12	862
Gumbo	24	886
Shale	9	895
Gumbo	199	1094
Shale	12	1106
Gumbo	59	1165
Sand, gumbo and boulders	35	1200
TOTAL DEPTH		3004
Well 41, partial log		
Delta Land and Timber Company, Pace et al , No. 1, 5 miles northwest of Evergreen, (from files of Texas Railroad Commission).		
Surface clay	18	18
Sand	4	22
Shale	360	382
Shale and sand	301	683
Shale, sand and shells	120	803
Sandy lime	5	808
Sandy shale	89	897
Shale and shells	106	1003
Sandy shale, and shells	224	1227
Broken sand	116	1343
Sticky shale	81	1424
Shale	30	1454
Sand and shale	51	1505
Lime	2	1507
Hard sandy lime	4	1511
Broken lime	4	1515
Shale and shells	8	1523
Shale	79	1602
Sand	95	1697
Shale	43	1740
Broken lime	16	1756
Shale and shells	83	1839
Sand and shells	80	1919
Sandy shale	51	1970
Shale	20	1990
Sand, shells and lignite	102	2092
Sandy shale	24	2116
Gumbo	21	2137
Shale and shells	9	2146
Sticky shale	34	2180

(Continued on next page)

Table of drillers' logs, San Jacinto County -- Continued

	Thickness (feet)	Depth (feet)
Well 41, partial log -- continued		
Shale	64	2244
Sand	80	2324
Shale and shells	28	2352
Broken sand	64	2416
Sand	7	2423
Sticky shale	27	2450
Shale	120	2570
Sticky shale	17	2587
Shale	3	2590
Sticky shale	30	2620
Shale	28	2648
Sticky shale	18	2666
Shale	13	2679
Gumbo	7	2686
Shale	13	2699
Shale and shells	11	2710
Sticky shale	161	2871
TOTAL DEPTH		4042

Well 50

W. S. Childress, 1 mile southwest of Coldspring.

Clay and sand	42	42
Water sand	22	64
Clay	2	66
Sand	25	91
Blue and brown clay	184	275

Well 63, partial log

Mrs. Ella McMurrey, Arkansas Fuel Oil Company, No. 1, 5 miles northeast of Coldspring.

Surface sand	30	30
Sand and clay	280	310
Sand	10	320
Sand and clay	38	358
Hard gummy clay	5	363
Sand and streaks of clay	167	530
Sand and gumbo	254	784
Gumbo and gummy shale	166	950
Gummy shale and boulders	65	1015

	Thickness (feet)	Depth (feet)
Well 63, partial log -- continued		
Sticky shale	240	1255
Shale	40	1295
Broken lime and shale	20	1315
TOTAL DEPTH		4050

Well 66

Foster Lumber Company, 5½ miles northwest of Coldspring.

Surface	23	23
Sand	16	39
Shale	10	49
Sand	53	102
Shale	11	113
Sand	16	129
Shale	6	135
Sand	14	149
Shale	99	248
Sand	23	271
Shale	12	283
Sand	23	306
Shale	100	406
Sandy shale	16	422
Shale	94	516
Sandy shale	37	553
Shale	64	617
Sandy shale	30	647
Shale	146	793
Sandy shale	26	819
Shale	34	853
Sandy shale	38	891
Shale	68	959
Sand	18	977

Well 67

Foster Lumber Company, 5½ miles northwest of Coldspring.

Sandy clay	42	42
Clay	18	60
Sand	16	76
Clay	7	83
Fine-grained sand	15	98
Clay	17	115

(Continued on next page)

Table of drillers' logs, San Jacinto County -- Continued

	Thickness (feet)	Depth (feet)
Well 67 -- continued		
Rock	2	117
Hard sand	4	121
Rock	4	125
Tight sand	17	142
Clay	18	160
Rock	5	165
Clay	90	255
Fine-grained sand	16	271
Clay	8	279
Fine-grained sand	25	304
Clay	116	420
Sand	3	423
Clay	101	524
Fine-grained sand	11	535
Clay	93	628
Well 68		
David Jackson, 4 miles west of Coldspring.		
Clay	18	18
Sand and rock	2	20
Clay	23	43
Sand	5	48
Clay	63	111
Sand	31	142
Well 71, partial log		
Foster Lumber Company, Piedmont Oil Company, No. 1, 5 miles south of Coldspring.		
Sand and gravel, water	245	245
Shale and shells	370	615
Shale	85	700
Broken sand	150	850
Hard sand	50	900
Sticky shale	70	970
Shale and shells	515	1485
TOTAL DEPTH		4474
Well 74, partial log		
Lobritsky and Vick, Proletarian Diamond Oil Company, No. 1, 15 miles south of Coldspring.		
Sand and gravel	428	428
Shale	327	755
Packsand and boulders	3	758
Gumbo	7	765
Packsand and boulders	7	772
Gumbo, shale and lime	133	905
Gumbo and shale	66	971
Blue sandy shale	21	992
Lime	15	1007
Sand	10	1017
Shale	7	1024
Sand	31	1055
Gumbo	39	1094
Shale	46	1140
Sand	37	1177
Gumbo, lime and shale	332	1509
Sand	26	1535
Gumbo and lime	363	1898
TOTAL DEPTH		4209
Well 75		
F. Yanoushek, 14½ miles south of Coldspring.		
Sand	41	41
Gravel	10	51
Clay	28	79
Rock	2	81
Clay	41	122
Sand	31	153
Well 77		
Mercy Camp, Shell Oil Company, Inc., 11½ miles south of Coldspring.		
Surface	24	24
Sand	156	180
Shale	176	356
Sand and shale	44	400
Shale	143	543
Sand	40	583

Table of drillers' logs, San Jacinto County -- Continued

	Thickness (feet)	Depth (feet)
Well 80		
Dr. Allen McMurrey, 13½ miles south of Coldspring.		
Clay	31	31
Sand	14	45
Clay	5	50
Sand	9	59
Clay	26	85
Sand	30	115
Well 81		
Lee Stringer, 13 miles south of Coldspring.		
Clay	28	28
Sand	8	36
Clay and sand streaks	44	80
Hard blue clay	20	100
Sand	39	139
Well 82		
Shell Oil Company, Inc., 12¾ miles south of Coldspring.		
Surface	24	24
Sand and shale	21	45
Shale	68	113
Sand	46	159
Sand and shale	22	181
Sand	22	203
Shale	44	247
Sand	20	267
Sand and shale	66	333
Shale	132	465
Sand and shale	23	488
Shale	16	504
Sand	13	517
Shale	13	530
Sand	22	552

	Thickness (feet)	Depth (feet)
Well 83		
Central Coal and Coke Company, 13 miles south of Coldspring.		
Surface	21	21
Sand	16	37
Shale	8	45
Sand	19	64
Shale	66	130
Sand	38	168
Shale	17	185
Sand	23	208
Shale	64	272
Sand	18	290
Shale	181	471
Sand	11	482
Shale	12	494
Sand	24	518
Shale	32	550
Well 84		
Wright Drilling Company, 13½ miles south of Coldspring.		
Clay	21	21
Sand	41	62
Clay	38	100
Sand	54	154
Well 85, partial log		
R. L. Bledsoe, Jones and Tarbett No. 1, ½ mile south of Shepherd.		
Sand	45	45
Clay	17	62
Sandy clay	28	90
Sand	20	110
Gravel	22	132
Gumbo	126	258
Hard shale	38	296
Sand	4	300
[illegible]	[illegible]	[illegible]
Sand	[illegible]	[illegible]

(Continued on next page)

Table of drillers' logs, San Jacinto County -- Continued

	Thickness (feet)	Depth (feet)
Well 85, partial log -- continued		
Rock	2	302
Sand	5	307
Gumbo and boulders	20	327
Hard shale	15	342
Gumbo	38	380
Sand and boulders	5	385
Shale	17	402
Gumbo	7	409
Hard sand	10	419
Hard shale	41	460
Gumbo and boulders	20	480
Water sand	60	540
Gumbo and boulders	128	668
Water sand	26	694
Gumbo and shale	55	749
Gumbo	23	772
Hard sand	9	781
Gumbo	36	817
Gumbo and boulders	8	825
Water sand	22	847
Gumbo	38	885
Shale	7	892
Water sand	17	909
Gumbo	4	913
Shale	8	921
Sandy gumbo	49	970
Gray gumbo	102	1072
TOTAL DEPTH		2900
Well 89		
C. O. Ford, 1 mile southwest of Shepherd.		
Clay	23	23
Fine-grained sand	21	44
Sand and gravel	58	102
Gumbo	91	193
Rock	1	194
Fine-grained sand	5	199
Rock	2	201
Gumbo	9	210
Rock	1	211
Shale	1	212
Rock	1	213
Shale	41	254
Gumbo	65	319
Shale	11	330
Rock	1	331
Shale	29	360
Sand	4	364
Rock	2	366
Shale	5	371
Rock	1	372
Shale and boulders	48	420
Water sand	20	440
Shale	29	469
Well 94		
Joe E. Gay, 6½ miles southwest of Shepherd.		
Clay	18	18
Sand	17	35
Clay	7	42
Sand and gravel	38	80
Well 101		
Tribe, Tarbett Oil Company, No. 1, 1½ miles north of Shepherd.		
Surface	1	1
Pink sand	29	30
Joint clay	10	40
White sand	35	75
Clay	75	150
Rock	4	154
Gumbo	26	180
Coarse shale	10	190
Gumbo	40	230
Sand rock	5	235
Pink sand	25	260
Gumbo	30	290
Sand rock	5	295
Sandy shale	55	350
Gumbo	25	375
Sand and shale	50	425
Sand rock	7	432
Gumbo	18	450
Rock	5	455
Sand and shale	40	495
Gumbo	75	570
Sand and shale	48	618
Very tough blue gumbo	102	720
Sand	10	730
Gumbo	65	795

(Continued on next page)

Table of drillers' logs, San Jacinto County -- Continued

	Thickness (feet)	Depth (feet)
Well 101 -- continued		
Sand and shale, gummy streaks	25	820
Gumbo	50	870
Sandy shale	10	880
Lime rock with pyrites	25	905
Gumbo and lime	10	915
Sand and lignite	49	964
Gumbo and lime	24	988
Sandy shale and lime	18	1006
Lime rock	2	1008
Lime and gumbo	197	1205
White sand	13	1218
Very tough blue gumbo	5	1223
Sandy shale, gummy streaks	12	1235
Sand	45	1280
Red sandy shale and salt water sand	15	1295
Black and blue gumbo	53	1348
Red and white clay	4	1352
Soft gumbo and shale	13	1365
Hard gumbo	30	1395
Hard sandy shale and gummy lime	10	1405
Gumbo and lime	25	1430
Hard shale and lime	6	1436
Hard gumbo and lime	11	1447

	Thickness (feet)	Depth (feet)
Well 120		
Jess Schrader, 4½ miles east of Shepherd.		
Sand	8	8
Clay	10	18
Sand	15	33
Clay	52	85
Fine-grained sand	15	100
Clay and boulders	15	115
Clay	40	155
Hard sand	3	158
Clay	27	185
Hard sand	10	195
Packsand	15	210
Sand rock	5	215
Sand and boulders	10	225
Sand	3	228
Sandy shale	22	250
Clay	84	334
Well 123		
Cochran and Falvey, 9½ miles southwest of Shepherd.		
Sand and clay	35	35
Gravel	20	55
Hard sand	5	60
Hard clay	95	155
Sand and gravel	25	180

Partial analyses of water from wells and springs in San Jacinto County, Texas

Analyzed at The University of Texas under the direction of W. W. Hastings, Chemist, U. S. Department of the Interior, Geological Survey, and Dr. E. P. Schoch, Director of the Bureau of Industrial Chemistry. Results are in parts per million. Well numbers correspond to numbers in table of well records.

Well	Owner	Depth of well (ft.)	Date of collection	Total dissolved solids	Silica (SiO_2)	Iron (fe)	Calcium (Ca)	Magnesium (Mg)	Sodium and Potassium (Na+K) (calc.)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Total hardness as $CaCO_3$ (calc.)
1	Columbia Lumber Co.	300	Oct. 23, 1941	366	61	0.18	55	3.6	56	268	12	28	0.4	0-	152
2	Oakhurst Public School	600	do.	460	29	0.22	124	9.7	32	403	115	52	0.2	0	351
3	D. D. Dolive	40	Jan. 10, 1947	210	-	0.39	25	4.8	38	96	24	30	-	24	82
4	Alton Aden	500	Sept. 5, 1945	341	-	-	68	6.3	37	261	11	36	-	0.2	196
5	E.J.Niederhofer	25	Jan. 10, 1947	220	-	0.11	22	7.1	37	66	30	44	-	22	84
6	R. W. Loving	23	Aug. 31, 1945	102	-	17	4.4	2.2	15	27	4	18	-	0	20
7	Albert Knight	60	do.	2,610	-	-	498	63	386	392	125	1,340	-	1.5	1,500
8	C. D. Cowart	47	do.	944	-	-	145	11	166	536	43	196	-	7.5	407
9	T. F. Toole	20	do.	321	-	-	18	0.9	54	8	24	90	-	9.6	49
16	W. W. Butler	645	Oct. 8, 1946	458	-	0.04	24	0.8	141	342	16	52	-	0.2	64
17	I. J. Owen	35	Jan. 10, 1947	607	-	0.20	82	3.5	98	87	18	242	-	0.5	219
18	J. L. Capers	34	do.	312	-	0.06	26	2.3	48	64	10	74	-	14	74
19	A. R. Shearer	411	Oct. 8, 1946	918	-	0.11	31	1.9	317	585	1	208	-	0	96
20	G.A.Williamson	Spring	Sept. 5, 1945	-	-	-	0.7	0.9	8.7	12	3	6	-	3.8	5
21	J. E. Street	Spring	do.	-	-	-	1.4	0.4	20	15	7	20	-	0.4	5
22	J. W. Johnson	36	do.	141	-	-	2.3	1.3	15	13	7	12	-	6.6	11
25	J. L. Hoot	15	Jan. 11, 1947	239	-	5.2	4.4	2.8	17	14	30	10	-	2.0	22
26	do.	585	Oct. 10, 1946	370	-	0.14	73	7.9	64	284	14	75	-	0	214
27	W. T. Carter	586	do.	386	-	0.03	79	7.4	52	270	10	77	-	0	228
28	C. T. Caldwell	97	do.	361	-	0.17	110	3.1	12	332	4	24	-	3.0	287
29	C. A. Caldwell	197	do.	373	-	0.03	100	5.5	19	292	10	45	-	0	272
30	H. R. McAdams	60	Nov. 28, 1946	-	-	0.08	-	-	-	176	10	685	-	9.0	698
34	C. A. Caldwell	106	Nov. 7, 1946	486	-	1.5	99	7.0	77	345	2	113	-	0.2	276
36	do.	201	Oct. 10, 1946	350	-	0.04	97	3.3	17	280	6	40	-	0	256
37	A. W. Ellisor	21	Nov. 7, 1946	494	-	0.05	118	4.8	58	468	18	20	-	11	314
38	H. F. Lewis	Spring	Jan. 11, 1947	50	-	0.09	3.5	1.8	7.4	12	2	12	-	4.3	16
39	F. S. Browder	50	do.	98	-	0.03	18	2.5	7.5	56	2	14	-	4.7	55

a/ Hardness by the soap method.

Partial analyses of water from wells and springs in San Jacinto County -- continued
(Results are in parts per million)

Well	Owner	Depth of well (ft.)	Date of collection	Total dissolved solids	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium and Potassium (Na+K) (calc.)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Total hardness as $CaCO_3$ (calc.)
40	W. W Cook	165	Nov. 7, 1946	211	-	5	22	2.6	49	135	2	42	-	0	66
42	San Jacinto County	Spring	Oct. 23, 1941	39	12	0.16	4.2	2.0	1.2	6	3	8	0.3	5	22
43	Baptist Church	Spring	Dec. 17, 1946	42	-	0.35	3.8	1.4	6.9	12	4	10	-	2.8	15
45	J.C.Hogue,Jr.	85	Jan. 11, 1947	108	-	0.06	7.6	2.7	20	32	7	20	-	15	30
46	do.	Spring	Dec. 17, 1946	-	-	.08	-	-	-	11	1	10	-	1.8	6a/
47	do.	60	do.	-	-	1.0	-	-	-	18	2	14	-	0.4	15a/
48	Sam McMurrey	76	Nov. 20, 1946	52	-	2.29	9.0	2.0	7.3	17	6.6	16	-	4	31
49	Guy Lilley	65	Nov. 28, 1946	82	-	0.43	4.0	2.0	23	48	2	14	-	7.8	18
50	W.S.Childress	-	Dec. 17, 1946	109	-	0.25	19	2.5	13	69	5	16	-	2.0	53
54	Hale Bros.	Spring	Jan. 11, 1947	107	-	0.03	5.0	2.6	13	8.0	2	18	-	22	23
55	J. A. Jordan	29	do.	374	-	1.6	39	5.1	61	102	14	96	-	23	113
56	O. L. Jordan	42	do.	234	-	0.06	16	7.4	44	28	20	62	-	42	70
57	Mrs.E.McMurrey	425	Oct. 31, 1946	383	-	3.1	28	2.6	119	269	20	70	-	0.2	80
58	C.L.McGowen	318	Oct. 10, 1946	355	-	1.7	28	3.7	110	230	20	70	-	0	85
59	Hale Bros.	535	Nov. 12, 1946	417	-	2.70	30	2.8	135	288	23	85	-	0	86
60	Mrs.E.McMurrey	427	Oct. 31, 1946	394	-	0.03	24	3.1	127	301	17	60	-	0	72
61	do.	459	do.	390	-	0.41	27	4.4	120	293	18	62	-	0.2	86
62	do.	468	do.	390	-	0.04	26	2.2	126	279	17	73	-	0	74
64	Woodruff Heirs	Spring	Dec. 17, 1946	-	-	0.05	--	-	-	12	3	16	-	4.0	21a/
68	David Jackson	142	Nov. 28, 1946	402	-	0.44	86	4.7	47	276	16	66	-	0	234
69	U. S. Forest Service	28	Sept.14, 1945	40	-	-	5.6	0.8	9.9	25	4	10	-	0	17
73	F. R. Dabney	60	do.	42	-	-	6.8	0.8	3.7	15	3	9	-	2	20
76	H. C. Rabe	135	Jan. 3, 1947	96	-	0.45	7.6	1.3	15	30	1	18	-	6.9	24
77	Shell Oil Co.	583	do.	319	-	4.3	52	12	60	320	15	22	-	0.0	180
78	Atlantic Pipe Line Co.	196	Jan. 4, 1947	80	-	4.9	11	1.3	17	52	1	18	-	0.0	33
79	Dr.Allen McMurrey	40	do.	143	-	3.8	34	1.5	15	112	5	14	-	7.8	91
80	do.	115	do.	105	-	0.87	12	1.6	17	44	2	18	-	12	37
81	Lee Stringer	139	do.	130	-	1.6	16	2.6	16	69	1	20	-	0.0	51

a/ Hardness by the soap method.

Partial analyses of water from wells and springs in San Jacinto County -- continued
(Results are in parts per million)

Well	Owner	Depth of well (ft.)	Date of collection	Total dissolved solids	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium and Potassium (Na+K) (calc.)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Total hardness as $CaCO_3$ (calc.)
82	Shell Oil Co.	552	Jan. 15, 1947	324	-	0.89	39	14	36	221	20	22	-	1.0	155
86	Shepherd Public School	465	Oct. 23, 1941	354	20	0.2	20	6.1	109	296	17	35	0.4	0	74
87	Shepherd Ice Plant	40	Nov. 8, 1946	169	-	0.08	16	5.9	18	3	11	40	-	42	64
88	B. Finger	100	Sept. 14, 1945	153	-	0.2	21	2.3	15	65	1	28	-	0	62
89	C. O. Ford	469	do.	368	-	-	27	5.5	112	312	22	38	-	0	90
90	John R. Elmore	685	Nov. 8, 1946	366	-	1.3	17	3.3	123	253	19	68	-	0	56
91	A. R. Cronin	72	Sept. 14, 1945	215	-	0.42	12	4.4	32	41	1	27	-	57	48
92	J. R. Elmore	710	do.	371	-	-	13	2.0	125	264	13	38	-	0	40
94	Joe E. Gay?	90	Nov. 8, 1946	206	-	0.04	18	6.1	18	28	2	28	-	56	70
95	W. R. Setphens	30	do.	438	-	0.15	46	18	46	24	12	42	-	246	189
98	R. I. Smith	150	Nov. 20, 1946	-	-	3.5	-	-	-	137	2	20	-	0.0	102
99	San Jacinto County	70	Nov. 15, 1946	-	-	0.0	-	-	-	246	3.0	52	-	0.0	147
100	J. P. Shirley	520	do.	296	-	0.19	26	4.6	91	288	10	25	-	0	84
102	W. H. Worsham	36	Nov. 18, 1946	-	-	0.15	-	-	-	13	24	32	-	4.4	54
103	Texas Long Leaf Lumber Co.	164	Nov. 8, 1946	344	-	0.51	39	8.1	85	246	15	70	-	0	131
104	Miss E. Langham	273	Nov. 25, 1946	305	-	0.06	16	2.5	103	274	12	27	-	0	50
105	do.	300	Jan. 6, 1947	358	-	.49	21	3.4	118	288	19	48	-	0.0	66
106	do.	265	Nov. 25, 1946	350	-	0.06	18	3.1	121	290	17	46	-	0	58
107	J. E. Blair	121	Nov. 8, 1946	248	-	0.31	38	7.9	46	229	5	24	-	0	127
108	Mrs.D.M.Filler	29	Jan. 13, 1947	175	-	0.39	50	1.6	12	154	18	3.0	-	1.0	131
109	Urbana Sand and Gravel Co.	120	Jan. 6, 1947	270	-	0.17	30	4.7	71	262	12	16	-	0.0	94
110	do.	120	do.	285	-	0.29	31	5.7	61	182	15	30	-	0.2	101
111	Ty Parker	15	Nov. 26, 1946	-	-	3.5	-	-	-	44	4.0	37	-	2.2	73
112	Obie Sels	27	do.	-	-	5.5	-	-	-	129	15	49	-	34	144
113	West Lumber Co.	150	do.	257	-	0.17	61	6.2	23	222	6	28	-	0	178
114	Lucy B.Modesett	400	Nov. 21, 1946	-	-	0.0	-	-	-	239	5.0	33	-	-	138
115	J.G.Greathouse	457	Nov. 25, 1946	253	-	0.23	10	2.3	92	240	11	18	-	0	34
116	do.	330	do.	398	-	0.03	11	1.7	148	306	17	62	-	0	34

a/ Hardness by the soap method.

Partial analyses of water from wells and springs in San Jacinto County -- continued
(Results are in parts per million)

Well	Owner	Depth of well (ft.)	Date of collection	Total dissolved solids	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium and Potassium (Na+K) (calc.)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Total hardness as $CaCO_3$ (calc.)
117	J. R. Elmore	240	Nov. 26, 1946	266	-	0.11	20	3.0	79	246	10	16	-	0.2	62
118	Cochran and James	200	Nov. 21, 1946	-	-	0.0	-	-	-	228	6.0	29	-	-	105
119	do.	600	do.	-	-	0.05	-	-	-	235	11	36	-	-	51
120	J. Schrader	334	Nov. 18, 1946	303	-	-	39	6.8	74	230	18	56	-	0.0	126
121	San Jacinto County	80	do.	-	-	0.05	-	-	-	120	2	33	-	0.2	96
122	G. W. Parker	21	do.	-	-	0.30	-	-	-	9.0	12	43	-	-	171
123	Cochran and Falvey	185	Nov. 13, 1946	-	-	0.25	-	-	-	136	2	20	-	0.0	96

a/ Hardness by the soap method.

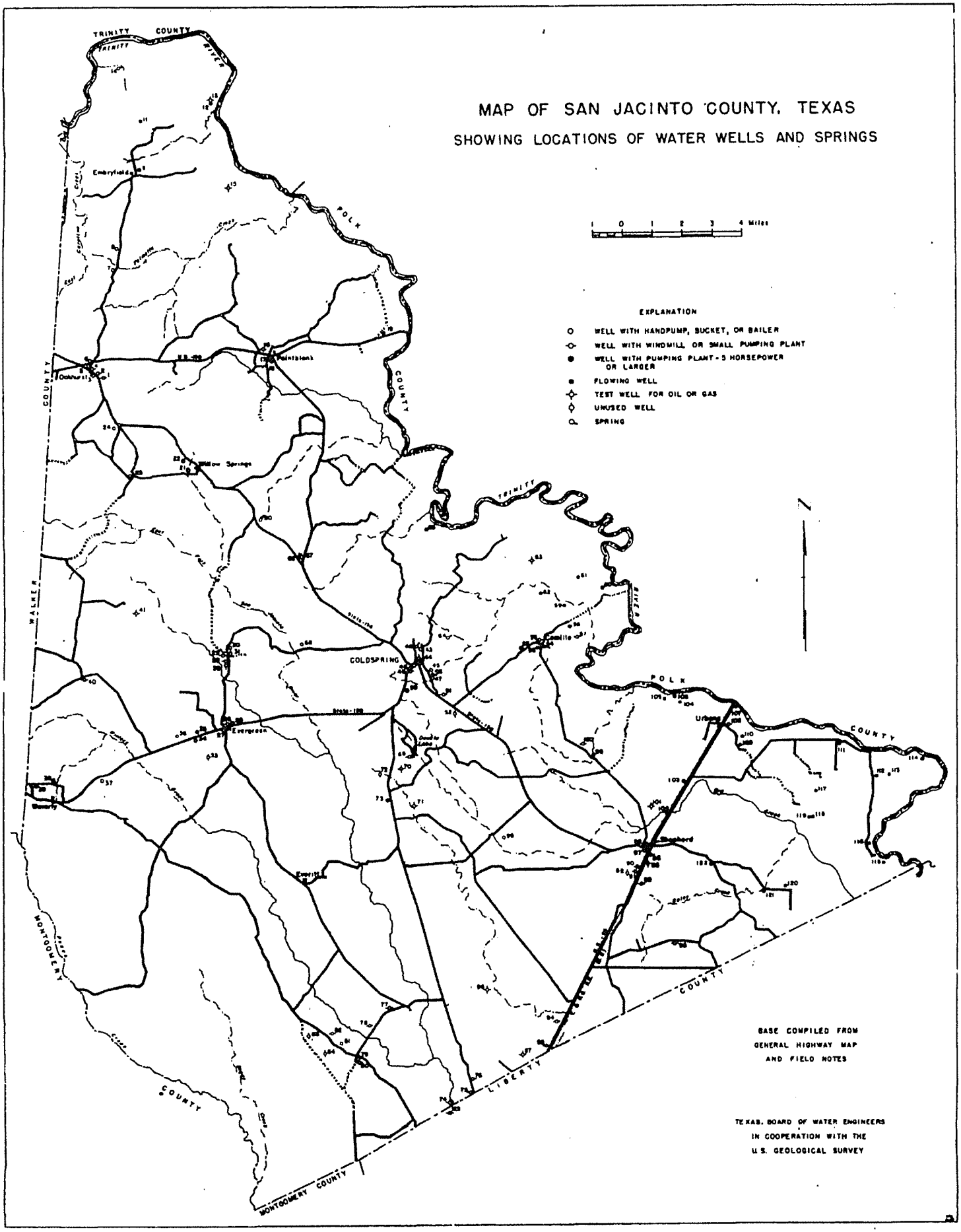
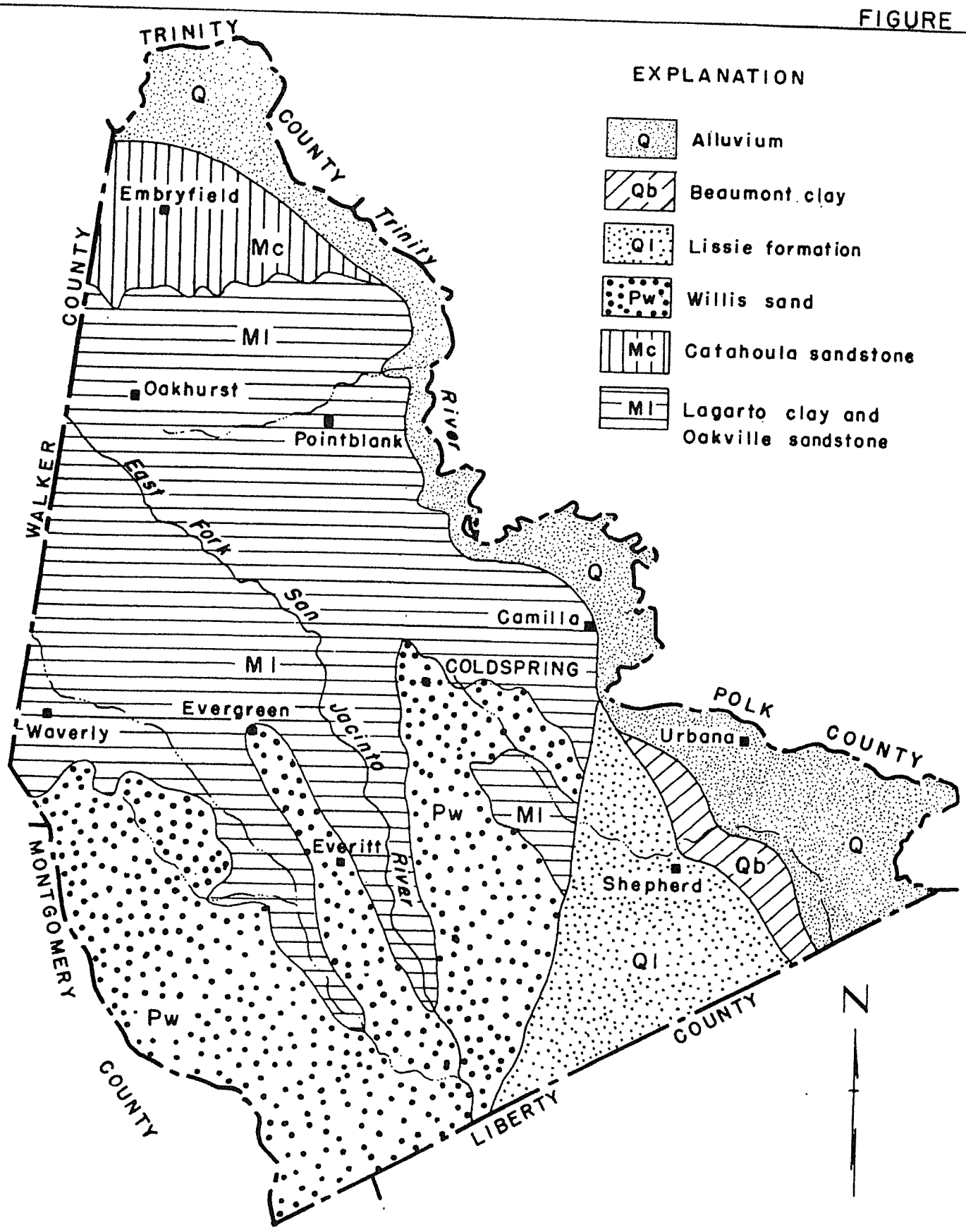

MAP OF SAN JACINTO COUNTY, TEXAS
SHOWING LOCATIONS OF WATER WELLS AND SPRINGS
0 1 2 3 4 Miles
EXPLANATION
WELL WITH HANDPUMP, BUCKET, OR BAILER
WELL WITH WINDMILL OR SMALL PUMPING PLANT
WELL WITH PUMPING PLANT - 5 HORSEPOWER OR LARGER
FLOWING WELL
TEST WELL FOR OIL OR GAS
UNUSED WELL
SPRING
TRINITY COUNTY
POLK COUNTY
WALKER COUNTY
MONTGOMERY COUNTY
LIBERTY COUNTY
COLDSPRING
Evergreen
Willow Springs
Onalaska
Livingston
Goodrich
Urland
Shepherd
Emmett
Coldspring
Cleveland
BASE COMPILED FROM GENERAL HIGHWAY MAP AND FIELD NOTES
TEXAS BOARD OF WATER ENGINEERS IN COOPERATION WITH THE U.S. GEOLOGICAL SURVEY

