Texas Commission on Environmental Quality Edwards Aquifer Application Cover Page

Our Review of Your Application

The Edwards Aquifer Program staff conducts an administrative and technical review of all applications. The turnaround time for administrative review can be up to 30 days as outlined in 30 TAC 213.4(e). Generally administrative completeness is determined during the intake meeting or within a few days of receipt. The turnaround time for technical review of an administratively complete Edwards Aquifer application is 90 days as outlined in 30 TAC 213.4(e). Please know that the review and approval time is directly impacted by the quality and completeness of the initial application that is received. In order to conduct a timely review, it is imperative that the information provided in an Edwards Aquifer application include final plans, be accurate, complete, and in compliance with <u>30 TAC 213</u>.

Administrative Review

1. <u>Edwards Aquifer applications</u> must be deemed administratively complete before a technical review can begin. To be considered administratively complete, the application must contain completed forms and attachments, provide the requested information, and meet all the site plan requirements. The submitted application and plan sheets should be final plans. Please submit one full-size set of plan sheets with the original application, and half-size sets with the additional copies.

To ensure that all applicable documents are included in the application, the program has developed tools to guide you and web pages to provide all forms, checklists, and guidance. Please visit the below website for assistance: <u>http://www.tceq.texas.gov/field/eapp</u>.

- 2. This Edwards Aquifer Application Cover Page form (certified by the applicant or agent) must be included in the application and brought to the administrative review meeting.
- 3. Administrative reviews are scheduled with program staff who will conduct the review. Applicants or their authorized agent should call the appropriate regional office, according to the county in which the project is located, to schedule a review. The average meeting time is one hour.
- 4. In the meeting, the application is examined for administrative completeness. Deficiencies will be noted by staff and emailed or faxed to the applicant and authorized agent at the end of the meeting, or shortly after. Administrative deficiencies will cause the application to be deemed incomplete and returned.

An appointment should be made to resubmit the application. The application is re-examined to ensure all deficiencies are resolved. The application will only be deemed administratively complete when all administrative deficiencies are addressed.

- 5. If an application is received by mail, courier service, or otherwise submitted without a review meeting, the administrative review will be conducted within 30 days. The applicant and agent will be contacted with the results of the administrative review. If the application is found to be administratively incomplete, it can be retrieved from the regional office or returned by regular mail. If returned by mail, the regional office may require arrangements for return shipping.
- 6. If the geologic assessment was completed before October 1, 2004 and the site contains "possibly sensitive" features, the assessment must be updated in accordance with the *Instructions to Geologists* (TCEQ-0585 Instructions).

Technical Review

- 1. When an application is deemed administratively complete, the technical review period begins. The regional office will distribute copies of the application to the identified affected city, county, and groundwater conservation district whose jurisdiction includes the subject site. These entities and the public have 30 days to provide comments on the application to the regional office. All comments received are reviewed by TCEQ.
- 2. A site assessment is usually conducted as part of the technical review, to evaluate the geologic assessment and observe existing site conditions. The site must be accessible to our staff. The site boundaries should be

clearly marked, features identified in the geologic assessment should be flagged, roadways marked and the alignment of the Sewage Collection System and manholes should be staked at the time the application is submitted. If the site is not marked the application may be returned.

- 3. We evaluate the application for technical completeness and contact the applicant and agent via Notice of Deficiency (NOD) to request additional information and identify technical deficiencies. There are two deficiency response periods available to the applicant. There are 14 days to resolve deficiencies noted in the first NOD. If a second NOD is issued, there is an additional 14 days to resolve deficiencies. If the response to the second notice is not received, is incomplete or inadequate, or provides new information that is incomplete or inadequate, the application must be withdrawn or will be denied. Please note that because the technical review is underway, whether the application is withdrawn or denied **the application fee will be forfeited**.
- 4. The program has 90 calendar days to complete the technical review of the application. If the application is technically adequate, such that it complies with the Edwards Aquifer rules, and is protective of the Edwards Aquifer during and after construction, an approval letter will be issued. Construction or other regulated activity may not begin until an approval is issued.

Mid-Review Modifications

It is important to have final site plans prior to beginning the permitting process with TCEQ to avoid delays.

Occasionally, circumstances arise where you may have significant design and/or site plan changes after your Edwards Aquifer application has been deemed administratively complete by TCEQ. This is considered a "Mid-Review Modification". Mid-Review Modifications may require redistribution of an application that includes the proposed modifications for public comment.

If you are proposing a Mid-Review Modification, two options are available:

- If the technical review has begun your application can be denied/withdrawn, your fees will be forfeited, and the plan will have to be resubmitted.
- TCEQ can continue the technical review of the application as it was submitted, and a modification application can be submitted at a later time.

If the application is denied/withdrawn, the resubmitted application will be subject to the administrative and technical review processes and will be treated as a new application. The application will be redistributed to the affected jurisdictions.

Please contact the regional office if you have questions. If your project is located in Williamson, Travis, or Hays County, contact TCEQ's Austin Regional Office at 512-339-2929. If your project is in Comal, Bexar, Medina, Uvalde, or Kinney County, contact TCEQ's San Antonio Regional Office at 210-490-3096

Please fill out all required fields below and submit with your application.

1. Regulated Entity Name: 23000 FM 306				2. Regulated Entity No.:					
3. Customer Name: April Wilkerson					4. Customer No.:				
5. Project Type: (Please circle/check one)	New Modification		Extension Exc		Exception				
6. Plan Type: (Please circle/check one)	WPAP	CZP	SCS	UST	AST	EXP	EXT	Technical Clarification	Optional Enhanced Measures
7. Land Use: (Please circle/check one)	Resider	ntial	Non-residential		8. Site		e (acres):	8.99 acres	
9. Application Fee:	\$5,00	0	10. Permanent B			BMP(s):		es, Extended Detention, er Strips, Batch
11. SCS (Linear Ft.):	N/A		12. AST/UST (No			o. Tar	. Tanks): N/A		
13. County:	Comal		14. Watershed:				Guadalupe		

Application Distribution

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Instructions: Use the table below to determine the number of applications required. One original and one copy of the application, plus additional copies (as needed) for each affected incorporated city, county, and groundwater conservation district are required. Linear projects or large projects, which cross into multiple jurisdictions, can require additional copies. Refer to the "Texas Groundwater Conservation Districts within the EAPP Boundaries" map found at:

http://www.tceq.texas.gov/assets/public/compliance/field_ops/eapp/EAPP%20GWCD%20map.pdf

For more detailed boundaries, please contact the conservation district directly.

Austin Region				
County:	Hays	Travis	Williamson	
Original (1 req.)		_	_	
Region (1 req.)		_	_	
County(ies)				
Groundwater Conservation District(s)	Edwards Aquifer Authority Barton Springs/ Edwards Aquifer Hays Trinity Plum Creek	Barton Springs/ Edwards Aquifer	NA	
City(ies) Jurisdiction	Austin Buda Dripping Springs Kyle Mountain City San Marcos Wimberley Woodcreek	Austin Bee Cave Pflugerville Rollingwood Round Rock Sunset Valley West Lake Hills	Austin Cedar Park Florence Georgetown Jerrell Leander Liberty Hill Pflugerville Round Rock	

	San Antonio Region				
County:	Bexar	Comal	Kinney	Medina	Uvalde
Original (1 req.)		1			
Region (1 req.)		1			
County(ies)		<u>1</u>			
Groundwater Conservation District(s)	Edwards Aquifer Authority Trinity-Glen Rose	Edwards Aquifer Authority	Kinney	EAA Medina	EAA Uvalde
City(ies) Jurisdiction	Castle Hills Fair Oaks Ranch Helotes Hill Country Village Hollywood Park San Antonio (SAWS) Shavano Park	Bulverde Fair Oaks Ranch Garden Ridge New Braunfels Schertz	NA	San Antonio ETJ (SAWS)	NA

Austin Region

I certify that to the best of my knowledge, that the application is complete and accurate. This application is hereby submitted to TCEQ for administrative review and technical review.

JAMES MCGARR, PE

Print Name of Customer/Authorized Agent

Signature of Customer/Authorized Agent

6-5-2023

Date

FOR TCEQ INTERNAL USE ONLY				
Date(s)Reviewed:	Date Administratively Complete:			
Received From:	Correct N	Correct Number of Copies:		
Received By:	Distributi	Distribution Date:		
EAPP File Number:	Complex:			
Admin. Review(s) (No.):	No. AR Re	No. AR Rounds:		
Delinquent Fees (Y/N):	Review Ti	ime Spent:		
Lat./Long. Verified:	SOS Custo	omer Verification:		
Agent Authorization Complete/Notarized (Y/N):	Fee	Payable to TCEQ (Y/N):		
Core Data Form Complete (Y/N):	Check: Signed (Y/N):			
Core Data Form Incomplete Nos.:	Less than 90 days old (Y/N):			

Contributing Zone Plan Application

Texas Commission on Environmental Quality

for Regulated Activities on the Contributing Zone to the Edwards Aquifer and Relating to 30 TAC §213.24(1), Effective June 1, 1999

To ensure that the application is administratively complete, confirm that all fields in the form are complete, verify that all requested information is provided, consistently reference the same site and contact person in all forms in the application, and ensure forms are signed by the appropriate party.

Note: Including all the information requested in the form and attachments contributes to more streamlined technical reviews.

Signature

To the best of my knowledge, the responses to this form accurately reflect all information requested concerning the proposed regulated activities and methods to protect the Edwards Aquifer. This **Contributing Zone Plan Application** is hereby submitted for TCEQ review and Executive Director approval. The application was prepared by:

Print Name of Customer/Agent: James McGarr

Date: 06/01/2023

Signature of Customer/Agent:

Regulated Entity Name: 23000 FM 306

Project Information

- 1. County: Comal
- 2. Stream Basin: Potter Creek
- 3. Groundwater Conservation District (if applicable):
- 4. Customer (Applicant): Pierced Oak LLC

Contact Person: Entity: Mailing Address: City, State: _аке, техаs Telephone: 5510 Email Address: @gmail.com

TCEQ-10257 (Rev. 02-11-15)

5. Agent/Representative (If any):

Contact Person: <u>James McGarr</u> Entity: <u>Civil Tech, PLLC</u> Mailing Address: <u>P.O. Box 2203</u> City, State: <u>Boerne, TX</u> Telephone: <u>210-365-5029</u> Email Address: <u>jmcgarr@civiltechmc.com</u>

Zip: <u>78006</u> Fax: _____

6. Project Location:

The project site is located inside the city limits of _____.

- The project site is located outside the city limits but inside the ETJ (extra-territorial jurisdiction) of <u>Canyon Lake, TX</u>.
- The project site is not located within any city's limits or ETJ.
- 7. The location of the project site is described below. Sufficient detail and clarity has been provided so that the TCEQ's Regional staff can easily locate the project and site boundaries for a field investigation.

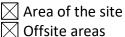
23000 FM 306, Canyon Lake, TX

- 8. Attachment A Road Map. A road map showing directions to and the location of the project site is attached. The map clearly shows the boundary of the project site.
- 9. Attachment B USGS Quadrangle Map. A copy of the official 7 ½ minute USGS Quadrangle Map (Scale: 1" = 2000') is attached. The map(s) clearly show:

Project site boundaries.

USGS Quadrangle Name(s).

10. Attachment C - Project Narrative. A detailed narrative description of the proposed project is attached. The project description is consistent throughout the application and contains, at a minimum, the following details:



- Impervious cover
- Permanent BMP(s)
- Proposed site use
- Site history
- Previous development
- Area(s) to be demolished
- 11. Existing project site conditions are noted below:
 - Existing commercial site
 - Existing industrial site

Existing residential site

Existing paved and/or unpaved roads

Undeveloped (Cleared)

Undeveloped (Undisturbed/Not cleared)

Other: _____

12. The type of project is:

Residential: # of Lots: _____
 Residential: # of Living Unit Equivalents: _____
 Commercial
 Industrial
 Other: _____

13. Total project area (size of site): 8.99 Acres

Total disturbed area: 8.99 Acres

- 14. Estimated projected population: 73
- 15. The amount and type of impervious cover expected after construction is complete is shown below:

Impervious Cover of Proposed Project	Sq. Ft.	Sq. Ft./Acre	Acres
Structures/Rooftops	3,062	÷ 43,560 =	0.07
Parking	69,922	÷ 43,560 =	1.61
Other paved surfaces	94,722	÷ 43,560 =	2.17
Total Impervious Cover	167,706	÷ 43,560 =	3.85

Table 1 - Impervious Cover

Total Impervious Cover 3.85 ÷ Total Acreage 8.99 X 100 = 42.8% Impervious Cover

16. Attachment D - Factors Affecting Surface Water Quality. A detailed description of all factors that could affect surface water quality is attached. If applicable, this includes the location and description of any discharge associated with industrial activity other than construction.