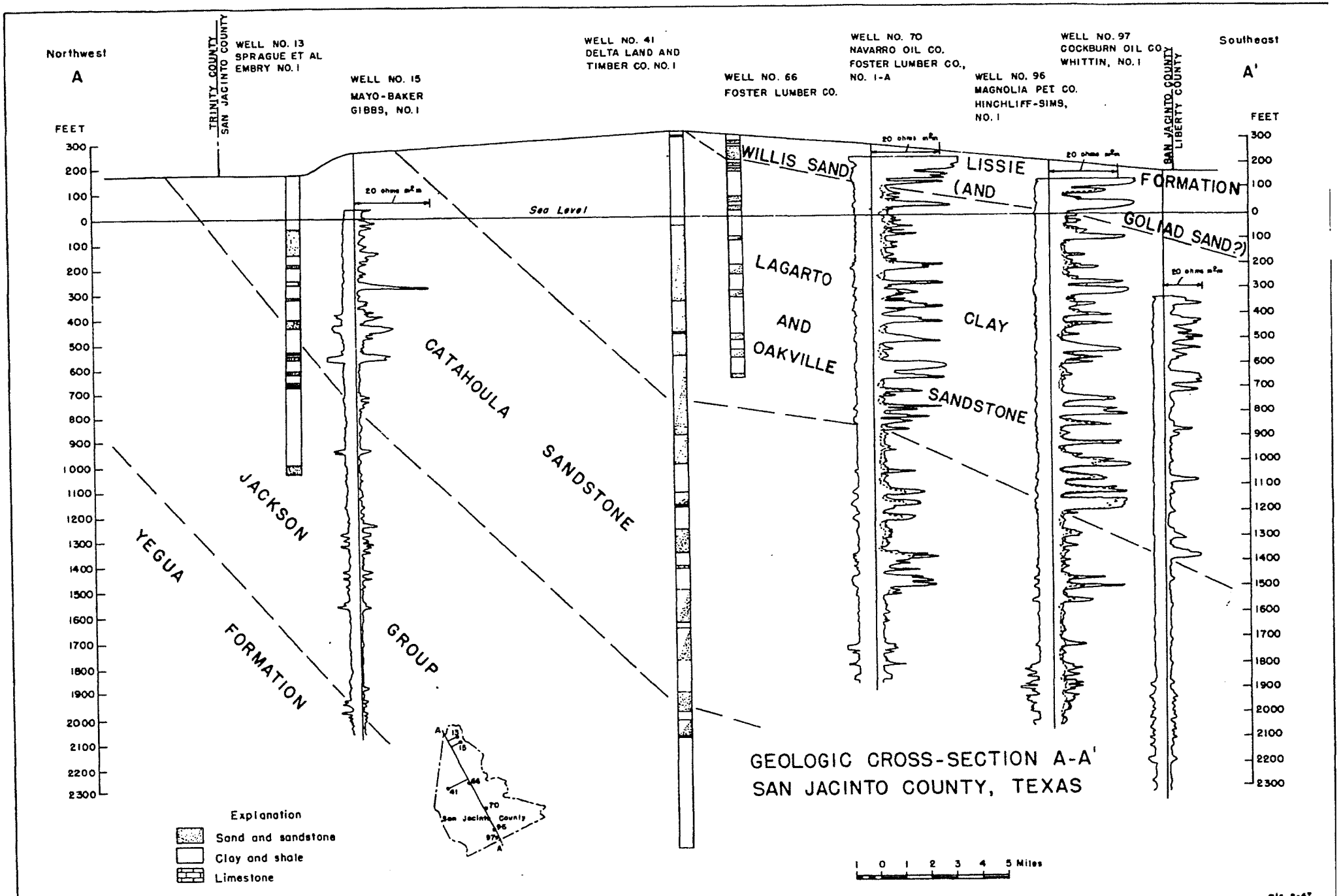
FIGURE 1



GEOLOGIC MAP OF SAN JACINTO COUNTY, TEXAS

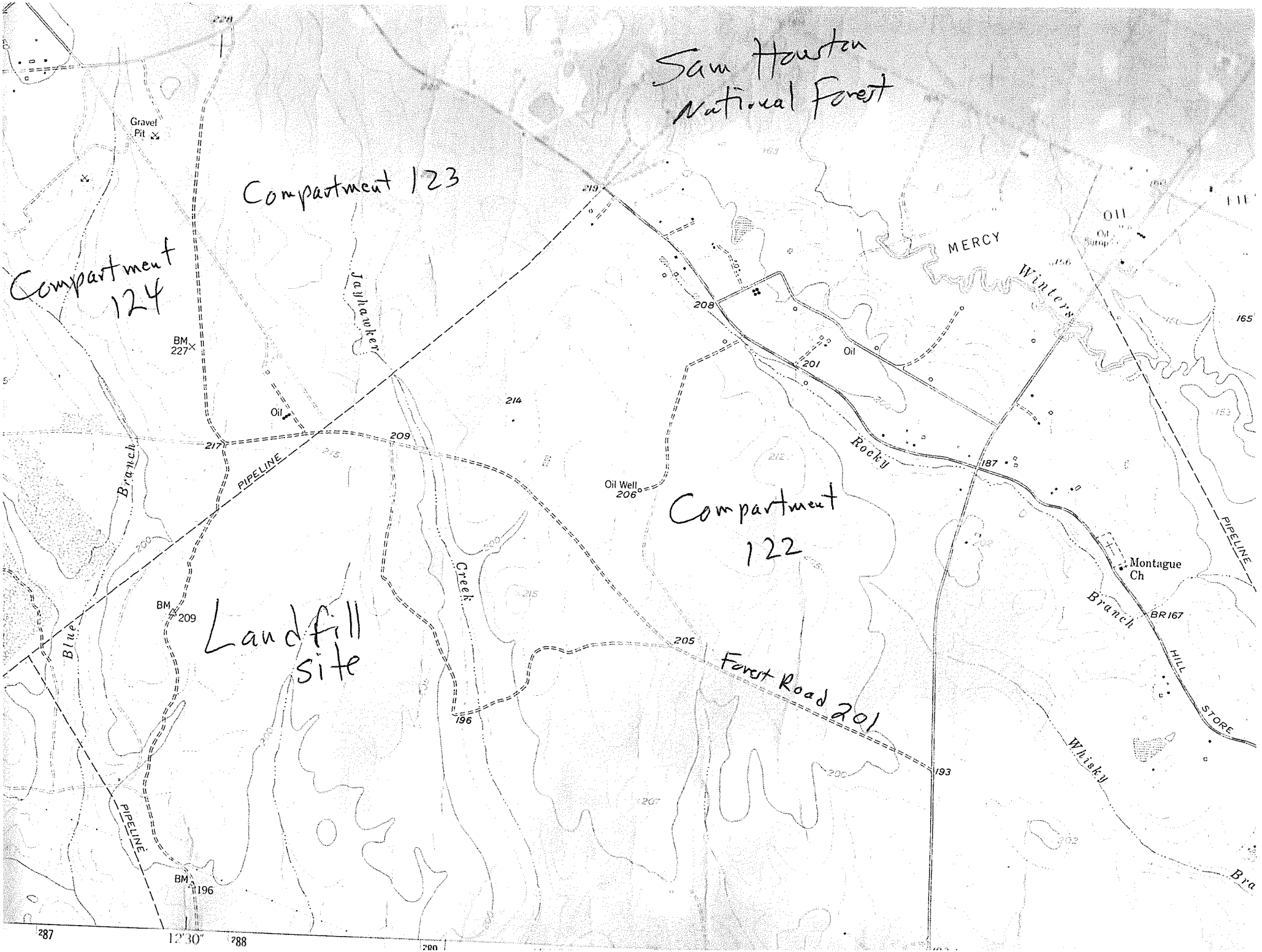
5 0 5 MILES

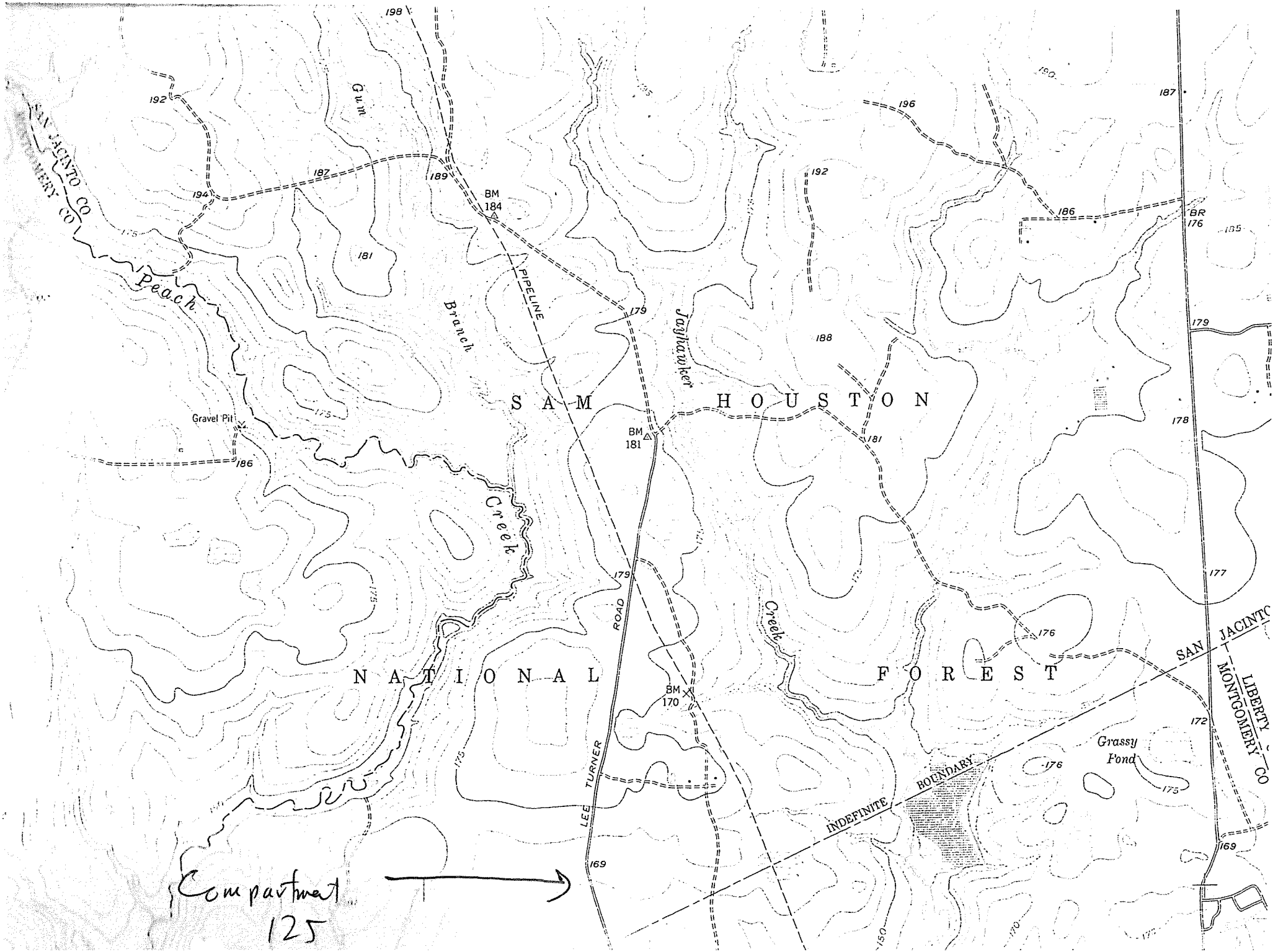
From geologic map of Texas, U.S. Geological Survey, 1937


Northwest
A
Southeast
A'
TRINITY COUNTY
SAN JACINTO COUNTY
WELL NO. 13
SPRAGUE ET AL
EMBRY NO. 1
WELL NO. 15
MAYO-BAKER
GIBBS, NO. 1
WELL NO. 41
DELTA LAND AND
TIMBER CO. NO. 1
WELL NO. 66
FOSTER LUMBER CO.
WELL NO. 70
NAVARRO OIL CO.
FOSTER LUMBER CO.,
NO. 1-A
WELL NO. 96
MAGNOLIA PET CO.
HINCHLIFF-SIMS,
NO. 1
WELL NO. 97
COCKBURN OIL CO.
WHITTIN, NO. 1
SAN JACINTO COUNTY
LIBERTY COUNTY
FEET
Sea Level
20 ohms m²/m
WILLIS SAND
LISSIE
(AND
FORMATION
GOLIAD SAND?)
LAGARTO
AND
OAKVILLE
CLAY
SANDSTONE
CATAHOULA
SANDSTONE
JACKSON
YEGUA
FORMATION
GROUP
GEOLOGIC CROSS-SECTION A-A'
SAN JACINTO COUNTY, TEXAS
Explanation
Sand and sandstone
Clay and shale
Limestone
San Jacinto County
1 0 1 2 3 4 5 Miles

Attachment 4

Topographic Maps Near the Proposed Peach Creek Landfill Site and Sam Houston National Forest


Sam Houston National Forest
Compartment 123
Compartment 124
Compartment 122
Landfill Site
Forest Road 201
Gravel Pit
BM 227
BM 209
BM 196
Oil
Oil Well 206
Jaybawker
Blue Branch
Creek
Rocky
Winters
MERCY
Montague Ch
Branch
HILL
STORE
Whisky
PIPELINE
PIPELINE
PIPELINE
BR 167
12'30"


SAN JACINTO CO
MONTGOMERY CO
Peach
Gum
Branch
PIPELINE
Jaybawker
Creek
Creek
SAM HOUSTON
NATIONAL FOREST
Gravel Pit
BM 184
BM 181
BM 170
BR 176
LEE TURNER ROAD
INDEFINITE BOUNDARY
SAN JACINTO
LIBERTY
MONTGOMERY CO
Grassy Pond
198
192
187
194
189
186
181
179
188
196
178
177
176
175
172
169
Compartment
125

Attachment 5

Sam Houston National Forest and Proposed Peach Creek Landfill Site NRCS Soil Series Information

LOCATION CONROE TX

Established Series
Rev. CDB:JMG
4/93

CONROE SERIES

The Conroe series consists of deep, moderately well drained, slowly permeable soils on uplands. The soil formed in acid clayey and loamy sediments. Slopes range from 0 to 12 percent.

TAXONOMIC CLASS: Clayey, kaolinitic, thermic Arenic Plinthic Paleudults

TYPICAL PEDON: Conroe gravelly loamy fine sand--forested. (Colors are for moist soil unless otherwise stated.)

A--0 to 4 inches; grayish brown (10YR 5/2) gravelly loamy fine sand, light gray (10YR 7/2) dry; single grained; loose; very friable; many medium and coarse roots; 17 percent by volume of nodules of ironstone up to 2 cm in diameter; very strongly acid; clear smooth boundary. (3 to 8 inches thick)

E--4 to 25 inches; light yellowish brown (10YR 6/4) gravelly loamy fine sand, very pale brown (10YR 7/4) dry; single grained; loose; many medium and coarse roots; 43 percent by volume of nodules of ironstone up to 2 cm in diameter; strongly acid; gradual wavy boundary. (15 to 25 inches thick)

Bt--25 to 31 inches; yellowish brown (10YR 5/6) sandy clay loam; brownish yellow (10YR 6/6) dry; common fine and medium distinct yellowish red and red mottles; moderate fine blocky structure; slightly firm, hard; common medium and coarse roots; few fine pores; thin patchy clay films on some peds; the centers of some mottles are slightly cemented dark red concretions; 20 percent by volume of nodules of ironstone; very strongly acid; gradual wavy boundary. (3 to 10 inches thick)

Btv1--31 to 38 inches; yellowish brown (10YR 5/6) sandy clay; many coarse and medium prominent red mottles; moderate medium blocky structure; extremely hard, firm and brittle, slightly sticky; few medium and coarse roots in the yellowish brown areas; few fine pores; thick continuous clay films; 10 percent by volume nodules of ironstone; plinthite comprises about 30 percent of the horizon and some red mottles have weakly cemented red concretions in their centers; very strongly acid; gradual wavy boundary. (5 to 14 inches thick)

Btv2--38 to 68 inches; coarsely and prominently mottled red (2.5YR 4/8; 10R 4/8) and yellow (10YR 7/6) dry, sandy clay; common coarse light brownish gray (10YR 6/2) mottles on the outsides of some peds; many of the coarse red mottles are bridged together; moderate coarse blocky structure, parting to fine and medium blocky structure; extremely hard, firm and brittle, slightly sticky; few roots penetrate parts of the yellow and light brownish gray areas and are concentrated in the uncemented part; few fine pores; few brown stains on faces of peds; thick continuous clay films; 6 percent by volume nodules of ironstone; about 40 percent plinthite; very strongly acid; diffuse wavy boundary. (15 to 35 inches thick)

Btv3--68 to 78 inches; coarsely and prominently mottled reddish yellow (7.5YR 6/8) and red (10R 4/8) dry, sandy clay; common medium light gray (10YR 7/1) streaks; moderate coarse blocky structure and few weak horizontal stratifications; extremely hard, brittle, firm; few fine roots in the gray areas; few fine pores; some coarse prisms have thick continuous glossy clay coatings; about 40 percent coarse red mottles of plinthite; few nodules of ironstone up to about 1 cm in diameter; common bridging of coarse red mottles; strongly acid; gradual wavy boundary. (10 to 25 inches thick)

BCv--78 to 96 inches; coarsely and distinctly mottled weak red (10R 5/4), red (2.5YR 4/8; 10R 4/8) and pale brown (10YR 7/4) dry, sandy clay loam; weak very coarse blocky structure and common weak horizontal

stratifications; extremely hard, firm, brittle; few fine roots; few medium and coarse pores filled with yellowish brown clay; few of the red mottles are weakly cemented; 30 to 40 percent plinthite; clay plugs fills channels that are at various angles from the horizontal plane, they are mostly less than 5 cm in diameter and extend less than 6 inches and are mostly 2 to 3 inches in length; thick patchy clay coatings up to about 2 mm thick on horizontal planes; strongly acid.

TYPE LOCATION: Montgomery County, Texas; from the intersection of U.S. Highway 75 and Farm Road 2432 in Willis, Texas; 4.4 miles southeast on Farm Road 2432; then north on private road 0.15 mile and 100 feet east of private road in woods.

RANGE IN CHARACTERISTICS: The solum ranges from 60 to more than 100 inches thick.

The A and E horizons are loamy fine sand, loamy sand, gravelly, or very gravelly phases of these textures. They range from 20 to 40 inches thick and from slightly acid through very strongly acid. Nodules of ironstone range from 5 to 50 percent by volume and in many pedons are concentrated in the E horizon. Graded phases are recognized. The A horizon ranges from dark gray (10YR 4/1) to light gray (10YR 7/2), or pale brown (10YR 6/3). The E horizon ranges from gray (10YR 5/1) or light gray (10YR 7/1), to pale brown (10YR 6/3), or light yellowish brown (10YR 6/4).

The Bt horizon ranges from brownish yellow (10YR 6/6, 6/8) to yellowish brown (10YR 5/4, 5/6, 5/8) with red or yellowish red mottles. It is sandy clay loam, sandy clay, clay loam, or clay. Ironstone nodules range from few to 25 percent by volume. Plinthite ranges from none to 10 percent by volume. The Bt horizon is strongly or very strongly acid. The Btv1 horizon ranges from brownish yellow (10YR 6/6, 6/8) to yellowish brown (10YR 5/4, 5/6, 5/8), with common to many yellowish red, red, or dark red mottles. Plinthite ranges from 10 to 40 percent by volume. The Btv2 horizon is mottled red, dark red, yellow, brownish yellow, strong brown, and gray. Plinthite ranges from 10 to 50 percent by volume. The Btv2 and Btv3 horizons are sandy clay or clay with 35 to 50 percent clay and less than 20 percent silt. Ironstone nodules range from few to 15 percent by volume and are strongly or very strongly acid. The Btv3 and BCv horizons are reticulately and coarsely mottled red, dark red, light gray, yellowish brown, strong brown, or pale brown. They are sandy clay or sandy clay loam. Reaction is strongly or very strongly acid.

COMPETING SERIES: There are no competing series in the same family. Similar series are the Depcor, Fuquay, Gunter, Lilbert, Rogan, Sunsweet and Wicksburg. Depcor soils have loamy control sections and have base saturation greater than 35 percent. Fuquay, Lilbert, and Rogan soils have loamy control sections. In addition, Rogan soils lack sandy A horizons more than 20 inches thick. Gunter soils have sandy A horizons more than 40 inches thick. Sunsweet soils lack sandy A horizons more than 20 inches thick. Wicksburg soils lack 5 percent or more plinthite in the solum

GEOGRAPHIC SETTING: Conroe soils are on gently sloping upland ridges and divides in the Western Coastal Plain. Slopes range from 0 to 12 percent, but are mainly 1 to 4 percent. The soil formed in unconsolidated acid sandy clays and sands with all known areas being the Willis formation of Pleistocene age. The climate is humid with an average annual rainfall of 40 to 55 inches. The mean annual temperature ranges from 67 to 70 degrees F.and Thornthwaite P-E index exceeds 64.

GEOGRAPHICALLY ASSOCIATED SOILS: These are competing Depcor, Gunter, Lilbert, and Rogan series and the Segno and Woodville series. Depcor, Lilbert, and Rogan soils are on slightly lower gentle slopes. Gunter soils are on similar positions. Segno and Woodville soils have A horizons less than 20 inches thick and are on nearby gentle slopes.

DRAINAGE AND PERMEABILITY: Moderately well drained; Internal drainage is moderate above the horizons containing plinthite and slow in the horizons having plinthite. Slow permeability. Runoff is low on 0 to 1 percent slopes, medium on 1 to 5 percent slopes, and high on 5 to 12 percent slopes.

USE AND VEGETATION: Most areas are in timber. Some have been cleared for row crops and pasture. Native vegetation is shortleaf, longleaf, and loblolly pine with such hardwoods as sweetgum, post oak, red oak,

and hickory. Understory is yaupon, wax-myrtle, American beautyberry, bay, and viburnum. Many areas of Conroe soils have been surface mined for the ironstone nodules.

DISTRIBUTION AND EXTENT: Southern Coastal Plain of Texas. The series is of large extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Temple, Texas

SERIES ESTABLISHED: Walker County, Texas; 1975.

REMARKS: Diagnostic horizons and features recognized in the pedons are:

Ochric epipedon - 0 to 25 inches

Arenic feature - 0 to 25 inches is loamy fine sand or coarser

Argillic horizon - 25 to 78 inches

Plinthic feature - 31 to 96 inches

ADDITIONAL DATA: Data from National Soil Survey Laboratory published in SS1R-30; S64TX-170-5(64275-64284) and S64TX-170-6(64285-64294) indicate 44 to 49 percent clay in the Bt horizon and more than 50 percent kaolinite and a base saturation of about 20 percent at 50 inches below the top of the Bt horizon.

National Cooperative Soil Survey
U.S.A.

LOCATION OTANYA TX

Established Series
KG-JKW-RM
07/2014

OTANYA SERIES

The Otanya series consists of very deep, well drained soils. These nearly level to gently sloping soils formed in loamy fluviomarine deposits of the Lissie Formation of early to mid Pleistocene age. Slope ranges from 1 to 5 percent. Mean annual temperature is about 19.4 degrees C (67 degrees F), and mean annual precipitation is about 1295 mm (51 in).

TAXONOMIC CLASS: Fine-loamy, siliceous, semiactive, thermic Typic Paleudults

TYPICAL PEDON: Otanya very fine sandy loam--forest; elevation is 40 m (130 ft). (Colors are for moist soil unless otherwise stated.)

Ap--0 to 15 cm (0 to 6 in); dark grayish brown (10YR 4/2), very fine sandy loam; weak fine subangular blocky and weak fine granular structure; friable, soft; many very fine to medium roots; common very fine and fine interstitial and tubular pores; 1 percent fine and medium distinct worm casts; 5 percent by volume fine and medium masses of brown (10YR 5/3) very fine sandy loam throughout; strongly acid; clear smooth boundary. (8 to 19 cm [3 to 8 in] thick)

E--15 to 30 cm (6 to 12 in); 70 percent light yellowish brown (10YR 6/4) and 30 percent brown (10YR 5/3), very fine sandy loam; weak fine subangular blocky structure; friable, soft; common very fine and fine roots; common very fine and fine interstitial and tubular pores; 1 percent medium cylindrical ironstone nodules;1 percent fine distinct brown (7.5YR 4/4) iron-manganese masses with sharp boundaries lining pores; very strongly acid; clear smooth boundary. (13 to 45 cm [5 to 18 in] thick)

EB--30 to 48 cm (12 to 19 in); 65 percent light yellowish brown (10YR 6/4) and 35 percent brownish yellow (10YR 6/6), very fine sandy loam; weak medium and coarse prismatic parting to weak medium and coarse subangular blocky structure; friable, slightly hard; common very fine and fine roots; few very fine tubular pores; 2 percent medium cylindrical ironstone nodules; 3 percent fine and medium distinct reddish yellow (7.5YR 6/6) masses of oxidized iron with sharp boundaries on surfaces of peds; very strongly acid; clear smooth boundary. (13 to 41 cm [5 to 16 in] thick)

Bt--48 to 71 cm (19 to 28 in); brownish yellow (10YR 6/6), very fine sandy loam; weak medium and coarse prismatic parting to weak medium and coarse subangular blocky structure; friable, slightly hard; common very fine roots; few very fine tubular pores; 2 percent light yellowish brown (10YR 6/4) very fine sandy loam glossic material; 15 percent distinct brownish yellow (10YR 6/8) clay films on surfaces of peds; 4 percent medium cylindrical ironstone nodules; 2 percent fine prominent yellowish red (5YR 5/8) masses of oxidized iron with sharp boundaries on surfaces of peds; 3 percent fine and medium distinct reddish yellow (7.5YR 6/8) masses of oxidized iron with sharp boundaries on surfaces of peds; very strongly acid; gradual smooth boundary. (13 to 41 cm [5 to 16 in] thick)

Btc1--71 to 109 cm (28 to 43 in); brownish yellow (10YR 6/8), sandy clay loam; weak medium and coarse prismatic parting to weak medium and coarse subangular blocky structure; firm, hard; few very fine roots; few very fine tubular pores; 2 percent light yellowish brown (10YR 6/4) very fine sandy loam glossic material; 15 percent distinct brownish yellow (10YR 6/8) clay films on surfaces of peds;10 percent medium cylindrical

ironstone nodules; 2 percent medium cylindrical red (2.5YR 4/6) plinthite nodules; 2 percent fine prominent yellowish red (5YR 5/6) masses of oxidized iron with sharp boundaries on vertical surfaces of peds; 5 percent fine and medium distinct reddish yellow (7.5YR 6/8) masses of oxidized iron with sharp boundaries on surfaces of peds; very strongly acid; clear smooth boundary.

Btc2--109 to 152 cm (43 to 60 in); brownish yellow (10YR 6/8), sandy clay loam; weak medium and coarse prismatic parting to weak medium and coarse subangular blocky structure; firm, hard; few very fine roots; few very fine tubular pores; 2 percent light yellowish brown (10YR 6/4) very fine sandy loam glossic material; 20 percent distinct brownish yellow (10YR 6/8) clay films on surfaces of peds; 12 percent medium cylindrical ironstone nodules; 3 percent medium cylindrical red (2.5YR 4/6) plinthite nodules; 1 percent fine distinct light brownish gray (10YR 6/2) iron depletions with sharp boundaries on surfaces along root channels; 2 percent fine prominent yellowish red (5YR 5/6) masses of oxidized iron with sharp boundaries on vertical surfaces of peds; 3 percent fine and medium distinct reddish yellow (7.5YR 6/8) masses of oxidized iron with sharp boundaries on surfaces of peds; 5 percent medium prominent red (2.5YR 4/8) masses of oxidized iron with sharp boundaries on surfaces of peds; very strongly acid; clear wavy boundary. (combined thickness of the Btc horizons is 45 to 109 cm [18 to 43 in])

B't1--152 to 198 cm (60 to 78 in); brownish yellow (10YR 6/8), sandy clay loam; weak coarse prismatic parting to weak medium and coarse subangular blocky structure; firm, hard; few very fine roots; few very fine tubular pores; 25 percent distinct brownish yellow (10YR 6/8) clay films on surfaces of peds; 5 percent medium cylindrical ironstone nodules; 2 percent medium cylindrical red (2.5YR 4/6) plinthite nodules; 2 percent fine distinct light brownish gray (10YR 6/2) iron depletions with sharp boundaries on surfaces along root channels; 2 percent fine prominent yellowish red (5YR 5/6) masses of oxidized iron with sharp boundaries on vertical surfaces of peds; 3 percent fine and medium distinct reddish yellow (7.5YR 6/8) masses of oxidized iron with sharp boundaries on surfaces of peds; 8 percent medium prominent red (2.5YR 4/8) masses of oxidized iron with sharp boundaries on surfaces of peds; very strongly acid; gradual wavy boundary. (combined thickness of the B't horizons is 51 to 96 cm [20 to 38 in] thick)

B't2--198 to 279 (78 to 110 in); brownish yellow (10YR 6/6) and 15 percent pale brown (10YR 6/3) and 25 percent light brownish gray (10YR 6/2), sandy clay loam; weak coarse subangular blocky structure; firm, hard; few very fine roots; few very fine tubular pores; 25 percent distinct brownish yellow (10YR 6/8) clay films on surfaces of peds; 5 percent medium cylindrical ironstone nodules; 2 percent medium cylindrical red (2.5YR 4/6) plinthite nodules; 2 percent fine prominent yellowish red (5YR 5/8) masses of oxidized iron with sharp boundaries on surfaces of peds; 3 percent fine distinct light brownish gray (10YR 6/2) iron depletions with sharp boundaries on surfaces along root channels; 5 percent fine and medium distinct reddish yellow (7.5YR 6/8) masses of oxidized iron with sharp boundaries on surfaces of peds; 8 percent medium prominent red (2.5YR 4/8) masses of oxidized iron with sharp boundaries on surfaces of peds; very strongly acid; gradual wavy boundary.

B't3--279 to 320 cm (110 to 126 in); brownish yellow (10YR 6/6) and 15 percent pale brown (10YR 6/3) and 25 percent light brownish gray (10YR 6/2) and 25 percent yellowish red (5YR 5/8), very fine sandy loam; weak very coarse subangular blocky structure; firm, hard; 25 percent distinct brownish yellow (10YR 6/8) clay films on surfaces of peds; 3 percent medium cylindrical ironstone nodules; 5 percent fine and medium distinct reddish yellow (7.5YR 6/8) masses of oxidized iron with sharp boundaries on surfaces of peds; 5 percent medium prominent red (2.5YR 4/8) masses of oxidized iron with sharp boundaries on surfaces of peds; very strongly acid.

TYPE LOCATION: Tyler County, Texas; from the intersection of Farm Road 92 and Farm Road 1493 in Fred; 3.3 miles west on Farm Road 1493 to county road; 0.7 mile south to forest road; 0.4 mile east on forest road; 200 feet north and then 50 feet west; Latitude: 30 degrees 32 minutes 53.00 seconds north N; Longitude: 94 degrees 13 minutes 53.00 seconds W. Fred topographic quadrangle; NAD 83.

RANGE IN CHARACTERISTICS:
Soil Moisture: An udic soil moisture regime. The soil moisture control section is 10 to 30 cm (4 to 12 in) below the soil surface and remains dry less than 90 cumulative days in most years.

Mean annual soil temperature: 20.6 to 21.7 degrees C (68 to 70 degrees F)
Depth to argillic horizon: 18 to 58 cm (7 to 23 in)
Particle-size control section (weighted average)
Clay content: 18 to 25 percent
CEC/clay ratio: 0.30 to 0.40

A Horizon
Hue: 10YR
Value: 3 to 5
Chroma: 2 or 3
Texture: fine sandy loam or very fine sandy loam
Clay content: 3 to 8 percent
Reaction: extremely acid to strongly acid

E Horizon

Hue: 7.5YR or 10YR
Value: 4 to 6
Chroma: 3 or 4
Texture: very fine sandy loam or fine sandy loam
Clay content: 4 to 11 percent
Ironstone nodules: amount-0 to 2 percent
Masses of oxidized iron: amount- 0 to 5 percent, color-shades of brown or yellow
Reaction: very strongly acid or strongly acid

Bt Horizon
Hue: 7.5YR or 10YR
Value: 5 or 6
Chroma: 4 to 8
Texture: very fine sandy loam, loam, or sandy clay loam
Clay content: 88 to 27 percent
Ironstone nodules: amount-1 to 8 percent
Plinthite nodules: amount-0 to 2 percent
Masses of oxidized iron: amount-2 to 15 percent, color-shades of brown, yellow, or red
Reaction: very strongly acid or strongly acid

Btc Horizon
Hue: 7.5YR, 10YR
Value: 5 or 6
Chroma: 4 to 8
Texture: loam, sandy clay loam, or clay loam
Clay content: 19 to 34 percent
Ironstone nodules: amount-5 to 10 percent
Plinthite nodules: amount-2 to 4 percent
Masses of oxidized iron: amount-5 to 20 percent, color-shades of brown, yellow, or red
Iron depletions: amount-0 to 5 percent, color-shades of gray
Base saturation: 25 to 35 percent
Reaction: extremely acid or very strongly acid

B't Horizon
Hue: 7.5YR, 10YR or 2.5Y
Value: 5 or 6
Chroma: 4 to 8

Texture: sandy clay loam or clay loam
Clay content: 18 to 32 percent
Ironstone nodules: amount-0 to 3 percent
Plinthite nodules: amount-0 to 3 percent
Masses of oxidized iron: amount-5 to 25 percent, color-shades of brown, yellow, or red
Iron depletions: amount-2 to 15 percent, color-shades of gray
Base saturation: 25 to 35 percent
Reaction: extremely acid to moderately acid

COMPETING SERIES: These include the Addielou (TX), Allen (TN), Avilla (AR), Dubach (LA), Etowah (TX), Holston (TN) Leesburg (AL), Lytle (LA), Nella (TN), Octavia (OK), , Ruston (LA), Sailes (TX), Silsbee (TX) and Warnock (AR) series in the same family.

Addielou soils: have an ochric pedon more than 50 cm (20 in) thick and the upper Bt horizons have a yellower hue
Allen soils: formed in alluvium or colluvium derived from sandstone and shale
Avilla soils: have more than 15 percent coarse fragments in the lower Bt
Dubach, Holston, and Warnock soils: have hue of 7.5YR or yellower throughout
Etowah soils: formed in alluvium or colluvium that is underlain by limestone
Leesburg and Nella, and Octavia soils: have sandstone or chert gravels in the Bt horizon
Lytle soils: formed from loess-mantled coastal plain sediments
Ruston soils: are bisequal, with a glossic horizon in the lower part
Sailes soils: formed in Tertiary-aged formations containing glauconitic parent materials
Silsbee soils: have hue redder than 7.5YR in the argillic horizon

GEOGRAPHIC SETTING:
Parent material: loamy fluviomarine deposits of the Lissie Formation of early to mid-Pleistocene age.
Landscape: inland dissected Coastal plain
Landform: interfluves
Slope: 1 to 5 percent
Mean annual air temperature range: 19.5 to 20.6 degrees C (67 to 69 degrees F).
Mean annual precipitation range: 1219 to 1473 mm (48 to 58 in)
Precipitation Pattern: Rainfall is generally uniform throughout the year with slight peaks in the spring and fall.
Frost-free period: 240 to 300 days
Elevation: 22.9 to 46 m (75 to 150 feet)

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Dallardsville (TX), Kirbyville (TX), Lelavale (TX), Niwana (TX), Silsbee (TX) , Sorter (TX), and Waller (TX) series.

Dallardsville soils: less than 18 percent clay in the particle-size control section; on mounds in complex with the Sorter or Waller soils
Kirbyville soils: have oxyaquic conditions; on a lower footslope position on a similar landform
Lelavale soils: have aquic conditions; in enclosed depressions
Niwana soils: less than 18 percent clay in the particle-size control section; on mounds in complex with the Kirbyville soils
Silsbee soils: have a redder argillic horizon; on steeper sideslopes on a similar landform
Sorter and Waller soils; have aquic conditions; on relict meander belt channels

DRAINAGE AND PERMEABILITY: Well drained. Permeability is moderately slow. Runoff is very low to medium on slopes less than 5 percent; high on slopes greater than 5 percent. A perched water table ranging from 107 to 122 cm (42 to 48 in) from the surface exists in normal years from January to March in most years on slopes up to 3 percent. For slopes greater than 3 percent the perched water table exists for periods less than 1 week in duration following heavy rainfall events from January to March in most years.

USE AND VEGETATION: These soils are used mainly for timber and pasture. Forest vegetation includes loblolly, shortleaf, slash and longleaf pines, sweetgum, red oak, and hickory trees. Pastures are mainly improved bermudagrass and bahiagrass. A few areas are cultivated and used for growing vegetables and blueberries.

DISTRIBUTION AND EXTENT: Southeast Texas and possibly southwestern Louisiana; LRR T; Western Gulf Coast Flatwoods (MLRA 152B); large extent

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Temple, Texas

SERIES ESTABLISHED: Polk County, Texas, 1983.

REMARKS: These soils have been included in the Segno and Malbis series. The Otanya series was proposed in Jasper County, Texas 1977 and was dropped in 1980. It was redefined slightly and proposed for active status in 1982. The type location was moved from Polk County to Tyler County, which is centrally located in the series province. The classification was changed from Plinthic Paleudults to Typic Paleudults during the correlation of the update of MLRA 152B in June 2004 after pit studies showed that less than 5 percent plinthite is common in most pedons. The water table depths and time period were established as a result of a water table study conducted in Jasper County, Texas and Beauregard Parish, Louisiana from 1998 to 2002.

Diagnostic horizons and features recognized in this pedon are:

Particle-size control section: 48 to 98 cm (19 to 39 in). (Bt and Btc1 horizons)
Ochric epipedon: 0 to 48 cm (0 to 19 in). (A, E1 and E2 horizons)
Argillic horizon: 48 to 203 cm (19 to 80 in) Bt, Btc1

The assignment of the cation-exchange activity class is supported by laboratory data number S98TX-457-001 from Tyler County, Texas.

ADDITIONAL DATA: Data from the Texas A&M University Soil Characterization laboratory exists from the series type location in Tyler County (S98TX-457-001) and from a representative pedon in Jasper County, Texas (S98TX-241-001). The data from Jasper County has a base saturation at 180 cm below the mineral surface of 52, which is out of range for the Ultisols order.

Taxonomic Version: Keys to Soil Taxonomy, Eleventh Edition, 2003

National Cooperative Soil Survey
U.S.A.

LOCATION PINETUCKY TX+LA

Established Series
Rev. KG:CN:LCB
10/2001

PINETUCKY SERIES

The Pinetucky series consists of deep, moderately well drained, moderately slowly permeable soils that formed in loamy coastal plain sediments of Pleistocene age. These gently sloping to sloping soils are on uplands. Slopes range from 1 to 8 percent.

TAXONOMIC CLASS: Fine-loamy, siliceous, semiactive, thermic Plinthic Paleudults

TYPICAL PEDON: Pinetucky fine sandy loam, on 8 percent slope, in forest.
(Colors are for moist soil unless otherwise stated.)

A--0 to 8 inches; grayish brown (10YR 5/2) fine sandy loam; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine, few medium roots; very strongly acid; clear smooth boundary. (4 to 13 inches thick)

E--8 to 13 inches; yellowish brown (10YR 5/6) fine sandy loam; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine and few medium roots; very strongly acid; clear smooth boundary. (4 to 13 inches thick)

Bt1--13 to 27 inches; strong brown (7.5YR 5/6) sandy clay loam, few medium faint strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; patchy clay films on faces of peds; few fine and medium roots; few fine pores, very strongly acid; clear wavy boundary. (5 to 26 inches thick)

Bt2--27 to 48 inches; yellowish brown (10YR 5/8) sandy clay loam; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few fine pores; patchy clay films on faces of peds; very strongly acid; gradual wavy boundary. (8 to 28 inches thick)

Btv1--48 to 65 inches; yellowish brown (10YR 5/8) sandy clay loam; many medium and coarse prominent red (2.5YR 4/6), yellowish red (5YR 4/8) and many fine and medium distinct light gray (10YR 7/2) mottles; moderate medium subangular blocky structure; hard, firm, sticky and plastic, few fine pores; few thin patches of clay films on faces of peds; plinthite comprises about 10 percent by volume of the horizon; very strongly acid; clear smooth boundary. (2 to 27 inches thick)

Btv2--65 to 80 inches; brownish yellow (10YR 6/6) sandy clay loam; many medium and coarse prominent red (2.5YR 4/8), yellowish red (5YR 4/8) and common fine and medium distinct light gray (10YR 7/2) mottles; weak medium subangular blocky structure; hard, firm, sticky and plastic; few apparent clay films; plinthite comprises about 2 percent by volume of the horizon; very strongly acid.

TYPE LOCATION: Newton County, Texas; from the intersection of U. S. Highway 190 and Texas Highway 87, 4.1 miles northeast along Texas Highway 87, 1.2 miles east of Farm Road 1414, 800 feet southeast along forest road to gate, 100 feet south and 50 feet west in forest.

RANGE IN CHARACTERISTICS: Solum thickness is greater than 60 inches. Depth to horizon that contains more than 5 percent plinthite is 25 to 60 inches. Strongly cemented to indurated iron oxide concretions less than 2 cm in diameter range from 0 to 10 percent in the A horizons and 0 to 5 percent in the Bt horizon. CEC ranges from 8 to 15 meq per 10 gm of soil.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The E horizon has a hue of 10YR, value of 5 or 6, and chroma of 3 to 6. The horizons are fine sandy loam, sandy loam, or loamy fine sand. Reaction is medium acid to very strongly acid.

The Bt horizons have hue of 10YR or 7.5YR, value of 5 or 6, and chroma from 4 through 8. Mottles range from none to many, with hues of 10R to 10YR, value of 4 to 7, and chroma from 3 to 8. The Btv horizons have the same colors as the upper Bt horizons, and in addition, contain few to many mottles with value of 6 or 7, and chroma from 1 to 3. The Btv horizon contains 5 to 20 percent plinthite in some part. The texture of the Bt and Btv horizons is sandy clay loam or clay loam throughout, with a clay content ranging from 20 to 35 percent. Reaction is strongly acid to very strongly acid.

COMPETING SERIES: These are the Baxterville, Bowie, Dothan, Malbis, Notcher, Otanya, Rogan, and Tifton series in the same family and the Boykin and Sunsweet series. Baxterville soils have Bt horizons that are 5YR and redder. Bowie soils are on Eocene age landscapes of the upper coastal plains. Boykin soils have loamy fine sand surface layers 20 to 40 inches thick. Dothan and Tifton soils have less than 20 percent silt in the control section. Malbis and Otanya soils have perched water tables at shallower depths. Notcher and Rogan soils have more than 15 percent ironstone pebbles. Sunsweet soils have more than 35 percent clay in their control sections.

GEOGRAPHIC SETTING: Pinetucky soils are on gently sloping to sloping uplands of the West Coastal Plains. Slopes range from 1 to 8 percent. The soils formed in loamy sediments of Pleistocene age, mainly from the Willis formation. Mean annual precipitation ranges from 46 to 58 inches. Summer rainfall ranges from 30 to 40 inches. Summer moisture deficit ranges from 0 to 4 inches. Mean annual temperature ranges from 65 to 70 degrees F., and the Thornthwaite annual P-E index exceeds 72.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Boykin and Rogan series and the Bonwier, Conroe, Doucette, Newco, Stringtown, and Urland soils. Bonwier, Urland, and Newco soils occur on ridgetops and low hills in the landscape; they all have clayey control sections. Boykin soils are on slightly higher areas. Conroe and Doucette soils are on similar positions and have thicker loamy fine sand surface layers. Rogan soils occur on gently sloping areas. Stringtown soils occur on steep side slopes and have a clay content in the Bt horizon that decreases within 60 inches of the surface.

DRAINAGE AND PERMEABILITY: Pinetucky soils are moderately well drained. Runoff is slow to medium and permeability is moderately slow.

USE AND VEGETATION: Used mainly for forest and pasture. Forest consists mainly of loblolly, shortleaf, and longleaf pines, sweetgum, and red oak trees with an understory of grasses and shrubs. Pastures are mainly bermudagrass and bahiagrass.

DISTRIBUTION AND EXTENT: West Coastal Plains of southeast Texas and southwest Louisiana. The series is of moderate extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Temple, Texas

SERIES ESTABLISHED: Newton County, Texas; 1980.

REMARKS: These soils were previously included in the Bowie series.

National Cooperative Soil Survey
U. S. A.

LOCATION SORTER TX

Established Series
IKW-RM
07/2014

SORTER SERIES

The Sorter series consists of very deep, poorly drained soils. These nearly level to very gently sloping soils formed in loamy fluviomarine deposits of the Lissie Formation of early to mid-Pleistocene age. Slope ranges from 0 to 1 percent. Mean annual temperature is about 19.5 degrees C (67 degrees F), and mean annual precipitation is about 1295 mm (51 in).

TAXONOMIC CLASS: Coarse-loamy, siliceous, superactive, thermic Natric Vermaqualfs

TYPICAL PEDON: Sorter silt loam--forest. (Colors are for moist soil unless otherwise stated.)

A--0 to 8 cm, (0 to 3 in); gray (10YR 5/1) silt loam; massive due to crayfish bioturbation; hard, friable; many fine and few medium roots; many fine pores; few wormcasts; 50 percent crayfish krotovinas; 1 percent very fine black (10YR 2/1) concretions; 2 percent fine prominent yellow (10YR 7/6) iron concentrations with diffuse boundaries; 2 percent fine distinct brown (10YR 4/3) iron concentrations with diffuse boundaries along roots and in pores; very strongly acid; clear irregular boundary. (5 to 15 cm [2 to 6 in] thick)

Bg--8 to 48 cm, (3 to 19 in); light brownish gray (10YR 6/2) silt loam; massive due to crayfish bioturbation; hard, friable; many fine and medium roots; many fine pores; 60 percent crayfish krotovinas; 1 percent black concretions; 2 percent fine distinct yellow (10YR 7/6) iron concentrations with diffuse boundaries; 5 percent fine prominent yellowish red (5YR 4/6) iron concentrations with clear boundaries along roots and in pores; 10 percent fine prominent reddish yellow (7.5YR 6/8) iron concentrations with diffuse boundaries; very strongly acid; gradual wavy boundary. (30 to 76 cm [12 to 30 in] thick)

Btg/Eg1--48 to 173 cm, (19 to 68 in); light brownish gray (10YR 6/2) silt loam; weak very coarse prismatic structure; very hard, firm; few fine roots along surfaces of prisms; few distinct clay films in pores; 1 percent black (10YR 2/1) concretions; 60 percent crayfish krotovinas; many coatings of dark gray clay cups up to 1 mm thick in krotovinas, vertical crevices and on krotovina walls; 15 percent fine and medium prominent yellowish brown (10YR 5/8) iron concentrations with diffuse boundaries on surfaces of peds; 8 percent fine and medium prominent reddish yellow (7.5YR 6/8) iron concentrations with clear boundaries on surfaces of peds and in pores; very strongly acid; diffuse wavy boundary. (76 to 127 cm [30 to 50 in] thick)

Btg/Eg2--173 to 201 cm (68 to 79 in); light gray (10YR 7/2) silt loam; weak medium and coarse prismatic structure; very hard, firm; few fine roots; common fine and medium pores; few distinct clay films on surfaces of peds and in pores; 1 percent fine black concretions; 45 percent crayfish krotovinas; few lenses of heavy silt loam, and common small masses and lenses of very fine sandy loam, and many dark gray clay cups at the bottom of crayfish krotovinas; 25 percent fine and medium distinct brownish yellow (10YR 6/8) iron concentrations with diffuse boundaries; 2 percent fine and medium reddish yellow (7.5YR 7/6) iron concentrations with clear boundaries on surfaces of peds and in pores; 1 percent fine prominent light greenish gray (10Y 7/1) iron depletions lining old root channels; moderately acid; diffuse wavy boundary. (25 to 64 cm [10 to 25 in] thick)

Btg/Eg3--201 to 236 cm, (79 to 93 in), 65 percent light gray (10YR 7/2) sandy clay loam (Btg); 35 percent light gray (10YR 7/2)(Eg); weak coarse prismatic structure; hard, firm; few distinct clay films on surfaces of peds and

in pores; 20 percent crayfish krotovinas; 5 percent coarse distinct brownish yellow (10YR 6/6) iron concentrations with diffuse boundaries; few very fine sand and silt coatings on surfaces of prisms; Btg consists of irregular masses 5 to 8 cm (2 or 3 in) wide; Eg consists of albic material of very fine sandy loam texture; 10 percent is brittle; slightly acid, diffuse wavy boundary. (25 to 76 cm [10 to 30 in] thick)

Eg/Btg--236 to 279 cm, (93 to 110 in), 60 percent light gray (10YR 7/2) fine sandy loam (Eg); 40 percent light gray (10YR 7/2)(Btg); weak coarse prismatic structure; few fine roots; hard, firm; few masses of fine sand up to about 4 cm (1 1/2 in) in diameter; 4 percent fine distinct coarse brownish yellow (10YR 6/6) iron concentrations with diffuse boundaries; 2 percent fine prominent reddish yellow (7.5YR 6/8) with clear boundaries in peds; Btg consists of masses of sandy clay loam up to 8 cm (3 in) wide slightly acid.

TYPE LOCATION: Montgomery County, Texas; from the intersection of U.S. Highway 59 and Farm Road 2090 in Splendora; 4 miles west on Farm Road 2090; 50 ft south in forest. Fostoria topographic quad; Latitude: 30 degrees 15 minutes 10.7 seconds N; Longitude: 95 degrees 13 minutes 12.2 seconds W. NAD 83.

RANGE IN CHARACTERISTICS:
Soil Moisture: An aquic soil moisture regime.
Mean annual soil temperature: 20.6 to 21.7 degrees C (69 to 71 degrees F)
Crayfish krotovinas range from 50 to 70 percent in the upper 100 centimeters.

Particle-size control section (weighted average)
Clay content: 4 to 12 percent
CEC/clay ratio: 0.65 to 1.0
Exchangeable Sodium Percentage: 7 to 15 in the particle-size control section and 1 to 15 throughout.

A Horizon
Hue: 10YR
Value: 4 to 6
Chroma: 1 or 2
Texture: silt loam or very fine sandy loam
Crayfish krotovinas: 40 to 60 percent
Redox accumulations: amount- 1 to 5 percent, color-shades of yellow or brown
Reaction: extremely acid to strongly acid

Bg Horizon
Hue: 10YR
Value: 5 to 7
Chroma: 1 or 2
Texture: very fine sandy loam, fine sandy loam, silt loam, or loam
Crayfish krotovinas: 50 to 80 percent
Redox accumulations: amount- 5 to 25 percent, color-shades of yellow, brown, or red
Reaction: extremely acid to strongly acid

Btg/Eg Horizons
(Btg part)
Hue: 10YR
Value: 6 or 7
Chroma: 1 or 2
(Eg Part
Hue: 10YR or 2.5Y
Value: 6 or 7
Chroma: 1 or 2
Texture: very fine sandy loam, fine sandy loam, silt loam, loam, or sandy clay loam
Crayfish krotovinas: 30 to 60 percent

Redox accumulations: amount- 10 to 25 percent, color-shades of brown, yellow, or red and are mostly in the Btg
Redox depletions: amount- 0 to 4 percent, color-shades of gray, green or blue and are mostly in the Btg
Reaction: very strongly acid to neutral

Eg/Btg Horizons (where present)
(Eg Part
Hue: 10YR or 2.5Y
Value: 6 or 7
Chroma: 1 or 2
(Btg part)
Hue: 10YR or 2.5Y
Value: 6 or 7
Chroma: 1 or 2
Texture: very fine sandy loam, fine sandy loam, or silt loam
Crayfish krotovinas: 0 to 10 percent
Redox accumulations: amount- 2to 15 percent, color-shades of brown, yellow, or red and are mostly in the Btg
Redox depletions: amount- 0 to 4 percent, color-shades of gray, green or blue and are mostly in the Btg
Reaction: slightly acid or neutral

COMPETING SERIES: There are no series in the same family. Similar soils include the Caddo (LA), Clodine (TX), Gessner (TX), Nona (TX), Ozan (AR), Plank (TX), and Waller (TX) series.

Caddo, Clodine, Gessner, Ozan and Waller soils: do not have more than 50 percent crayfish bioturbation in the particle-size control section. In addition, Caddo and Nona soils have a fine-silty particle-size control section.
Clodine soils: do not more than 50 percent crayfish activity in the upper 100 cm.
Gessner soils: are in a fine-loamy family; are neutral to moderately alkaline; formed under prairie conditions.
Ozan soils: are in a subactive CEC/clay class; do not have more than 50 percent crayfish activity in the upper 100 cm.
Plank soils: have a coarse-silty particle-size control section.
Waller soils: have a fine-loamy particle-size control section; do not have more than 50 percent crayfish activity in the upper 100 cm.

GEOGRAPHIC SETTING:
Parent material: loamy fluviomarine deposits derived from the Lissie Formation of Pleistocene age
Landscape: coastal plains
Landform: flats
Slope: 0 to 1 percent but are mainly less than 0.5 percent
Mean annual air temperature range: 19.5 to 20.6 degrees C (67 to 69 degrees F)
Mean annual precipitation range: 1219 to 1473 mm (48 to 58 in)
Precipitation Pattern: Precipitation is generally uniform throughout the year with slight peaks in the spring and fall months.
Frost-free period: 240 to 300 days
Elevation: 22.9 to 46 m (75 to 150 ft)

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Dallardsville (TX), Kirbyville (TX), Kountze (TX), Plank (TX), Segno (TX), Splendora (TX) and Waller (TX) series.
Dallardsville, Kirbyville, and Kountze soils: are moderately well drained; on relict meander belt levees and bars.
Plank soils: have a coarse-silty particle-size control section; on similar landform.
Segno, Splendora and Waller soils: have a fine-loamy particle-size control section. Segno and Splendora soils are on relict meander belt levees and bars. Waller soils are on a similar landform.

DRAINAGE AND PERMEABILITY: Poorly drained. Runoff is high. Permeability is slow. These soils remain saturated with aquic conditions for long periods, especially during the winter and spring months.

USE AND VEGETATION: Most areas are in forest. Some areas have been cleared for pasture. Native vegetation includes lobolly and shortleaf pine and water oak, willow oak, red oak, and sweetgum. Understory includes blackgum, post oak, yaupon, persimmon, wax myrtle, American elm, and American beautyberry.

DISTRIBUTION AND EXTENT: Southeastern Texas and southwestern Louisiana; LRR T; The Western Gulf Coast Flatwoods (MLRA 152B); series of large extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Temple, Texas.

SERIES ESTABLISHED: Montgomery County, Texas; 1975.

REMARKS: The Sorter series was redescribed in 1997 to reflect the change in Soil Taxonomy with the addition of the Vermaqualfs great group.

Diagnostic horizons and features in this pedon include:

Ochric epipedon: 0 to 8 cm (0 to 3 in) (A horizon)

Vermic feature: over 50 percent crayfish bioturbation (Bg and Btg/Eg1 horizons)

Argillic horizon: 48 to 203 cm (19 to 80 in) (Btg/Eg horizons)

Natric horizon: Exchangeable sodium percentage of more than 7 in the particle-size control section.

Glossic horizon: 48 to 203 cm (19 to 80 in) (Btg/Eg horizons. The glossic horizon is series criteria but is not diagnostic for classification.)

Taxonomic Version: Keys to Soil Taxonomic, Eleventh Edition, 2010.

ADDITIONAL DATA: Data available from Beltsville Lab on Lab Nos. 4295-64302 and 64303-64309 in Montgomery County. Data available from Texas A&M University Soil Characterization Lab for pedon number S78TX-339-003 from, Soil Morphology and Moisture Regimes Along a Hillslope in the Texas Coastal Plain, a dissertation by Michael John Verpraskas and Larry P. Wilding, Texas A&M University, 1980 in Montgomery County. Also, TAMU Soil Characterization Lab for pedon S95TX-199-008 from Hardin County and S00TX-457-002 from Tyler County.

National Cooperative Soil Survey
U.S.A.

LOCATION SPLENDORA TX

Established Series
CLN:JKW:RM
07/2014

SPLENDORA SERIES

The Splendora series consists of very deep, moderately well to somewhat poorly drained soils that formed in loamy fluviomarine deposits of Pleistocene age. Slope ranges from 0 to 2 percent. Mean annual temperature is about 19.5 degrees C (67 degrees F), and mean annual precipitation is about 1350 mm (53 in).

TAXONOMIC CLASS: Fine-loamy, siliceous, active, thermic Oxyaquic Paleudalfs

TYPICAL PEDON: Splendora fine sandy loam in forest. (Colors are for moist soil unless otherwise stated).

A--0 to 15 cm, (0 to 6 in); dark grayish brown (10YR 4/2), fine sandy loam, grayish brown (10YR 5/2), dry; weak medium granular structure; soft, friable, nonsticky, nonplastic; common fine and medium roots; common fine interstitial pores; very strongly acid; clear smooth boundary. (8 to 26 cm [3 to 10 in] thick)

E--15 to 38 cm, (6 to 15 in); brown (10YR 5/3), fine sandy loam, pale brown (10YR 6/3), dry; weak fine subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; common fine roots throughout; common fine tubular pores; 1 percent fine faint light brownish gray (10YR 6/2) iron depletions with clear boundaries in matrix surrounding redox concentrations; 2 percent fine distinct yellowish red (5YR 4/6) masses of oxidized iron with sharp boundaries on surfaces along root channels; 1 percent fine worm casts; 2 percent nonflat subrounded moderately cemented 25 to 30 mm (10 to 12 in) ironstone nodules; very strongly acid; clear smooth boundary. (10 to 59 cm [4 to 23 in] thick)

Bt/E--38 to 71 cm, (15 to 28 in); 75 percent brownish yellow (10YR 6/6) and 15 percent pale brown (10YR 6/3), loam; weak medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; few fine roots throughout; common fine tubular pores; 15 percent distinct brownish yellow (10YR 6/6) clay films on all faces of peds; 2 percent fine faint light brownish gray (10YR 6/2) iron depletions with clear boundaries in matrix surrounding redox concentrations; 5 percent fine distinct red (7.5R 4/6) masses of oxidized iron with sharp boundaries on surfaces along root channels; 1 percent nonflat subrounded moderately cemented 25 to 35 mm (10 to 12 in) ironstone nodules; very strongly acid; gradual wavy boundary. (15 to 66 cm [6 to 26 in] thick)

Bt1--71 to 109 cm, (28 to 43 in); 80 percent brownish yellow (10YR 6/6) and 20 percent pale brown (10YR 6/3), loam; weak medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; few fine roots throughout; 15 percent distinct brownish yellow (10YR 6/6) clay films on all faces of peds; 3 percent fine prominent yellowish red (5YR 5/6) masses of oxidized iron with sharp boundaries in matrix; 5 percent fine faint light brownish gray (10YR 6/2) iron depletions with clear boundaries in matrix surrounding redox concentrations; 10 percent fine distinct red (7.5R 5/6) masses of oxidized iron with sharp boundaries on surfaces along root channels; 5 percent nonflat subrounded moderately cemented 25 to 45 mm (10 to 18 in) ironstone nodules; very strongly acid; diffuse wavy boundary.

Bt2--109 to 142 cm, (43 to 56 in); light yellowish brown (10YR 6/4), loam; moderate medium prismatic structure parts to moderate medium subangular blocky; very hard, firm, moderately sticky, moderately plastic; few fine roots throughout; 10 percent distinct light yellowish brown (10YR 6/4) clay films on all faces of peds; 10 percent fine faint light brownish gray (10YR 6/2) iron depletions with clear boundaries in matrix surrounding redox concentrations; 10 percent fine distinct red (7.5R 5/6) masses of oxidized iron with sharp boundaries on

surfaces along root channels; 15 percent fine prominent yellowish red (5YR 5/6) masses of oxidized iron with sharp boundaries in matrix; 10 percent nonflat subrounded moderately cemented 25 to 45 mm (10 to 18 in) ironstone nodules; very strongly acid; diffuse wavy boundary. (Combined thickness of the Bt horizons is 22 to 107 cm [9 to 42 in] thick)

Btg--142 to 178 cm, (56 to 70 in); sandy clay loam, light gray (10YR 7/1); moderate medium prismatic structure parts to moderate medium subangular blocky; very hard, firm, moderately sticky, moderately plastic; few very fine roots throughout; 10 percent prominent light yellowish brown (10YR 6/4) clay films on all faces of peds; 20 percent coarse prominent brownish yellow (10YR 6/6) masses of oxidized iron with diffuse boundaries in matrix; 5 percent coarse prominent red (2.5YR 4/6) masses of oxidized iron with sharp boundaries in matrix; 25 percent coarse prominent yellowish red (5YR 5/6) masses of oxidized iron with sharp boundaries in matrix; 5 percent nonflat subrounded moderately cemented 25 to 45 mm (10 to 18 in) ironstone nodules; very strongly acid; diffuse wavy boundary. (Combined thickness of the Btg horizons is 25 to 112 cm [10 to 44 in] thick)

Btgx--178 to 203 cm, (70 to 80 in); light gray (10YR 7/1), sandy clay loam; moderate coarse prismatic structure parts to moderate coarse subangular blocky; very hard, firm, weakly cemented, moderately sticky, moderately plastic; very fine roots throughout; 5 percent distinct light brownish gray (10YR 6/2) clay films on vertical faces of peds; 15 percent distinct light yellowish brown (10YR 6/4) clay films on all faces of peds; 20 percent coarse prominent brownish yellow (10YR 6/6) masses of oxidized iron with diffuse boundaries in matrix; 30 percent coarse prominent yellowish red (5YR 5/6) masses of oxidized iron with sharp boundaries in matrix; 1 percent nonflat subrounded moderately cemented 25 to 45 mm (10 to 18 in) ironstone nodules; very strongly acid; diffuse wavy boundary.

TYPE LOCATION: Montgomery County, Texas; from the intersection of US Interstate 45 and Texas Highway 105 in Conroe; 6.1 miles south on US Interstate 45 to Farm Road 1488; 2.5 miles west on Farm Road 1488; 1 mile south and 0.3 mile east on forest road; 100 feet south; Latitude: 30 degrees 12 minutes 25.00 seconds N; Longitude: 95 degrees 25 minutes 10.00 seconds west W. Tamina topographic quadrangle; WGS 84.

RANGE IN CHARACTERISTICS:
Soil Moisture: A udic soil moisture regime. The soil moisture control section is 10 to 30 cm (4 to 12 in) below the soil surface and remains dry less than 90 cumulative days in most years. Soil moisture conditions are fairly constant throughout the year, while July through September is the driest period; the fall and spring months are the wettest.
Mean annual soil temperature: 20.6 to 21.7 degrees C (69 to 71 degrees F)
Particle-size control section (weighted average)
Clay content: 18 to 25 percent

A Horizon
Hue: 10YR
Value: 4 or 5
Chroma: 2 to 4
Texture: very fine sandy loam, fine sandy loam, loam, or silt loam
Ironstone nodules: amount-0 to 1 percent
Reaction: extremely acid to moderately acid

E Horizon
Hue: 10YR
Value: 5 to 7
Chroma: 3 or 4
Texture: very fine sandy loam, fine sandy loam, loam, or silt loam
Redox concentrations: amount-0 to 5 percent, shades-brown
Redox depletions: amount-0 to 2 percent, shades-gray
Ironstone nodules: amount-0 to 2 percent
Reaction: very strongly acid or strongly acid

Bt/E Horizons
Hue: 10YR or 7.5YR
Value: 5 to 7
Chroma: 2 to 6
Texture: fine sandy loam, loam, sandy clay loam
Redox concentrations: amount-5 to 35 percent, shades-yellow, brown, or red
Redox depletions: amount-2 to 20 percent shades-gray
Ironstone nodules: amount-0 to 10 percent
Reaction: extremely acid to moderately acid

Bt Horizons
Hue: 10YR or 7.5YR
Value: 5 to 7
Chroma: 3 to 6
Texture: loam, sandy clay loam, clay loam, or clay
Redox concentrations: amount-5 to 35 percent, shades-yellow, brown, or red
Redox depletions: amount-2 to 20 percent shades-gray
Ironstone nodules: amount-0 to 15 percent
Reaction: extremely acid to slightly acid

Btg and Btxg Horizons
Hue: 10YR
Value: 5 to 7
Chroma: 1 or 2
Texture: loam, sandy clay loam, clay loam, clay
Redox concentrations: amount-15 to 50 percent, shades-yellow, brown, or red
Redox depletions: amount-0 to 20 percent shades-gray, green or blue
Ironstone nodules: amount-0 to 8 percent
Reaction: extremely acid to slightly acid

COMPETING SERIES: There are no series in the same family. Similar soils include the Dallardsville (TX), Katy (TX), Kirbyville (TX), Kountze (TX), Westcott(T) (TX)series
Dallardsville soils: have less than 35 percent base saturation in the lower part of the argillic horizon
Katy soils: are in a hyperthermic soil temperature regime
Kirbyville soils: have less than 35 percent base saturation in the lower part of the argillic horizon.
Kountze soils: have less than 18 percent clay in the particle-size control section; have less than 35 percent base saturation in the lower part of the argillic horizon
Westcott soils: have less than 18 percent clay in the particle-size control section

GEOGRAPHIC SETTING:
Parent material: Loamy sediments derived from the Lissie Formation of early to mid-Pleistocene age.
Landscape: inland dissected coastal plains
Landform: interfluves
Slope: 0 to 2 percent
Mean annual air temperature: 19.5 to 20.6 degrees C (67 to 69 degrees F).
Mean annual precipitation: 1219 to 1473 mm (48 to 58 in)
Precipitation pattern: uniform throughout the year with slight peaks in the spring and summer
Frost-free period: 240 to 300 days
Elevation: 22.9 to 46 m (75 to 150 ft)
Thornthwaite annual P-E indices: 68 to 80

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Segno (TX), Sorter (TX), Tarkington (T) (TX), Westcott (T) (TX), and Waller (TX) series.

Segno soils: are well drained and on a higher landform
Sorter soils: are poorly drained and on flats
Tarkingon soils: are on pimple mounds
Westcott soils: are in a coarse-loamy family and on a similar landform
Waller soils: are poorly drained and on flats

DRAINAGE AND PERMEABILITY: Moderately well to somewhat poorly drained. Runoff is medium to high. A perched water table is at a depth of 38 to 71 cm (15 to 28 in) and lasts from December to April in normal years. An apparent water table starts at a depth of 178 cm (70 in) and lasts from December to April in normal years.

USE AND VEGETATION: Used primarily for timber production and wildlife habitat. The main trees are loblolly pine, shortleaf pine, longleaf pine, water oak, willow oak, southern red oak, and sweetgum. Understory includes yaupon, southern bayberry, pinehill bluestem, longleaf uniola, and sedges.

DISTRIBUTION AND EXTENT: Western Gulf Coast Flatwoods (MLRA 152B) of southeast Texas. The series is of moderate extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Temple, Texas

SERIES ESTABLISHED: Montgomery County, Texas, 1965.

REMARKS: During the update of MLRA 152B observations of these soils indicate saturation occurs but not aquic conditions. In some survey areas, these soils were previously correlated as the Kirbyville series. During the update of MLRA 152B, soil survey office lab data indicate these areas are alfisols.

Diagnostic horizons and features for this pedon are:

Ochric epipedon--0 to 38 cm (0 to 15 in) (A and E horizons)

Argillic horizon--38 to 203 cm (15 to 80 in) (Bt/E, Bt1, Bt2, Btg, and Btgx horizons)

Glossic horizon-38 to 71 cm (15 to 28 in) (Bt/E horizon)

ADDITIONAL DATA: Kellogg Soil Survey Lab data pending on pedon S12TX2911034 from Liberty Count. Data from 2 pedons in Montgomery County, Texas is published in SSIR-30;--S64TX-170-1 and S64TX-170-2. Additional data available in PhD thesis by Michael J. Vepraskas, Soil Morphology and Moisture Regimes along a Hillslope in the Texas Coastal Plain, 1980, Texas A&M University.

Taxonomic Version: Keys to Soil Taxonomy, Eleventh Edition, 2010.

National Cooperative Soil Survey
U.S.A.

LOCATION WALLER TX+LA

Established Series
JKW-RM
08/2018

WALLER SERIES

The Waller series consists of very deep, poorly drained soils. These nearly level soils formed in loamy fluviomarine deposits of the Lissie Formation of Pleistocene age. Slope ranges from 0 to 1 percent, but are mainly less than 0.5 percent. Mean annual air temperature is about 20 degrees C (68 degrees F), and mean annual precipitation is about 1351 mm (53 in).

TAXONOMIC CLASS: Fine-loamy, siliceous, active, thermic Typic Glossaqualfs

TYPICAL PEDON: Waller silt loam-in an area of Waller-Dallardsville complex, 0 to 1 percent slopes-forest (Colors are for moist soil unless otherwise stated).

A--0 to 9 cm, (0 to 4 in); dark gray (10YR 4/1), silt loam; weak fine and medium granular structure; very friable, soft; many very fine and fine roots and common medium and coarse roots; common fine and medium interstitial and common coarse interstitial pores; 2 percent fine prominent yellowish brown (10YR 5/8) masses of oxidized iron lining pores with clear boundaries; 1 percent fine prominent black (N 2.5/) manganese masses on faces of peds with sharp boundaries; 18 percent of the horizon is crayfish krotovinas; krotovinas filled with gray (10YR 5/1) silt loam and very pale brown (10YR 7/3) very fine sand; very strongly acid; clear smooth boundary. (10 to 23 cm [4 to 9 in] thick)

E1--9 to 22 cm, (4 to 9 in); gray (10YR 5/1), silt loam; weak coarse prismatic structure parting to weak fine and medium subangular blocky; very friable, soft; common very fine and fine roots and common medium roots; common fine interstitial and common very fine interstitial pores; 12 percent fine prominent pink (7.5YR 7/3) masses of oxidized iron on faces of peds with clear boundaries; 4 percent fine prominent black (N 2.5/) manganese masses on faces of peds with sharp boundaries; 4 percent fine prominent yellowish brown (10YR 5/6) masses of oxidized iron lining pores with diffuse boundaries; 14 percent of the horizon is crayfish krotovinas; krotovinas filled with gray (10YR 5/1) silt loam and very pale brown (10YR 7/3) very fine sand; very strongly acid; clear smooth boundary. (Combined thickness of the E horizons is (25 to 81 cm [10 to 32 in])

E2--22 to 37 cm, (9 to 15 in); grayish brown (10YR 5/2) and 25 percent light brownish gray (10YR 6/2), silt loam; weak coarse prismatic structure parting to weak medium subangular blocky; very friable, soft; common very fine and fine roots and common medium roots; common fine interstitial and common very fine interstitial pores; 14 percent fine prominent brownish yellow (10YR 6/6) masses of oxidized iron in matrix with diffuse boundaries; 6 percent fine prominent strong brown (7.5YR 5/6) masses of oxidized iron lining pores with clear boundaries; 2 percent fine prominent black (N 2.5/) manganese masses on faces of peds with sharp boundaries; 8 percent of the horizon is crayfish krotovinas; krotovinas filled with gray (10YR 5/1) silt loam and light gray (10YR 7/2) very fine sand; very strongly acid; clear smooth boundary.