17. 🛛 Only inert materials as defined by 30 TAC 330.2 will be used as fill material.

For Road Projects Only

Complete questions 18 - 23 if this application is exclusively for a road project.

🗌 N/A

18.	Туре	of	project:
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TXDOT road project. County road or roads built to county specifications. City thoroughfare or roads to be dedicated to a municipality. Street or road providing access to private driveways. 19. Type of pavement or road surface to be used: Concrete Asphaltic concrete pavement Other: 20. Right of Way (R.O.W.): Length of R.O.W.: _____ feet. Width of R.O.W.: feet. $L \times W = Ft^2 \div 43,560 Ft^2/Acre = acres.$ 21. Pavement Area: Length of pavement area: _____ feet. Width of pavement area: feet. $L \times W = Ft^2 \div 43,560 Ft^2/Acre = acres.$ Pavement area acres ÷ R.O.W. area acres x 100 = % impervious cover.

22. A rest stop will be included in this project.

A rest stop will not be included in this project.

23. Maintenance and repair of existing roadways that do not require approval from the TCEQ Executive Director. Modifications to existing roadways such as widening roads/adding shoulders totaling more than one-half (1/2) the width of one (1) existing lane require prior approval from the TCEQ.

Stormwater to be generated by the Proposed Project

24. Attachment E - Volume and Character of Stormwater. A detailed description of the volume (quantity) and character (quality) of the stormwater runoff which is expected to occur from the proposed project is attached. The estimates of stormwater runoff quality and quantity are based on area and type of impervious cover. Include the runoff coefficient of the site for both pre-construction and post-construction conditions.

Wastewater to be generated by the Proposed Project

- 25. Wastewater is to be discharged in the contributing zone. Requirements under 30 TAC §213.6(c) relating to Wastewater Treatment and Disposal Systems have been satisfied.
 - N/A

26. Wastewater will be disposed of by:

On-Site Sewage Facility (OSSF/Septic Tank):

 Attachment F - Suitability Letter from Authorized Agent. An on-site sewage facility will be used to treat and dispose of the wastewater from this site. The appropriate licensing authority's (authorized agent) written approval is attached. It states that the land is suitable for the use of private sewage facilities and will meet or exceed the requirements for on-site sewage facilities as specified under 30 TAC Chapter 285 relating to On-site Sewage Facilities. Each lot in this project/development is at least one (1) acre (43,560 square feet) in size. The system will be designed by a licensed professional engineer or registered sanitarian and installed by a licensed installer in compliance with 30 TAC Chapter 285.
Sewage Collection System (Sewer Lines): The sewage collection system will convey the wastewater to the (name) Treatment Plant. The treatment facility is:
Existing. Proposed.
□ N/A
ermanent Aboveground Storage Tanks(ASTs) \geq 500

Permanent Aboveground Storage Tanks(ASTs) ≥ 500 Gallons

Complete questions 27 - 33 if this project includes the installation of AST(s) with volume(s) greater than or equal to 500 gallons.

N/A

27. Tanks and substance stored:

Table 2 - Tanks and Substance Storage

AST Number	Size (Gallons)	Substance to be Stored	Tank Material
1			
2			
3			
4			
5			
		To	tal x 1.5 = Gallons

28. The AST will be placed within a containment structure that is sized to capture one and one-half (1 1/2) times the storage capacity of the system. For facilities with more than

TCEQ-10257 (Rev. 02-11-15)

one tank system, the containment structure is sized to capture one and one-half (1 1/2) times the cumulative storage capacity of all systems.

Attachment G - Alternative Secondary Containment Methods. Alternative methods for providing secondary containment are proposed. Specifications showing equivalent protection for the Edwards Aquifer are attached.

29. Inside dimensions and capacity of containment structure(s):

Table 3 - Secondary Containment

Length (L)(Ft.)	Width(W)(Ft.)	Height (H)(Ft.)	L x W x H = (Ft3)	Gallons

Total: _____ Gallons

30. Piping:

All piping, hoses, and dispensers will be located inside the containment structure.

Some of the piping to dispensers or equipment will extend outside the containment structure.

The piping will be aboveground

The piping will be underground

- 31. The containment area must be constructed of and in a material impervious to the substance(s) being stored. The proposed containment structure will be constructed of:
- 32. Attachment H AST Containment Structure Drawings. A scaled drawing of the containment structure is attached that shows the following:
 - Interior dimensions (length, width, depth and wall and floor thickness).
 - Internal drainage to a point convenient for the collection of any spillage.

Tanks clearly labeled

Piping clearly labeled

Dispenser clearly labeled

33. Any spills must be directed to a point convenient for collection and recovery. Spills from storage tank facilities must be removed from the controlled drainage area for disposal within 24 hours of the spill.

In the event of a spill, any spillage will be removed from the containment structure within 24 hours of the spill and disposed of properly.

In the event of a spill, any spillage will be drained from the containment structure through a drain and valve within 24 hours of the spill and disposed of properly. The drain and valve system are shown in detail on the scaled drawing.

Site Plan Requirements

Items 34 - 46 must be included on the Site Plan.

34. \square The Site Plan must have a minimum scale of 1" = 400'.

Site Plan Scale: 1" = <u>20</u>'.

35. 100-year floodplain boundaries:

Some part(s) of the project site is located within the 100-year floodplain. The floodplain is shown and labeled.

No part of the project site is located within the 100-year floodplain.

The 100-year floodplain boundaries are based on the following specific (including date of material) sources(s): <u>FEMA FIRM 480091C0095F</u>, <u>Effective 09/02/2009</u>.

36. The layout of the development is shown with existing and finished contours at appropriate, but not greater than ten-foot contour intervals. Lots, recreation centers, buildings, roads, etc. are shown on the site plan.

The layout of the development is shown with existing contours at appropriate, but not greater than ten-foot contour intervals. Finished topographic contours will not differ from the existing topographic configuration and are not shown. Lots, recreation centers, buildings, roads, etc. are shown on the site plan.

- 37. \square A drainage plan showing all paths of drainage from the site to surface streams.
- 38. 🖂 The drainage patterns and approximate slopes anticipated after major grading activities.
- 39. \boxtimes Areas of soil disturbance and areas which will not be disturbed.
- 40. 🔀 Locations of major structural and nonstructural controls. These are the temporary and permanent best management practices.
- 41. 🔀 Locations where soil stabilization practices are expected to occur.
- 42. Surface waters (including wetlands).

N/A

43. Locations where stormwater discharges to surface water.

There will be no discharges to surface water.

44. Temporary aboveground storage tank facilities.

Temporary aboveground storage tank facilities will not be located on this site.

45. Permanent aboveground storage tank facilities.

Permanent aboveground storage tank facilities will not be located on this site.

46. \square Legal boundaries of the site are shown.

Permanent Best Management Practices (BMPs)

Practices and measures that will be used during and after construction is completed.

47. Permanent BMPs and measures must be implemented to control the discharge of pollution from regulated activities after the completion of construction.

🗌 N/A

- 48. These practices and measures have been designed, and will be constructed, operated, and maintained to insure that 80% of the incremental increase in the annual mass loading of total suspended solids (TSS) from the site caused by the regulated activity is removed. These quantities have been calculated in accordance with technical guidance prepared or accepted by the executive director.
 - The TCEQ Technical Guidance Manual (TGM) was used to design permanent BMPs and measures for this site.

A technical guidance other than the TCEQ TGM was used to design permanent BMPs and measures for this site. The complete citation for the technical guidance that was used is: _____.

N/A

49. Owners must insure that permanent BMPs and measures are constructed and function as designed. A Texas Licensed Professional Engineer must certify in writing that the permanent BMPs or measures were constructed as designed. The certification letter must be submitted to the appropriate regional office within 30 days of site completion.

🗌 N/A

50. Where a site is used for low density single-family residential development and has 20 % or less impervious cover, other permanent BMPs are not required. This exemption from permanent BMPs must be recorded in the county deed records, with a notice that if the percent impervious cover increases above 20% or land use changes, the exemption for the whole site as described in the property boundaries required by 30 TAC §213.4(g) (relating to Application Processing and Approval), may no longer apply and the property owner must notify the appropriate regional office of these changes.

The site will be used for low density single-family residential development and has 20% or less impervious cover.

The site will be used for low density single-family residential development but has more than 20% impervious cover.

The site will not be used for low density single-family residential development.

or less
nust be
ious cover
s described in
n Processing
appropriate
r i s n

Attachment I - 20% or Less Impervious Cover Waiver. The site will be used for
multi-family residential developments, schools, or small business sites and has 20%
or less impervious cover. A request to waive the requirements for other permanent
BMPs and measures is attached.

The site will be used for multi-family residential developments, schools, or small
business sites but has more than 20% impervious cover.

Х	The site will not be used for multi-family residential developments, schools,	or small
	business sites.	

52. X Attachment J - BMPs for Upgradient Stormwater.

A description of the BMPs and measures that will be used to prevent pollution of surface water, groundwater, or stormwater that originates upgradient from the site and flows across the site is attached.

No surface water, groundwater or stormwater originates upgradient from the site and flows across the site, and an explanation is attached.

Permanent BMPs or measures are not required to prevent pollution of surface water, groundwater, or stormwater that originates upgradient from the site and flows across the site, and an explanation is attached.

53. X Attachment K - BMPs for On-site Stormwater.

A description of the BMPs and measures that will be used to prevent pollution of surface water or groundwater that originates on-site or flows off the site, including pollution caused by contaminated stormwater runoff from the site is attached.
 Permanent BMPs or measures are not required to prevent pollution of surface water or groundwater that originates on-site or flows off the site, including pollution caused by contaminated stormwater runoff.

- 54. Attachment L BMPs for Surface Streams. A description of the BMPs and measures that prevent pollutants from entering surface streams is attached.
 - 🛛 N/A
- 55. Attachment M Construction Plans. Construction plans and design calculations for the proposed permanent BMPs and measures have been prepared by or under the direct supervision of a Texas Licensed Professional Engineer, and are signed, sealed, and dated. Construction plans for the proposed permanent BMPs and measures are

attached and include: Design calculations, TCEQ Construction Notes, all proposed structural plans and specifications, and appropriate details.

🛛 N/A

9	Attachment N - Inspection, Maintenance, Repair and Retrofit Plan. A site and BMP specific plan for the inspection, maintenance, repair, and, if necessary, retrofit of the permanent BMPs and measures is attached. The plan fulfills all of the following:
] [[Prepared and certified by the engineer designing the permanent BMPs and measures Signed by the owner or responsible party Outlines specific procedures for documenting inspections, maintenance, repairs, and, if necessary, retrofit. Contains a discussion of record keeping procedures
ا	N/A
	Attachment O - Pilot-Scale Field Testing Plan. Pilot studies for BMPs that are not recognized by the Executive Director require prior approval from the TCEQ. A plan for pilot-scale field testing is attached.
N	N/A
	Attachment P - Measures for Minimizing Surface Stream Contamination. A description of the measures that will be used to avoid or minimize surface stream contamination and changes in the way in which water enters a stream as a result of the construction and development is attached. The measures address increased stream flashing, the creation of stronger flows and in-stream velocities, and other in-stream effects caused by the regulated activity, which increase erosion that result in water quality degradation.
ı 🔀	N/A

Responsibility for Maintenance of Permanent BMPs and Measures after Construction is Complete.