E/Bt--37 to 65 cm, (15 to 26 in); light brownish gray (10YR 6/2) and 25 percent gray (10YR 6/1), silt loam; weak medium and coarse prismatic structure parting to weak fine and medium subangular blocky; friable, slightly hard; common very fine and fine roots; common very fine and fine interstitial pores; 3 percent faint gray (10YR 6/1) clay films on vertical faces of peds; 16 percent fine and medium prominent brownish yellow (10YR 6/6) masses of oxidized iron in matrix with diffuse boundaries; 4 percent fine prominent strong brown (7.5YR 5/6) masses of oxidized iron lining pores with clear boundaries; 3 percent fine prominent black (N 2.5/)

manganese masses on faces of peds with sharp boundaries; 11 percent of the horizon is crayfish krotovinas; krotovinas filled with gray (10YR 5/1) silt loam and light gray (10YR 7/2) very fine sand; very strongly acid; gradual smooth boundary. (0 to 67 cm [0 to 26 in] thick)

Bt/E1--65 to 94 cm, (26 to 37 in); yellowish brown (10YR 5/8) and 20 percent light brownish gray (10YR 6/2) loam; weak medium and coarse prismatic structure parting to weak medium subangular blocky; firm, hard; common very fine and fine roots; common fine and medium tubular pores; 20 percent by volume albic tongues; 15 percent faint gray (10YR 6/1) clay films on faces of peds; 18 percent fine faint light yellowish brown (10YR 6/4) masses of oxidized iron in matrix with clear boundaries; 14 percent fine prominent brownish yellow (10YR 6/6) masses of oxidized iron in matrix with diffuse boundaries; 6 percent fine prominent strong brown (7.5YR 5/6) masses of oxidized iron lining pores with clear boundaries; 2 percent fine prominent black (N 2.5/) manganese masses on faces of peds with sharp boundaries; 5 percent of the horizon is crayfish krotovinas; krotovinas filled with gray (10YR 5/1) silt loam and pink (7.5YR 7/3) very fine sand; strongly acid; gradual wavy boundary. (Combined thickness of the Bt/E horizons is 23 to 105 cm [9 to 41 in])

Bt/E2--94 to 126 cm, (37 to 50 in); yellowish brown (10YR 5/8) and 15 percent light brownish gray (2.5Y 6/2), clay loam; moderate medium prismatic structure parting to moderate medium subangular blocky; firm, hard; common very fine and fine roots; common very fine and fine tubular pores; 15 percent by volume albic tongues; 20 percent faint yellowish brown (10YR 5/6) clay films on faces of peds; 17 percent fine and medium prominent red (2.5YR 5/6) masses of oxidized iron in matrix with sharp boundaries; 11 percent medium prominent red (2.5YR 4/6) masses of oxidized iron in matrix with clear boundaries; 10 percent medium and coarse prominent gray (2.5Y 6/1) iron depletions in matrix with clear boundaries; 3 percent medium spherical red (2.5YR 5/6) ironstone nodules; 2 percent medium spherical red (10R 5/6) plinthite nodules; red (2.5YR 4/6) redox concentrations are brittle but plinthite; strongly acid; gradual wavy boundary.

Btg/E1--126 to 165 (50 to 65 in); light brownish gray (2.5Y 6/2), clay loam; weak medium prismatic structure parting to weak medium subangular blocky; firm, hard; few very fine and fine roots; common very fine tubular pores; 15 percent by volume albic tongues; 10 percent faint strong brown (7.5YR 5/8) clay films on faces of peds; 14 percent fine and medium prominent red (2.5YR 5/6) masses of oxidized iron in matrix with sharp boundaries; 7 percent fine and medium prominent light gray (2.5Y 7/1) iron depletions in matrix with clear boundaries; 7 percent fine and medium prominent strong brown (7.5YR 5/8) masses of oxidized iron in matrix with clear boundaries; 6 percent fine and medium prominent red (2.5YR 4/6) masses of oxidized iron in matrix with sharp boundaries; 2 percent medium red (10R 4/6) plinthite nodules; strong brown (7.5YR 5/8) redox concentrations are brittle but plinthite; strongly acid; gradual wavy boundary. (Combined thickness of the Btg/E horizons is 33 to 96 cm [13 to 38 in])

Btg/E2--165 to 203 (65 to 80 in); light gray (2.5Y 7/2), sandy clay loam; weak medium and coarse prismatic structure parting to weak medium subangular blocky; firm, hard; few very fine and fine roots; common very fine tubular pores; 15 percent by volume albic tongues; 8 percent faint light gray (5Y 7/1) clay films on faces of peds; 23 percent fine and medium prominent strong brown (7.5YR 5/8) masses of oxidized iron in matrix with clear boundaries; 10 percent fine prominent red (2.5YR 5/6) masses of oxidized iron in matrix with sharp boundaries; 8 percent medium and coarse prominent light gray (5Y 7/1) iron depletions on faces of peds with diffuse boundaries; strongly acid.

TYPE LOCATION: Tyler County, Texas; from the intersection of Farm Road 92 and Farm Road 1943 in Fred,2.2 miles south on Farm Road 92 to county road, 1.3 miles west on county road to forest road, 0.1 mile north and 0.6 mile northeast on forest road, and 100 feet west of road in forest.
USGS topographic quad: Fred, TX;
Latitude: 30 degrees, 32 minutes, 23.10 seconds N;
Longitude: 94 degrees, 12 minutes, 2.00 seconds W;
Datum: WGS 84

RANGE IN CHARACTERISTICS:
Soil Moisture: aquic soil moisture regime.

Mean annual soil temperature: 20.6 to 21.7 degrees C (69 to 71 degrees F)
Thickness of the A and Eg horizons: 51 to 102 cm (20 to 40 in)
Particle-size control section (weighted average)
Clay content: 18 to 30 percent
Crawfish krotovina: 20 to 40 percent
CEC/clay ratio: 0.40 to 0.50

A Horizon
Hue: 10YR or 2.5 Y
Value: 4 to 6
Chroma: 1 or 2
Texture: silt loam, loam, or very fine sandy loam?
Redox concentrations: amount-0 to 4 percent, shades-brown
Reaction: extremely acid to strongly acid

E Horizon
Hue: 10YR or 2.5 Y
Value: 6 or 7
Chroma: 1 or 2
Texture: silt loam, loam, or very fine sandy loam?
Redox concentrations: amount-5 to 20 percent, shades-brown or yellow
Reaction: Extremely acid to strongly acid

E/Bt Horizon
(E part makes up 65 to 85 percent of the horizon and consists of tongues of loam, silt loam or very fine sandy loam that is 2 to 10 cm [1 to 4 in] wide; are spaced about 15 to 20 cm [6 to 8 in] apart)
Hue: 10YR or 2.5Y
Value: 6 or 7
Chroma: 1 or 2.
(Bt part)
Hue: 10YR or 2.5Y
Value: 5 to 7
Chroma: 1 or 2.
Texture: silt loam, loam, or very fine sandy loam
Redox concentrations: amount- 10 to 30 percent, shades- brown, yellow, or red
Redox depletions: amount-0 to 5 percent, shades-gray, green, or blue
Reaction: extremely acid to strongly acid

Bt/E Horizon
(Btg part)
Hue: 10YR or 2.5Y
Value: 5 to 7
Chroma: 6 or 8.
(E part makes up 15 to 35 percent of the horizon and consists of tongues of loam, silt loam or very fine sandy loam that is 2 to 10 cm [1 to 4 in] wide; are spaced about 15 to 20 cm [6 to 8 in] apart; taper to 1 to 5 cm [0.5 to 2 in] with depth
Hue: 10YR or 2.5Y
Value: 6 or 7
Chroma: 1 or 2.
Texture: silt loam, loam, or sandy clay loam
Redox concentrations: amount- 10 to 30 percent, shades- brown, yellow, or red
Redox depletions: amount-0 to 2 percent, shades-gray, green, or blue
Gypsum: 0 to 3 percent
Reaction: extremely acid to strongly acid

Btg/E Horizon
(Btg part)
Hue: 10YR or 2.5Y
Value: 5 to 7
Chroma: 1 or 2.
(E part makes up 15 to 35 percent of the horizon and consists of tongues of loam, silt loam or very fine sandy loam that is 2 to 10 cm [1 to 4 in] wide; are spaced about 15 to 20 cm [6 to 8 in] apart; taper to 1 to 5 cm [0.5 to 2 in] with depth
Hue: 10YR or 2.5Y
Value: 6 or 7
Chroma: 1 or 2.
Texture: loam, sandy clay loam, or clay loam
Redox concentrations: amount- 10 to 30 percent, shades- brown, yellow, or red
Redox depletions: amount-0 to 5 percent, shades-gray, green, or blue
Gypsum: 0 to 3 percent
Reaction: extremely acid to strongly acid

COMPETING SERIES: These are the Colita (TX), Mollville (TX), and Vimville (MS) series. Similar soils are the Caddo, Caneyhead, Guyton, Lelavale, Mollco, and Sorter series.
Colita soils: deep to paralithic contact of tuffaceous siltstone or shale
Mollville and Vimville soils: A and E horizons less than 51 cm (20 in) thick
Caddo, Caneyhead and Guyton soils: in a fine-silty family
Lelavale and Mollco soils: very poorly drained
Sorter soils: coarse-loamy family

GEOGRAPHIC SETTING:
Parent material: loamy fluviomarine deposits derived from igneous, metamorphic and sedimentary rock of the Lissie Formation of Pleistocene age
Landscape: coastal plains
Landform: flats
Slope: 0 to 1 percent but are mainly less than 0.5 percent
Mean annual air temperature range: 19.5 to 20.6 degrees C (67 to 69 degrees F)
Mean annual precipitation range: 1219 to 1473 mm (48 to 58 in)
Elevation: 22.9 to 46 m (75 to 150 ft)
Precipitation Pattern: Precipitation is generally uniform throughout the year with slight peaks in the spring and fall months.
Frost-free period: 240 to 300 days
Thornthwaite annual P-E indices: 68 to 80

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Dallardsville (TX), Kirbyville (TX), Kountze (TX), Plank (TX), Segno (TX), Sorter (TX), and Splendora (TX) series.
Dallardsville soils: are moderately well drained; on mounds
Kirbyville and Kountze soils: are moderately well drained; on convex interfluves
Plank soils: are coarse-silty; on a similar landform
Segno soils: are well drained; on interfluves
Sorter soils: are coarse-loamy; on a similar landform
Splendora soils: are somewhat poorly drained; on interfluves

DRAINAGE AND PERMEABILITY:
Drainage class: Poorly.
Permeability class: slow.
Runoff: high on slopes of 0 to less than 1 percent.
Wetness: soil remains saturated throughout from December to April in normal years due to a high water table.

USE AND VEGETATION: Most areas are in forest. A few areas have been cleared for pasture. Timber is mostly a mix of hardwoods and pine. Hardwoods include water and willow oak, sweetgum, and persimmon. Pine species include loblolly and slash.

DISTRIBUTION AND EXTENT: Southeast Texas; Land Resource Region T; MLRA 152B (Western Gulf Coast Flatwoods); the series is of moderate extent.

SOIL SURVEY REGIONAL OFFICE (SSRO) RESPONSIBLE: Temple, Texas

SERIES ESTABLISHED: Waller County, Texas; 1948.

REMARKS: Based on Lincoln Soil Survey Laboratory Data of closely associated soils, the mineralogy class was changed from mixed to siliceous. See Dr. Grossman's memo dated September 14, 1972, SOILS - Harris County, Texas, in reference to the Hockley and Wockley series. Study and Thesis by M. Vepraskas (TAMU) shows E horizon is slowly permeable. The Lelavale series was established in 1998 in Hardin County, Texas to separate the very poorly drained Waller, depressional unit from the Waller series.

Diagnostic horizons and features for this pedon are:
Ochric epipedon: 0 to 86 cm (0 to 34 in) (A and Eg horizon)
Argillic horizon: 86 to 203 cm (34 to 80 in) (Btg/Eg horizon)
Glossic horizon: 86 to 203 cm (34 to 80 in) (Btg/Eg horizon)
Aquic moisture regime: these soils have aquic conditions from December to April in normal years.

ADDITIONAL DATA: TAMU Data from the Tyler County, Texas taxonomic unit location on pedon S00TX-457-004. KSSL data from Montgomery County, Texas on pedon S12TX3391033 (lab pedon number 12N8327)

TAXONOMIC Version: Keys to Soil Taxonomy, Twelfth Edition, 2014.

National Cooperative Soil Survey
U.S.A.

Attachment 6

August 13, 2021, H.C. Clark, Email to TCEQ About Proposed Peach Creek Landfill

H.C. Clark <hcclark@rice.edu> 8/13/2021 6:35 PM

Peach Creek Landfill comments submitted

To Van Weldon <woodduckfarm@yahoo.com> • Brandt Mannchen <brandt_mannchen@comcast.net>

I wrote something. This application is far from complete. Look at the checklist that the reviewer uses.

H.C. Clark
hcclark@rice.edu

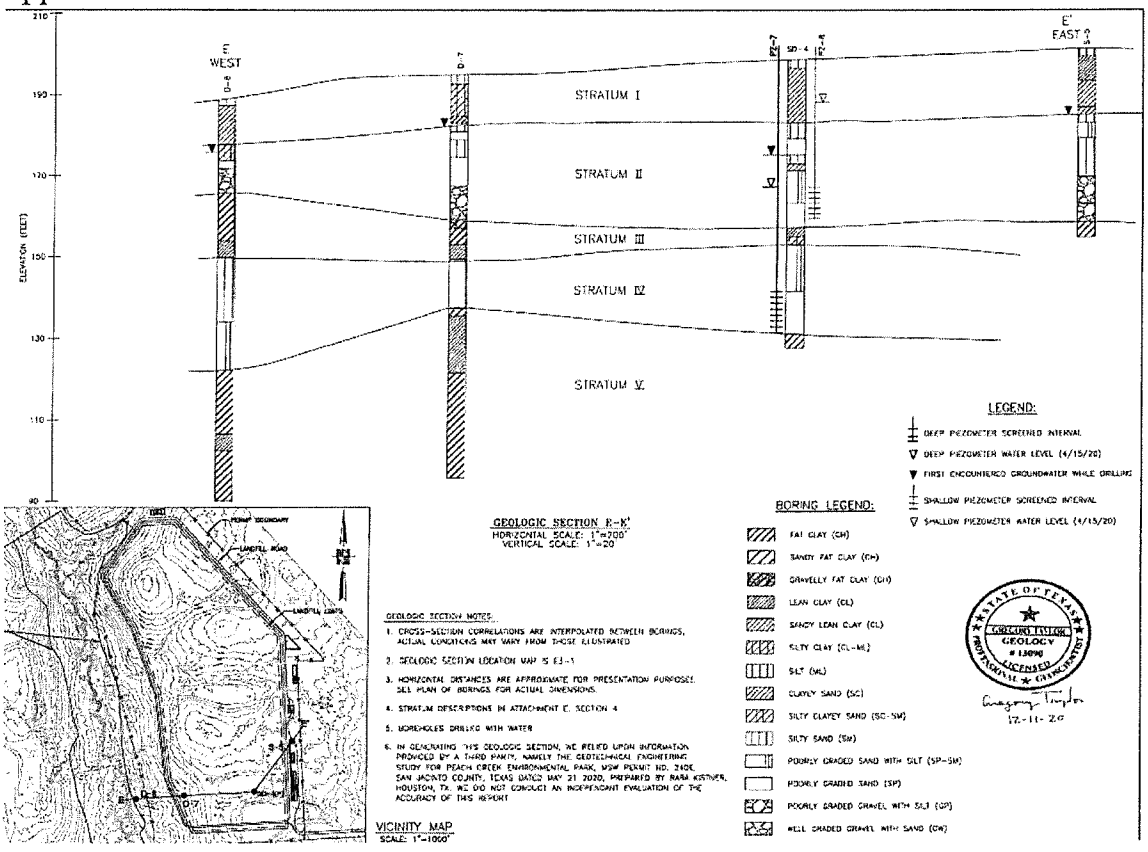
- Peach Creek Landfill..pdf (2 MB)

To: Office of the Chief Clerk, TCEQ, Austin TX, via online submission
From: H.C. Clark

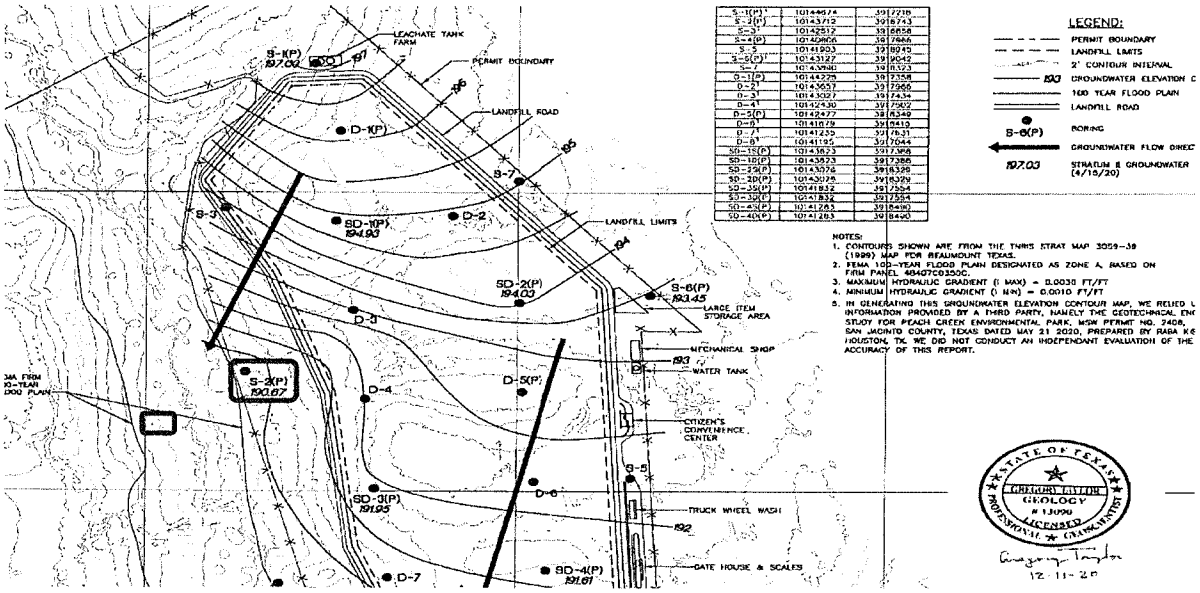
Peach Creek Landfill (MSW 2406) application comments and questions

I have reviewed the submittals posted on the Peach Creek Environmental Park website and have several concerns about the landfill hydrogeology and that particular part of the landfill application. The landfill is next door to Van Weldon's Wood Duck Farm, and Van is a friend from long ago and our common association with the Urban Harvest Farmers' Market. I participated in a day long review of the farm and am also familiar with the area geology and the nearby Security and Montgomery Contractors landfills and the Daryl Dickey Landfill to the north.

My primary concern is the gravel that controls the hydrogeology of the uppermost aquifer at the site. This gravel forms a pervasive layer at the base of Stratum II that daylights at Peach Creek as shown in this section and map from the application.



The aquifer is apparently unconfined and the potentiometric surface, or water table, seems to join the creek, and the aquifer is the creek's baseflow. The relationship is shown on this map of the groundwater surface superposed on the topographic map, taken from the application (note the topo contour and the water surface contour).



This setting poses several questions:
The application implicitly recognizes the gravel location restriction insofar as Class I nonhazardous is not listed as waste to be accepted. Will the permit explicitly state that Class I waste may not be and never will be accepted here because of this hydrogeologic limitation?

Next, the figure immediately above is not actually what will happen here. The potentiometric surface will be aggressively altered by dewatering of the uppermost aquifer in order to maintain a negative hydrostatic condition until waste fills each cell. This is not sidewall dewatering for construction purposes, but a long term alteration of the uppermost aquifer that serves as the monitoring system for the landfill. The sink created by pumping will draw water into the landfill rather than allowing it to pass beneath the liner and detect a leak as that groundwater moves through the point of compliance. Water will move inward rather than out. This is similar to the situation at the Juliff Gardens Landfill where the applicant proposed to permanently draw down the downgradient detention pond, preventing a meaningful monitoring by the adjacent monitor wells outside. A proposed dewatering well is shown in the figure on the following page taken from the application. How will this problem be addressed?

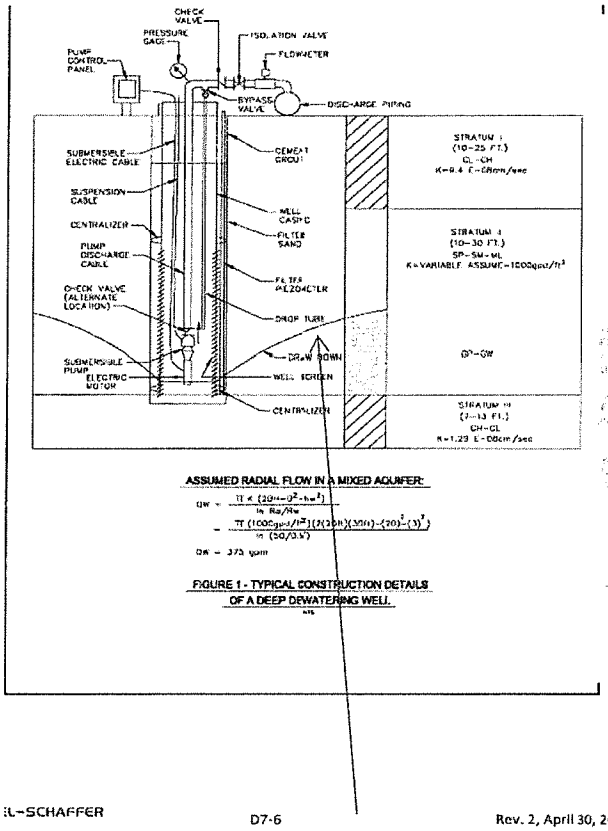


FIGURE 1 - TYPICAL CONSTRUCTION DETAILS OF A DEEP DEWATERING WELL

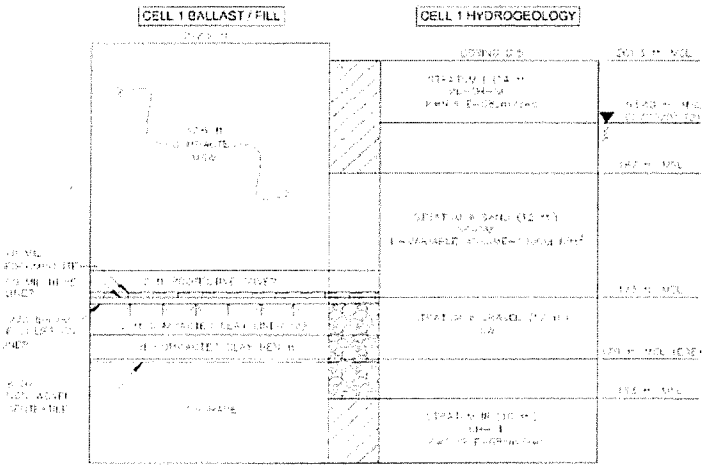
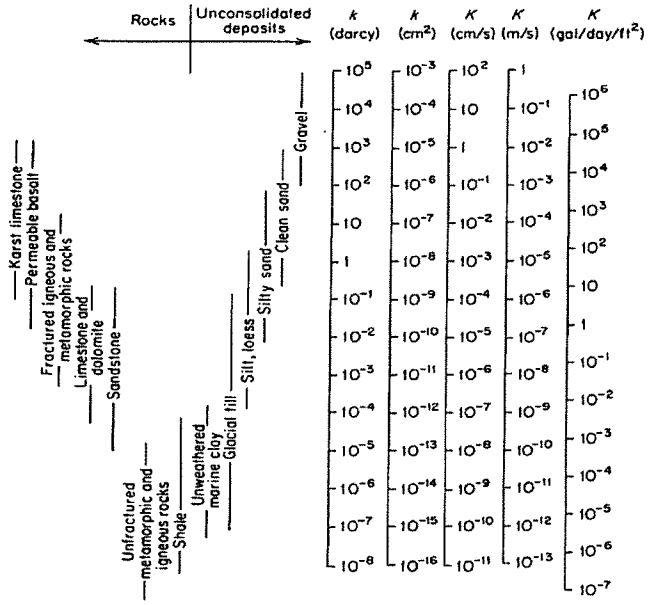


FIGURE 2 - CELL 1 BALLAST PLAN (1)

From 6/11/20 7-44

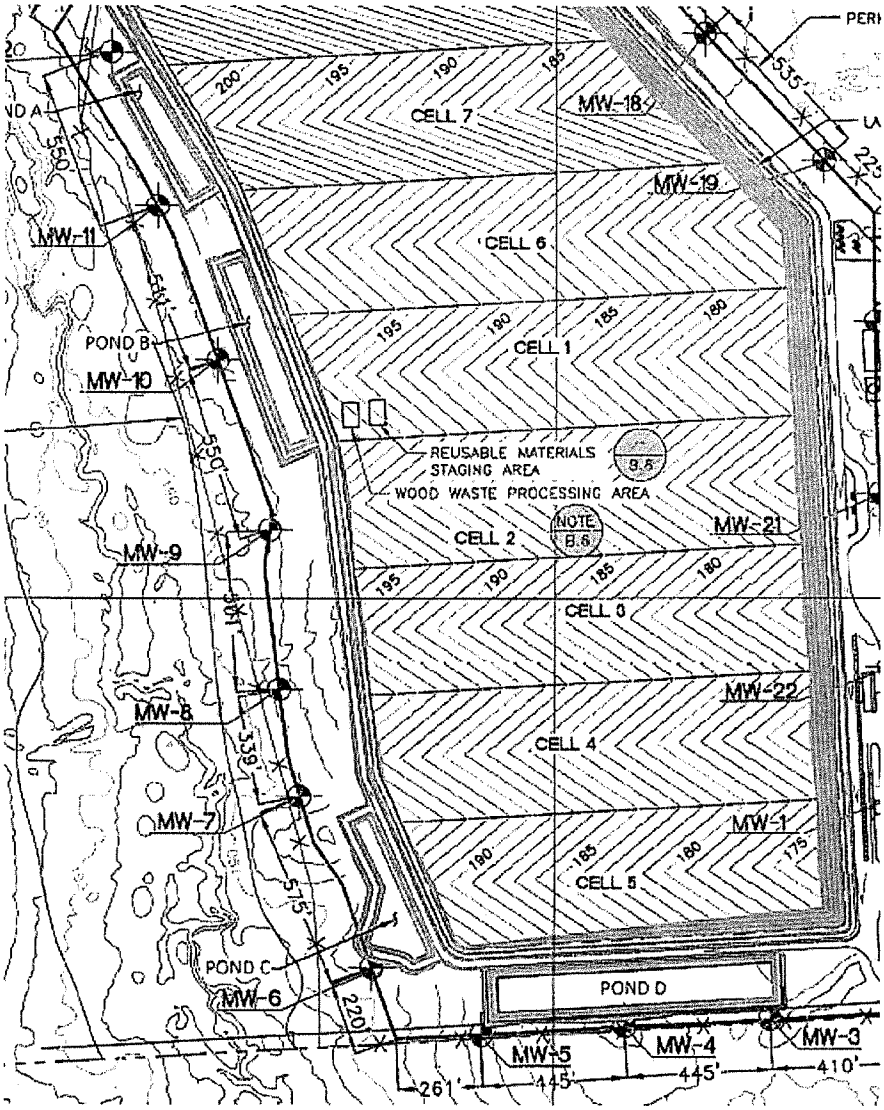
The goal of the pumping is clearly stated in the application—create the drawdown shown in the figure above. This creates several problems; first, a relatively minor issue—the K for the aquifer is noted as 10^3 and that is optimistic for dewatering, velocity and dispersion calculations.

A reasonable value for hydraulic conductivity at the site should be used, and more importantly, measured at the site. The table from Freeze and Cherry makes the point. Water will move through the gravel at orders of magnitude greater velocities than the application anticipates. In a way, that's not our problem.



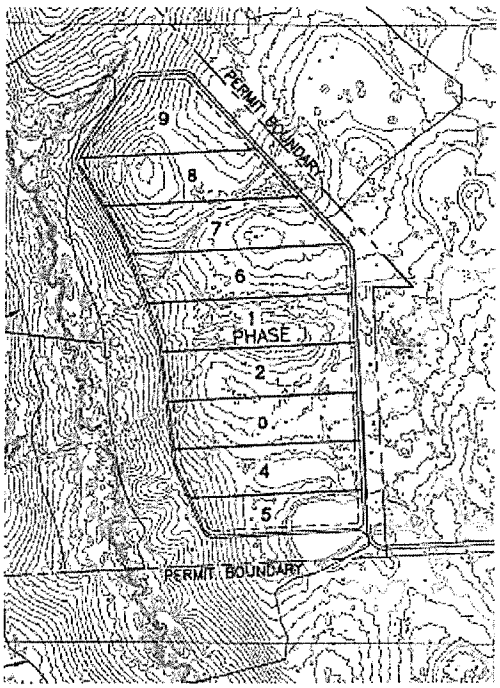
Second, another minor point, but an important one: The figure above shows that the excavation will not penetrate completely through the uppermost aquifer, for if it did, that would block flow and make the downgradient monitoring meaningless. Is there a specific statement in the application, planned for the permit, and in the operating plan—that the base of the liner system will be sufficiently above the base of the uppermost aquifer to allow groundwater to pass and be detected at the point of compliance?

Monitor wells 11, 10, 6, 3, 4, and 5 are adjacent to unlined detention ponds that will recharge Stratum I immediately and move quickly to uppermost aquifer, diluting any contaminant for a period following a rainfall event. How will this dilution situation be avoided?



Each of the comments and questions above involve the gravel problem. Each may be resolved by permit conditions and alterations to the landfill plan. A key question that may have no answer is: can this site groundwater be effectively monitored? The monitor well array is based on the assumptions inherent in the typical Texas sand: wells default 600' apart, maybe a little less. But that's not the case here; examine the boring logs in the application and the K table above. The application is simply wrong to use sand permeability when the role of gravel is obvious—that can be corrected, but then what? More monitor wells? How many? Modeling? One thing is clear the downgradient bound of the site must be fully characterized in order to determine the distribution and character of the gravel. Once this is done, the problem of monitoring a gravel that moves potential contamination quickly and directly along a limited streamline can be formulated.

Finally, is this an above grade landfill? And, is the creek the ultimate monitor and its own point of compliance inasmuch as it captures the flow through an imaginary plane through the uppermost aquifer along the landfill's downgradient edge?



Thank you for reading this, and I am available to answer any questions you may have.

H.C. Clark hclark@rice.edu

Brandt Mannchen
20923 Kings Clover Ct.
Humble, TX 77346

CERTIFIED MAIL®

7020 3160 0000 5227 4546

1000

78711

U.S. POSTAGE PAID
FCM LG ENV
KINGWOOD, TX
77339
SEP 22, 21
AMOUNT
$9.96
R2304N117284-01

Office of Chief Clerk
MC 105
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

RECEIVED
SEP 24 2021
TCEQ MAIL CENTER
BC

CHIEF CLERKS OFFICE
2021 SEP 24 PM 2:58
TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

MSW
117709

REVIEWED
AUG 02 2021
By GCW

July 30, 2021

Office of Chief Clerk
MC 105
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
2021 AUG -2 PM 4:1
CHIEF CLERKS OFFICE

Dear Chief Clerk of the Texas Commission on Environmental Quality,

The Houston Regional Group and Lone Star Chapter of the Sierra Club (Sierra Club) request that the Texas Commission on Environmental Quality (TCEQ) amend Permit #2406, the 635-acre Peach Creek Landfill (PCL), and include how this proposed facility will be accessed by garbage trucks and other vehicles.

This vehicle access issue and all other issues/concerns should be assessed, evaluated, and analyzed for environmental, social, and economic impacts, preferably in an environmental impact statement (EIS), before any decision is made about Permit #2406. The Sierra Club supports and urges TCEQ to conduct a contested case hearing on this proposal.

This is needed because TCEQ has U.S. Environmental Protection Agency authorization to operate the federal solid waste regulatory and permitting system in Texas which includes household, commercial, industrial, and special wastes that will stored in the PCL (1,300 tons/day, 474 garbage trucks/day, and 371,000 tons/year of waste).

It is of concern that the investors that want Permit #2406 are from Mississippi and their sole purpose is to get a permit from TCEQ so they can sell it for upwards of $20 million to another entity who will have to construct and operate the facility. These investors are not concerned about what they agree to and what happens later. Their interest is simply manufactured and not reality as it is for nearby residents, Sam Houston National Forest (SHNF), and those who will have to live with the proposed landfill for a lifetime.

The Sierra Club provides a list of some of the issues/concerns that the TCEQ should assess, evaluate, and analyze and consider in Permit #2406 and a contested case hearing before it decides whether to approve this permit. These issues/concerns include:

1. PCL threatens local farms, like Wood Duck Farm, and personal homesteads that rely upon clean surface and groundwater and unpolluted environments in San Jacinto, Liberty, and Montgomery Counties, including the City of Cleveland.

2. PCL threatens SHNF to the north (adjacent to the proposed site), south (downstream), and west where there are over 4,000 acres of federal public national forest lands.

The Sierra Club has a very special relationship with SHNF. It is the largest public land unit in the National Forests and Grasslands in Texas (NFGT) and in Southeast Texas. A variety of important ecosystems, recreational areas and uses, and natural resources exist in SHNF.

The Lone Star Hiking Trail, which the Sierra Club conceived, helped build, and has conducted trail maintenance on, is in SHNF along with the federally endangered Red-cockaded Woodpecker (RCW), Winters Bayou Scenic Area, Big Creek Scenic Area, important seeps, seepage creeks, baygalls, East Fork of the San Jacinto River, Floodplain Forests, Longleaf Pine Forests, Shortleaf Pine Forests, Upland Hardwood Forests, wetlands, and San Jacinto Flatwood Forests.