- 59. The applicant is responsible for maintaining the permanent BMPs after construction until such time as the maintenance obligation is either assumed in writing by another entity having ownership or control of the property (such as without limitation, an owner's association, a new property owner or lessee, a district, or municipality) or the ownership of the property is transferred to the entity. Such entity shall then be responsible for maintenance until another entity assumes such obligations in writing or ownership is transferred.
- 60. A copy of the transfer of responsibility must be filed with the executive director at the appropriate regional office within 30 days of the transfer if the site is for use as a multiple single-family residential development, a multi-family residential development,

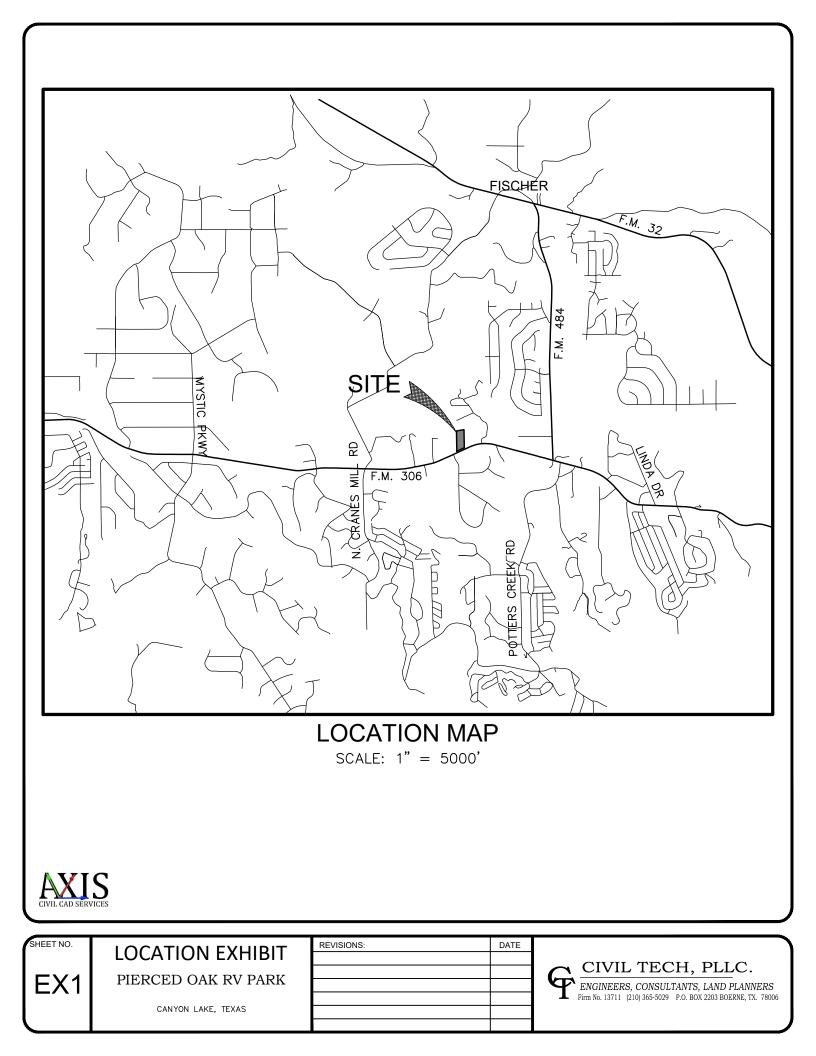
or a non-residential development such as commercial, industrial, institutional, schools, and other sites where regulated activities occur.

Administrative Information

- 61. Submit one (1) original and one (1) copy of the application, plus additional copies as needed for each affected incorporated city, groundwater conservation district, and county in which the project will be located. The TCEQ will distribute the additional copies to these jurisdictions.
- 62. Any modification of this Contributing Zone Plan may require TCEQ review and Executive Director approval prior to construction, and may require submission of a revised application, with appropriate fees.
- 63. The site description, controls, maintenance, and inspection requirements for the storm water pollution prevention plan (SWPPP) developed under the EPA NPDES general permits for stormwater discharges have been submitted to fulfill paragraphs 30 TAC §213.24(1-5) of the technical report. All requirements of 30 TAC §213.24(1-5) have been met by the SWPPP document.
 - The Temporary Stormwater Section (TCEQ-0602) is included with the application.

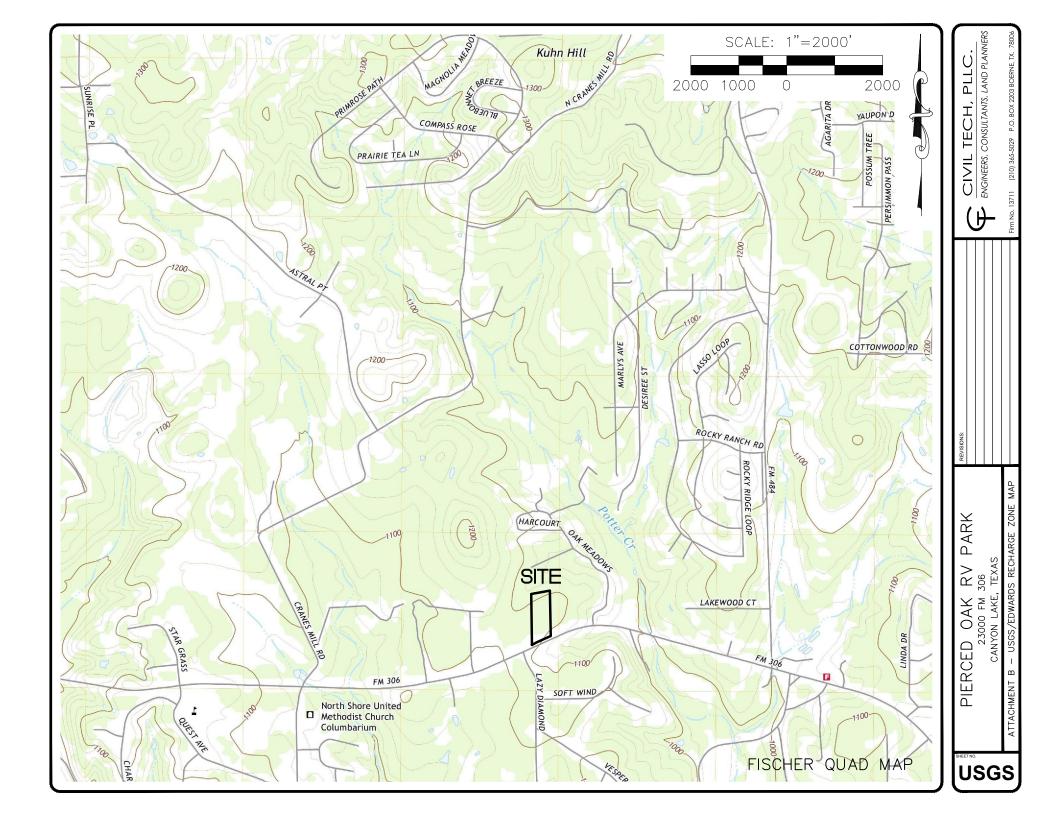
ATTACHMENT A

Road Map



ATTACHMENT B

USGS Quadrangle Map



ATTACHMENT C

Project Narrative

Attachment C – Project Narrative

Pierced Oak PWC is proposing to develop $8.99 \pm$ acres into a commercial RV Park located on FM 306 approximately 4,750 feet west of the intersection of FM 306 and FM 484. The property is located within the ETJ of Canyon Lake, Texas. The project site is identified as 23000 FM 306 (hereinafter referred to as the project site). The project site is bound by an unnamed tributary to Potters Creek to the north, 2 large residential lots on the west and east, and FM 306 to the south.

The current condition of the project site is large lot residential with several areas of brushy area with native grasses, some cleared pasture areas, and paved driveways. Average slopes across the site range from 3% to 7% typically with some areas of steep slopes (~33%) toward the northern and southern sections of the project site. The project site drains both to the north and to the south, the split is roughly equal. The proposed improvements include parking facilities, utilities, and drainage infrastructure. Two proposed on-site detention pond will mitigate peak flow rates to pre-project conditions. Since the property is located within the Edwards Aquifer Contributing Zone, best management practices (BMP) facilities will be provided to reduce total suspended solids (TSS) loading. The project site pre-development impervious cover equals 3.4%, while post-development impervious cover equals 47.1%.

BMPs provided include vegetated swales, two (2) batch detention facilities, an extended detention pond, and an engineered vegetative filter strip. Engineered filter strips are proposed on the downstream side of the private access road where other BMPs are impractical. Temporary BMP's will be installed and maintained to control sedimentation during all phases of construction, including but not limited to silt fences, rock berms, stabilized construction entrances, and concrete wash-out pits. Permanent BMP's will be installed within the beginning stages of their respective phase and have been designed to provide sufficient treatment of anticipated increases in sediment and contaminants as required in the TCEQ Technical Guidance Manual.

ATTACHMENT D

Factors Affecting Surface Water Quality

Attachment D – Factors Affecting Surface Water Quality

The major factors that may affect water quality during construction are:

- Sediment from disturbed soil;
- Sediment from stock piled material;
- Fluids from construction equipment;
- Trash from workers and material packaging;
- Rinse water from concrete trucks.

The major factors which may affect wate quality once development is complete are:

- Automotive fluids;
- Landscape products including fertilizer and herbacides;
- Pest control products.

The temporary and permanent BMP's for this project have been designed to conform to the TCEQ Technical Guidance Manual to treat the required amount of storm water runoff as to not significantly impact water quality entering surface or groundwater.

ATTACHMENT E

Volume and Character of Stormwater

Attachment E – Volume and Character of Stormwater

Increases in stormwater runoff from pre-project to post-project conditions necessitated the use of onsite above ground detention. The relatively small size of the watershed (less than 20 acres) allows the application of the modified rational method for detention pond sizing. Approximately 6.03 acres of the 8.99-acre project site is routed through three detention ponds, with the detention pond over-detaining to account for any uncontrolled portions of onsite runoff. The stage-storage curve is provided within the stormwater management plan.

The required versus actual water quality storage volume for each of the following systems were developed:

		Required	Actual
		WQV	WQV
	Туре	(ft3)	(ft3)
Pond A	Extended Detention	3622	6086
Pond B	Batch Detention	5880	5973
Pond C	Batch Detention	4393	4705

The character of storm water generated onsite will be influenced by site features that generate nonpoint sources of pollution. Non-point sources will include oil and grease from the pavement areas, suspended solids, sedimentation, nutrients for landscape care and maintenance, pesticides, and herbicides. No unusual contaminants other than those typical with a commercial development are anticipated. The nearest downstream receiving stream is identified as Potters Creek (ephemeral) from the FEMA National Flood Hazard Layer

ATTACHMENT F

Suitability Letter from Authorized Agent



June 15, 2023

Mr. James McGarr, P.E. Civil Tech PLLC Via e-mail: jmcgarr@civiltechmc.com

Re: Pierced Oak RV Park Suitability Letter within Comal County Texas

Dear Mr. McGarr:

In accordance with TAC §213.24(8)(B), Comal County has found that the entire referenced site is suitable for the use of private sewage facilities and will meet the requirements for on-site sewage facilities.

If you have any questions or need additional information, please contact our office.

Sincerely,

Robert Boyd, P.E. Comal County Assistant Engineer

cc: Jen Crownover, Comal County Commissioner, Precinct No. 4

Page 1 of 1

ATTACHMENT G

Alternative Secondary Containment Methods

Not Applicable

ATTACHMENT H

AST Containment Structure Drawings

Not Applicable

ATTACHMENT I

20% or Less Impervious Cover Waiver

Not Applicable

ATTACHMENT J

BMPs for Upgradient Stormwater

Attachment J – BMPs for Upgradient Stormwater

There is a small area of upgradient stormwater west of the project site that drains through the existing and proposed driveway of the project site at the southern property line. There is no impervious associated with this drainage area and the water is not routed through any of the proposed BMPs.

ATTACHMENT K

BMP's for On-site Stormwater

Attachment K – BMPs for Onsite Stormwater

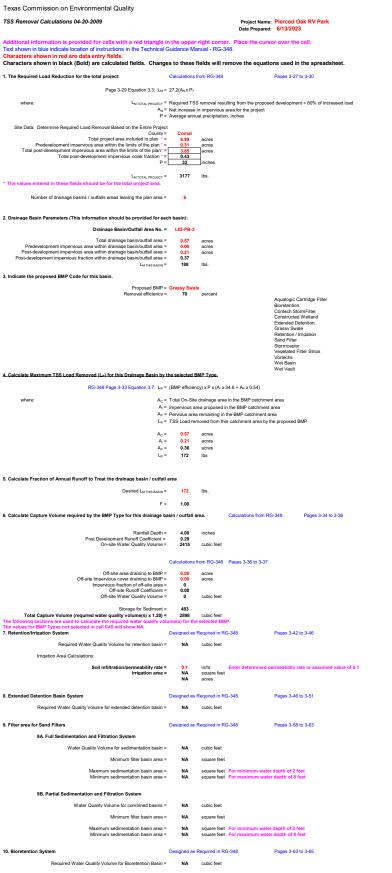
BMPs for treating onsite storm water include vegetated swales, batch detention facilities, extended detention facility, and engineered filter strips.