Both ground and surface waters are filtered and flow through SHNF and provide the City of Houston with clean water from some of the headwaters of the San Jacinto River. These headwaters connect via the East Fork of the San Jacinto River and its' tributaries, some of which are on the east side of SHNF.

Some of these tributaries include: Peach Creek, Boggy Creek, Blue Branch, Winters Bayou, Jayhawker Creek, Shell Branch, Little Caney Creek, Turkey Creek, Nebletts Creek, Tarkington Bayou, Bradley Branch, Bear Creek, Gum Branch, Spring Branch, Black Branch, Whiskey Branch, Pumpkin Creek, Chinquapin Creek, West Fork, Miller Creek, Hickman Branch, and others which eventually flow into Lake Houston, the prime drinking water lake for the City of Houston, central and west Harris County, and southern Montgomery County, and recharge zones, shallow water aquifers, water tables, gravel and sand beds, and deeper aquifers.

3. PCL will create or encourage increases in litter and dumping due to the nature and location of the facility.

4. PCL will cause wildfires to spread due to the nature and operation of the facility (8,200 fires/year occur at landfills). Wildfires in landfills can burn deep like coal and peat fires, are difficult to put out, and cause toxic, smoke (particulate), and ozone precursor air pollution. Air quality analysis, assessment, and evaluation is required as well as an air quality control mitigation plan to reduce PCL air pollution.

5. PCL will produce odors that make pleasant use of SHNF and living in nearby residences less likely.

6. PCL will attract birds and other animals (raccoons, opossums, rats, mice, etc.) that will feed on what is in the landfill and could create meso-predator population increases which could affect bird, reptile, amphibian, mammal, and invertebrate populations in SHNF and the surrounding area.

7. PCL will impact individual homesteads, residences, subdivisions, and communities by depressing property values which economically affects individuals who own the properties and public authorities who rely upon taxes from these properties.

8. PCL will create noise via operation of equipment to handle and bury the trash and 100's of trucks accessing and leaving the site each day.

9. PCL will impact and conflict with adjacent property by making use or development less likely.

10. PCL will affect existing or potential federally endangered Red-cockaded Woodpecker (RCW) habitat.

11.PCL presents a litter hazard to wildlife which eat or are caught in plastic and other trash materials.

12. PCL will create more roadkill since roads used will have more large trucks and garbage trucks traversing them.

13. PCL will exist for decades, will be several stories high, and will degrade aesthetic and scenic qualities of the area.

14. PCL must be required to analyze and prepare for leaks and contaminated ground and surface water. PCL must have a spill response and long-term monitoring and water clean-up plan and must implement that plan from construction until there are no more contaminants left at (in) the site (cradle to grave over the long-term).

15. PCL must be required to have a bond that is large enough to take care of groundwater and surface water contamination and other environmental problems for as long as the landfill is active and closed (as long as it has environmental contaminants on the surface or underground).

16. PCL will require additional law enforcement (that counties, communities, or municipalities pay for) to handle the littering, dumping, and vandalism that will be created due to the landfill.

17. PCL will require large landfill leachate storage tanks which must be pumped out each day (40,000-100,000 gallons/day) and will be subject to leaks, spills, and accidents when leachate collection trucks leave the facility and operate on public roads.

18. PCL will cause deterioration of local, state, and federal roads because they are not constructed to withstand 474 heavy trucks traveling over them twice a day (948 total passes) when PCL is open. The garbage trucks go through either SHNF or

neighborhoods and will create a traffic hazard and significant road damage whose costs the public must pay.

19. PCL will leak methane (CH4), a powerful greenhouse gas air pollutant, even with a methane collection and flare burning system. PCL will use of equipment and provide vehicle and garbage truck access that will create substantial amounts of carbon dioxide (CO2), another significant greenhouse gas air pollutant. Methane can also contaminate groundwater and create an explosion hazard.

20. TCEQ should address climate change via PCL in a climate change analysis that covers the landfill climate change air pollutant releases. Climate change will alter existing ecosystems in SHNF and the surrounding area and make it more difficult for many plants and animals to adapt successfully to these changed ecosystems.

This includes hotter weather, more or more powerful rain-storms, more or more powerful hurricanes, more and more extensive flooding in floodplains (within 100 feet of the 100-year floodplain and within the existing 500-year floodplain), and other impacts due to climate change.

The TCEQ should prepare a climate change ecological resilience and resistance plan (CCERRP). This CCERRP would assess the biological and ecological elements in SHNF and surrounding area where the PCL is located and the effects that climate change has had and will have on them. The CCERRP would assist plants, animals, and ecosystems in adapting to climate change and would require monitoring of changes and mitigation measure effectiveness. The CCERRP would be based on:

1) Protection of existing functioning ecosystems in SHNF and the surrounding area.

2) Reduction of stressors on the ecosystems in SHNF and the surrounding area.

3) Restoration of natural functioning ecological processes in SHNF and the surrounding area.

4) Use of natural recovery in SHNF and the surrounding area, in most instances.

5) Acquisition of buffers and corridors to expand and ensure connectivity of ecosystems in SHNF and the surrounding area.

6) Intervention to manipulate (manage) ecosystems in SHNF and the surrounding area as a last resort.

7) Reduction of climate change air pollution in SHNF and the surrounding area so there is zero emissions and a reduced carbon footprint due to this proposal.

8) Removal of carbon dioxide and methane from the air to account for already released climate change air pollution.

21. PCL will inherently leak because landfill liners do not last forever. The U.S. Environmental Protection Agency (EPA) has said in the past that it is not a question of if, but when landfills will leak. That is why EPA created regulations that require groundwater monitoring in 1991.

22. Future expansion of PCL, will create more and long-term impacts of all the problems mentioned above and must be analyzed in an EIS.

For these reasons the Sierra Club requests that TCEQ amend the PCL Permit #2406 to address the access road needed for this landfill and conduct a complete environmental analysis with full public review, comments, and meetings before any decision is made.

The Sierra Club supports a contested case hearing on Permit #2406 and urges TCEQ to hold one near the proposed site so the public can participate and attend the hearing and public meetings that should be associated with it.

The Sierra Club appreciates this opportunity to comment. Please keep the Sierra Club informed about the status of this proposal. Thank you.

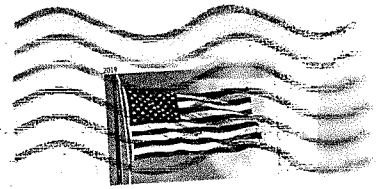
Sincerely,

Brandt Mannchen

Brandt Mannchen
Forest Management Issue Chair
Lone Star Chapter of the Sierra Club
Chair, Forestry Subcommittee
Houston Regional Group of the Sierra Club
20923 Kings Clover Court
Humble, Texas 77346
281-570-7212
brandt_mannchen@comcast.net

Brandt Mannchen
20923 Kings Clover Ct.
Humble, TX 77346

NORTH HOUSTON TX 773
30 JUL 2021 PM 3 L



FOREVER / USA

Office of Chief Clerk
MC 105
Texas Commission on Enviromental Quality
P.O. Box 13087
Austin, Texas 78711-3087

RECEIVED
AUG 02 2021
TCEQ MAIL CENTER
JH

78711-308787

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
2021 AUG -2 PM 4:10
CHIEF CLERKS OFFICE

Melissa Schmidt

From: PUBCOMMENT-OCC
Sent: Monday, August 2, 2021 9:25 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Sierra Club Comments About Amending Permit # 2406, Peach Creek Landfill
Attachments: Landfill SHNF TCEQ Comments 2021.docx; ja_2021_garabedian_001.pdf

PM
H

From: CHIEFCLK <chiefclk@tceq.texas.gov>
Sent: Sunday, August 1, 2021 1:05 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: FW: Sierra Club Comments About Amending Permit # 2406, Peach Creek Landfill

From: Brandt Mannchen <brandt_mannchen@comcast.net>
Sent: Sunday, August 1, 2021 11:56 AM
To: CHIEFCLK <chiefclk@tceq.texas.gov>
Cc: brandt_mannchen@comcast.net
Subject: Sierra Club Comments About Amending Permit # 2406, Peach Creek Landfill

Dear Chief Clerk of TCEQ,

The Sierra Club presents one additional issue that should be considered regarding the amendment of Permit #2406, Peach Creek Landfill.

Attached is a research article about the effect that feral hogs have on sanitary waste landfills. Sam Houston National Forest (SHNF) has a feral hog problem. The Peach Creek Landfill may make the problem worse and increase the number of feral hogs in SHNF (next door to the proposed landfill) which will result in degradation of wildlife populations, vegetation, soil, water quality, and other forest resources.

Thanks for your consideration.

Brandt Mannchen
Forest Management Issue Chair
Lone Star Chapter of the Sierra Club
Chair, Forestry Subcommittee
Houston Regional Group of the Sierra Club
20923 Kings Clover Court
Humble, Texas 77346
281-570-7212
brandt_mannchen@comcast.net

---------- Original Message ----------
From: Brandt Mannchen <brandt_mannchen@comcast.net>
To: "chiefclk@tceq.texas.gov" <chiefclk@tceq.texas.gov>

Cc: "brandt_mannchen@comcast.net" <brandt_mannchen@comcast.net>, "woodduckfarm@yahoo.com" <woodduckfarm@yahoo.com>, "elmerz@hal-pc.org" <elmerz@hal-pc.org>, "frankblake@juno.com" <frankblake@juno.com>, Ken Kramer <kramerkenw@gmail.com>, "kristen@bayoucitywaterkeeper.org" <kristen@bayoucitywaterkeeper.org>, "c.nazor@earthlink.net" <c.nazor@earthlink.net>, "balinsky@gmail.com" <balinsky@gmail.com>, "cyrus.reed@sierraclub.org" <cyrus.reed@sierraclub.org>, "eva.hernandez@sierraclub.org" <eva.hernandez@sierraclub.org>, "ellenbuchanan@sbcglobal.net" <ellenbuchanan@sbcglobal.net>, "samubaarak@gmail.com" <samubaarak@gmail.com>, "oldham_melanie@yahoo.com" <oldham_melanie@yahoo.com>, "aapaul@yahoo.com" <aapaul@yahoo.com>, "lmundwiller@hotmail.com" <lmundwiller@hotmail.com>, "alexandrabboyce@gmail.com" <alexandrabboyce@gmail.com>, "devika.taneja14@gmail.com" <devika.taneja14@gmail.com>, "rahnaik34@utexas.edu" <rahnaik34@utexas.edu>, "raineygib@aol.com" <raineygib@aol.com>, "cworonow@gmail.com" <cworonow@gmail.com>, "larryosageshelton@yahoo.com" <larryosageshelton@yahoo.com>, "ddonovan@consolidated.net" <ddonovan@consolidated.net>, "gdonovan40@aol.com" <gdonovan40@aol.com>, "janicecrumpbezanson@gmail.com" <janicecrumpbezanson@gmail.com>, Naomi D'Amours <naomidamours@gmail.com>, "dboydretared@sbcglobal.net" <dboydretared@sbcglobal.net>, "jarodkc@gmail.com" <jarodkc@gmail.com>, "hmannhis@gmail.com" <hmannhis@gmail.com>, "buchanle35@gmail.com" <buchanle35@gmail.com>, "bean.kristen87@gmail.com" <bean.kristen87@gmail.com>, "morin_jason92@yahoo.com" <morin_jason92@yahoo.com>, "mmichaelchuk@gmail.com" <mmichaelchuk@gmail.com>, "jane_prentiss@yahoo.com" <jane_prentiss@yahoo.com>
Date: 07/30/2021 10:52 AM
Subject: Sierra Club Comments About Amending Permit # 2406, Peach Creek Landfill

Dear Chief Clerk of the TCEQ,

Attached are Sierra Club comments that request an amendment to Permit #2406, Peach Creek Landfill to add an access road to the site, a list of environmental and other issues/concerns that should be analyzed and considered in this permit process, and a request that a contested case hearing be held for this proposal.

Please keep the Sierra Club up-to-date about the status of this proposed permit and permit amendment. Thank you.

Brandt Mannchen
Forest Management Issue Chair
Lone Star Chapter of the Sierra Club
Chair, Forestry Subcommittee
Houston Regional Group of the Sierra Club
20923 Kings Clover Court
Humble, Texas 77346
281-570-7212
brandt_mannchen@comcast.net

July 30, 2021

Office of Chief Clerk
MC 105
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

Dear Chief Clerk of the Texas Commission on Environmental Quality,

The Houston Regional Group and Lone Star Chapter of the Sierra Club (Sierra Club) request that the Texas Commission on Environmental Quality (TCEQ) amend Permit #2406, the 635-acre Peach Creek Landfill (PCL), and include how this proposed facility will be accessed by garbage trucks and other vehicles.

This vehicle access issue and all other issues/concerns should be assessed, evaluated, and analyzed for environmental, social, and economic impacts, preferably in an environmental impact statement (EIS), before any decision is made about Permit #2406. The Sierra Club supports and urges TCEQ to conduct a contested case hearing on this proposal.

This is needed because TCEQ has U.S. Environmental Protection Agency authorization to operate the federal solid waste regulatory and permitting system in Texas which includes household, commercial, industrial, and special wastes that will stored in the PCL (1,300 tons/day, 474 garbage trucks/day, and 371,000 tons/year of waste).

It is of concern that the investors that want Permit #2406 are from Mississippi and their sole purpose is to get a permit from TCEQ so they can sell it for upwards of $20 million to another entity who will have to construct and operate the facility. These investors are not concerned about what they agree to and what happens later. Their interest is simply manufactured and not reality as it is for nearby residents, Sam Houston National Forest (SHNF), and those who will have to live with the proposed landfill for a lifetime.

The Sierra Club provides a list of some of the issues/concerns that the TCEQ should assess, evaluate, and analyze and consider in Permit #2406 and a contested case hearing before it decides whether to approve this permit. These issues/concerns include:

1. PCL threatens local farms, like Wood Duck Farm, and personal homesteads that rely upon clean surface and groundwater and unpolluted environments in San Jacinto, Liberty, and Montgomery Counties, including the City of Cleveland.

2. PCL threatens SHNF to the north (adjacent to the proposed site), south (downstream), and west where there are over 4,000 acres of federal public national forest lands.

The Sierra Club has a very special relationship with SHNF. It is the largest public land unit in the National Forests and Grasslands in Texas (NFGT) and in Southeast Texas. A variety of important ecosystems, recreational areas and uses, and natural resources exist in SHNF.

The Lone Star Hiking Trail, which the Sierra Club conceived, helped build, and has conducted trail maintenance on, is in SHNF along with the federally endangered Red-cockaded Woodpecker (RCW), Winters Bayou Scenic Area, Big Creek Scenic Area, important seeps, seepage creeks, baygalls, East Fork of the San Jacinto River, Floodplain Forests, Longleaf Pine Forests, Shortleaf Pine Forests, Upland Hardwood Forests, wetlands, and San Jacinto Flatwood Forests.

Both ground and surface waters are filtered and flow through SHNF and provide the City of Houston with clean water from some of the headwaters of the San Jacinto River. These headwaters connect via the East Fork of the San Jacinto River and its' tributaries, some of which are on the east side of SHNF.

Some of these tributaries include: Peach Creek, Boggy Creek, Blue Branch, Winters Bayou, Jayhawker Creek, Shell Branch, Little Caney Creek, Turkey Creek, Nebletts Creek, Tarkington Bayou, Bradley Branch, Bear Creek, Gum Branch, Spring Branch, Black Branch, Whiskey Branch, Pumpkin Creek, Chinquapin Creek, West Fork, Miller Creek, Hickman Branch, and others which eventually flow into Lake Houston, the prime drinking water lake for the City of Houston, central and west Harris County, and southern Montgomery County, and recharge zones, shallow water aquifers, water tables, gravel and sand beds, and deeper aquifers.

3. PCL will create or encourage increases in litter and dumping due to the nature and location of the facility.

4. PCL will cause wildfires to spread due to the nature and operation of the facility (8,200 fires/year occur at landfills). Wildfires in landfills can burn deep like coal and peat fires, are difficult to put out, and cause toxic, smoke (particulate), and ozone precursor air pollution. Air quality analysis, assessment, and evaluation is required as well as an air quality control mitigation plan to reduce PCL air pollution.

5. PCL will produce odors that make pleasant use of SHNF and living in nearby residences less likely.

6. PCL will attract birds and other animals (raccoons, opossums, rats, mice, etc.) that will feed on what is in the landfill and could create meso-predator population increases which could affect bird, reptile, amphibian, mammal, and invertebrate populations in SHNF and the surrounding area.

7. PCL will impact individual homesteads, residences, subdivisions, and communities by depressing property values which economically affects individuals who own the properties and public authorities who rely upon taxes from these properties.

8. PCL will create noise via operation of equipment to handle and bury the trash and 100's of trucks accessing and leaving the site each day.

9. PCL will impact and conflict with adjacent property by making use or development less likely.

10. PCL will affect existing or potential federally endangered Red-cockaded Woodpecker (RCW) habitat.

11.PCL presents a litter hazard to wildlife which eat or are caught in plastic and other trash materials.

12. PCL will create more roadkill since roads used will have more large trucks and garbage trucks traversing them.

13. PCL will exist for decades, will be several stories high, and will degrade aesthetic and scenic qualities of the area.

14. PCL must be required to analyze and prepare for leaks and contaminated ground and surface water. PCL must have a spill response and long-term monitoring and water clean-up plan and must implement that plan from construction until there are no more contaminants left at (in) the site (cradle to grave over the long-term).

15. PCL must be required to have a bond that is large enough to take care of groundwater and surface water contamination and other environmental problems for as long as the landfill is active and closed (as long as it has environmental contaminants on the surface or underground).

16. PCL will require additional law enforcement (that counties, communities, or municipalities pay for) to handle the littering, dumping, and vandalism that will be created due to the landfill.

17. PCL will require large landfill leachate storage tanks which must be pumped out each day (40,000-100,000 gallons/day) and will be subject to leaks, spills, and accidents when leachate collection trucks leave the facility and operate on public roads.

18. PCL will cause deterioration of local, state, and federal roads because they are not constructed to withstand 474 heavy trucks traveling over them twice a day (948 total passes) when PCL is open. The garbage trucks go through either SHNF or

neighborhoods and will create a traffic hazard and significant road damage whose costs the public must pay.

19. PCL will leak methane (CH4), a powerful greenhouse gas air pollutant, even with a methane collection and flare burning system. PCL will use of equipment and provide vehicle and garbage truck access that will create substantial amounts of carbon dioxide (CO2), another significant greenhouse gas air pollutant. Methane can also contaminate groundwater and create an explosion hazard.

20. TCEQ should address climate change via PCL in a climate change analysis that covers the landfill climate change air pollutant releases. Climate change will alter existing ecosystems in SHNF and the surrounding area and make it more difficult for many plants and animals to adapt successfully to these changed ecosystems.

This includes hotter weather, more or more powerful rain-storms, more or more powerful hurricanes, more and more extensive flooding in floodplains (within 100 feet of the 100-year floodplain and within the existing 500-year floodplain), and other impacts due to climate change.

The TCEQ should prepare a climate change ecological resilience and resistance plan (CCERRP). This CCERRP would assess the biological and ecological elements in SHNF and surrounding area where the PCL is located and the effects that climate change has had and will have on them. The CCERRP would assist plants, animals, and ecosystems in adapting to climate change and would require monitoring of changes and mitigation measure effectiveness. The CCERRP would be based on:

1) Protection of existing functioning ecosystems in SHNF and the surrounding area.

2) Reduction of stressors on the ecosystems in SHNF and the surrounding area.

3) Restoration of natural functioning ecological processes in SHNF and the surrounding area.

4) Use of natural recovery in SHNF and the surrounding area, in most instances.

5) Acquisition of buffers and corridors to expand and ensure connectivity of ecosystems in SHNF and the surrounding area.

6) Intervention to manipulate (manage) ecosystems in SHNF and the surrounding area as a last resort.

7) Reduction of climate change air pollution in SHNF and the surrounding area so there is zero emissions and a reduced carbon footprint due to this proposal.

8) Removal of carbon dioxide and methane from the air to account for already released climate change air pollution.

21. PCL will inherently leak because landfill liners do not last forever. The U.S. Environmental Protection Agency (EPA) has said in the past that it is not a question of if, but when landfills will leak. That is why EPA created regulations that require groundwater monitoring in 1991.

22. Future expansion of PCL, will create more and long-term impacts of all the problems mentioned above and must be analyzed in an EIS.

For these reasons the Sierra Club requests that TCEQ amend the PCL Permit #2406 to address the access road needed for this landfill and conduct a complete environmental analysis with full public review, comments, and meetings before any decision is made.

The Sierra Club supports a contested case hearing on Permit #2406 and urges TCEQ to hold one near the proposed site so the public can participate and attend the hearing and public meetings that should be associated with it.

The Sierra Club appreciates this opportunity to comment. Please keep the Sierra Club informed about the status of this proposal. Thank you.

Sincerely,

Brandt Mannchen
Forest Management Issue Chair
Lone Star Chapter of the Sierra Club
Chair, Forestry Subcommittee
Houston Regional Group of the Sierra Club
20923 Kings Clover Court
Humble, Texas 77346
281-570-7212
brandt_mannchen@comcast.net

The Journal of Wildlife Management 85(5):868–879; 2021; DOI: 10.1002/jwmg.22042

Research Article

Sanitary Waste Landfill Effects on an Invasive Wild Pig Population

JOHN J. MAYER,[1] *Savannah River National Laboratory, Savannah River Nuclear Solutions LLC, Savannah River Site, Bldg. 999-W, Aiken, SC 29808, USA*

THOMAS B. EDWARDS, *Savannah River National Laboratory, Savannah River Nuclear Solutions LLC, Savannah River Site, Bldg. 999-W, Aiken, SC 29808, USA*

JAMES E. GARABEDIAN, *USDA Forest Service, Southern Research Station, P.O. Box 700, New Ellenton, SC 29809, USA*

JOHN C. KILGO, *USDA Forest Service, Southern Research Station, P.O. Box 700, New Ellenton, SC 29809, USA*

ABSTRACT Being opportunistic omnivores, wild pigs (*Sus scrofa*) readily feed on edible garbage. Given the presence of substantial volumes of edible food waste, large multi-county and regional municipal sanitary waste landfills constitute attractive forage resources for pigs, providing a year-round anthropogenic source of potentially high-quality forage. Our objective was to assess the effects that a large regional landfill has on the local pigs foraging in that facility's waste disposal cells. The landfill, located on the United States Department of Energy's Savannah River Site (SRS) in South Carolina, USA, became operational in 1998 and pigs began foraging there in 2001. By 2009 >100 pigs/night were observed foraging in the landfill, suggesting landfill establishment may have important consequences for population dynamics, public safety, and disease transmission. We evaluated changes in body mass, fetal litter size, numbers of pigs removed, and wild pig-vehicle collisions (WPVCs) before (1980–2000) and after (2001–2019) pigs began foraging in the landfill on SRS. Body mass during the after period increased to a greater extent for pigs in the vicinity of the landfill compared to pigs on the rest of SRS. Fetal litter size increased for pigs in the vicinity of the landfill, whereas it remained unchanged on the rest of SRS. Our density surrogate (number of pigs harvested) increased around the landfill during the after period by 2.9 times, whereas on the rest of the site it only increased by 53%. No WPVCs occurred adjacent to the landfill before 2001, but WPVCs increased along the 2 major roads bordering the landfill after 2001. Effects of sanitary waste landfills on wild pig populations scavenging there can present unique challenges to population management, control, public safety, and disease transmission. Potential approaches to address these challenges could be exclusion fencing to prevent access to the landfill's waste disposal cells or enhanced placement of waste cell covers to reduce access. © 2021 The Wildlife Society.

KEY WORDS body mass, feral swine, garbage, landfill, litter size, scavenging, South Carolina, *Sus scrofa*, vehicle collision, wild pig.

Wild pigs (*Sus scrofa*), native to parts of Europe, Asia, and North Africa, have spread across much of the globe, largely as a result of translocation by humans. Wild pigs cause extensive ecological and economic damage to natural and anthropogenic environments in the introduced and native portions of this species' global range (Mayer 2009*a*). In the portion of that range where wild pigs are not native, the Species Survival Commission of the World Conservation Union listed wild pigs among the 100 worst invasive alien species in the world (Lowe et al. 2000). The term wild pig collectively encompasses the 3 wild-living forms of *Sus scrofa*, including Eurasian wild boar, feral pigs (wild pigs solely of domestic ancestry), and hybrids between these 2 forms (Keiter et al. 2016).

Received: 7 October 2020; Accepted: 9 February 2021

[1]*E-mail: john.mayer@srnl.doe.gov*

Wild pigs are opportunistic omnivores (Ditchkoff and Mayer 2009, Ballari and Barrios-Garcia 2014). The ability of this invasive species to survive on almost anything edible is one of the primary reasons it has been so successful in establishing new populations in the introduced portions of the species' global range. The typical percent composition of material by volume in wild pig diets includes approximately 91% plant material, 7% animal material, and 2% other material (Schley and Roper 2003, Ditchkoff and Mayer 2009, Ballari and Barrios-Garcia 2014). The specific composition of the diet among wild pig populations is largely dependent upon what foods are available in their local area at any point in time (Schley and Roper 2003, Ditchkoff and Mayer 2009, Ballari and Barrios-Garcia 2014).

Wild pigs have been reported to feed on garbage (Hanson and Karstad 1959, Henry and Conley 1972, Hafeez et al. 2008, Cahill et al. 2012). This has been documented in

a number of locations to include edible (e.g., discarded food waste) and non-food (e.g., diapers, paper, plastic, polyethylene bags, rubber bands) garbage (Hafeez et al. 2008, Ditchkoff and Mayer 2009). The source and volume of garbage accessed by wild pigs varies from individual garbage containers to larger garbage dumps and regional landfills (Henry and Conley 1972, Cahill et al. 2012, Podgórski et al. 2013). Given the presence of substantial volumes of edible waste in multi-county regional municipal sanitary waste landfills (e.g., the Guadalupe Landfill, San Jose, CA, USA; Seminole County Landfill, Orlando, FL, USA), these landfills constitute attractive forage resources for large numbers (e.g., ~3,000 at 1 location) of wild pigs (Berry 1992, Do 2017). Compared to the natural environmental food base, the large volume of edible garbage present in landfills has the potential to provide a year-round anthropogenic source of high-quality forage for pigs (Hafeez et al. 2008, Leib et al. 2016). As such, edible garbage can be locally more abundant and potentially of higher nutritional quality and thus more preferred than local, seasonal, natural foods in their environment (Hafeez et al. 2008, Ditchkoff and Mayer 2009).

The quality and amount of forage resources can affect wild pig growth, reproduction, and population biology parameters (Matschke 1964, Schley and Roper 2003, Ditchkoff and Mayer 2009). Differential use of certain forage resources among sex and age classes has also been reported for wild pigs (Ditchkoff and Mayer 2009, Ballari and Barrios-Garcia 2014).

In this study we predicted that the establishment of a regional landfill would affect the productivity, individual condition, and demographics of the local wild pigs. More specifically, we predicted that wild pigs in the area immediately surrounding the landfill (i.e., impact area) would have greater body mass, litter sizes, and density than those distant from it (i.e., control area), and that these effects, combined with differential resource use among ages and sexes, would result in differences in sex ratio and age structure of wild pigs on impact and control areas. Additionally, we predicted that wild pig-vehicle collisions (WPVCs) would be greater on the impact area compared to the control area during the after-landfill period compared to before, but that the temporal pattern of WPVCs would not differ between control and impact areas during either time period.

STUDY AREA

We conducted this study from 1980–2019 on the Savannah River Site (SRS), a federal nuclear facility operated by the United States Department of Energy (DOE). The SRS encompassed 803 km^2 in western South Carolina (Fig. 1). The SRS was located entirely within the upper Atlantic Coastal Plain with elevations ranging from 20–130 m. The climate was humid subtropical, with a mean annual temperature of 18°C and mean annual rainfall of 122.5 cm. From June through September, extreme high temperature exceeded 40°C, and extreme low temperatures were observed in January and December (i.e., −19.4°C and −13.9°C, respectively). Greatest mean monthly rainfall occurred in July (13.1 cm) and least occurred in November (6.6 cm). We defined seasons as winter (Dec–Feb), spring (Mar–May), summer (Jun–Aug), and fall (Sep–Nov). Approximately 95% of SRS lands were undeveloped with the remainder of the site occupied by DOE industrialized areas. Managed pine (*Pinus* spp.) forests dominated the SRS landscape, which included several riparian corridors composed of bottomland hardwood forest and forested swamp. In addition, pockets of upland hardwood forest and mixed pine-hardwood forest, and isolated Carolina bay wetlands were scattered throughout the site. Large wildlife species present included white-tailed deer (*Odocoileus virginianus*), coyote (*Canis latrans*), bobcat (*Lynx rufus*), wild turkey (*Meteagris gallopava*), and American alligator (*Alligator mississippiensis*; Kilgo and Blake 2005).

The introduced population of wild pigs on the SRS has been in existence for >80 years, having originated from free-ranging domestic pigs that went feral possibly as early as the eighteenth century (Mayer and Brisbin 2012). Beginning in the mid-1970s, this population was hybridized with illegally released animals exhibiting mixed wild boar and feral pig characteristics (Mayer and Brisbin 2012, Mayer et al. 2020). Based on both morphological and genetic characteristics, the wild pig population on SRS during the study was composed of wild boar × feral pig hybrids (Mayer and Brisbin 2012). Since the early 1950s, wild pigs affected the SRS through rooting damage, forest resource damage, disease transmission, predation of native species, competition with native wildlife, vehicle collisions, hazards to SRS personnel, and property damage. Between 1956 and the present, the population was managed by DOE through annual public deer hunts (during which wild pigs were legally harvested), a contract control program, and control activities conducted by the United States Forest Service, Savannah River. These efforts entailed lethal removal of wild pigs through shooting, trapping, and hunting with dogs (Mayer and Brisbin 2012).

The Three Rivers Solid Waste Authority (TRSWA) operated a 9-county regional federal Resource Conservation and Recovery Act Subtitle D sanitary waste landfill on the SRS (DOE 1995). The SRS was divided into wildlife management compartments, and the TRSWA landfill (i.e., the landfill) was completely encompassed within wildlife compartment (WC) 20, which was 3,242 ha in size (Fig. 1). The landfill began waste disposal operations in late 1998 and continued operation through the duration of the study. The landfill encompassed 134 ha of open ground (its overall footprint), surrounded by forest, with the active waste disposal cells (i.e., garbage disposal pits) occupying 28 ha within the footprint (Fig. 1). The landfill received about 907 metric tons of waste per day, or about 226,796 metric tons/year (TRSWA 2019), which variously included household waste, trash, refuse, paper, rubbish, industrial waste, ashes, appliances, food waste and other materials (DOE 1995). Neither the landfill footprint nor the waste disposal cells were fenced, and forest management in the remainder of WC 20 continued consistent with management on the rest of SRS.

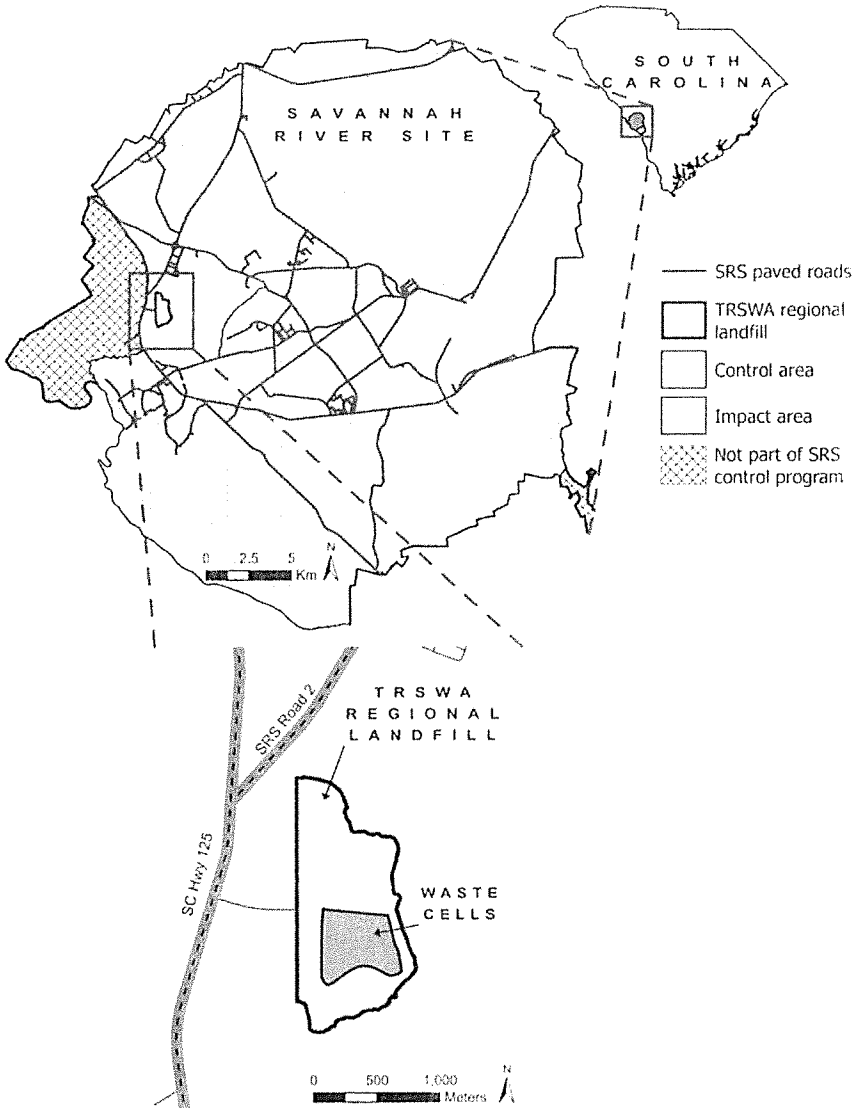


Figure 1. Location of the Savannah River Site (SRS) in South Carolina, USA, and location of the Three Rivers Solid Waste Authority (TRSWA) regional landfill, with waste disposal cells, within Wildlife Compartment 20, labeled as impact area, on the SRS. Cross-hatched area west of the landfill is on SRS property but is managed by the South Carolina Department of Natural Resources and therefore not within the SRS wild pig control program.