Below is a summary of TSS removal for the project site:

Total TSS Removal Required for Project Site:	3,177 lbs/yr
TSS Removal by Vegetated Swale (LID-PB-3)	172 lbs/yr
TSS Removal by Vegetated Filter Strip 1 (LID-PB-2)	144lbs/yr
TSS Removal by Vegetated Filter Strip 2 (LID-PA-4)	49 lbs/yr
TSS Removal by Pond A (Extended Detention) (LID-PA-2)	718 lbs/yr
TSS Removal by Pond B (Batch Detention) (LID-PB-4)	1297 lbs/yr
TSS Removal by Pond C (Batch Detention) (LID-PA-3)	830 lbs/yr
Total TSS Removal Provided for Project Site:	3,210 lbs/yr

The following supporting calculations are provided below.

- TSS Calculations by Vegetated Swale (LID-PB-3)
- TSS Calculations by Vegetated Filter Strip 1 (LID-PB-2)
- TSS Calculations by Vegetated Filter Strip 2 (LID-PA-4)
- TSS Calculations by Pond A (Extended Detention)(LID-PA-2)
- TSS Calculations by Pond B (Batch Detention) (LID-PB-4)
- TSS Calculations by Pond C (Batch Detention) (LID-PA-3)





11. Wet Basins		Designed as R	equired in R	G-348	P	ages 3-66 to 3-71	
	Required capacity of Permanent Pool = Required capacity at WQV Elevation =	NA NA	cubic feet cubic feet	Total Capa	city should	city is 1.20 times the WQV be the Permanent Pool Ca	pacity
				plus a seco			
12. Constructed Wetlands		Designed as R	equired in R	G-348	P	ages 3-71 to 3-73	
Required Water Q	tuality Volume for Constructed Wetlands =	NA	cubic feet				
13. AquaLogic [™] Cartridge System		Designed as R	equired in R	6-348	P	ages 3-74 to 3-78	
	I (RG-348) does not exempt the required						
	equired Sedimentation chamber capacity =	NA	cubic feet				
	Filter canisters (FCs) to treat WQV = Filter basin area (RIA _F) =		cartridges square feet				
14. Stormwater Management Storm	Filter® by CONTECH						
Required Water Quality	Volume for Contech StormFilter System =	NA	cubic feet				
	THE FOLLOWING BMPs / LOAD REMOV			OW RATES			
15. Grassy Swales		Designed as R				ages 3-51 to 3-54	
Design parameters fo	or the swale:						
Draina	age Area to be Treated by the Swale = A = Impervious Cover in Drainage Area =	0.20	acres acres in/hr				
	Rainfall intensity = i = Swale Slope = Side Slope (z) =	0.025	ft/ft				
	Side Slope (z) = Design Water Depth = y = Weighted Runoff Coefficient = C =	0.33	ft				
Aci	s = cross-sectional area of flow in Swale = P _w = Wetted Perimeter =						
R _H = hydrau	lic radius of flow cross-section = A _{CS} /P _W = n = Mannino's roughness coefficient =	0.16	feet				
ISA. Using the Method Described in		0.2					
Man	ning's Equation: $Q = 1.49 A_{CS} R_{H}^{2/3} S^{0.5}$						
	$b = \frac{0.134 \times Q}{v^{1.07} S^{0.5}} - zv$	-0.08	feet				
	V S Q=CIA=	0.29	ofo				
To calculate the flow velocity in the		0.25	CIB				
	V (Velocity of Flow in the swale) = Q/A _{CS} =	0.56	ft/sec				
To calculate the resulting swale len							
	um Swale Length = V (ft/sec) * 300 (sec) =	168.42	feet				
	values do not meet the design requiremen						
	Design Q = CiA = Manning's Equation Q =		cfs			-0.95	
			4		Error 1 =	-0.85	
	Swale Width=		ft		Error 1 =	-0.85	
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	Swale Width= wided to the right (green comments). Flow Velocity Minimum Length = wided to the right (blue comments).	6.00 0.56 168.42	ft/s ft		Error 1 =	-0.30	
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Instructions are pro if any of the resulting values do not if any of the resulting values at the 16. Vegetator Filter 16. Vegetator Filter 17. Wei Vauts 17. Wei Vauts 17. Wei Vauts 18. Required 18. First calculate the load removal at the Calculate 19. Percent TSS Removal 18. Appender Control	Swale Width- wided to the right (areen comments). Flow Velocity Minimum Length = relation of the right (blue comments). Design Width = Design Destrage Design Destrage Design Destrage Design Destrage The velocity Minimum Length = t meet the design requirement set forth on on meet the design requirement set forth on ot meet the design requirement set forth and the design requirement set forth on the design requirement set forth on the design requirement set forth and on the design requirement set forth for determining the load or size of vege for determining the load or size of vege def or an interim permanent BMP, they Load Removal Based upon Equation 3.3 = 0 1.1 infhour RG-348 Page 3.30 Equation 3.4: Q = CIA = runoff coefficient for the drainage area i = a load removal bases area in acres = Q = flow rate in cubic feet per second = G-348 Page 3.31 Equation 3.5: Von = QIA Q = Runoff actionate above A = Water surface area in the wet watt = Von = Overflow Rate = Load removed by Wet Vaut = Load removed by Wet Vaut = heat per forth of sufficient of the drainage area in acres RG-348 Page 3.31 (RG-348 Page 3.31) =	6.00 0.56 188.42 6 1.28 0.33 0.49 148.40 In RG-348, the ord in RG-348, the Designed as R 148.70 Designed as R 0.22 0.25 1550 0.00 0.25 1550 0.00 0.25 1550 0.00 0.25 1550 0.00 0.25 1550 0.00 0.25 1550 0.00 0.25 1550 0.00 0.25 1550 0.00 0.25 1550 0.00 0.25 1550 155	fris ft ft ft cfs ft ft dealem nature widening til dealem nature widening til dealem nature strips with in grade as a described equired in Ri bis in/hour acute feel/s cubic feel/s cubic feel/s cubic feel/s feel/sec	ec ec ec	Error 2 = be modifie tom value r P ope of 20% lope exceet 6 of RG-341 P	-0.97 d and the solver rerun. new not be possible. ages 3-55 to 3-57 or is 20%. i. ages 3-30 to 3-32 & 3-79	0.03
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Instructions are pro if any of the resulting values do not fany of the resulting values and of 46. Vegetated Filter Strips There are no calculations required the 80% removal is provided when the sheet flow leaving the the imper- ion of the strips are propose 17. Wet Vauts First calculate the load removal at the Calculate the load removal at the Calculate the load removal at the Calculate the efficiency reduction of Calculate the efficiency reduction of Calculate the Calculate the efficiency reduction of Calculate the Calculate the efficiency reduction of Calculate the Calculate the filter of Calculate the filter of Calculate the efficiency reduction of Calculate the Calculate the filter of Calculate the filter of Cal	Swale Width- wided to the right (areen comments). Flow Velocity Minimum Length = wided to the right (blue comments). Design Width = Design Discharge = Design Discharge = Piow Velocity Minimum Length = Minimum Length = the entitle design requirement set forth on on meet the design requirement set forth on other the design requirement set forth on other the design requirement set forth on other the design requirement set forth on the contributing display of the display of the display the contributing display of the display of the display blue contributing display of the display of the display blue contributing display of the display of the display are display of the display of the display of the display Load Removal Based upon Equation 3.3 = 0 = 11. Infihour RG-348 Page 3-30 Equation 3.4: Q = CIA = runoff coefficient for the drainage area =	6.00 0.56 188.42 6 1.26 0.33 0.49 188.40 In RG-348, the output in RG-348, the out	ft/s ft c/s ft ft delatem parter widening tit dialectories delatem anter sinhour acres acuire feet so cubic feet/s cubic f	ec ec ec	Error 2 = be modifie tom value r P ope of 20% lope exceet 6 of RG-341 P	-0.97 d and the solver rerun. new not be possible. ages 3-55 to 3-57 or is 20%. i. ages 3-30 to 3-32 & 3-79	0.03

To solve for bottom width of the trapezoidal swale (b) using the Excel solver: Excel can simultaneously solve the "Design Q" (C211) vs "Manning's Q" (C219) by varying the "Swale Width" (C220). The required "Swale Width" occurs when the "Design Q" = "Manning's Q".

 First, highlight Cell F219 (Error 1 value). The equation showing in the fx screen for Cell F219 should be "= \$C\$217.\$C\$219"

 Then click on "Toole" and "Solver". The "Solver Parameters" screen poos up.

 The value in the "Se Target cell" should be \$F\$219

 "Error 1 ="

 The value in the "By Changing Cells" should be \$C\$220

 "Swale Width"

 Click on solve.

The resulting "Swale Width" must be less than 10 feet to meet the requirements of the TGM. If the resulting "Swale Width" exceeds 10 feet then the design parameters must be revised and the solver run again.

If there is not the option for "Solver" under "Tools" Click on "Tools" and "Add Ins" and then check "Solver Add-in" Then proceed as instructed above.

If you would like to increase the bottom width of the trapezoidal availe (b): Excel can simultaneously solve the "Design Or (C217) vs "Design Discharge" (C232) by varying the "Design Depth" (C233). The required "Design Depth" for a 1940b bottom with occurs when the "Design Of (C217) = the "Design Discharge" (C232).

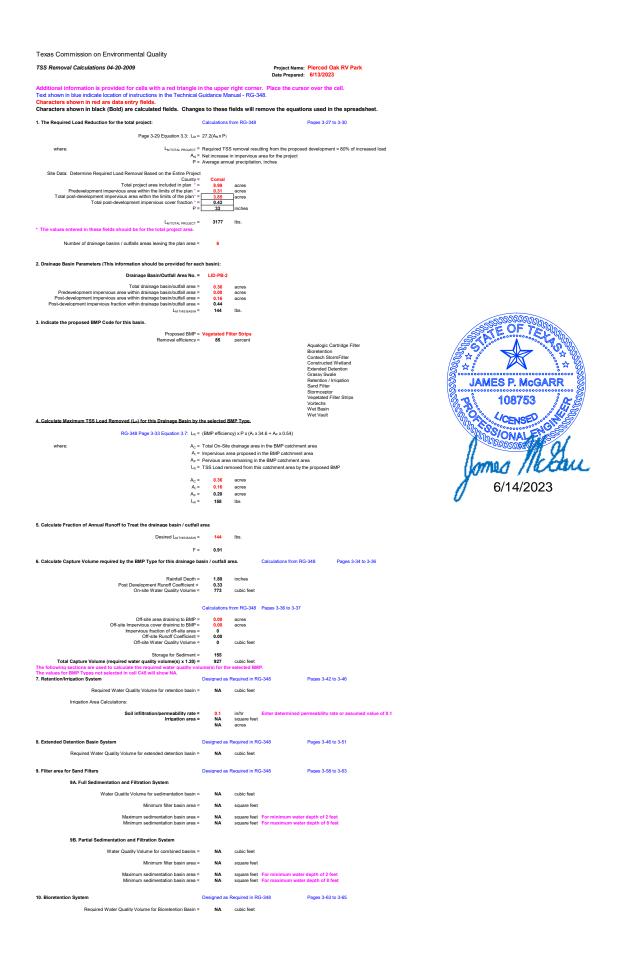
First set the desired bottom width in Cell C231. Highlight Cell F232. The equation showing in the fx screen for Cell F232 should be "= \$C\$217-\$C\$232"

Click on "Tools" and "Solver". The "Solver Parameters" screen poos up. The value in the "Set Target cell" should be \$F\$232 "Error 2" The value in the "By Changing Cells" should be \$C\$233 "Design Depth" Click on solve.

The resulting "Design Depth" must be equal to or less than 0.33 feet to meet the requirements of the TGM. If the resulting "Design Depth" exceeds 0.33 feet than the design parameters must be revised and the solver run again. First set the desired bottom within to call C23. Highlight Call F232. The equation showing in the fx screen for Call F232 should be "= \$C\$217.4C\$232" Click on "Tools" and "Solver" "Ima "Bolver Parameters" screen googs ". The value in the "Set Target call" should be \$F\$232. The value in the "Set Target call" should be \$C\$233. "Design Depth" Click on solve.

The resulting "Design Depth" must be equal to or less than 0.33 feet to meet the requirements of the TGM. If the resulting "Design Depth" exceeds 0.33 feet then the design parameters must be revised and the solver run again.

19. BMPs Installed	d in a Series	Designed as	Required in RG-348	Pages 3-32
м	ichael E. Barrett, Ph.D., P.E. recommended that the coel	ficient for E ₂ be	e changed from 0.5 to 0.6	5 on May 3, 2006
	$E_{TOT} = [1 - ((1 - E_1) \times (1 - 0.65E_2) \times (1 - 0.25E_3))] \times 100$	= 86.3	8 percent NET EFFIC	IENCY OF THE BMPs IN THE SERIES
	EFFICIENCY OF FIRST BMP IN THE SERIES = E1	= 75.0	0 percent	
E	EFFICIENCY OF THE SECOND BMP IN THE SERIES = E_2	= 70.0	0 percent	
	EFFICIENCY OF THE THIRD BMP IN THE SERIES = E_3	= 0.0	0 percent	
	HEREFORE, THE NET LOAD REMOVAL WOULD BE: (AND AP VALUES ARE FROM SECTION 3 ABOVE)			
	$L_R = E_{TOT} \times P \times (A_1 \times 34.6 \times A_P \times 0.54)$	= 212.6	5 lbs	
20. Stormceptor				
	Required TSS Removal in BMP Drainage Area Impervious Cover Overtreatment	= 0.0000	lbs ac	
BI	TSS Removal for Uncaptured Area MP Sizing	= 0.00	lbs	
	Effective Area Calculated Model Size(s) Actual Model Size (if multiple values provided in Calculate	= #N/A	EA	
	Model Size or if you are choosing a larger model size)	= 0	Model Size	
	Surface Area	= #N/A	ft ²	
	Overflow Rate		V _{or}	
	Rounded Overflow Rate		V _{or}	
	BMP Efficiency %		%	
	L _R Value	= #VALUE!	lbs	
	TSS Load Credit	= #VALUE!	Ibs	
Is	Sufficient Treatment Available? (TSS Credit > TSS Uncapt	.) #VALUE!		
	TSS Treatment by BMP (LM + TSS Uncapt.)	= #VALUE!		
21. Vortech				
	Required TSS Removal in BMP Drainage Area		lbs	
	Impervious Cover Overtreatment TSS Removal for Uncaptured Area		ac Ibs	
BI	MP Sizing	- 0.00	105	
	Effective Area Calculated Model Size(s)		EA	
	Actual Model Size (if choosing larger model size)	= Vx1000	Pick Model Size	
	Surface Area	= 7.10	ft ²	
	Overflow Rate	= #VALUE!	Vor	
	Rounded Overflow Rate	= #VALUE!	Vor	
	BMP Efficiency %		%	
	L _R Value	= #VALUE!	lbs	
	TSS Load Credit	= #VALUE!	lbs	
Is	Sufficient Treatment Available? (TSS Credit > TSS Uncapt	.) #VALUE!		
	TSS Treatment by BMP (LM + TSS Uncapt.)	= #VALUE!		



11. Wet Basins	Designed as R	equired in RC	G-348	Pages	3-66 to 3-71
Required capacity of Permanent Pool = Required capacity at WQV Elevation =	NA NA	cubic feet cubic feet	Permanent Poo Total Capacity	I Capacity is should be the	a 1.20 times the WQV Re Permanent Pool Capacity
			plus a second V	VQV.	
12. Constructed Wetlands	Designed as R	equired in RO	G-348	Pages	3-71 to 3-73
Required Water Quality Volume for Constructed Wetlands =	= NA	cubic feet			
13. AquaLogic [™] Cartridge System	Designed as R				3-74 to 3-78
** 2005 Technical Guidance Manual (RG-348) does not exempt the required	d 20% increase	with mainter	nance contract w	ith AquaLo	gic™.
Required Sedimentation chamber capacity = Filter canisters (FCs) to treat WQV =	NA NA	cubic feet cartridges			
Filter basin area (RIA _F) =	= NA	square feet			
14. Stormwater Management StormFilter® by CONTECH					
Required Water Quality Volume for Contech StormFilter System =	= NA	cubic feet			
THE SIZING REQUIREMENTS FOR THE FOLLOWING BMPs / LOAD REMOV	VALS ARE BASI		OW RATES - NOT		ED WATER QUALITY VOLUMES
15. Grassy Swales	Designed as R	equired in RC	G-348	Pages	3-51 to 3-54
Design parameters for the swale:					
Drainage Area to be Treated by the Swale = A =	- 0.00	acres			
Impervious Cover in Drainage Area Rainfall intensity = i =	4.00	acres in/hr			
Swale Slope = Side Slope (z) =	0.01	ft/ft			
Design Water Depth = y = Weighted Runoff Coefficient = C =	= 0.33 = 0.54				
A_{CS} = cross-sectional area of flow in Swale = P_W = Wetted Perimeter =					
R _H = hydraulic radius of flow cross-section = A _{CS} /P _w = n = Manning's roughness coefficient =	0.32	feet			
n = Manning's roughness coefficient =	- U.2				
Manning's Equation: Q = 1.49 A _{CS} R _H ²³ S ^{0.1}	5				
"					
b = <u>0.134 x Q</u> - zy =	38.51	feet			
v ¹⁸⁷ S ^{0.5}					
Q = CiA =	= 4.71	cfs			
To calculate the flow velocity in the swale:					
V (Velocity of Flow in the swale) = Q/A _{CS} =	= 0.36	ft/sec			
To calculate the resulting swale length:					
L = Minimum Swale Length = V (ft/sec) * 300 (sec) = If any of the resulting values do not meet the design requiremen					
15B. Alternative Method using Excel Solver					
Design Q = CiA =	= 4.71	cfs			
Manning's Equation Q =			Erro	r 1 =	3.95
Swale Width=	= 6.00	ft			
Instructions are provided to the right (green comments).					
Flow Velocity	y 0.36	ft/s			
Minimum Length =	107.24	ft			
Instructions are provided to the right (blue comments).					
Design Width = Design Discharge =	= 0.76	ft cfs	Erro	r 2 =	3.95
Design Depth = Flow Velocity =	= 0.32	cfs			
Minimum Length =					
If any of the resulting values do not meet the design requirement set forth If any of the resulting values still do not meet the design requirement set (forth in RG-348, the	design para widening th	meters may be n le swale bottom	value may r	ot be possible.
16. Vegetated Filter Strips	Designed as R	equired in RC	G-348	Pages	3-55 to 3-57
There are no calculations required for determining the load or size of vege The 80% removal is provided when the contributing drainage area does no	etative filter stri	ps. et (direction)	of flow) and		
the sheet flow leaving the impervious cover is directed across 15 feet of e across 50 feet of natural vegetation with a maximum slope of 10%. There	engineerea tiiter	strips with r	naximum siope	of 20% or exceeds 20	¥6.
If vegetative filter strips are proposed for an interim permanent BMP, they					
17. Wet Vaults	Designed as R	equired in RG	ə-348	Pages	3-30 to 3-32 & 3-79
Required Load Removal Based upon Equation 3.3 =	- NA	105			
RG-348 Page 3-30 Equation 3.4: Q = CiA	4				
C = runoff coefficient for the drainage area =	= 0.28		C = Rupoff Coe	fficient = ^ 4	i46 (IC) ² + 0.328 (IC) + 0.03
i = design rainfall intensity = A = drainage area in acres =	= 1.1	in/hour acres			
Q = flow rate in cubic feet per second =		cubic feet/se	ec.		
RG-348 Page 3-31 Equation 3.5: V _{OR} = Q/A					
Q = Runoff rate calculated above =	= 0.31	cubic feet/se	ic		
A = Water surface area in the wet vault =	150	square feet			
V _{OR} = Overflow Rate =		feet/sec			
Percent TSS Removal from Figure 3-1 (RG-348 Page 3-31) =		percent			
Load removed by Wet Vault =	#VALUE!	lbs			
If a bypass occurs at a rainfall intensity of less than 1.1 in/hours Calculate the efficiency reduction for the actual rainfall intensity rate					
Actual Rainfall Intensity at which Wet Vault bypass Occurs =	0.5	in/hour			
Fraction of rainfall treated from Figure 3-2 RG-348 Page 3-32 =	0.75	percent			
Efficiency Reduction for Actual Rainfall Intensity =		percent			
Resultant TSS Load removed by Wet Vault =	#VALUE!	IDS			
18. Permeable Concrete	Designed as R	equired in RO	G-348	Pages	3-79 to 3-83
REDMEADLE CONCRETE MAY ONLY BE USED ON THE CONTRIBUTING 7	ONE				

To solve for bottom width of the trapezoidal swale (b) using the Excel solver: Excel can simultaneously solve the "Design Q" (C211) vs "Manning's Q" (C219) by varying the "Swale Width" (C220). The required "Swale Width" occurs when the "Design Q" = "Manning's Q".

 First, highlight Cell F219 (Error 1 value). The equation showing in the fx screen for Cell F219 should be "= \$C\$217.\$C\$219"

 Then click on "Toole" and "Solver". The "Solver Parameters" screen poos up.

 The value in the "Se Target cell" should be \$F\$219

 "Error 1 ="

 The value in the "By Changing Cells" should be \$C\$220

 "Swale Width"

 Click on solve.

The resulting "Swale Width" must be less than 10 feet to meet the requirements of the TGM. If the resulting "Swale Width" exceeds 10 feet then the design parameters must be revised and the solver run again.

If there is not the option for "Solver" under "Tools" Click on "Tools" and "Add Ins" and then check "Solver Add-in" Then proceed as instructed above.

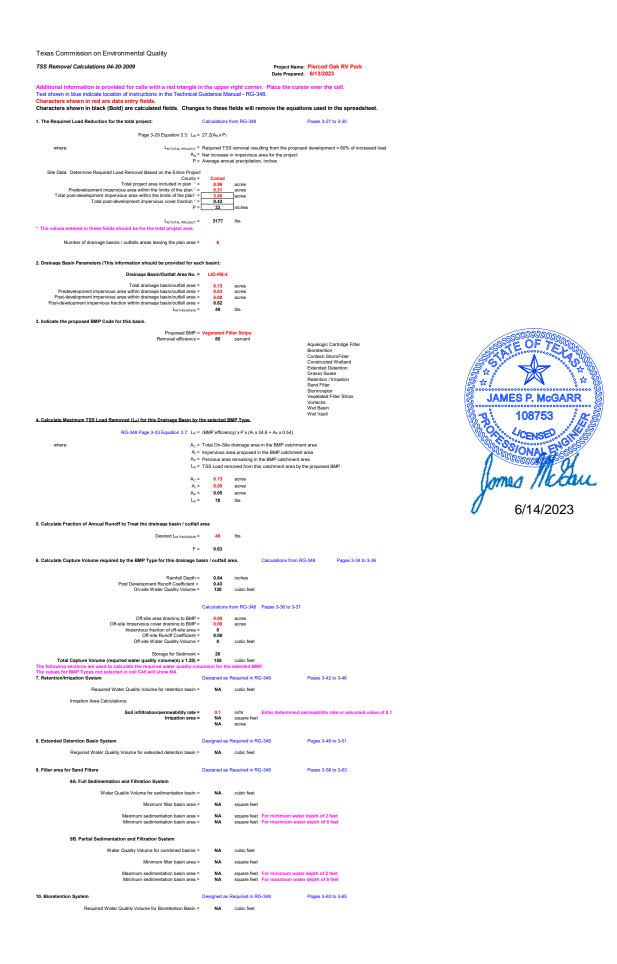
If you would like to increase the bottom width of the trapezoidal availe (b): Excel can simultaneously solve the "Design Or (C217) vs "Design Discharge" (C232) by varying the "Design Depth" (C233). The required "Design Depth" for a 1940b bottom with occurs when the "Design Of (C217) = the "Design Discharge" (C232).

First set the desired bottom width in Cell C231. Highlight Cell F232. The equation showing in the fx screen for Cell F232 should be "= \$C\$217-\$C\$232"

Click on "Tools" and "Solver". The "Solver Parameters" screen poos up. The value in the "Set Target cell" should be \$F\$232 "Error 2" The value in the "By Changing Cells" should be \$C\$233 "Design Depth" Click on solve.

The resulting "Design Depth" must be equal to or less than 0.33 feet to meet the requirements of the TGM. If the resulting "Design Depth" exceeds 0.33 feet than the design parameters must be revised and the solver run again. First set the desired bottom within to call C23. Highlight Call F232. The equation showing in the fx screen for Call F232 should be "= \$C\$217.4C\$232" Click on "Tools" and "Solver" The "Solver Parameters" screen poor 2. The value in the "Set Target call" should be \$F\$232. The value in the "Set Target call" should be \$F\$232. The value in the "Set Target call" should be \$C\$233. "Design Depth" Click on solve.