In late 2001 wild pigs were observed foraging in the landfill's waste disposal cells for the first time (C. W. Covington, TRSWA, personal communication). By 2009 >100 pigs/night were frequently observed foraging in the landfill (Mayer and Brisbin 2012). Based on global positioning system (GPS) fixes from radio-collared pigs, this extensive use of the landfill by wild pigs as a forage resource continued through 2016 (Fig. 2; J. C. Kilgo, USDA Forest Service, unpublished data), and anecdotal observations indicate that it continued through the end of 2019 (T. T. Mims, U.S. Forest Service, personal communication).

METHODS

Data Collection

We obtained data from SRS harvest records and the SRS control program, collected by SRS personnel. Data from each pig included its location and date of removal, body mass, sex, and age class (i.e., piglet, juvenile, yearling, subadult, and adult as defined in Mayer and Brisbin 2012). Workers also recorded fetal litter count for all pregnant females taken during public hunts and a subsample of those removed by contractors. We considered number of wild pigs removed from an area an approximate indicator of density, following Massei et al. (1997), Merli and Meriggi (2006), and Massei et al. (2015). We recognize that removals may not accurately reflect true density; however, Imperio et al. (2010) reported a significant correlation between harvest and actual counts of wild pigs in Italy. During annual public deer hunts, each WC was hunted only 1 day/year. Although contract trappers may have focused somewhat more effort in areas of greater density, contractors were responsible for implementing the control program across SRS and therefore were unable to concentrate disproportionate effort in any single area. We acknowledge that any bias in contractor effort could result in greater removals from that area and

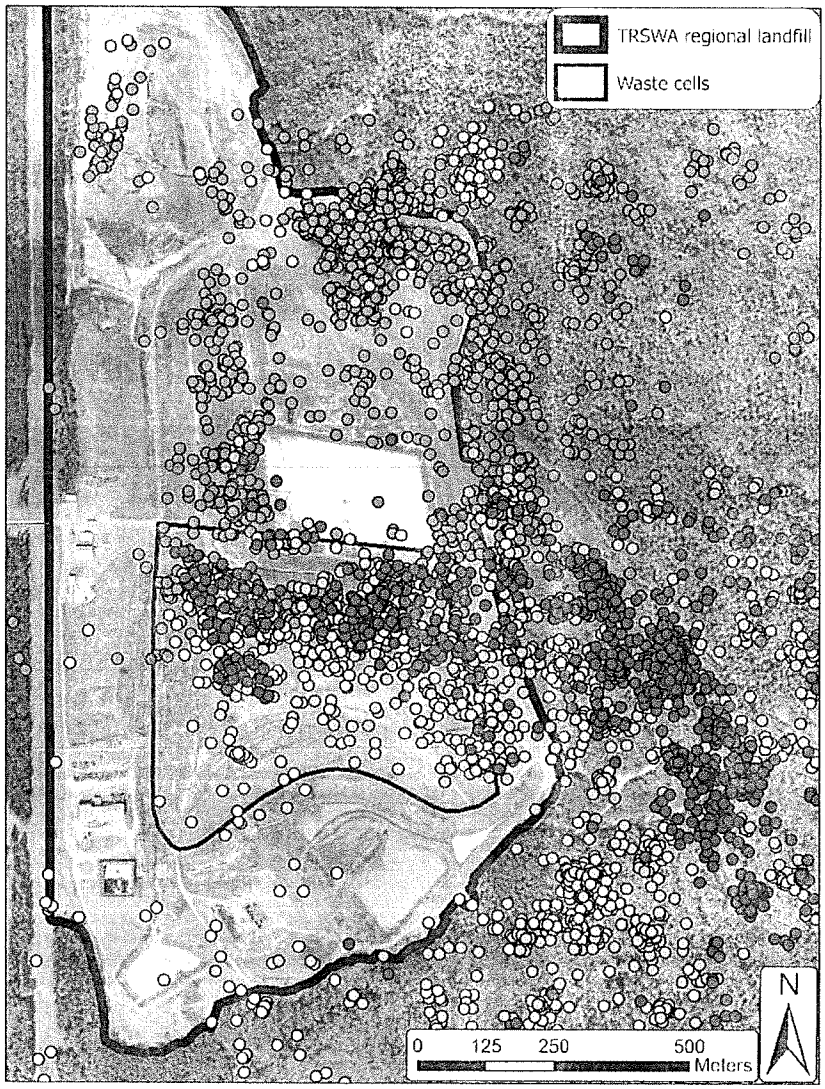


Figure 2. Color-coded global positioning system (GPS) locations of 1 subadult or adult female from each of 7 wild pig sounders GPS-collared in and around the Three Rivers Solid Waste Authority (TRSWA) regional landfill, on the Savannah River Site, South Carolina, USA, 1 January–20 August 2016. Collars were programmed to acquire GPS fixes at 2-hour intervals. The concentration of locations in the central portion of the landfill footprint is in the waste disposal cells (J. C. Kilgo, unpublished data).

potentially exaggerate the appearance of a difference in density on impact and control areas. If such bias occurred, we feel that it would provide further indication that density was greater in those areas, even if not to the precise extent indicated by the data. Thus, lacking actual density estimates, the number of pigs removed represented a reasonable approximation of wild pig density at SRS because removal effort was generally similar across the site during the study period owing to the widespread nature of the damage caused by wild pigs. Similarly, we used sex and age composition of removed pigs to approximate sex ratio and age structure of the population. Although older age classes may be less susceptible to capture in traps (Mayer 2009*b*), any such bias would have been uniform across our dataset because the SRS control program targeted all age and sex classes consistently through time and across the entire SRS, and therefore would not have influenced our comparisons.

We compiled SRS-wide WPVCs records between 1980 and 2018 from data collected by SRS law enforcement and contractors. These data included date, location, sex and age class of the pig, and time of day.

Data Analysis

Based on a before-after-control-impact (BACI; Stewart-Oaten et al. 1986) design, we compared body mass and fetal litter size of pigs from WC 20, containing the landfill (i.e., impact area, encompassing 3,242 ha), with that of pigs from all other compartments on SRS (i.e., control area, encompassing 70,199 ha), before (1980–2000) and after (2001–2019) pigs were actively foraging in the landfill. We developed mixed-effects analysis of variance (ANOVA) models separately for body mass and litter size to test for differences in means between treatment areas (impact and control areas) between time periods (before and after time

periods). In both models, we fit treatment area, time period, and their interaction (i.e., the BACI effect) as fixed effects to explicitly test for differences. In the body mass model, we also included fixed effects for age and sex to control for increases in body mass as pigs age and differences between sexes. Similarly, we included a fixed effect for age in the litter size model to account for potential increases in litter size as pigs age. On the SRS, most (92%) litters are produced by females in the yearling and older age classes after a 115-day gestation period (Mayer and Brisbin 2012). We included only litters from yearling and older females (≥1 yr old) because of inadequate sample sizes in younger age classes (i.e., piglets: $n = 1$; juveniles: $n = 6$). We fit treatment area (impact and control) and year as random intercepts in each model to account for unbalanced sample sizes and non-independence of observations within each treatment area (Schielzeth and Forstmeier 2009). We evaluated model fit and assumptions by examining residual distributions for each model. Based on a visual examination of the distribution of body mass model residuals, we used a square root transformation of body mass to normalize model residuals. Distribution of litter size model residuals indicated no deviation from normality, so we did not apply any transformation to litter size values.

We used pairwise contrasts to assess effects of landfill establishment on body mass and litter size in 2 ways. First, we developed pairwise before versus after landfill contrasts to determine if overall body mass and litter size means for impact and control areas differed between before and after time periods. Second, we developed pairwise impact versus control contrasts to determine if the magnitude of before versus after landfill differences in mean body mass and litter size differed between impact and control areas (i.e., was the magnitude of difference in before vs. after landfill means, or the BACI effect, consistent between impact and control areas?).

We developed tests of equal or given proportions (Zar 1984) to compare age and sex class composition between treatment areas during each time period separately for pig removal and WPCV datasets. Because our main interest was determining whether number of pigs removed and WPVCs observed (total numbers and by sex and age class) in the impact area differed from the control area, we tested hypotheses that proportions (based on observed numbers) in the impact area were not equal to those in the control area (i.e., 2-tailed tests). Accordingly, we used the observed proportion of pigs removed from the control area to approximate the *a priori* expected proportion in the impact area. For example, if the observed proportion of male pigs removed in the control area during the before landfill time period was 0.25, we tested the null hypothesis that the proportion of male pigs removed in the impact area during the before landfill time period was not equal to 0.25. Finally, we used calculated effect sizes for pairwise differences in proportions using Cohen's *h* (Cohen 1988).

For the removal dataset, we compared proportions of pigs removed between time periods for each treatment area (e.g., control-before-total vs. control-after-total), proportions of males and females removed between treatment areas during each time period (e.g., control-before-males vs. impact-before-males), and proportions of specific age classes removed between treatment areas during each time period (e.g., control-before-adult vs. impact-before-adult). For the collision dataset, we only tested data during the after-landfill time period because no collisions occurred on the 2 major roads bordering the impact area (i.e., SC Highway 125 and SRS Road 2; Fig. 1) during the before landfill time period. Accordingly, we compared proportions of males and females involved in collisions between treatment areas during the after time period (e.g., control-after-male vs. impact-after-male), proportions of specific age classes involved in collisions between treatment areas during the after time period (e.g., control-after-adult vs. impact-after-adult), proportions of collisions between treatment areas during individual months (e.g., control-after-May vs. impact-after-May), and proportions of collisions between treatment areas during individual seasons (e.g., control-after-spring vs. impact-after-spring).

We conducted all analyses in the R statistical environment (R Core Team 2020) using the contributed packages lme4 (Bates et al. 2015) to fit mixed-effects ANOVAs, emmeans (Lenth et al. 2020) for pairwise contrasts, the R base function prop.test for chi-square tests of proportions, and the contributed package pwr (Champely et al. 2020) to calculate effect sizes for proportion tests. We considered pairwise before versus after time period contrasts significant if 90% confidence intervals of contrast estimates did not overlap, and pairwise impact versus control contrasts significant if 90% confidence intervals did not overlap zero. Similarly, we considered pairwise differences in before versus after landfill proportions significant if 90% confidence intervals of proportion differences did not overlap zero.

RESULTS

We compiled body mass data on 11,296 pigs harvested between 1980 and 2019 (control-before = 8,543; control-after = 2,010; impact-before = 529; impact-after = 214). Overall, body mass averaged 34.0 ± 33.1 kg (SD) and ranged 0.5–189.0 kg. Body mass was affected by age ($\chi^2 = 74{,}505.4$, $P \leq 0.001$), sex ($\chi^2 = 137.7$, $P \leq 0.001$), and the interaction between treatment area and time period (i.e., the BACI effect; $\chi^2 = 10.9$, $P \leq 0.001$; Table 1). Pairwise before- versus after-landfill contrasts indicated mean body mass was greater during the after time period for both treatment areas (Fig. 3), but pairwise impact versus control contrasts indicated the magnitude of the BACI effect was significantly larger for the impact area compared to the control area (i.e., the magnitude of after-landfill increase in body mass was larger in the impact area compared to the control area; Table 2).

Our data included fetal counts of *in utero* litters from 799 pregnant pigs harvested between 1980 and 2019 (i.e., control-before = 502; control-after = 236; impact-before = 39; impact-after = 22). Overall, litter sizes averaged 6.2 ± 1.9 and ranged 1–14. Litter size was affected by age ($\chi^2 = 5.6$, $P = 0.06$) and the interaction between treatment

Table 1. Parameter estimates, 90% confidence intervals (CI), and associated *P*-values from analysis of variance models comparing wild pig body mass and fetal litter size between control and impact areas before and after wild pigs began foraging in the Three Rivers Solid Waste Authority regional landfill, 1980–2019, Savannah River Site, South Carolina, USA.

	Body mass (kg)			Litter size		
Parameter	β	90% CI	*P*	β	90% CI	*P*
(Intercept)	8.97	8.91 to 9.03	≤0.001	6.17	5.96 to 6.39	≤0.001
Treatment area (impact area)	−0.10	−0.20 to −0.01	0.083	−0.23	−0.80 to 0.33	0.490
Time period (after)	0.43	0.39 to 0.47	≤0.001	0.07	−0.19 to 0.33	0.650
Sex (male)	0.22	0.19 to 0.26	≤0.001			
Age (subadult)	−1.29	−1.35 to −1.24	≤0.001	0.11	−0.16 to 0.38	0.510
Age (yearling)	−2.39	−2.44 to −2.34	≤0.001	−0.33	−0.63 to −0.03	0.072
Age (juvenile)	−4.05	−4.10 to −3.99	≤0.001			
Age (piglet)	−6.77	−6.81 to −6.72	≤0.001			
Treatment area (impact area) × time period (after)	0.28	0.14 to 0.42	≤0.001	1.15	0.25 to 2.04	0.035

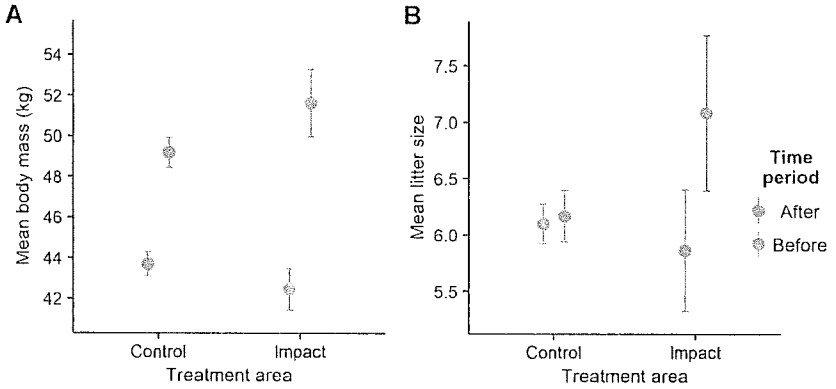


Figure 3. Differences in mean body mass (A) and litter size (B) of wild pigs sampled on impact and control areas on Savannah River Site, South Carolina, USA, before (1980–2000) versus after (2001–2019) wild pigs began foraging in the Three Rivers Solid Waste Authority regional landfill.

area and time period (the BACI effect; $\chi^2 = 4.43$, $P = 0.04$; Table 1). Pairwise before- versus after-landfill contrasts indicated mean litter size was larger during the after time period in the impact area but not the control area (Fig. 3), and pairwise impact versus control contrasts indicated the magnitude of the BACI effect was significant for the impact area but not the control area (Table 2). Specifically, fetal litter size in the impact area increased from 5.9 during the pre-landfill period to 7.1 during the after-time period, a difference of 1.2 fetuses per litter (Fig. 3).

Our removal data included 23,983 pigs (i.e., control-before = 8,445; control-after = 12,939; impact-before = 528; impact-after = 2,071). The proportion of pigs removed was lower in impact area compared to the control area during the before time period (proportion difference = 0.192; 90% CI = 0.177–0.206) but was greater in the impact area compared to the control area during the after period (proportion difference = −0.192; 90% CI = −0.206 to −0.177). The proportion of pigs removed from the impact area increased by 2.92 times between before and after time periods, whereas the proportion removed on the control area only increased by 53% between before and after time periods (Fig. 4; Table 3). Our removal data included age and sex class for 11,804 and 23,983 pigs, respectively, harvested between 1980 and 2019 (available online in Supporting Information Tables S1 and S2). Sex ratios of removed pigs did not differ between impact and control areas during either time period (Table 3). There were no consistent differences in proportion of age classes removed between the impact and control areas during either time period (Table 3), but there was evidence that a greater proportion of adults and piglets were removed during the after time period in the impact area compared to the control area (Table 3).

Table 2. Pairwise treatment versus control contrasts of before-after-control-impact effects for body mass and litter size of wild pigs before (1980–2000) and after (2001–2019) they began foraging in the Three Rivers Solid Waste Authority regional landfill on Savannah River Site (SRS), South Carolina, USA. Impact area is wildlife compartment 20 surrounding the landfill and control area is the rest of SRS.

Response	Time period	Contrast	Contrast estimate (90% CI)
Body mass	Before	Impact-control	−1.24 (−2.41 to −0.07)
	After	Impact-control	2.44 (0.62 to 4.25)
Litter size	Before	Impact-control	−0.24 (−0.80 to 0.33)
	After	Impact-control	0.91 (0.19 to 1.63)

Our data included records for 496 WPVCs documented on SRS roads between 2000 and 2018 (Supporting Information Tables S3 and S4). No WPVCs occurred adjacent to the impact area during the before time period, with the first occurring in 2003. From 2003–2018, 20 WPVCs occurred adjacent to the impact area (Fig. 5). Sex ratio of pigs involved in WPVCs did not differ between impact and control areas (Table 4). Age classes of pigs

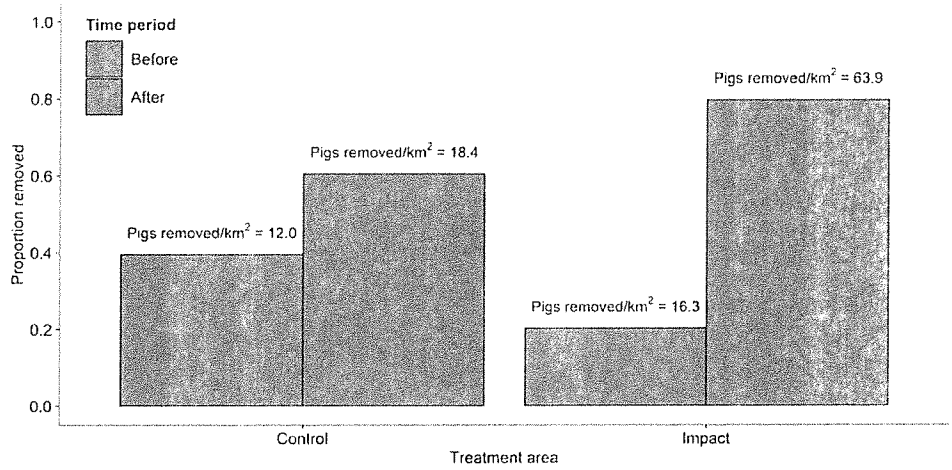


Figure 4. Proportions of wild pigs removed from control and impact areas on the Savannah River Site, South Carolina, USA, before (1980–2000) and after (2001–2019) they began foraging in the Three Rivers Solid Waste Authority regional landfill.

involved in WPVCs did not differ between impact and control areas, but there was evidence for marginally higher and lower numbers of adult and yearling pigs involved in WPVCs, respectively, around the impact area compared to the control area (Table 4). Documented WPVCs occurred during every month and season of the year, with monthly and seasonal peaks in the impact area during May and September and spring and fall, respectively, compared to the

Table 3. Pairwise comparisons of proportional differences in sex and age class composition, with 90% confidence intervals (CI), Cohen's *h* effect size for differences in proportions and associated *z*-scores (*h* [*z*-score]), and percent difference in proportions of wild pigs removed from impact and control areas (wildlife compartment 20 containing the Three Rivers Solid Waste Authority regional landfill and the rest of Savannah River Site, respectively) on Savannah River Site, South Carolina, USA, before (1980–2000) and after (2000–2019) wild pigs began foraging in the landfill. Proportion differences for which the 90% confidence intervals did not overlap zero are indicated with asterisks.

Grouping factor	Time period	Treatment area	Proportion	Proportion difference (90% CI)	*h* (*z*-score)	% difference
Sex						
Male	Before	Control	0.526	−0.014 (−0.052 to 0.024)	−0.03 (0.57)	−3%
		Impact	0.512			
	After	Control	0.465	0.010 (−0.045 to 0.066)	0.02 (0.25)	2%
		Impact	0.475			
Female	Before	Control	0.474	0.014 (−0.024 to 0.052)	0.03 (0.57)	3%
		Impact	0.488			
	After	Control	0.535	−0.010 (−0.066 to 0.045)	−0.02 (0.25)	−2%
		Impact	0.525			
Age						
Adult	Before	Control	0.174	−0.057 (−0.081 to −0.032)*	−0.16 (3.29)	−49%
		Impact	0.117			
	After	Control	0.265	0.179 (0.124 to 0.234)*	0.38 (6.02)	40%
		Impact	0.444			
Subadult	Before	Control	0.120	0.027 (0.001 to 0.054)*	0.08 (1.78)	18%
		Impact	0.147			
	After	Control	0.222	0.029 (−0.019 to 0.078)	0.07 (1.01)	12%
		Impact	0.251			
Yearling	Before	Control	0.142	−0.023 (−0.048 to 0.002)	−0.07 (1.40)	−19%
		Impact	0.119			
	After	Control	0.184	−0.006 (−0.050 to 0.036)	−0.02 (0.18)	−3%
		Impact	0.178			
Juvenile	Before	Control	0.146	−0.017 (−0.044 to 0.008)	−0.05 (1.07)	−13%
		Impact	0.129			
	After	Control	0.179	−0.048 (−0.086 to −0.009)*	−0.13 (1.83)	−37%
		Impact	0.131			
Piglet	Before	Control	0.418	−0.030 (−0.067 to 0.007)	−0.06 (1.32)	−8%
		Impact	0.388			
	After	Control	0.150	0.051 (0.006 to 0.095)*	0.13 (2.04)	25%
		Impact	0.201			
Totals						
Control	Before		0.395	0.210 (0.202 to 0.218)*	0.42 (43.5)	53%
	After		0.605			
Impact	Before		0.203	0.594 (0.575 to 0.612)*	1.27 (42.8)	292%
	After		0.797			

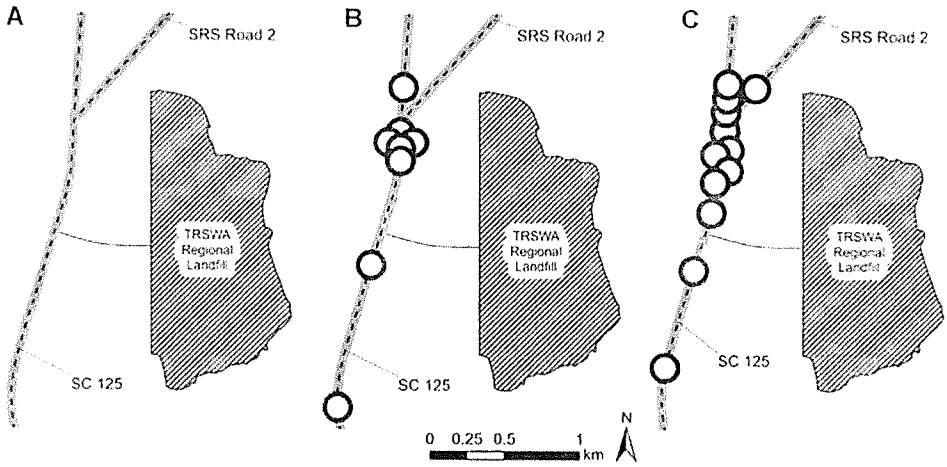


Figure 5. Illustration of the increase in wild pig-vehicle collision sites along South Carolina Highway 125 and SRS Road 2 adjacent to the Three Rivers Solid Waste Authority (TRSWA) regional landfill on the Savannah River Site (SRS), South Carolina, USA, during 3 time periods: A) 1980–1999, B) 2000–2009, and C) 2010–2019. Wild pigs were present throughout the Savannah River Site area depicted from 1980 through 2019.

Table 4. Pairwise comparisons of proportional differences in sex and age class composition, with 90% confidence intervals (CI), Cohen's *h* effect size for differences in proportions and associated *z*-scores (*h* [*z*-score]), and percent difference in proportions of wild pig-vehicle collisions along South Carolina Highway 125 and Savannah River Site (SRS) Road 2 adjacent to Three Rivers Solid Waste Authority regional landfill (impact area) and for the rest of SRS (control area), South Carolina, USA, between 2000 and 2018.

Grouping factor	Treatment area	Proportion	Proportion difference (90% CI)	*h* (*z*-score)	% difference
Sex					
Male	Control	0.557	0.064 (−0.107–0.235)	0.13 (0.48)	10%
	Impact	0.621			
Female	Control	0.443	−0.064 (−0.235–0.107)	−0.13 (0.48)	−17%
	Impact	0.379			
Age					
Adult	Control	0.081	0.126 (−0.018–0.269)	0.37 (1.97)	61%
	Impact	0.207			
Subadult	Control	0.289	−0.048 (−0.201–0.106)	−0.11 (0.34)	−20%
	Impact	0.241			
Yearling	Control	0.238	−0.100 (−0.228–0.029)	−0.26 (1.01)	−72%
	Impact	0.138			
Juvenile	Control	0.229	0.012 (−0.135–0.159)	0.03 (0.00)	5%
	Impact	0.241			
Piglet	Control	0.163	0.009 (−0.119–0.138)	0.02 (0.00)	5%
	Impact	0.172			

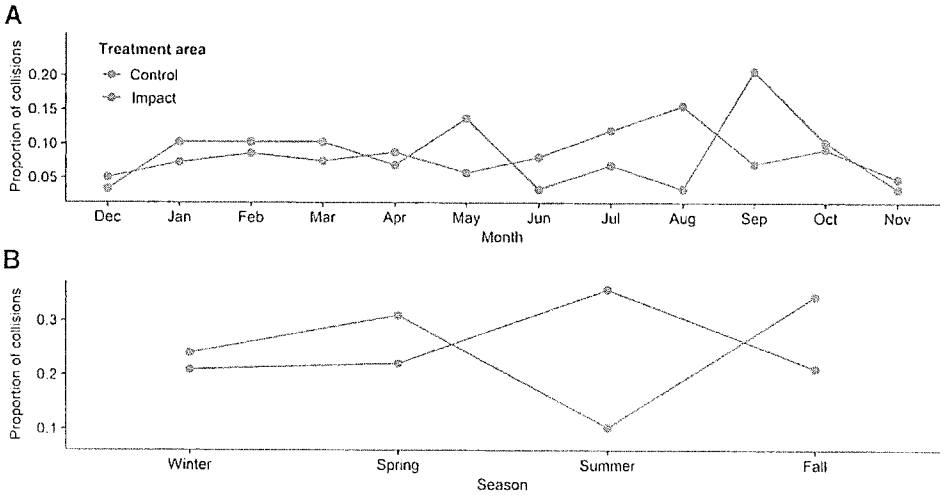


Figure 6. Proportions of monthly (A) and seasonal (B) wild pig-vehicle collisions along South Carolina Highway 125 and SRS Road 2 adjacent to Three Rivers Solid Waste Authority regional landfill (impact area) and for the rest of Savannah River Site (control area) in South Carolina, USA, after wild pigs began foraging in the landfill (2000–2019).

control area (Fig. 6). There were no clear monthly or seasonal differences in WPVCs between impact and control areas (Supporting Information Table S5). Of the 15 WPVCs for which a time of the accident was available, 14 were within 1 hour before or after sunrise. The latest accident occurred 2.5 hours after sunset.

DISCUSSION

Landfills have various environmental effects (Maheshwari et al. 2015). Our findings concur with previous work documenting specific effects on various wildlife species foraging in landfills, including increases in mean body mass, reproductive output, population density (e.g., herring gull [*Larus argentatus*], Pons and Migot 1995; glaucous gulls [*Larus hyperboreus*], Weiser and Powell 2010; kelp gulls [*Larus dominicanus*], Lenzia et al. 2019), and changes in behavioral patterns (white stork [*Ciconia ciconia*], Blanco 1996). Although we remain uncertain as to why body mass increased across SRS as a whole, the marked increase in body mass we observed among pigs foraging in the landfill has 2 potential repercussions. First, increased body mass in sexually mature female wild pigs is correlated with increased litter size (Comer and Mayer 2009), which we also observed. Secondly, a larger body mass represents an increased safety risk with respect to WPVCs. The heaviest female (181 kg) and male (204 kg) body masses ever recorded for wild pigs at SRS were 2 animals harvested in 2017 on a portion of SRS that is public wildlife management area land (Fig. 1) directly across South Carolina Highway 125 adjacent to the landfill (M. B. Caudell, South Carolina Department of Natural Resources, personal communication). The 20% increase in litter size we observed (an increase of 1.2 fetuses/litter over the control area average of 5.9) could have a large effect on population size over a relatively short period (e.g., 10 yr), assuming the additional fetuses survived at the same rate as the rest of the litter. Such increased recruitment would represent a significant challenge to management efforts aimed at reducing the size of a wild pig population.

Between 1980 and 2019, the wild pig population increased in size across the entire SRS (Mayer et al. 2020), as evidenced in our data. The extent of increase was much greater on the impact area than the control area, particularly among the adult and piglet age classes, the latter of which is consistent with the increased litter size observed on the impact area after landfill establishment. Research at SRS conducted either prior to the establishment of the landfill or in areas away from it reported densities of 1–6 pigs/km^2 (Mayer and Brisbin 2012, Keiter et al. 2017, Schlichting et al. 2020). During 2014, a motion-sensitive camera survey in the area surrounding the landfill estimated density there to be 16.5 pigs/km^2 (J. C. Kilgo, unpublished data), 2.75 times greater than the highest previously reported density and an increase in density that corresponds well with the 2.92 times increase in removals reported herein. Therefore, we believe the significant increase in the number of wild pigs harvested on the impact area compared to the control area, regardless of its precision, resulted from both a general population increase across SRS and an increase in the number of pigs present around the landfill.

Although data on traffic patterns around the landfill are unavailable, the increase in WPVCs we observed there cannot be attributed to increased traffic flow. First, the SRS employee population and associated traffic volume have decreased from the 1980s through the present; increased traffic associated with landfill operation (e.g., garbage trucks) was offset by the overall reduction in employee traffic on SRS during this period (Kilgo and Blake 2005, DOE 2020). Second, traffic associated with the landfill itself occurred during daylight hours when the landfill operates, which is not when most WPVCs occurred. Because wild pigs have not been observed in the waste disposal cells during daylight hours, presumably because of human activity there, we assume that the animals involved in accidents around sunrise were leaving the landfill and around sunset were entering the facility. Locations from GPS fixes from radio-collared pigs indicating nocturnal use of the waste disposal cells corroborates this assumption (J. C. Kilgo, unpublished data). Finally, WPVCs have occurred on the 225 km of maintained primary roads on SRS since the late 1960s (Mayer and Johns 2007) and were documented and reported annually by SRS law enforcement and contractors. Between 1980 and 2002, no WPVCs occurred on the 5.6 km of roads adjacent to the landfill. After the first WPVC occurred in 2003, numbers of WPVCs began to increase along the adjacent roads bordering the landfill to the extent that the SRS erected wild pig crossing signs along that roadway on either end of the landfill's footprint in 2012.

In addition to an increase in number of WPVCs, presence of the landfill on SRS has contributed to the problem of WPVCs there in other ways. Pigs are larger around the landfill and adults (the largest age class) are more frequently involved in WPVCs there. Larger and heavier pigs likely result in more severe consequences from such accidents (Mayer and Johns 2007), highlighting the increased safety risk to humans from pigs with increased body mass crossing roads to access the landfill. In addition, WPVCs on the SRS occur more frequently at the road crossings of stream and drainage corridors, especially where steel guardrails and bridge walls act as barriers to pigs attempting to leave the roadway in front of oncoming vehicles (Mayer and Johns 2007, Beasley et al. 2014). None of the roads bordering the landfill have any of these natural movement corridors or physical road barriers, suggesting the costs of movement in the absence of natural corridors are offset by the benefits of food resources provided in the landfill. Thus, the landfill has created a new location for WPVCs and those accidents may cause greater damage.

In general, allowing wild pigs to forage on garbage in a landfill creates several operational problems for the facility. Foraging activity by pigs roots up and exposes covered and decomposing waste in disposal cells (Berry 1992). The uncovered and scattered waste is also available to other local scavengers on the SRS (e.g., crows [*Corvus* spp.], vultures

[Cathartidae], gulls [*Larus* spp.], coyotes), causing further scattering of the waste. Wild pig rooting on the sides or slopes of landfills can also lead to erosion and slumping of the landfill cap or cover (Van Hoof 2019). Collectively, such damage caused by foraging pigs requires cleanup of dispersed and unearthed food waste and repairs to the landfill cap (Mann 2016).

Potential disease or pathogen transmission to wild pigs can also result from these animals foraging in sanitary landfill waste disposal cells. For example, African swine fever virus (ASFV) currently is spreading across Eurasia, having reached Belgium in the west and China, Far East Russia, and the northern region of South Korea in the east (Spickler 2019, Gavier-Widén et al. 2020). Several credible scenarios exist for the introduction of ASFV into the United States (Golnar et al. 2019, Jurado et al. 2019). Based on the paths of transmission across Eurasia, a number of these scenarios involve wild pigs foraging in landfills (Costard et al. 2013, Brown and Bevins 2018). Elimination of ASFV from a wild pig population once it has become endemic is difficult (Gogin et al. 2013). The introduction of ASFV into a wild pig population can potentially result in transmission into local domestic herds, as has happened in Eurasia (Gavier-Widén et al. 2015). Such an outbreak of ASFV or other foreign animal diseases in domestic swine in the United States could cost billions of dollars in losses in headcount, productivity, or sales (Paarlberg et al. 2009, Pineda-Krch et al. 2010, Mayer 2018). Therefore, unrestricted wild pig access to food waste in landfills could have very serious consequences from disease transmission that can have broad biological and economic implications.

A variety of animals can be attracted to the concentrated foraging and shelter resources provided by municipal solid waste deposited in landfills. The effect of such concentrated resources on wild pig populations can present unique challenges to public safety, population control, and disease transmission. Although control efforts in the form of increased trapping and shooting could be intensified around landfills, complete elimination of pigs from the surrounding area is impossible given the extent of the populations surrounding many landfills and their capacity as a source for rapid recolonization. One solution would be to simply prevent pigs from accessing landfill resources by erecting an exclusion barrier of pig-proof fencing (e.g., Reidy et al. 2008, Doupé et al. 2010, Rattan et al. 2010). Upon accessing the landfill and learning that the landfill provides concentrated forage resources, individual wild pigs are likely to be more motivated to cross exclusion fences or other physical barriers to movement surrounding the landfill (Mayer 2018, Mitchell 2011, Ditchkoff and Bodenchuk 2020). Such a fence would require monitoring and maintenance to successfully function as a barrier. Another possible approach could involve minimizing the attractiveness or accessibility of the waste by placement of cover fill (i.e., soil) to a depth that would preclude rooting and foraging; however, wild pigs can root as deep as 120 cm for targeted forage resources (Mayer and Brisbin 2012), so maintaining such a daily cover depth may not be economically feasible. Placement of reusable tarps or other durable covers (e.g., Posi-Shell® environmental coatings; LSC, Apalachin, NY, USA) may also represent an option for excluding pigs.