19. BMPs Insta	Illed in a Series		Designed as R	lequired in RG	G-348 Pages 3-32
	Michael E. Bar	rett, Ph.D., P.E. recommended that the coeffi	cient for E ₂ be	changed fro	m 0.5 to 0.65 on May 3, 2006
	E _{TOT} = [1	- ((1 - E ₁) X (1 - 0.65E ₂) x (1 - 0.25E ₃))] X 100 =	86.38	percent	NET EFFICIENCY OF THE BMPs IN THE SERIES
	EFFI	CIENCY OF FIRST BMP IN THE SERIES = E ₁ =	75.00	percent	
	EFFICIENCY	OF THE SECOND BMP IN THE SERIES = E ₂ =	70.00	percent	
	EFFICIENC	CY OF THE THIRD BMP IN THE SERIES = $E_3 =$	0.00	percent	
		THE NET LOAD REMOVAL WOULD BE: LUES ARE FROM SECTION 3 ABOVE)			
		L _R = E _{TOT} X P X (A ₁ X 34.6 X A _P X0.54) =	160.88	lbs	
20. Stormcept					
		Required TSS Removal in BMP Drainage Area= Impervious Cover Overtreatment=	NA 0.0000	lbs ac	
		TSS Removal for Uncaptured Area =	0.000	ac Ibs	
	BMP Sizing				
		Effective Area = Calculated Model Size(s) =	NA #N/A	EA	
	Actual Mod	el Size (if multiple values provided in Calculated	#N/A		
		size or if you are choosing a larger model size) =	0	Model Size	
		Surface Area =	#N/A	ft ²	
		Overflow Rate =	#VALUE!	Vor	
		Rounded Overflow Rate =	#VALUE!	Vor	
		BMP Efficiency % =	#VALUE!	%	
		L _R Value =	#VALUE!	lbs	
		TSS Load Credit =	#VALUE!	lbs	
	Is Sufficient Tr	eatment Available? (TSS Credit > TSS Uncapt.)	#VALUE!		
		TSS Treatment by BMP (LM + TSS Uncapt.) =	#VALUE!		
21. Vortech					
		Required TSS Removal in BMP Drainage Area= Impervious Cover Overtreatment=	NA 0.0000	lbs ac	
		TSS Removal for Uncaptured Area =	0.00	lbs	
	BMP Sizing				
		Effective Area = Calculated Model Size(s) =	NA #N/A	EA	
	Act	tual Model Size (if choosing larger model size) =	Vx1000	Pick Model S	Size
		Surface Area =	7.10	ft ²	
		Overflow Rate =	#VALUE!	Vor	
		Rounded Overflow Rate =	#VALUE!	Vor	
		BMP Efficiency % =	#VALUE!	%	
		L _R Value =	#VALUE!	lbs	
		TSS Load Credit =	#VALUE!	lbs	
	Is Sufficient Tr	eatment Available? (TSS Credit > TSS Uncapt.)	#VALUE!		
		TSS Treatment by BMP (LM + TSS Uncapt.) =	#VALUE!		



11. Wet Basins							
		Designed as R	lequired in R	G-348	F	Pages 3-	66 to 3-71
	Required capacity of Permanent Pool = Required capacity at WQV Elevation =	NA NA	cubic feet cubic feet	Total Capa	city should	city is 1 I be the	20 times the WQV Permanent Pool Capacity
				plus a seco			
12. Constructed Wetlands		Designed as R	lequired in R	G-348	F	ages 3-	71 to 3-73
Required Water C	Quality Volume for Constructed Wetlands =	NA	cubic feet				
13. AquaLogic [™] Cartridge System		Designed as R	loquirod in P	C 249			74 to 3-78
	I (RG-348) does not exempt the required						
	equired Sedimentation chamber capacity =		cubic feet			uurogio	
	Filter canisters (FCs) to treat WQV = Filter basin area (RIA _F) =	NA	cartridges square feet				
14. Stormwater Management Storn							
Required Water Quality	/ Volume for Contech StormFilter System =	NA	cubic feet				
11E SIZING REQUIREMENTS FOR	THE FOLLOWING BMPs / LOAD REMOV	Designed as R					D WATER QUALITY VOLUM
Design parameters f	for the swale:						
Drain	hage Area to be Treated by the Swale = A = Impervious Cover in Drainage Area =	0.20	acres				
	Rainfall intensity = i = Swale Slope = Side Slope (z) =	0.025					
	Side Slope (2) = Design Water Depth = y = Weighted Runoff Coefficient = C =	0.33	ft				
	weighted Ruhon Coenicient - C -	0.48					
Ac	_{CS} = cross-sectional area of flow in Swale = P _W = Wetted Perimeter =						
R _H = hydrau	ulic radius of flow cross-section = A_{CS}/P_W =	0.16	feet				
ISA Liene the Mathews	n = Manning's roughness coefficient =	0.2					
ISA. Using the Method Described i	III uid RG-340						
Mar	nning's Equation: $Q = \frac{1.49}{R_{CS}} R_H^{23} S^{0.5}$						
	$b = \frac{0.134 \times Q}{0.5} - zy =$	-0.08	feet				
	y ^{1.87} S ^{0.5}						
Fo calculate the flow velocity in th	Q = CiA =	0.29	cfs				
	v (Velocity of Flow in the swale) = Q/A _{CS} =	0.56	ft/sec				
To calculate the resulting swale lea		0.56	IUSEC				
	ium Swale Length = V (ft/sec) * 300 (sec) =	168.42	feet				
	q values do not meet the design requiremen						d d 4b b
	Design Q = CiA = Manning's Equation Q = Swale Width=	1.24	cfs		Error 1 =	-(0.95
Instructions are pro	ovided to the right (green comments).						
		0.50					
	Flow Velocity Minimum Length =	168.42	ft/s ft				
Instructions are pro	Flow Velocity Minimum Length = ovided to the right (blue comments).	168.42	ft/s ft				
Instructions are pro	Minimum Length = ovided to the right (blue comments). Design Width =	168.42	ft				
Instructions are pro	Minimum Length = ovided to the right (blue comments). Design Discharge = Design Descharge = Design Desth =	168.42 6 1.26 0.33	ft cfs ft		Error 2 =	-().97
Instructions are pro	Minimum Length = ovided to the right (blue comments). Design Width = Design Discharce =	168.42 6 1.26 0.33 0.49	ft cfs ft cfs		Error 2 =	-(9.97
f any of the resulting values do no	Minimum Length = ovided to the right (blue comments). Design Discharge = Design Discharge = Design Depth = Fiow Velocity = Minimum Length = ot meet the design requirement set forth	168.42 6 1.26 0.33 0.49 148.40 in RG-348 , the	ft cfs ft cfs ft design para	ameters may	be modifie	d and th	ne solver rerun.
If any of the resulting values do no	Minimum Length = ovided to the right (blue comments). Design Width = Design Discharge = Design Deoth = Flow Velocity = Minimum Length =	168.42 6 1.26 0.33 0.49 148.40 in RG-348 , the	ft cfs ft cfs ft design para , widening t	ameters may he swale bot	be modifie tom value	d and ti may not	ne solver rerun.
If any of the resulting values do no If any of the resulting values still d 16. Vegetated Filter Strips There are no calculations required	Minimum Length = ovided to the right (blue comments). Design Width – Design Dicharge – Design Dicharge – Design Dicharge – Minimum Length = of meet the design requirement set forth to not meet the design requirement set forth for determining the load or size of vege	168.42 6 1.26 0.33 0.49 148.40 in RG-348, the orth in RG-348, Designed as R tative filter stri	ft cfs ft cfs ft design para widening ti tequired in R ps.	ameters may he swale bot G-348	be modifie tom value F	d and ti may not	te solver rerun. be possible.
f any of the resulting values do no f any of the resulting values still d 16. Vegetated Filter Strips There are no calculations required The 80% removal is provided when the sheet (flow leaving the impeory	Minimum Length = ovided to the right (blue comments). Design Widh – Design Dichators Design Dichators Design Dichators Design Dichators Disk Dichators Design Dichators Disk Dichators Disk Disk Disk Disk Minimum Length = to meet the design requirement set forth for determining the load or size of vege the contributing drainage area does no us cover is directed across 15 feet of e	168.42 6 1.26 0.33 0.49 148.40 in RG-348, the orth in RG-348, Designed as R tative filter stri t exceed 72 fet	ft cfs ft cfs ft design para widening ti tequired in R ps. et (direction strips with	ameters may he swale bot G-348 of flow) and maximum sl	be modifie tom value F ope of 20%	ed and the may not Pages 3-4	te solver rerun. be possible.
If any of the resulting values do no f any of the resulting values still 16. Vegetated Filter Strips There are no calculations required the 80% removal is provided when the sheet flow learing the impeory across 50 feet of natural vegetation	Minimum Length = ovided to the right (blue comments). Design Widh Design Widh Design Widh Design Desh Plow Velocity = Winimum Length = ot meet the design requirement set forth for determining the load or size of vege the contributing drainage area dates in the contributin	168.42 6 1.26 0.33 0.49 148.40 In RG-348, the orth in RG-348, Designed as R tative filter stri to exceed 72 fec ngineered filter can be a break	ft cfs ft cfs ft design para widening t tequired in R ps. st (direction strips with in grade as	ameters may he swale bot G-348 of flow) and maximum sl long as no s	be modifie tom value F ope of 20% lope excee	ed and th may not Pages 3-3 o or ds 20%.	te solver rerun. be possible.
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f any of the resulting values do n f any of the resulting values still of the Vegetated Filter Strips There are no calculations required the 80% removal is provided when the sheet flow leaving the impeory increas 50 feet of natural vegetation f vegetative filter strips are proport 17. Wet Vaults	Minimum Length = ovided to the right (blue comments). Besim Withh Design Dicharge Design Dicharge Design Dicharge Design Dicharge Minimum Length = ot meet the design requirement set forth for determining the load or size of vege the contributing drainage area does on us cover is directed across 15 feet of e n with a maximum slope of 10%. There sed for an interim permanent BMP, they	6 1262 0.33 0.44 148.40 In RG-348, the orth in RG-348, Designed as R tative filter stri t exceed 72 factors filter t exceed 72 factors filter and b a b area may be sized a Designed as R	ft cfs cfs ft ccfs ft design para widening ti videning ti kequired in R ps. st (direction r strips with in grade as is described tequired in R	ameters may he swale bot G-348 of flow) and maximum si long as no s I on Page 3-5	be modifie tom value F ope of 20% lope excee i6 of RG-34	od and th may not Pages 3-3 or ds 20%. 8.	te solver rerun. be possible.
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If any of the resulting values do no f any of the resulting values still (5. Vegetated Filter Strips) There are no calculations resulted the 80% removals is revised with the softer flow leaving the imperivi- concess 50 feet of natural vegetation of vegetative filter strips are propor 17. Wet Vaults Required First calculate the load removal at C Results of the strips are proportion (C) (C) (C) (C) (C) (C) (C) (C) (C) (C)	Minimum Length = winimum Length = winimum Length = winimum Length = Design Within = Design Within = Design Discharge = Design Discharge = Design Discharge = Design Discharge = Nimimum Length =	168.42 6 1.26 0.33 0.49 148.40 In RG-348, the Orth in RG-348, the Designed as R Rative filter stri t exceed 72 fef and be break may be sized a NA 0.44 1.1 1 1 0.48 0.48 1550 0.48 1550 0.48 1550 0.48 1550 0.48	ft ft cfs cfs ft cfs ft cfs ft design para scalar ft ft design para scalar ft ft design para scalar ft design para scalar ft ft design para scalar ft design para ft design para ft ft ft ft ft ft ft ft ft ft	ameters may he swale bot G-348 of flow) and maximum si long as no s lon Page 3-5 G-348 C = Runoff ec	be modifie tom value ope of 20% lope excee i6 of RG-34	ed and th may not Pages 3-4 or ds 20%. 8. Pages 3-4	ne solver rerun, be possible. 55 to 3-57 30 to 3-32 & 3-79
If any of the resulting values do nd if any of the resulting values at ind 16. Vegetated Filter Strips There are no calculations required the 80% removals is provided with the 80% removals is provided with resorts 50 feet of antural vegetation if vegetative filter strips are proper 17. Wet Vaults Required First calculate the load removal at C Percent TSS Removal 16 abypass occurs at a rainfall inter	Minimum Length = winimum Length = winimum Length = Design With = Design With = Design With = Design Deshape Design Deshape Picow Velocity Ficow Velocity Fic	168.42 6 1.26 0.33 0.49 148.40 In RG-348, the Orth in RG-348, the Designed as R Rative filter stri t exceed 72 fef and be break may be sized a NA 0.44 1.1 1 1 0.48 0.48 1550 0.48 1550 0.48 1550 0.48 1550 0.48	ft ft cfs cfs ft cfs ft cfs ft design para scalar ft ft design para scalar ft ft design para scalar ft design para scalar ft ft design para scalar ft design para ft design para ft ft ft ft ft ft ft ft ft ft	ameters may he swale bot G-348 of flow) and maximum si long as no s lon Page 3-5 G-348 C = Runoff ec	be modifie tom value ope of 20% lope excee i6 of RG-34	ed and th may not Pages 3-4 or ds 20%. 8. Pages 3-4	ne solver rerun, be possible. 55 to 3-57 30 to 3-32 & 3-79
If any of the resulting values do no f any of the resulting values still dis. Vegetated Filter Strips There are no calculations reculted the 80% emovals is rervided with the stored flow leaving the impervio crosses 50 etc of natural vegetation of vegetative filter strips are propor ti. Wet Vaults Required First calculate the load removal at C Percent TSS Remove the appages occurs at a reinfall inte Calculate the discover reductions	Minimum Length = windle do the right (blue comments). Design With = Design With = Design With = Design Deshape = Design Deshape = Design Depth = Design Dept	168.42 6 1.26 0.33 148.40 In RG-348, the ord in RG-	ft ft cfs cfs cfs cfs cfs cfs cfs cfs	ameters may he swale bot G-348 of flow) and maximum si long as no s lon Page 3-5 G-348 C = Runoff ec	be modifie tom value ope of 20% lope excee i6 of RG-34	ed and th may not Pages 3-4 or ds 20%. 8. Pages 3-4	ne solver rerun, be possible. 55 to 3-57 30 to 3-32 & 3-79
If any of the resulting values do no f any of the resulting values still 16. Vegetated Filter Strips There are no calculations required the sheet flow leaving the impervi- cores 50 feet of antrul vegetation if vegetative filter strips are propor 17. Wet Vaults Required First calculate the load removal at C Percent TSS Remove if a bypass occurs at a rainfall inte Calculate the efficiency reduction Actual Rainfall the Fraction of amaliat	Minimum Length = Minimum Length = Volted to the right (blue comments). Design Withh = Design Discharge = Design Discharge = Design Discharge = Design Depth = Flow Velocity = Minimum Length = flow Velocity = Minimum Length = the confinuting drainage area does no mith a maximum aloge of 10%. There = ead for an interim permanent BMP, they Load Removal Based upon Equation 3.3 = 1.1 inhour RG-348 Page 3.30 Equation 3.4: 0 = CIA t = runoff coefficient for the drainage area in area = 0 = flow rate in cubic feet per second = CG-348 Page 3.31 Equation 3.5: Von = CIA CG-348 Page 3.31 Equation 3.1: Von VON VEIVEIVEI CG-348 Page 3.31 Equation 3.1: Von VON VEIVEIVEI CG-348 Page 3.31 Equation 3.1: Von VON VEIVEIVEI CG-348 Page 3.31 Equation 3.1: Von VON VEIVEIVEIVEI CG-348 Page 3.31 Equation 3.1: Von VON VEIVEIVEIVEIVE	168.42 6 1.26 0.33 1.86.048, the ord in RG-348, the	ft ft cfs cfs cfs cfs cfs ft cfs cfs ft cfs cfs ft cfs ft cfs cfs cfs cfs cfs cfs cfs cfs cfs cfs	ameters may he swale bot G-348 of flow) and maximum si long as no s lon Page 3-5 G-348 C = Runoff ec	be modifie tom value ope of 20% lope excee i6 of RG-34	ed and th may not Pages 3-4 or ds 20%. 8. Pages 3-4	ne solver rerun, be possible. 55 to 3-57 30 to 3-32 & 3-79
If any of the resulting values do no ff any of the resulting values do no ff any of the resulting values at 10 16. Vegetated Filter Strips There are no calculations required the 80% emovals is provided when the sheet flow leaving the impervi- cences 50 feet of anitral vegetation if vegetative filter strips are proport 17. Wet Vaults Required First calculate the load removal at C Percent TSS Remove if a bypass occurs at a rainfail inte Calculate the efficiency reduction Actual Rainfail Inte Fraction of rainfail Inte Efficient	Minimum Length = wided to the right (blue comments). Design Width = Design Discharge Nimimum Length = Flow Velocity Minimum Length = flow Velocity In the design requirement set forth on on treet the design requirement set forth on the contribution drainage area in the contribution drainage area in the contribution drainage area in the design requirement set I.1 inshour RG-348 Page 3-30 Equation 3.4: Q = CIA Q = flow rate in cubic feet per second Q = flow rate in cubic feet per second Q = flow rate in cubic feet per second Q = A evertow rate = Cuard Page 3-31 Equation 3.5: Vox = QIA Q = Row rate in cubic feet per second Q = A evertow rate = Cuard Page 3-31 (RG-348 Page 3-31) = Lead removed by Wet Vaut = naity of less than 1.1 inhour For the actual rainfall intensity rate ensity of less than 1.1 inhour	168.42 6 1.26 0.33 1.86.45 1.26 0.49 1.88.40 1.86.348, the order in RG-348, the order in RG-3	ft ft cfs cfs cfs cfs cfs cfs cfs cfs	ameters may he swale bot G-348 of flow) and maximum si long as no s lon Page 3-5 G-348 C = Runoff ec	be modifie tom value ope of 20% lope excee i6 of RG-34	ed and th may not Pages 3-4 or ds 20%. 8. Pages 3-4	ne solver rerun, be possible. 55 to 3-57 30 to 3-32 & 3-79

To solve for bottom width of the trapezoidal swale (b) using the Excel solver: Excel can simultaneously solve the "Design Q" (C211) vs "Manning's Q" (C219) by varying the "Swale Width" (C220). The required "Swale Width" occurs when the "Design Q" = "Manning's Q".

 First, highlight Cell F219 (Error 1 value). The equation showing in the fx screen for Cell F219 should be "= \$C\$217.\$C\$219"

 Then click on "Toole" and "Solver". The "Solver Parameters" screen poos up.

 The value in the "Se Target cell" should be \$F\$219

 "Error 1 ="

 The value in the "By Changing Cells" should be \$C\$220

 "Swale Width"

 Click on solve.

The resulting "Swale Width" must be less than 10 feet to meet the requirements of the TGM. If the resulting "Swale Width" exceeds 10 feet then the design parameters must be revised and the solver run again.

If there is not the option for "Solver" under "Tools" Click on "Tools" and "Add Ins" and then check "Solver Add-in" Then proceed as instructed above.

If you would like to increase the bottom width of the trapezoidal availe (b): Excel can simultaneously solve the "Design Or (C217) vs "Design Discharge" (C232) by varying the "Design Depth" (C233). The required "Design Depth" for a 1940b bottom with occurs when the "Design Of (C217) = the "Design Discharge" (C232).

First set the desired bottom width in Cell C231. Highlight Cell F232. The equation showing in the fx screen for Cell F232 should be "= \$C\$217-\$C\$232"

Click on "Tools" and "Solver". The "Solver Parameters" screen poos up. The value in the "Set Target cell" should be \$F\$232 "Error 2" The value in the "By Changing Cells" should be \$C\$233 "Design Depth" Click on solve.

The resulting "Design Depth" must be equal to or less than 0.33 feet to meet the requirements of the TGM. If the resulting "Design Depth" exceeds 0.33 feet than the design parameters must be revised and the solver run again. First set the desired bottom within to call C23. Highlight Call F232. The equation showing in the fx screen for Call F232 should be "= \$C\$217.4C\$232" Click on "Tools" and "Solver" The "Solver Parameters" screen poor 2. The value in the "Set Target call" should be \$F\$232. The value in the "Set Target call" should be \$F\$232. The value in the "Set Target call" should be \$C\$233. "Design Depth" Click on solve.

19. BMPs Installed in	a Series	Designed as R	Required in RG-348 Pages 3-32
Micha	el E. Barrett, Ph.D., P.E. recommended that the coeffic	cient for E ₂ be	changed from 0.5 to 0.65 on May 3, 2006
1	$E_{TOT} = [1 - ((1 - E_1) \times (1 - 0.65E_2) \times (1 - 0.25E_3))] \times 100 =$	86.38	3 percent NET EFFICIENCY OF THE BMPs IN THE SERIES
	EFFICIENCY OF FIRST BMP IN THE SERIES = E1 =	75.00) percent
EFFI	CIENCY OF THE SECOND BMP IN THE SERIES = E_2 =	70.00) percent
EF	FICIENCY OF THE THIRD BMP IN THE SERIES = $E_3 =$	0.00) percent
	EFORE, THE NET LOAD REMOVAL WOULD BE: D A _P VALUES ARE FROM SECTION 3 ABOVE)		
	$L_R = E_{TOT} \times P \times (A_1 \times 34.6 \times A_p \times 0.54) =$	79.67	7 lbs
20. Stormceptor			
BMPS	Required TSS Removal in BMP Drainage Area= Impervious Cover Overtreatment= TSS Removal for Uncaptured Area =	NA 0.0000 0.00	lbs ac lbs
	Effective Area = Calculated Model Size(s) = tual Model Size (if multiple values provided in Calculated	NA #N/A	EA
	Model Size or if you are choosing a larger model size) =	0	Model Size
	Surface Area =	#N/A	ft ²
	Overflow Rate =	#VALUE!	V _{or}
	Rounded Overflow Rate =	#VALUE!	V _{or}
	BMP Efficiency % =	#VALUE!	%
	L _R Value =	#VALUE!	Ibs
	TSS Load Credit =	#VALUE!	lbs
Is Suf	ficient Treatment Available? (TSS Credit > TSS Uncapt.)	#VALUE!	
	TSS Treatment by BMP (LM + TSS Uncapt.) =	#VALUE!	
21. Vortech		NA	
	Required TSS Removal in BMP Drainage Area= Impervious Cover Overtreatment=	0.0000	lbs ac
	TSS Removal for Uncaptured Area =	0.00	lbs
BMP S		0.00	
	Effective Area = Calculated Model Size(s) =	NA #N/A	EA
	Actual Model Size (if choosing larger model size) =	Vx1000	Pick Model Size
	Surface Area =	7.10	ft ²
	Overflow Rate =	#VALUE!	V _{er}
	Rounded Overflow Rate =	#VALUE!	V _{er}
	BMP Efficiency % =	#VALUE!	%
	L _R Value =	#VALUE!	lbs
	TSS Load Credit =	#VALUE!	lbs
Is Suf	ficient Treatment Available? (TSS Credit > TSS Uncapt.)	#VALUE!	
	TSS Treatment by BMP (LM + TSS Uncapt.) =	#VALUE!	