MANAGEMENT IMPLICATIONS

Our research indicates that wild pigs are attracted to landfills with varying consequences for pigs and humans. The larger body mass and litter sizes of wild pigs foraging in a municipal solid waste landfill, which results in greater density and incidence of WPVCs, amplifies the difficulty of controlling wild pig populations around landfills. Thus, management should focus on exploring the relative cost and benefits of different exclusion methods, and ways to minimize the attractiveness of landfills to wild pigs.

ACKNOWLEDGMENTS

We appreciate helpful comments from J. C. Beasley, J. C. Cathey, K. C. VerCauteren, and 2 anonymous reviewers that improved the quality of earlier drafts of the manuscript. Contributions from JJM and TBE were supported by the United States Department of Energy Office of Environmental Management under Contract DE-AC09-08SR22470 to Savannah River Nuclear Solutions LLC. Contributions from JCK and JEG were supported by the United States Department of Energy under Interagency Agreement No. DE-EM0003622 to the United States Department of Agriculture Forest Service.

LITERATURE CITED

Ballari, S. A., and M. N. Barrios-Garcia. 2014. A review of wild boar *Sus scrofa* diet and factors affecting food selection in native and introduced ranges. Mammal Review 44:124–134.

Bates, D., M. Mächler, B. Bolker, and S. Walker. 2015. Fitting linear mixed-effects models using lme4. Journal of Statistical Software 67:1–48.

Beasley, J. C., T. E. Grazia, P. E. Johns, and J. J. Mayer. 2014. Habitats associated with vehicle collisions with wild pigs. Wildlife Research 40:654–660.

Berry, M. 1992. Hogs keep pigging out at landfill. The Orlando Sentinel, March 12. <https://www.orlandosentinel.com/news/os-xpm-1992-03-12-9203120875-story.html>. Accessed 10 Sep 2019.

Blanco, G. 1996. Population dynamics and communal roosting of white storks foraging at a Spanish refuse dump. Colonial Waterbirds 19:273–276.

Brown, V. R., and S. N. Bevins. 2018. A review of African swine fever and the potential for introduction into the United States and the possibility of subsequent establishment in feral swine and native ticks. Frontiers in Veterinary Science 5:11. https://doi.org/10.3389/fvets.2018.00011

Cahill, S., F. Llimona, L. Cabañeros, and F. Calomardo. 2012. Characteristics of wild boar (*Sus scrofa*) habituation to urban areas in the Collserola Natural Park (Barcelona) and comparison with other locations. Animal Biodiversity and Conservation 35:221–233.

Champely, S., C. Ekstrom, P. Dalgaard, J. Gill, S. Weibelzahl, A. Anandkumar, C. Ford, R. Volcic, and H. De Rosario. 2020. pwr: basic functions for power analysis. Version 1.3-0. https://CRAN.R-project.org/package=pwr

Cohen, J. 1988. Statistical power analysis for the behavioral sciences. Second edition. Lawrence Erlbaum Associates Publishing, Hillsdale, New Jersey, USA.

Comer, C. E., and J. J. Mayer. 2009. Wild pig reproductive biology. Pages 51–75 *in* J. J. Mayer and I. L. Brisbin, Jr., editors. Wild pigs: biology, damage, control techniques and management. SRNL-RP-2009-00869. Savannah River National Laboratory, Aiken, South Carolina, USA.

Costard, S., B. A. Jones, B. Martínez-López, L. Mur, A. de la Torre, M. Martínez, F. Sánchez-Vizcaíno, J.-M. Sánchez-Vizcaíno, D. U. Pfeiffer, and B. Wieland. 2013. Introduction of African swine fever into

the European Union through illegal importation of pork and pork products. PLoS ONE 8:e61104.

Department of Energy [DOE]. 1995. Environmental assessment for the construction and operation of the Three Rivers Solid Waste Authority regional waste management center at the Savannah River Site. DOE/EA-1079. U.S. Department of Energy, Savannah River Operations Office, Savannah River Site, Aiken, South Carolina, USA.

Department of Energy [DOE]. 2020. An overview of the Savannah River Site: environmental stewardship, nuclear security, science and energy. U.S. Department of Energy, Savannah River Operations Office, Savannah River Site, Aiken, South Carolina, USA.

Ditchkoff, S. S., and M. J. Bodenchuk. 2020. Management of wild pigs. Pages 175–197 *in* K. C. VerCauteren, J. C. Beasley, S. S. Ditchkoff, J. J. Mayer, G. J. Roloff, and B. K. Strickland, editors. Invasive wild pigs in North America: ecology, impacts, and management. CRC Press, Taylor & Francis Group, Boca Raton, Florida, USA.

Ditchkoff, S. S., and J. J. Mayer. 2009. Wild pig food habits. Pages 105–143 *in* J. J. Mayer and I. L. Brisbin, Jr., editors. Wild pigs: biology, damage, control techniques and management. SRNL-RP-2009-00869. Savannah River National Laboratory, Aiken, South Carolina, USA.

Do, K. 2017. San Jose neighborhoods beset by wild boar. KPIX Channel 5 CBS SF Bay Area, September 21. <https://sanfrancisco.cbslocal.com/2017/09/21/san-jose-neighborhoods-beset-by-wild-boar/>. Accessed 17 Sep 2019.

Doupé, R. G., J. Mitchell, M. J. Knott, A. M. Davis, and A. J. Lymbery. 2010. Efficacy of exclusion fencing to protect ephemeral floodplain lagoon habitats from feral pigs (*Sus scrofa*). Wetlands Ecology and Management 18:69–78.

Gavier-Widén, D., C. Gortázar, K. Ståhl, A. S. Neimanis, S. Rossi, C. Hård av Segerstad, and T. Kuiken. 2015. African swine fever in wild boar in Europe: a notable challenge. Veterinary Record 176:199–200.

Gavier-Widén, D. K., Stah, and L. Dixon. 2020. No hasty solutions for African swine fever: African swine fever vaccines could pose risk of causing disease and spreading the virus further. Science 367:622–624.

Gogin, A., V. Gerasimov, A. Malogolovkin, and D. Kolbasov. 2013. African swine fever in the North Caucasus region and the Russian Federation in years 2007–2012. Virus Research 173:198–203.

Golnar, A. J., E. Martin, J. D. Wormington, R. C. Kading, P. D. Teel, S. A. Hamer, and G. L. Hamer. 2019. Reviewing the potential vectors and hosts of African swine fever virus transmission in the United States. Vector-Borne and Zoonotic Diseases 19:512–524.

Hafeez, S., M. Abbas, A. H. Khan, and E. U. Rehman. 2008. Analysis of the diet of wild boar in Islamabad City, Pakistan. Journal of Applied Biosciences 9:403–406.

Hanson, R. P., and L. Karstad. 1959. Feral swine in the southeastern United States. Journal of Wildlife Management 23:64–74.

Henry, V. G., and R. H. Conley. 1972. Fall foods of the European wild hogs in the southern Appalachians. Journal of Wildlife Management 36:854–860.

Imperio, S., M. Ferrante, A. Grignetti, C. Santini, and S. Focardi. 2010. Investigating population dynamics in ungulates: do hunting statistics make up a good index of population abundance? Wildlife Biology 16:205–214.

Jurado, C., G. Paternoster, B. Martínez-López, K. Burton, and L. Mur. 2019. Could African swine fever and classical swine fever viruses enter into the United States via swine products carried in air passengers' luggage? Transboundary and Emerging Diseases 66:166–180.

Kilgo, J. C. and J. I. Blake, editors. 2005. Ecology and management of a forested landscape: fifty years on the Savannah River Site. Island Press, Washington, D.C., USA.

Keiter, D. A., A. J. Davis, O. E. Rhodes, Jr., F. L. Cunningham, J. C. Kilgo, K. M. Pepin, and J. C. Beasley. 2017. Effects of scale of movement, detection probability, and true population density on common methods of estimating population density. Scientific Reports 7:9446. https://doi.org/10.1038/s41598-017-09746-5

Keiter, D. A., J. J. Mayer, and J. C. Beasley. 2016. What's in a "common" name? A call for consistent terminology for non-native *Sus scrofa*. Wildlife Society Bulletin 40:384–387.

Leib, E.B., O. Balkus, C. Rice, M. Maley, R. Taneja, R. Cheng, N. Civita, and T. Alvoid. 2016. Leftovers for livestock: a legal guide for using food scraps as animal feed. The Harvard Food Law and Policy Clinic and the Food Recovery Project, University of Arkansas School of Law, Fayetteville, USA.

Lenth, R. V., P. Buerkner, M. Herve, J. Love, H. Riebl, and H. Singmann. 2020. emmeans: estimated marginal means, aka least-squares means. Version 1.5.3. https://CRAN.R-project.org/package=emmeans

Lenzia, J., I. González-Bergonzonid, E. Machín, B. Pijanowski, and E. Flaherty. 2019. The impact of anthropogenic food subsidies on a generalist seabird during nestling growth. Science of The Total Environment 687:546–553.

Lowe, S., M. Browne, S. Boudjelas, and M. De Poorter. 2000. 100 of the world's worst invasive alien species: a selection from the global invasive species database. Invasive Species Specialist Group, Species Survival Commission, World Conservation Union (IUCN), Auckland, New Zealand.

Maheshwari, R., S. Gupta, and K. Das. 2015. Impact of landfill waste on health: an overview. Journal of Environmental Science, Toxicology and Food Technology 1:17–23.

Mann, J. 2016. Off the charts: feral hog population explosion creates problems. Fort Rucker Public Affairs News. <https://www.rucker.army.mil/pao/armyflier/2016/05/26/off_the_charts_feral_hog_population_explosion_creates_problems/>. Accessed 6 Sep 2019.

Massei, G., P. V. Genov, B. W. Staines, and M. L. Gorman. 1997. Factors influencing home range and activity of wild boar, *Sus scrofa*, in a Mediterranean coastal area. Journal of Zoology 242:411–423.

Massei, G., J. Kindberg, A. Licoppe, D. Gačić, N. Šprem, J. Kamler, E. Baubet, U. Hohmann, A. Monaco, J. Ozoliņš, et al. 2015. Wild boar populations up, numbers of hunters down? A review of trends and implications for Europe. Pest Management Science 71:492–500.

Matschke, G. H. 1964. The influence of oak mast on European wild hog reproduction. Proceedings of the Annual Conference of the Southeastern Association of Game and Fish Commissioners 18:35–39.

Mayer, J. J. 2009*a*. Overview of wild pig damage. Pages 221–246 *in* J. J. Mayer and I. L. Brisbin, Jr., editors. Wild pigs: biology, damage, control techniques and management. SRNL-RP-2009-00869. Savannah River National Laboratory, Aiken, South Carolina, USA.

Mayer, J. J. 2009*b*. Comparison of five harvest techniques for wild pigs. Pages 315–327 *in* J. J. Mayer and I. L. Brisbin, Jr., editors. Wild pigs: biology, damage, control techniques and management. SRNL-RP-2009-00869. Savannah River National Laboratory, Aiken, South Carolina, USA.

Mayer, J. J. 2018. Introduced wild pigs in North America: history, problems and management. Pages 299–312 *in* M. Melletti and E. Meijaard, editors. Ecology, evolution and management of wild pigs and peccaries: implications for conservation. Cambridge University Press, Cambridge, United Kingdom.

Mayer, J. J., J. C., Beasley, R. K., Boughton, S. S., and Ditchkoff. 2020. Wild pigs in southeastern North America. Pages 369–402 *in* K. C. VerCauteren, J. C. Beasley, S. S. Ditchkoff, J. J. Mayer, G. J. Roloff, and B. K. Strickland, editors. Invasive wild pigs in North America: ecology, impacts, and management. CRC Press, Taylor & Francis Group, Boca Raton, Florida, USA.

Mayer, J. J., and I. L. Brisbin, Jr. 2012. Wild pigs of the Savannah River Site. SRNL-RP-2011-00295. Savannah River National Laboratory, Aiken, South Carolina, USA.

Mayer, J. J., and P. E. Johns. 2007. Characterization of wild pig-vehicle collisions. Proceedings of the Wildlife Damage Management Conference 12:175–187.

Merli, E., and A. Meriggi. 2006. Using harvest data to predict habitat-population relationship of the wild boar *Sus scrofa* in Northern Italy. Acta Theriologica 51:383–394.

Mitchell, J. 2011. Exclusion fencing of feral pigs. North Queensland Dry Tropics, Townsville, Queensland, Australia.

Paarlberg, P. L., A. Hillberg Seitzinger, H. G. Lee, and K. H. Mathews. 2009. Supply reductions, export restrictions, and expectations for hog returns in a potential classical swine fever outbreak in the United States. Journal of Swine Health and Production 17:155–162.

Pineda-Krch, M., J. M. O'Brien, C. Thunes, and T. E. Carpenter. 2010. Potential impact of introduction of foot-and-mouth disease from wild pigs into commercial livestock premises in California. American Journal of Veterinary Research 71:82–88.

Podgórski, T., G. Baś, B. Jędrzejewska, L. Sönnichsen, S. Śnieżko, W. Jędrzejewski, and H. Okarma. 2013. Spatiotemporal behavioral plasticity of wild boar (*Sus scrofa*) under contrasting conditions of human pressure:

primeval forest and metropolitan area. Journal of Mammalogy 94:109–119.
Pons, J.-M., and P. Migot. 1995. Life-history strategy of the herring gull: changes in survival and fecundity in a population. Journal of Animal Ecology 64:592–599.
R Core Team. 2020. R: a language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria.
Rattan, J. M., B. J. Higginbotham, D. B. Long, and T. A. Campbell. 2010. Exclusion fencing for feral hogs at white-tailed deer feeders. Texas Journal of Agriculture and Natural Resource 23:83–89.
Reidy, M. M., T. A. Campbell, and D. G. Hewitt. 2008. Evaluation of electric fencing to inhibit feral pig movements. Journal of Wildlife Management 72:1012–1018.
Schielzeth, H., and W. Forstmeier. 2009. Conclusions beyond support: overconfident estimates in mixed models. Behavioral Ecology 20:416–420.
Schley, L., and T. J. Roper. 2003. Diet of wild boar *Sus scrofa* in Western Europe, with particular reference to consumption of agricultural crops. Mammal Review 33:43–56.
Schlichting, P. E., J. C. Beasley, R. K. Baughton, A. J. Davis, K. M. Pepin, M. P. Glow, N. P. Snow, R. S. Miller, K. C. VerCauteren, and J. S. Lewis. 2020. A rapid population assessment method for wild pigs using baited cameras at 3 study sites. Wildlife Society Bulletin 44: 372–382.
Spickler, A. R. 2019. African swine fever. The Center for Food Security & Public Health, Iowa State University, Ames, Iowa, USA. <http://www.cfsph.iastate.edu/DiseaseInfo/factsheets.php>. Accessed 12 Aug 2019.
Stewart-Oaten, A., W. W. Murdoch, and K. R. Parker. 1986. Environmental impact assessment: "pseudoreplication" in time? Ecology 67:929–940.
Three Rivers Solid Waste Authority. 2019. Three rivers solid waste authority: landfill webpage. <https://trswa.org/landfill.shtml>. Accessed 26 Jan 2021.
Van Hoof, J. C. 2019. Annual CCR landfill inspection: Cleco Dolet Hills Power Station. Providence Engineering & Environmental Group LLC, Baton Rouge, Louisiana. USA.
Weiser, E. L., and A. N. Powell. 2010. Does garbage in the diet improve reproductive output of glaucous gulls? Condor 112:530–538.
Zar, J. H. 1984. Biostatistical analysis. Prentice-Hall, Englewood Cliffs, New Jersey, USA.

Associate Editor: Kathryn Schoenecker.

SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article at the publisher's website.

Melissa Schmidt

From: PUBCOMMENT-OCC
Sent: Monday, August 2, 2021 9:03 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Sierra Club Comments About Amending Permit # 2406, Peach Creek Landfill
Attachments: Landfill SHNF TCEQ Comments 2021.docx

PM
H

From: CHIEFCLK <chiefclk@tceq.texas.gov>
Sent: Friday, July 30, 2021 1:55 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: FW: Sierra Club Comments About Amending Permit # 2406, Peach Creek Landfill

From: Brandt Mannchen <brandt_mannchen@comcast.net>
Sent: Friday, July 30, 2021 10:53 AM
To: CHIEFCLK <chiefclk@tceq.texas.gov>
Cc: brandt_mannchen@comcast.net; woodduckfarm@yahoo.com; elmerz@hal-pc.org; frankblake@juno.com; Ken Kramer <kramerkenw@gmail.com>; kristen@bayoucitywaterkeeper.org; c.nazor@earthlink.net; balinsky@gmail.com; cyrus.reed@sierraclub.org; eva.hernandez@sierraclub.org; ellenbuchanan@sbcglobal.net; samubaarak@gmail.com; oldham_melanie@yahoo.com; aapaul@yahoo.com; lmundwiller@hotmail.com; alexandrabboyce@gmail.com; devika.taneja14@gmail.com; rahnaik34@utexas.edu; raineygib@aol.com; cworonow@gmail.com; larryosageshelton@yahoo.com; ddonovan@consolidated.net; gdonovan40@aol.com; janicecrumpbezanson@gmail.com; Naomi D'Amours <naomidamours@gmail.com>; dboydretared@sbcglobal.net; jarodkc@gmail.com; hmannhis@gmail.com; buchanle35@gmail.com; bean.kristen87@gmail.com; morin_jason92@yahoo.com; mmichaelchuk@gmail.com; jane_prentiss@yahoo.com
Subject: Sierra Club Comments About Amending Permit # 2406, Peach Creek Landfill

Dear Chief Clerk of the TCEQ,

Attached are Sierra Club comments that request an amendment to Permit #2406, Peach Creek Landfill to add an access road to the site, a list of environmental and other issues/concerns that should be analyzed and considered in this permit process, and a request that a contested case hearing be held for this proposal.

Please keep the Sierra Club up-to-date about the status of this proposed permit and permit amendment. Thank you.

Brandt Mannchen
Forest Management Issue Chair
Lone Star Chapter of the Sierra Club
Chair, Forestry Subcommittee
Houston Regional Group of the Sierra Club
20923 Kings Clover Court
Humble, Texas 77346
281-570-7212
brandt_mannchen@comcast.net

July 30, 2021

Office of Chief Clerk
MC 105
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

Dear Chief Clerk of the Texas Commission on Environmental Quality,

The Houston Regional Group and Lone Star Chapter of the Sierra Club (Sierra Club) request that the Texas Commission on Environmental Quality (TCEQ) amend Permit #2406, the 635-acre Peach Creek Landfill (PCL), and include how this proposed facility will be accessed by garbage trucks and other vehicles.

This vehicle access issue and all other issues/concerns should be assessed, evaluated, and analyzed for environmental, social, and economic impacts, preferably in an environmental impact statement (EIS), before any decision is made about Permit #2406. The Sierra Club supports and urges TCEQ to conduct a contested case hearing on this proposal.

This is needed because TCEQ has U.S. Environmental Protection Agency authorization to operate the federal solid waste regulatory and permitting system in Texas which includes household, commercial, industrial, and special wastes that will stored in the PCL (1,300 tons/day, 474 garbage trucks/day, and 371,000 tons/year of waste).

It is of concern that the investors that want Permit #2406 are from Mississippi and their sole purpose is to get a permit from TCEQ so they can sell it for upwards of $20 million to another entity who will have to construct and operate the facility. These investors are not concerned about what they agree to and what happens later. Their interest is simply manufactured and not reality as it is for nearby residents, Sam Houston National Forest (SHNF), and those who will have to live with the proposed landfill for a lifetime.

The Sierra Club provides a list of some of the issues/concerns that the TCEQ should assess, evaluate, and analyze and consider in Permit #2406 and a contested case hearing before it decides whether to approve this permit. These issues/concerns include:

1. PCL threatens local farms, like Wood Duck Farm, and personal homesteads that rely upon clean surface and groundwater and unpolluted environments in San Jacinto, Liberty, and Montgomery Counties, including the City of Cleveland.

2. PCL threatens SHNF to the north (adjacent to the proposed site), south (downstream), and west where there are over 4,000 acres of federal public national forest lands.

The Sierra Club has a very special relationship with SHNF. It is the largest public land unit in the National Forests and Grasslands in Texas (NFGT) and in Southeast Texas. A variety of important ecosystems, recreational areas and uses, and natural resources exist in SHNF.

The Lone Star Hiking Trail, which the Sierra Club conceived, helped build, and has conducted trail maintenance on, is in SHNF along with the federally endangered Red-cockaded Woodpecker (RCW), Winters Bayou Scenic Area, Big Creek Scenic Area, important seeps, seepage creeks, baygalls, East Fork of the San Jacinto River, Floodplain Forests, Longleaf Pine Forests, Shortleaf Pine Forests, Upland Hardwood Forests, wetlands, and San Jacinto Flatwood Forests.

Both ground and surface waters are filtered and flow through SHNF and provide the City of Houston with clean water from some of the headwaters of the San Jacinto River. These headwaters connect via the East Fork of the San Jacinto River and its' tributaries, some of which are on the east side of SHNF.

Some of these tributaries include: Peach Creek, Boggy Creek, Blue Branch, Winters Bayou, Jayhawker Creek, Shell Branch, Little Caney Creek, Turkey Creek, Nebletts Creek, Tarkington Bayou, Bradley Branch, Bear Creek, Gum Branch, Spring Branch, Black Branch, Whiskey Branch, Pumpkin Creek, Chinquapin Creek, West Fork, Miller Creek, Hickman Branch, and others which eventually flow into Lake Houston, the prime drinking water lake for the City of Houston, central and west Harris County, and southern Montgomery County, and recharge zones, shallow water aquifers, water tables, gravel and sand beds, and deeper aquifers.

3. PCL will create or encourage increases in litter and dumping due to the nature and location of the facility.

4. PCL will cause wildfires to spread due to the nature and operation of the facility (8,200 fires/year occur at landfills). Wildfires in landfills can burn deep like coal and peat fires, are difficult to put out, and cause toxic, smoke (particulate), and ozone precursor air pollution. Air quality analysis, assessment, and evaluation is required as well as an air quality control mitigation plan to reduce PCL air pollution.

5. PCL will produce odors that make pleasant use of SHNF and living in nearby residences less likely.

6. PCL will attract birds and other animals (raccoons, opossums, rats, mice, etc.) that will feed on what is in the landfill and could create meso-predator population increases which could affect bird, reptile, amphibian, mammal, and invertebrate populations in SHNF and the surrounding area.

7. PCL will impact individual homesteads, residences, subdivisions, and communities by depressing property values which economically affects individuals who own the properties and public authorities who rely upon taxes from these properties.

8. PCL will create noise via operation of equipment to handle and bury the trash and 100's of trucks accessing and leaving the site each day.

9. PCL will impact and conflict with adjacent property by making use or development less likely.

10. PCL will affect existing or potential federally endangered Red-cockaded Woodpecker (RCW) habitat.

11.PCL presents a litter hazard to wildlife which eat or are caught in plastic and other trash materials.

12. PCL will create more roadkill since roads used will have more large trucks and garbage trucks traversing them.

13. PCL will exist for decades, will be several stories high, and will degrade aesthetic and scenic qualities of the area.

14. PCL must be required to analyze and prepare for leaks and contaminated ground and surface water. PCL must have a spill response and long-term monitoring and water clean-up plan and must implement that plan from construction until there are no more contaminants left at (in) the site (cradle to grave over the long-term).

15. PCL must be required to have a bond that is large enough to take care of groundwater and surface water contamination and other environmental problems for as long as the landfill is active and closed (as long as it has environmental contaminants on the surface or underground).

16. PCL will require additional law enforcement (that counties, communities, or municipalities pay for) to handle the littering, dumping, and vandalism that will be created due to the landfill.

17. PCL will require large landfill leachate storage tanks which must be pumped out each day (40,000-100,000 gallons/day) and will be subject to leaks, spills, and accidents when leachate collection trucks leave the facility and operate on public roads.

18. PCL will cause deterioration of local, state, and federal roads because they are not constructed to withstand 474 heavy trucks traveling over them twice a day (948 total passes) when PCL is open. The garbage trucks go through either SHNF or

neighborhoods and will create a traffic hazard and significant road damage whose costs the public must pay.

19. PCL will leak methane (CH4), a powerful greenhouse gas air pollutant, even with a methane collection and flare burning system. PCL will use of equipment and provide vehicle and garbage truck access that will create substantial amounts of carbon dioxide (CO2), another significant greenhouse gas air pollutant. Methane can also contaminate groundwater and create an explosion hazard.

20. TCEQ should address climate change via PCL in a climate change analysis that covers the landfill climate change air pollutant releases. Climate change will alter existing ecosystems in SHNF and the surrounding area and make it more difficult for many plants and animals to adapt successfully to these changed ecosystems.

This includes hotter weather, more or more powerful rain-storms, more or more powerful hurricanes, more and more extensive flooding in floodplains (within 100 feet of the 100-year floodplain and within the existing 500-year floodplain), and other impacts due to climate change.

The TCEQ should prepare a climate change ecological resilience and resistance plan (CCERRP). This CCERRP would assess the biological and ecological elements in SHNF and surrounding area where the PCL is located and the effects that climate change has had and will have on them. The CCERRP would assist plants, animals, and ecosystems in adapting to climate change and would require monitoring of changes and mitigation measure effectiveness. The CCERRP would be based on:

1) Protection of existing functioning ecosystems in SHNF and the surrounding area.

2) Reduction of stressors on the ecosystems in SHNF and the surrounding area.

3) Restoration of natural functioning ecological processes in SHNF and the surrounding area.

4) Use of natural recovery in SHNF and the surrounding area, in most instances.

5) Acquisition of buffers and corridors to expand and ensure connectivity of ecosystems in SHNF and the surrounding area.

6) Intervention to manipulate (manage) ecosystems in SHNF and the surrounding area as a last resort.

7) Reduction of climate change air pollution in SHNF and the surrounding area so there is zero emissions and a reduced carbon footprint due to this proposal.

8) Removal of carbon dioxide and methane from the air to account for already released climate change air pollution.

21. PCL will inherently leak because landfill liners do not last forever. The U.S. Environmental Protection Agency (EPA) has said in the past that it is not a question of if, but when landfills will leak. That is why EPA created regulations that require groundwater monitoring in 1991.

22. Future expansion of PCL, will create more and long-term impacts of all the problems mentioned above and must be analyzed in an EIS.

For these reasons the Sierra Club requests that TCEQ amend the PCL Permit #2406 to address the access road needed for this landfill and conduct a complete environmental analysis with full public review, comments, and meetings before any decision is made.

The Sierra Club supports a contested case hearing on Permit #2406 and urges TCEQ to hold one near the proposed site so the public can participate and attend the hearing and public meetings that should be associated with it.

The Sierra Club appreciates this opportunity to comment. Please keep the Sierra Club informed about the status of this proposal. Thank you.

Sincerely,

Brandt Mannchen
Forest Management Issue Chair
Lone Star Chapter of the Sierra Club
Chair, Forestry Subcommittee
Houston Regional Group of the Sierra Club
20923 Kings Clover Court
Humble, Texas 77346
281-570-7212
brandt_mannchen@comcast.net

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Wednesday, February 23, 2022 3:39 PM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

RFR

From: jem25577@yahoo.com <jem25577@yahoo.com>
Sent: Wednesday, February 23, 2022 1:29 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Jeremiah Edward Marek

E-MAIL: jem25577@yahoo.com

COMPANY:

ADDRESS: 951 JAYHAWKER RD
CLEVELAND TX 77328-2380

PHONE: 7134710847

FAX:

COMMENTS: I oppose this landfill. I live across the street from proposed location and feel the environmental aspects from drinking water as well as air quality are enough to cancel this proposed landfill. I also feel for the safety of my children playing in the area with the amount of traffic from garbage truck's coming down this small backroad. Not to mention the road conditions are already less than idea. These extremely heavy trucks are just going to worsen the road conditions. Please reconsider this proposal. Thank you Jeremiah Marek

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Monday, March 1, 2021 4:23 PM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

RFR

From: jbmarquez05@gmail.com <jbmarquez05@gmail.com>
Sent: Monday, March 1, 2021 2:15 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: MR Jose Marquez

E-MAIL: jbmarquez05@gmail.com

COMPANY:

ADDRESS: 2015 WHITE BUCK CT
CLEVELAND TX 77328-8879

PHONE: 8323870725

FAX:

COMMENTS: I am a property owner at Peach Creek Plantation, and I am writing this letter to protest the decision of adding a landfill off Fostoria Road (TCEQ Permit No.: 2406). Unfortunately, there is already a broad consensus that negative impressions of the city of Cleveland are formed when driving along Highway 105 with the many under-regulated and disorderly yard sales. It should be the local government's mission to work at fostering a more welcoming gateway and more positive impressions of the city of Cleveland by improving the city's beautification and streetscape of

the neighborhoods across the city, not making it worse by adding more landfills along Highway 105. The residents at Peach Creek Plantation join me in protesting the new location for the landfill. This landfill could post a potential environmental disaster for the creeks, San Jacinto River, and Lake Houston when there is a flood. Even during normal rainfall, toxins will end up in the water. The decision to place a landfill in this location will not only impact the water source for household water wells, but also harm the wildlife in the area which includes endangered woodpeckers, bald eagles, deers, and so much more. The impact on the National Forest will be devastating. Our roads will be torn to pieces with the big trucks that will use this landfill. Our property values will decrease significantly, but more importantly, the toxins that the landfill will put off will impact our health. Today, Peach Creek Plantation is a balanced eco-system that is used for recreation and wildlife habitat— we would like to keep it that way. We kindly ask that you please reconsider your decision of locating another landfill along Highway 105. The residents of Peach Creek Plantation and I would appreciate a response from you regarding this issue. I can be reached at the phone number or email address below. Thank you for taking the time to read this letter.

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Monday, March 1, 2021 4:25 PM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

RFR

From: v.l.marquez@hotmail.com <v.l.marquez@hotmail.com>
Sent: Monday, March 1, 2021 2:10 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: MRS VERONCIA L MARQUEZ

E-MAIL: v.l.marquez@hotmail.com

COMPANY:

ADDRESS: 2015 WHITE BUCK CT
CLEVELAND TX 77328-8879

PHONE: 8328770261

FAX:

COMMENTS: I am a property owner at Peach Creek Plantation, and I am writing this letter to protest the decision of adding another landfill off Fostoria Road (TCEQ Permit No.: 2406). Unfortunately, there is already a broad consensus that negative impressions of the city of Cleveland are formed when driving along Highway 105 with the many under-regulated and disorderly yard sales. It should be the local government's mission to work at fostering a more welcoming gateway and more positive impressions of the city of Cleveland by improving the city's beautification and streetscape of

the neighborhoods across the city, not making it worse by adding more landfills along Highway 105. The residents at Peach Creek Plantation join me in protesting the new location for the landfill. This landfill could post a potential environmental disaster for the creeks, San Jacinto River, and Lake Houston when there is a flood. Even during normal rainfall, toxins will end up in the water. The decision to place a landfill in this location will not only impact the water source for our household water wells, but also harm the wildlife in the area which includes endangered woodpeckers, bald eagles, deers, and so much more wildlife. The impact on the National Forest will be devastating. Our roads will be torn to pieces with the big trucks that will use this landfill. Our property values will decrease significantly, but more importantly, the toxins that this waste will put off will impact our health. Today, Peach Creek Plantation is a balanced eco-system that is used for recreation and wildlife habitat— we would like to keep it that way. We kindly ask that you please reconsider your decision of locating another landfill along Highway 105. The residents of Peach Creek Plantation and I would appreciate a response from you regarding this issue. I can be reached at the phone number or email address below. Thank you for taking the time to read this letter.

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Wednesday, September 15, 2021 3:32 PM
To: PUBCOMMENT-WPD; PUBCOMMENT-ELD; PUBCOMMENT-OCC2; PUBCOMMENT-OPIC
Subject: CORRECTION: Public comment on Permit Number 2406

H

From: PUBCOMMENT-OCC
Sent: Monday, September 13, 2021 7:19 AM
To: PUBCOMMENT-WPD <pubcomment-wpd@tceq.texas.gov>; PUBCOMMENT-ELD <pubcomment-eld@tceq.texas.gov>; PUBCOMMENT-OCC2 <pubcomment-occ2@tceq.texas.gov>; PUBCOMMENT-OPIC <pubcomment-opic@tceq.texas.gov>
Subject: FW: Public comment on Permit Number 2406

From: marshallteam@yahoo.com <marshallteam@yahoo.com>
Sent: Saturday, September 11, 2021 11:14 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: MS Lisa Marshall

E-MAIL: marshallteam@yahoo.com

COMPANY:

ADDRESS: 18823 COVE MILL LN
CYPRESS TX 77433-3386

PHONE: 8322475889

FAX:

COMMENTS: I urge you to amend Permit #2406, Peach Creek Municipal Landfill (PCML), to include the access road and hold a contested case hearing on this proposal because: I am concerned that unacceptable environmental impacts will occur on Sam Houston National Forest, Wood Duck Farm, and private homesteads due to PCML. (if you have visited SHNF tell TCEQ this, why you visit, and what it means to you; if you have bought WDF produce state why you did so and what this means to you; if you live near the PCML site, tell TCEQ and describe how close you are). I am concerned about road access, water, air, noise, odor, litter, and scenic pollutions, flooding, fires, road overuse/damage, and other environmental impacts that PCML may have. (expand on these environmental concerns or add other issues that you are concerned about). Because of these problems I oppose Permit #2406. Thank you. - Ms. Marshall (a native Texan, a resident of Cypress Texas and a Sam Houston National Forest visitor).

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Monday, September 13, 2021 7:20 AM
To: PUBCOMMENT-WPD; PUBCOMMENT-ELD; PUBCOMMENT-OCC2; PUBCOMMENT-OPIC
Subject: FW: Public comment on Permit Number 2406

From: marshallteam@yahoo.com <marshallteam@yahoo.com>
Sent: Saturday, September 11, 2021 11:14 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: MS Lisa Marshall

E-MAIL: marshallteam@yahoo.com

COMPANY:

ADDRESS: 18823 COVE MILL LN
CYPRESS TX 77433-3386

PHONE: 8322475889

FAX:

COMMENTS: I urge you to amend Permit #2406, Peach Creek Municipal Landfill (PCML), to include the access road and hold a contested case hearing on this proposal because: I am concerned that unacceptable environmental impacts will occur on Sam Houston National Forest, Wood Duck Farm, and private homesteads due to PCML. (if you have visited SHNF tell TCEQ this, why you visit, and what it means to you; if you have bought WDF produce state why you did so and what this means to you; if you live near the PCML site, tell TCEQ and describe how close you are). I am concerned about

road access, water, air, noise, odor, litter, and scenic pollutions, flooding, fires, road overuse/damage, and other environmental impacts that PCML may have. (expand on these environmental concerns or add other issues that you are concerned about). Because of these problems I oppose Permit #2406. Thank you. - Ms. Marshall (a native Texan, a resident of Cypress Texas and a Sam Houston National Forest visitor).

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Friday, November 5, 2021 10:24 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

H

From: jgfm1969@att.net <jgfm1969@att.net>
Sent: Friday, November 5, 2021 10:08 AM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: MS Janie G Martinez

E-MAIL: jgfm1969@att.net

COMPANY:

ADDRESS: 14210 BATEAU DR
CYPRESS TX 77429-2553

PHONE: 2819556029

FAX:

COMMENTS: I support a contested case hearing; am concerned about unacceptable landfill environmental impacts to SHNF and WDF including road access problems, water, air, noise, odor, litter, and scenic pollutions, flooding, fires, and road overuse/damage; I oppose PCL. There has to be a better solution.

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Wednesday, November 4, 2020 4:27 PM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

From: maxine.king-mcadam@attnet <maxine.king-mcadam@attnet>
Sent: Wednesday, November 4, 2020 2:23 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Maxine McAdams

E-MAIL: maxine.king-mcadam@attnet

COMPANY:

ADDRESS: 71 A J MEEKINS RD
CLEVELAND TX 77328-8403

PHONE: 2815922823

FAX:

COMMENTS: We need a public hearing for this project, none of the people in the surrounding area was notified about a landfill being planned for their area. Not only will ruin our wells, and our roads, but the traffic will be terrible for our small country area.

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Thursday, September 9, 2021 7:52 AM
To: PUBCOMMENT-WPD; PUBCOMMENT-ELD; PUBCOMMENT-OCC2; PUBCOMMENT-OPIC
Subject: FW: Public comment on Permit Number 2406

H

From: jmcauliffe@e-mds.com <jmcauliffe@e-mds.com>
Sent: Thursday, September 9, 2021 7:39 AM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: MS Jill McAuliffe

E-MAIL: jmcauliffe@e-mds.com

COMPANY:

ADDRESS: 1111 AVENUE L
GALVESTON TX 77550-6134

PHONE: 5126236984

FAX:

COMMENTS: September 9, 2021 Office of Chief Clerk MC 105 Texas Commission on Environmental Quality P.O. Box 13087 Austin, Texas 78711-3087 Dear Chief Clerk, I urge you to amend Permit #2406, Peach Creek Municipal Landfill (PCML), to include the access road and hold a contested case hearing on this proposal because: I am concerned that unacceptable environmental impacts will occur on Sam Houston National Forest, Wood Duck Farm, and private homesteads due to PCML. (if you have visited SHNF tell TCEQ this, why you visit, and what it means to you; if you have

bought WDF produce state why you did so and what this means to you; if you live near the PCML site, tell TCEQ and describe how close you are). I am concerned about road access, water, air, noise, odor, litter, and scenic pollutions, flooding, fires, road overuse/damage, and other environmental impacts that PCML may have. (expand on these environmental concerns or add other issues that you are concerned about). Because of these problems I oppose Permit #2406. I look forward to hearing from you soon about my request to amend Permit #2406 to include the access road and hold a contested case hearing. Thank you. Sincerely, Jill McAuliffe 1111 Avenue L Galveston, TX 77550 512 6236984 jmcauliffe@e-mds.com

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Monday, October 11, 2021 11:25 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

H

From: dmac374@hotmail.com <dmac374@hotmail.com>
Sent: Sunday, October 10, 2021 1:15 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: John McDonald

E-MAIL: dmac374@hotmail.com

COMPANY:

ADDRESS: 650 JAYHAWKER RD
CLEVELAND TX 77328-7974

PHONE: 2818445814

FAX:

COMMENTS: Please deny this application. I request a formal hearing for this project. CONCERNS REGARDING THIS PROJECT: Road access and maintenance and safety: At the hearing, the PCII rep stated that Rajak Rd was asphalt paved.This is not true. Rajak Road is a granular (dirt) road. Any asphalt found in this road is only fill pieces used by the County to repair the washouts. The U.S>. Forest Service denied the developer use of their road for access. Instead, the developer plans to use small, poorly maintained San Jacinto County roads for dozens to hundreds of heavy trucks every

day. What kind of environmental impact will this have to the area? Noise pollution, excessive dust on the dirt roads, destruction of the county roads that will cause failure of vehicle components which will cause leakage of fluids. Trash and related liquids spilling onto the roads. All of which will work its way into the local water supply. What about the children and school buses that use Jayhawker Rd, Rajak Rd., Fostoria Tram, and FM1725?? The rep for PCII estimated a garbage truck or waste haul truck uses these road upwards of one every 6 minutes!!! Fostoria Tram Road, already has a posted sign "No Thru Trucks" due to the road condition, and damage caused by heavy trucks. This is not a safe environment!! My well is within 3/4 of a mile to this dump. It was not even recorded in the State's official count. With the undeniable effects of climate change. More and stronger rainfall events are coming. Hurricane Harvey dumped 38 inches of rain on my property. This landfill does not adequate provisions to safely handle any amount of rain, remotely, close to that amount in their plan. This project has a 100 year floodplan running through this overall property, and the Sam Houston National Forest as a neighbor. What impact will these rains have on them?!! The Sam Houston National Forest is property owned by all citizens for recreation, environment protection for both wildlife and fauna. The USAD and US Forest Service do not take lightly the damage done to the lands that they are entrusted to protect. This landfill is too close to the forest, and will directly impact exiting wildlife patterns, and bring an abundance of nonindigenous species to the area (vermin, insects, birds, etc.).

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Monday, March 21, 2022 9:34 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406
Attachments: NOAA Climate Study Highlights 2-27-22.pdf

From: dmac374@hotmail.com <dmac374@hotmail.com>
Sent: Sunday, March 20, 2022 10:18 AM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: John McDonald

E-MAIL: dmac374@hotmail.com

COMPANY:

ADDRESS: 650 JAYHAWKER RD
CLEVELAND TX 77328-7974

PHONE: 2818445814

FAX:

COMMENTS: The National Center for Climate Study (NOAA) released their latest study indicating more frequent and more severe storms / hurricanes for the Gulf Coast, including the SE TX area. I have tried to attach the lastest, February 2022, NOAA Impact Study for San Jacinto County TX. Unfortunately, this report is too large to submit on this platform. Please review and note the adverse impact that these weather changes will have on San Jacinto County, and the

population, therein. This proposed landfill lies in an area bordered by two FEMA designated flood plains. Its location is directly above major water sources that serves hundreds of thousands of Texans. The inevitable flooding that occurs in this location will have a devastating effect on the landfill, and will contaminate these waters.

National Risk Index

February 27, 2022

San Jacinto County, Texas

Summary

Risk Index is **Relatively Moderate**

Score **16.50**

Expected Annual Loss is **Relatively Moderate**

Score **18.37**

Social Vulnerability is **Relatively Moderate**

Score **37.64**

Community Resilience is **Very Low**

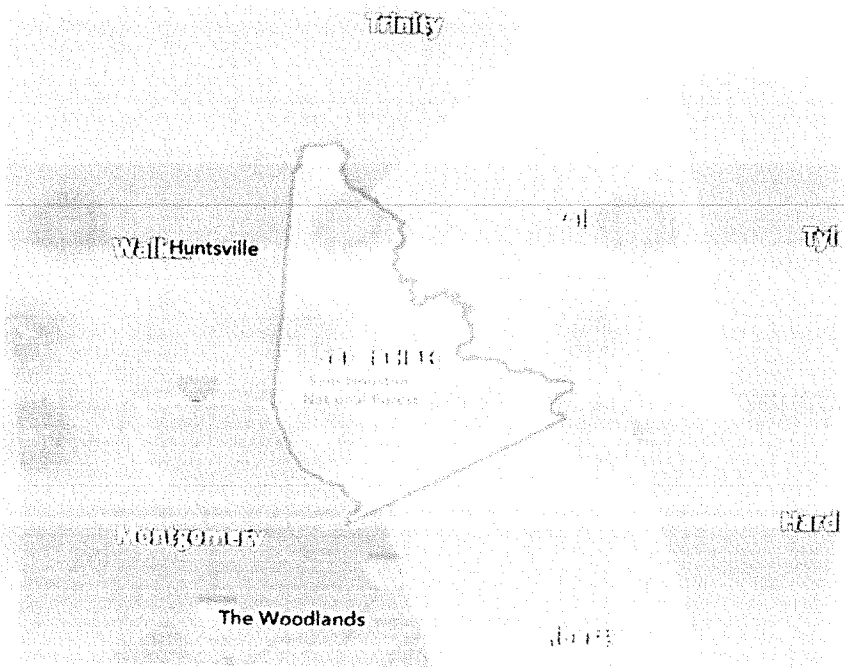
Score **48.42**

While reviewing this report, keep in mind that low risk is driven by lower loss due to natural hazards, lower social vulnerability, and higher community resilience.

For more information about the National Risk Index, its data, and how to interpret the information it provides, please review the **About the National Risk Index** and **How to Take Action** sections at the end of this report. Or, visit the National Risk Index website at hazards.fema.gov/nri/learn-more to access supporting documentation and links.

Risk Index

The Risk Index rating is **Relatively Moderate** for **San Jacinto County, TX** when compared to the rest of the U.S.



Score **16.5**

San Jacinto County, TX
16.50

Texas Average
12.89

National Average
10.60

0 100

88.3% of U.S. counties have a lower Risk Index

80.7% of counties in Texas have a lower Risk Index

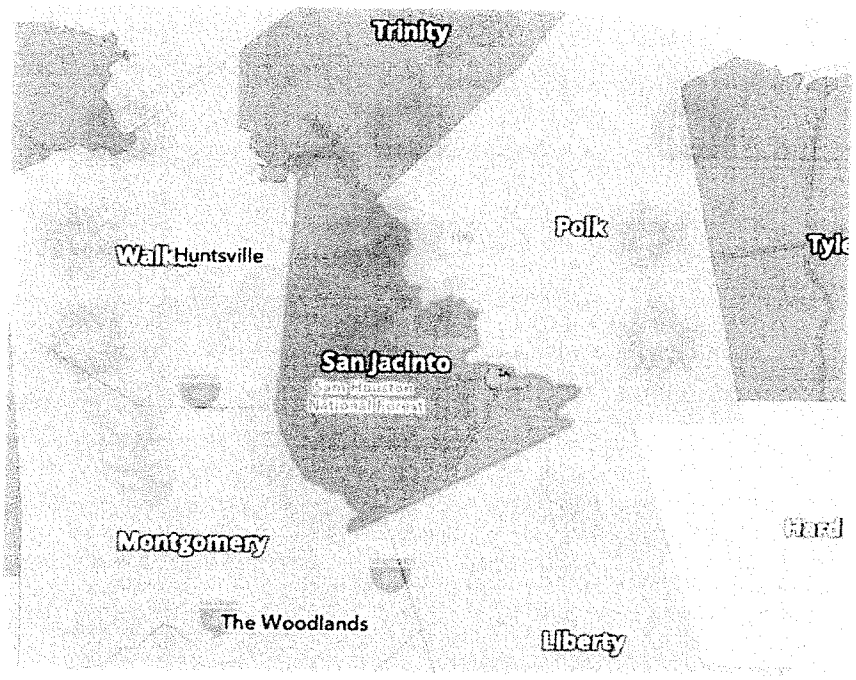
Risk Index Legend

Very High | Relatively High | Relatively Moderate | Relatively Low | Very Low

No Rating | Not Applicable | Insufficient Data

Community Resilience

Communities in **San Jacinto County, TX** have a **Very Low** ability to prepare for anticipated natural hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions when compared to the rest of the U.S.



Score **48.42**

San Jacinto County, TX
48.42

Texas Average
52.30

National Average
54.59

0 100

98.1% of U.S. counties have a higher Community Resilience

94.9% of counties in Texas have a higher Community Resilience

Community Resilience Legend

Very High | Relatively High | Relatively Moderate | Relatively Low | Very Low

Data Unavailable

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Monday, December 6, 2021 9:44 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Peach Creek Environmental Park (PCEP) Proposed Landfill Application No. Permit# 2406

From: David McDonald <DMAC374@hotmail.com>
Sent: Saturday, December 4, 2021 9:12 AM
To: CHIEFCLK <chiefclk@tceq.texas.gov>
Subject: Peach Creek Environmental Park (PCEP) Proposed Landfill Application No. Permit#2406

TCEQ Office of the Chief Clerk, MC-105

P.O. Box 13087

Austin, Texas 78711-3087

Re: Peach Creek Environmental Park (PCEP) Proposed Landfill Permit Application No. Permit #2406

I am writing to request that the permit for Peach Creek EP Landfill MSW No 2406 **be denied**. There are three main concerns that form the basis for my comments.

1) The Sam Houston National Forest sits on the east and north side of the proposed landfill. The USFS was started to help provide clean water to our country. When it rains, the SHNF acts as a filter to cleanse water going downstream to Lake Houston. The leachate tanks are to sit on the north side of the LF, within a few feet of the FEMA 100-year floodplain. Storm water overflow, leachate, and VOCs will make the Jayhawker Creek floodplain a conduit for contamination which will impact drinking water downstream.

2) Dr. HC Clark wrote a geological assessment to the TCEQ back in August, to quote him "The application implicitly recognizes the gravel location restriction insofar as Class I nonhazardous is not listed as waste to be accepted. Will the permit explicitly state that Class I waste may not be and never will be accepted here because of this hydrogeologic limitation?" ..... "The sink created by pumping will draw water into the landfill rather than allowing it to pass beneath the liner and detect a leak as that groundwater moves through the point of compliance. Water will move inward rather than out."...."How will this problem be addressed?"

3) It is a fact that millions of seagulls feast at LF across North America. South Wake MSW landfill in NC is comprised of approximately 179 acres and has an estimated seagull population of 50,000. Phase 1 of this 2406 LF will be about 124 acres, or almost 37% smaller which equates to almost 31,500 seagulls as an estimated flock number. Studies from Duke Univ School for the Environment determined that these seagulls dropped over a ton of droppings each year. A year-round fruit and vegetable operation, Wood Duck Farm is located bordering the 2406 LF from the east. What are the plans to keep seagull droppings off farm produce growing in the field? What are the plans to keep seagulls from eating the crops? What type of disease vector plan might be implemented? How will the applicant mitigate wild animal scavenging? How will the extra nitrogen and phosphorus impact the SHNF?

http://www.newsobserver.com/news/local/counties/wake-county/article158475619.html

I strongly request that you take the next logical step and **REJECT** this current Application No. MSW-2406.

Thank you for your consideration.

Sincerely,

J. David McDonald

650 Jayhawker Rd. Cleveland TX 77328

Sent from Mail for Windows

Lori Rowe

From:	PUBCOMMENT-OCC
Sent:	Monday, October 11, 2021 11:04 AM
To:	PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject:	FW: Public comment on Permit Number 2406
Attachments:	Texas Tribune Climate Change article 10-7-21.pdf

From: dmac374@hotmail.com <dmac374@hotmail.com>
Sent: Sunday, October 10, 2021 12:48 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: John McDonald

E-MAIL: dmac374@hotmail.com

COMPANY:

ADDRESS: 650 JAYHAWKER RD
CLEVELAND TX 77328-7974

PHONE: 2818445814

FAX:

COMMENTS: I am attaching an article from the Texas Tribune, published October 7,2021. The article discusses the effect of climate change on our weather and environment. The article, specifically, calls out the more intense storms / hurricanes that will increase our rainfall in the area of this proposed landfill. As this site is adjacent to a 100 year

floodplain, it seems obvious, that FEMA will be revising these areas for more flooding. I have highlighted portions of this article. Please deny this application before the public waters become polluted!!

Printed: Texas Tribune Author: Erin Douglas Published: Oct. 7, 2021

Climate change has made the Texas heat worse, with less relief as nighttime temperatures warm, a report from the state's climatologist published Thursday found.

Climate data also show that the state is experiencing extreme rainfall — especially in eastern Texas — bigger storm surges as seas rise along the Gulf Coast and more flooding from hurricanes strengthened by a warming ocean, the report says.

Those trends are expected to accelerate in the next 15 years, according to the report, which analyzes extreme weather risks for the state and was last updated in 2019. The report was funded in part by Texas 2036, a nonpartisan economic policy nonprofit group named for the state's upcoming bicentennial.

The average annual temperature in Texas is expected to be 3 degrees warmer by 2036 than the average of the 1950s, the report found. The number of 100-degree days is expected to nearly double compared with 2000-2018, especially in urban areas.

"From here on out, it's going to be very unusual that we ever have a year as mild as a typical year during the 20th century," said John Nielsen-Gammon, the Texas state climatologist who authored the report. "Just about all of them are going to be warmer."

A hotter Texas will threaten public health, squeeze the state's water supply, strain the electric grid and push more species toward extinction, experts told The Texas Tribune.

Nielsen-Gammon said that weather data showed minimum temperatures across the state have rapidly risen in recent years. The entire baseline of temperatures in the state has shifted upward — a trend that is likely to continue to cause problems for the state's aging infrastructure, experts said.

"I was surprised at how strong the upward trend was in the coldest temperatures of the summer," Nielsen-Gammon said. While global temperature analysis had already shown that trend, he said, it is now very clearly happening on the local level in Texas.

Even this year, which was considered a mild year because Texas didn't see temperatures above 100 degrees in much of the state, Nielsen-Gammon said nighttime temperatures stayed warm enough to put 2021 in the top 20% of years with the hottest summer nights on record.

Persistently higher temperatures cause a host of issues for public health. Heat stroke becomes more common, and the number of days and hours each year when it's safe to work outdoors is reduced. In the last decade, 53 workers in Texas have died from a heat stroke, nearly double the number of workers that died in the decade prior, according to an NPR investigation.

Droughts are enhanced, which places even more pressure on the state's rivers and lakes, already strained by a growing population. And pathogens can more easily grow and infiltrate public water systems.

"If you have situations where more parts of the state are pulling from lower reservoirs, rivers that are flowing less and warmer water temperatures, there's a real concern about what pathogens end up in [the water] system," said Gabriel Collins, a Baker Botts fellow in energy and environmental affairs at Rice University.

In Lake Jackson in 2020, a brain-eating amoeba was found in the water supply, which caused the death of a 6-year-old child. Warmer water temperatures caused by climate change could increase the prevalence of such water-borne amoebas, according to the U.S. Centers for Disease Control and Prevention.

The combination of higher heat and heavier precipitation in the eastern half of Texas also damages underground water pipes by causing the ground around them to expand and contract more, Collins said. It's likely that Texans will continue to see more frequent interruptions in their water supply as the state warms, he said.

And the state's power grid can be strained during extreme heat when Texans turn up the air conditioning to stay cool. At the same time, higher temperatures make it more difficult for power plants to run as efficiently as they do during normal conditions, decreasing the power supply — and increasing the risk of blackouts.

"We will see more risk of outages due to increased demand," said Juliana Felkner, an assistant professor of architecture at the University of Texas whose research focused on sustainable development and design. "Power plants need water to run, so if there is a lack of water, this makes them less efficient and they generate less electricity."

The Electric Reliability Council of Texas, the state's grid operator, **included extreme calculations for heat and drought** in its assessment of potential power supply conditions this summer, seeking to "broaden the debate" on making the grid more resilient. After a February winter storm knocked out power to millions of Texans for days, Texas Public Utility commissioners, who

oversee the grid, questioned whether the grid could withstand more extreme weather as they looked to improve the grid's operations.

The environment, too, is damaged by persistently higher temperatures. Shaye Wolf, the climate science director for the Center for Biological Diversity, said more species' extinctions can be expected. Many species of lizards, for example, are going extinct in the U.S. and globally because when it gets too hot, they retreat to the shade and can't hunt for food. Each species plays an important role in the local ecosystem, Wolf said, which is important for the safety of humans, not just plants and animals.

"When you destroy the web of life, it not only makes for a lonelier planet, but a more dangerous planet," Wolf said.

Local extinctions, or the disappearance of a species to a specific area but not the globe, are already widespread due to climate change, a 2016 study by University of Arizona researchers found. Among almost 1,000 species surveyed, nearly half of them were locally extinct.

Texans can expect every aspect of public infrastructure to be damaged by the heat brought by climate change, said infrastructure expert Mikhail Chester, associate professor of engineering and the director of the Metis Center for Infrastructure and Sustainable Engineering at Arizona State University. While

each individual effect may seem small — a boil water notice here, a broken pipe there — the total effect is a massive public challenge, he said.

"Climate change is slightly shifting everything: It's slightly breaking infrastructure, and it's pushing us beyond what we design things for," Chester said. "When you add all of that up, it's monumental."

Disclosure: Rice University, Texas 2036 and the University of Arizona have been financial supporters of The Texas Tribune, a nonprofit, nonpartisan news organization that is funded in part by donations from members, foundations and corporate sponsors. Financial supporters play no role in the Tribune's journalism. Find a complete ***list of them here****.*

Correction, Oct. 7, 2021: *A previous version of the map in this story incorrectly labeled the temperature change in Texas counties between 1975 and 2020. It represents the average increase each decade, not the increase over the entire 45 year period.*

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Tuesday, October 27, 2020 2:01 PM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406
Attachments: Rajack dirt photos.pdf

From: dmac374@hotmail.com <dmac374@hotmail.com>
Sent: Tuesday, October 27, 2020 8:50 AM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: John McDonald

E-MAIL: dmac374@hotmail.com

COMPANY:

ADDRESS: 650 JAYHAWKER RD
CLEVELAND TX 77328-7974

PHONE: 2818445814

FAX:

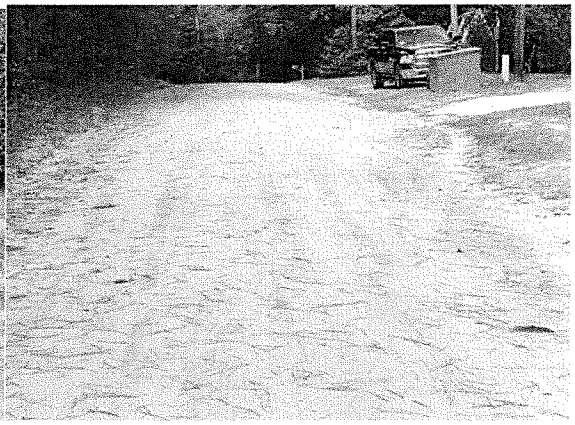
COMMENTS: Please find the pictures for the submission of this morning, 10-27-2020

Speed Limit Jayhawker Road

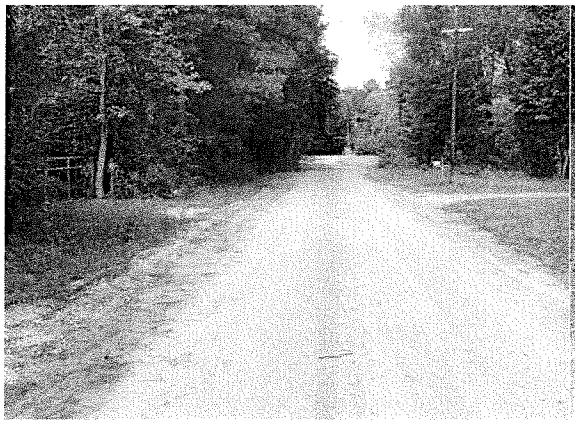
Rajack at Bob's Driveway looking north

Rajack at Mike's driveway looking north

Rajack at our and Miah's driveway looking north



Rajack at Bobby Dale's driveway looking north



Rajack looking north from Jayhawker

Boring Site and markers on Rajack Road

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Tuesday, October 27, 2020 8:32 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

From: dmac374@hotmail.com <dmac374@hotmail.com>
Sent: Tuesday, October 27, 2020 8:20 AM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: John McDonald

E-MAIL: dmac374@hotmail.com

COMPANY:

ADDRESS: 650 JAYHAWKER RD
CLEVELAND TX 77328-7974

PHONE: 2818445814

FAX:

COMMENTS: Upon review of the Neel Schaffer Report dated August 27.2020, I found omissions and errors. Section8.1 Traffic Information - Error: Jayhawker Rd. is not all asphalt. What asphalt there is stops approx. 3/8 of a mile going West where it crosses the creek. From there, it is dirt. Rajak (Rajack) is not asphalt at all, as is stated in the report. This road is entirely dirt. I was told by DPS that the reason for the speed limit being reduced (45mph to 35mph), on Fostoria Tram, was Fostoria Tram being designated a "Residential Road". The speed limits on Fostoria Tram is 35mph, Jayhawker is 30 mph, and Rajack is 30 mph. Oil, Gas, and Water Well Location Map My well is not listed on this map. 650 Jayhawker (

corner of Jayhawker and Rajak. I have grave concerns about the validity of this report, when these, seemingly simple, details are not correct. Pictures attached

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Tuesday, October 20, 2020 4:05 PM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406
Attachments: road photos.pdf

From: dmac374@hotmail.com <dmac374@hotmail.com>
Sent: Tuesday, October 20, 2020 1:15 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: J. David McDonald

E-MAIL: dmac374@hotmail.com

COMPANY:

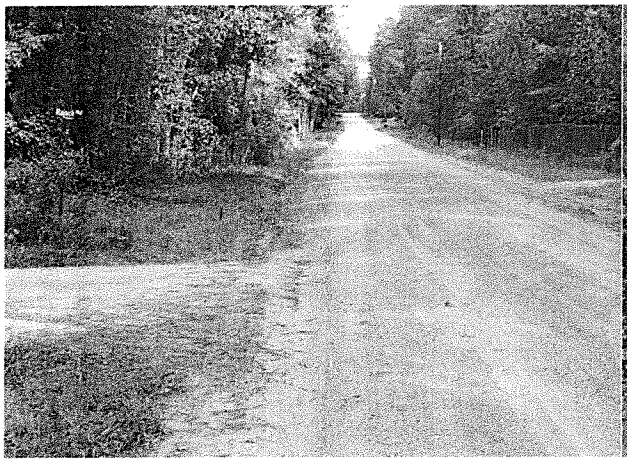
ADDRESS: 650 JAYHAWKER RD
CLEVELAND TX 77328-7974

PHONE: 2818445814

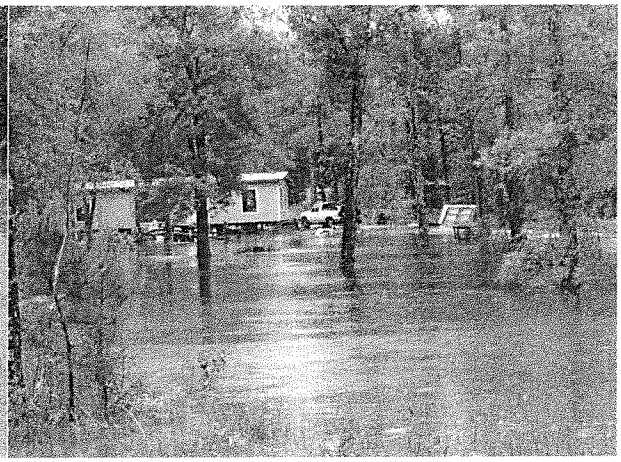
FAX:

COMMENTS: First, I have received no communication or correspondence regarding this project. I was only made aware of this proposal, last Thursday, October 15, 2020. I wish to be included on the mailing list. I am approximately ¾ of a mile from the proposed site. The proposed access to this site runs along Jayhawker Rd. to Rajack. That is the location of my home! My home is 60 feet from Rajack. Jayhawker road is "paved" for about 3/8 of a mile from Fostoria Tram, heading west. The asphalt paving was merely laid on the dirt. No actual road bed or prep work was performed. From the creek

crossing on Jayhawker going west, the road is dirt. Rajack is entirely dirt. These roads run through a residential only area. Rajack is a dead end road with 4 families living along it. Along Rajack, there is a creek approx.. ¼ of mile north of Jayhawker. A short distance north of the creek, the road rises and then makes a drop. Every rain event causes the forest to drain, and flood Rajack. Jayhawker floods, as well, especially where it crosses the creek. I can only speculate that the forest area in this proposed site is susceptible to major flooding as well. Flooding varies from several inches to a few feet that washes the roads out making travel impossible. I would ask that you consult with David Brandon, San Jacinto County Commissioner for Precinct 3, for his input as to flooding and road conditions. I have attached some photos that show the flooding, and dates of same. These are not isolated occurrences, as you will note from the dates. It is generally an annual event. By their application, this company estimates the road traffic to begin at 336 vehicles per day and escalates up to 511 in 5 years!! This traffic would all be using roads that run through a residential area and are currently inadequate. All the more inadequate for trucks of 80,000 pounds! Additionally, the noise, pollution, and inherent danger of all these trucks traveling on these roads will skyrocket to astronomical levels. Respectfully, J. David McDonald



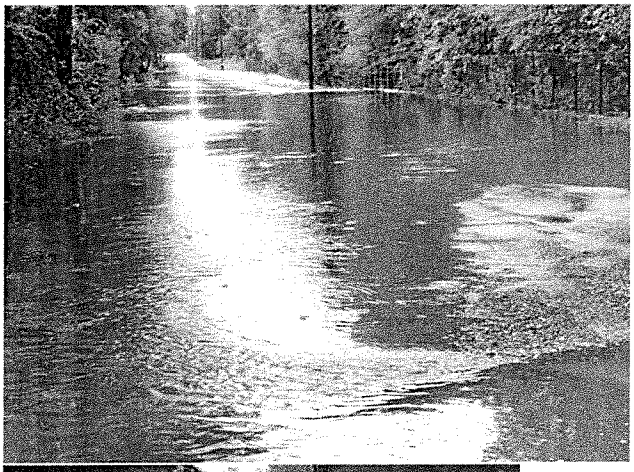
Jayhawker Road looking east at Rajack Oct '20

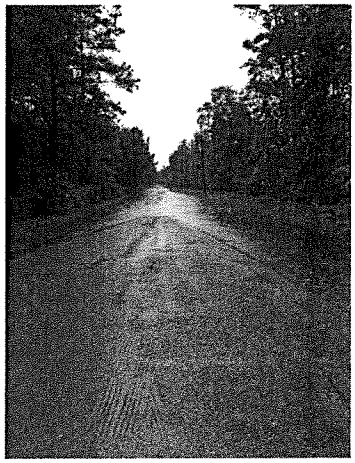


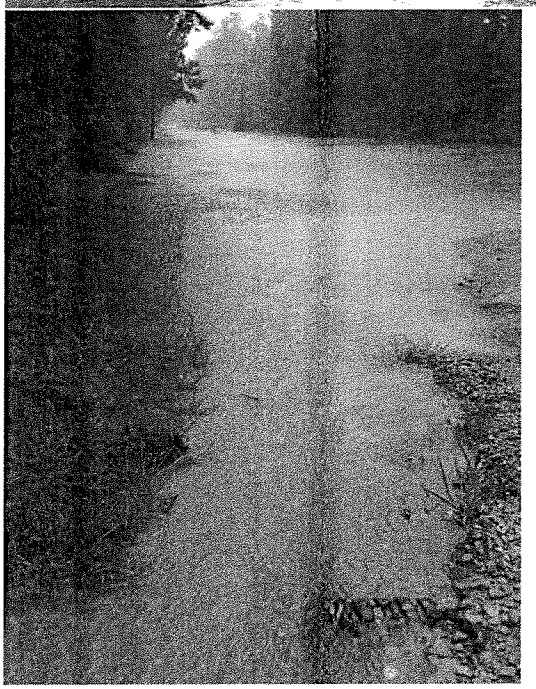
Baker home on Rajack May '04

Jayhawker Road at creek Sept '19

Rajack looking north Apr'16







Jayhawker looking east from our driveway,
past Rajack and creek Aug '17

Lori Rowe

From: PUBCOMMENT-OCC
Sent: Wednesday, September 29, 2021 9:23 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

H

From: varenyamehta@gmail.com <varenyamehta@gmail.com>
Sent: Tuesday, September 28, 2021 1:56 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Varenya Mehta

E-MAIL: varenyamehta@gmail.com

COMPANY:

ADDRESS: 1202 SEAGLER RD APT 152
HOUSTON TX 77042-2060

PHONE: 2173051092

FAX:

COMMENTS: Office of Chief Clerk MC 105 Texas Commission on Environmental Quality P.O. Box 13087 Austin, Texas 78711-3087 Dear Chief Clerk, I urge you to amend Permit #2406, Peach Creek Municipal Landfill (PCML), to include the access road and hold a contested case hearing on this proposal because: 1. I am concerned that unacceptable environmental impacts will occur on Sam Houston National Forest, Wood Duck Farm, and private homesteads due to PCML. (if you have visited SHNF tell TCEQ this, why you visit, and what it means to you; if you have bought WDF produce

state why you did so and what this means to you; if you live near the PCML site, tell TCEQ and describe how close you are). 2. I am concerned about road access, water, air, noise, odor, litter, and scenic pollutions, flooding, fires, road overuse/damage, and other environmental impacts that PCML may have. (expand on these environmental concerns or add other issues that you are concerned about). Because of these problems I oppose Permit #2406. I look forward to hearing from you soon about my request to amend Permit #2406 to include the access road and hold a contested case hearing. Thank you. Sincerely, Varenya Mehta

Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Thursday, April 29, 2021 8:31 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WPD
Subject: FW: Public comment on Permit Number 2406

H

From: Kylermejia15@gmail.com <Kylermejia15@gmail.com>
Sent: Wednesday, April 28, 2021 9:47 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number 2406

REGULATED ENTY NAME PEACH CREEK ENVIRONMENTAL PARK

RN NUMBER: RN110843042

PERMIT NUMBER: 2406

DOCKET NUMBER:

COUNTY: SAN JACINTO

PRINCIPAL NAME: PC-II LLC

CN NUMBER: CN605694611

FROM

NAME: Kyle Mejia

E-MAIL: Kylermejia15@gmail.com

COMPANY:

ADDRESS: 3314 ABBEY FIELD LN
PORTER TX 77365-8514

PHONE: 3464022124

FAX:

COMMENTS: I am leaving this comment to request that a public hearing be held.