SS Removal Calculations 04-20-2009					
			Project Name Date Prepared	Pierced Oak RV Park 6/13/2023	
dditional information is provided for cells with a red triangle in				or over the cell.	
ext shown in blue indicate location of instructions in the Technical G haracters shown in red are data entry fields.					
haracters shown in black (Bold) are calculated fields. Change			move the equation		
		from RG-348		Pages 3-27 to 3-30	
Page 3-29 Equation 3.3: L _M =	27.2(A _N x P)				
			ting from the propose rea for the project	d development = 80% of increased load	
P =	Average ann	ual precipitation	, inches		
Site Data: Determine Required Load Removal Based on the Entire Project County =	Comal				
Total project area included in plan * = Predevelopment impervious area within the limits of the plan * =	8.99 0.31	acres acres			
Total post-development impervious area within the limits of the plan* = Total post-development impervious cover fraction * =	3.85 0.43	acres			
P =[33	inches			
$L_{MTOTALPROJECT} = \label{eq:loss}$ The values entered in these fields should be for the total project area.	3177	lbs.			
Number of drainage basins / outfalls areas leaving the plan area =	6				
Drainage Basin Parameters (This information should be provided for eac	h basin):				
Drainage Basin/Outfall Area No. =	LID-PA-2				
Total drainage basin/outfall area = Predevelopment impervious area within drainage basin/outfall area =	1.95 0.21	acres acres			
Post-development impervious area within drainage basin/outfall area = Post-development impervious fraction within drainage basin/outfall area =	1.01 0.52	acres			-55
L _{M THS} BASIN =	718	lbs.			STATES STATES
ndicate the proposed BMP Code for this basin.	Fotos 1.77				STAL
Proposed BMP = Removal efficiency =	Extended D 75	etention percent		Aquelonic Certridae Elitor	/ <u>A</u>
				Aqualogic Cartridge Filter Bioretention Contech StormFilter	B A ?
				Contech StormFlitter Constructed Wetland Extended Detention	
				Grassy Swale Retention / Irrigation	JAMES
				Sand Filter Stormceptor	\& x 10
				Vegetated Filter Strips Vortechs Wet Basin	Cores Lu
Iculate Maximum TSS Load Removed (Le) for this Drainage Basin by th	he soloct- '	BMD Tune		Wet Basin Wet Vault	
			46+4-054		- CILLING
RG-348 Page 3-33 Equation 3.7: $L_{\rm R}$ = where: $$A_{\rm C}$$ =			4.6 + A _P x 0.54) in the BMP catchmer	t area	A COL
A ₁ =	Impervious a	area proposed in	the BMP catchment	area	Ilan
			ne BMP catchment a catchment area by t		UC//H
A _C =	1.95	acres			/ 6
A _i = A _i p	1.01 0.94	acres			v
L _R =	877	lbs			
alculate Fraction of Annual Runoff to Treat the drainage basin / outfall a					
Desired L _{M THS BASIN} =	718	lbs.			
F = alculate Capture Volume required by the BMP Type for this drainage ba	0.82 sin / outfall :	area.	Calculations from R	3-348 Pages 3-34 to 3-36	
	outian		- around the indiff R	Line Cages Show to 3h30	
Rainfall Depth = Post Development Runoff Coefficient =	1.16 0.37	inches			
On-site Water Quality Volume =	3018	cubic feet			
	Calculations	from RG-348	Pages 3-36 to 3-37		
Off-site area draining to BMP = Off-site Impervious cover draining to BMP =	0.00	acres			
Impervious fraction of off-site area =	0.00	acres			
Off-site Runoff Coofficient =		cubic feet			
Off-site Runoff Coefficient = Off-site Water Quality Volume =	0	Cubic leet			
Off-site Water Quality Volume = Storage for Sediment =	0 604	cubic feet			
Off-site Water Quality Volume = Storage for Sediment = Total Capture Volume (required water quality volume(s) x 1.20) =	0 604 3622				
Off-site Water Quality Volume = Storage for Sediment = Total Capture Volume (required water quality volume(s) 1: 1.0) = Iollowing socions are used to calculate the required water quality volu values for BMP Types not selected in cell C45 will show NA. tention/Irrigation System	0 604 3622 Ime(s) for th Designed as	cubic feet e selected BMF Required in RG		Pages 3-42 to 3-46	
Off-site Water Quality Volume = Storage for Sediment = Total Capture Volume (reguired water quality volume() a 1.20 = following sections are used to calculate the reguired water quality volu values for MBP Types not selected in cell C45 will show NA. etention/Irrigation System Required Water Quality Volume for retention basin =	0 604 3622 ume(s) for th	cubic feet e selected BMF		Pages 3-42 to 3-46	
Off-site Water Quality Volume = Storage for Sediment = Total Capture Volume (required water quality volume() s.t.0) = following sections are used to calculate the required water quality volu- values for IBMP Types not selected in cell C45 will show NA. Required Water Quality Volume for retention basin = Irrigation Area Calculations:	0 604 3622 ume(s) for th Designed as NA	cubic feet e selected BMF Required in RG cubic feet	-348		
Off-site Water Quality Volume = Storage for Sediment = Total Capture Volume (reguired water quality volume() a 1.20 = following sections are used to calculate the reguired water quality volu values for MBP Types not selected in cell C45 will show NA. etention/Irrigation System Required Water Quality Volume for retention basin =	0 604 3622 Ime(s) for th Designed as NA 0.1 NA	cubic feet le selected BMF Required in RG cubic feet in/hr square feet	-348	Pages 3-42 to 3-46 ermeability rate or assumed value of 0.1	
Off-site Water Quality Volume = Storage for Sediment = following sections are used to calculate the required water quality volume(s) at 2.0 = following for MP types not selected in cell C4S will show NA. etention/Irrigation System Required Water Quality Volume for retention basin = Irrigation Area Calculations: Soli Infiltration/permeability rate =	0 604 3622 ume(s) for th Designed as NA 0.1	cubic feet e selected BMP Required in RG cubic feet in/hr	-348		
Off-site Water Quality Volume = Storage for Sediment = Total Capture Volume (required water quality volume(s) st.20 = following sections are used to calculate the required water quality volu- tention/firigation system Required Water Quality Volume for retention basin = Irrigation Area Calculations: Soil infiltration/permeability rate = Irrigation area =	0 604 3622 ime(s) for th Designed as 0.1 NA NA Designed as	cubic feet le selected BMF Required in RG cubic feet in/hr square feet	-348 Enter determined p		
Off-site Water Quality Volume = Storage for Sediment = Total Capture Volume (required water quality volume() s 1.20 = olfowing sections are used to calculate the required water quality volu also for BMP / report setsetced in cell C45 will show NA. Lention/Irrigation System Required Water Quality Volume for retention basin = Irrigation Area Calculations: Soli Infiltration/permeability rate = Irrigation area =	0 604 3622 ime(s) for th Designed as 0.1 NA NA Designed as	cubic feet le selected BMF Required in RG cubic feet in/hr square feet acres	-348 Enter determined p	armeability rate or assumed value of 0.1	
Off-site Water Quality Volume = Storage for Sediment = Storage for Sediment = Total Capture Volume (required water quality volume() s 1.20 = olfowing sections are used to calculate the required water quality volumes for HBP/repsent selected in cell C4S will show NA. tention/trigation System Required Water Quality Volume for retention basin = Irrigation area = tended Detention Basin System Required Water Quality Volume for extended detention basin =	0 604 3622 ime(s) for th Designed as NA 0.1 NA NA Designed as 3622	cubic feet e selected BMF Required in RG cubic feet in/hr square feet acres	-348 Enter determined p -348	armeability rate or assumed value of 0.1	
Off-site Water Quality Volume = Storage for Sediment = Storage for Sediment = Total Capture Volume (required water quality volume(s) st.20 = following sections are used to calculate the required water quality volumes for HMP Types not selected in cell C4S will show NA. tention/Irrigation System Required Water Quality Volume for retention basin = Irrigation area = tended Detention Basin System Required Water Quality Volume for extended detention basin =	0 604 3622 ime(s) for th Designed as NA 0.1 NA NA Designed as 3622	cubic feet e selected BMF Required in RG cubic feet in/hr square feet acres Required in RG cubic feet	-348 Enter determined p -348	ermeability rate or assumed value of 0.1 Pages 3-46 to 3-51	
Off-site Water Quality Volume = Storage for Sediment = Total Capture Volume (required water quality working) st.2.09 = following sectors are used to calculate the required water quality volume tention/ingation System Required Water Quality Volume for retention basin = Irrigation Area Calculations: Soll Infiltration/permeability rate = Irrigation area = dended Detention Basin System Required Water Quality Volume for extended detention basin = Iter area for Sand Filters	0 604 3622 ime(s) for th Designed as NA 0.1 NA NA Designed as 3622	cubic feet e selected BMF Required in RG cubic feet in/hr square feet acres Required in RG cubic feet	-348 Enter determined p -348	ermeability rate or assumed value of 0.1 Pages 3-46 to 3-51	
Off-site Water Quality Volume = Storage for Sediment = Total Capture Volume (required water quality volume)s 12.30 = following sections are used to calculate the required water quality volume)s 12.40 = tention(rigation System) Required Water Quality Volume for retention basin = Irrigation Area Calculations: Soil infiltration/permeability rate = Irrigation area = tended Detention Basin System Required Water Quality Volume for extended detention basin = ter area for Sand Filters 9A. Full Sedimentation and Filtration System	0 604 3622 mme(s) for th Designed as NA 0.1 NA NA Designed as 3622 Designed as	cubic feet e selected BMF Required in RG cubic feet in/hr square feet acres Required in RG cubic feet Required in RG	-348 Enter determined p -348	ermeability rate or assumed value of 0.1 Pages 3-46 to 3-51	
Off-site Water Quality Volume = Storage for Sediment = Total Capture Volume (required water quality doutines) s 1.20 = following sections are used to calculate the required water quality volume() s 1.20 = following sections are used to calculate the required water quality volume() s 1.20 = Intrigation Area Calculations: Soil infitration/permeability rate = Irrigation Area Calculations: Soil infitration/permeability rate = Irrigation area = Extended Detention Basin System Required Water Quality Volume for extended detention basin = iiter area for Sand Filters Water Quality Volume for admentation basin = Marinum filter basin area =	0 604 3622 Ime(s) for th Designed as 0.1 NA NA Designed as 3622 Designed as NA NA	cubic feet e selected BMF Required in RG cubic feet acres Required in RG cubic feet Required in RG cubic feet cubic feet square feet square feet	-348 Enter determined p -348 -348	rmeability rate or assumed value of 0.1 Pages 3-46 to 3-51 Pages 3-58 to 3-63 depth of 2 feet	
Off-site Water Quality Volume = Storage for Sediment = Storage for Sediment = Total Capture Volume (required water quality volume(s) st.20) = following sections are used to calculate the required water quality volume(s) st.20) = Required Water Quality Volume for retention basin = Irrigation Area Calculations: Soil Infiltration/permeability rate = Irrigation Basin System Required Water Quality Volume for extended detention basin = Irrigation and Filters SA Full Sedimentation and Filtration System Water Quality Volume for extended detention basin = Irrigation area = Irrigation and Filters A Full Sedimentation and Filtration System Mater Quality Volume for sedimentation basin = Irrigation area = Irrigation System Required Water Quality Volume for sedimentation basin = Irrigation area = Irrigation System Required Water Quality Volume for sedimentation basin = Irrigation area = Irrigation System Required Water Quality Volume for sedimentation basin = Irrigation area = Irrigation System Required Water Quality Volume for sedimentation basin = Irrigation System Required Water Quality Volume for sedimentation basin = Irrigation System Required Water Quality Volume for sedimentation basin = Irrigation System Required Water Quality Volume for sedimentation basin = Irrigation System Required Water Quality Volume for sedimentation basin = Irrigation System Required Water Quality Volume for sedimentation basin = Irrigation System Required Water Quality Volume for sedimentation basin = Irrigation System Required Water Quality Volume for sedimentation basin = Irrigation System Required Water Quality Volume for sedimentation basin = Irrigation System Required Water Quality Volume for sedimentation basin = Irrigation System Required Water Quality Volume for sedimentation basin = Irrigation System Required Water Quality Volume for sedimentation basin = Irrigation System Required Water Quality Volume for sedimentation basin = Irrigation System Required Water Quality Volume for sedimentation basin = Irrigation System Required Water	0 604 3622 ame(s) for th Designed as NA 0.1 NA NA Designed as 3622 Designed as NA NA	cubic feet e selected BMF Required in RG cubic feet acres Required in RG cubic feet Required in RG cubic feet cubic feet square feet square feet	-348 Enter determined p -348 -348	rmeability rate or assumed value of 0.1 Pages 3-46 to 3-51 Pages 3-58 to 3-63 depth of 2 feet	
Off-site Water Quality Volume = Storage for Seedings following sectors are used to calculate the required water quality volume(s) st.20) = following sectors are used to calculate the required water quality volume(s) st.20) = following sectors are used to calculate the required water quality volume(s) st.20) = following sectors are used to calculate the required water quality volume for retention basis = intraction Area Calculation: Soli infitration/permeability rate = Irrigation area Calculations: Method Detention Basin System Required Water Quality Volume for extended detention basis = itter area for Sand Filters Mater Quality Volume for extended detention basis = Maximum sedmentation basis area = Maximum sedmentation basis area =	0 604 3622 Imme(s) for th Designed as 0.1 NA NA Designed as 3622 Designed as NA NA NA	cubic feet e selected BMF Required in RG cubic feet souare feet acres Required in RG cubic feet Required in RG cubic feet square feet square feet	-348 Enter determined p -348 -348	rmeability rate or assumed value of 0.1 Pages 3-46 to 3-51 Pages 3-58 to 3-63 depth of 2 feet	
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Off-site Water Quality Volume = Storage for Sedment = Storage for	0 604 3622 Intre(s) for th Designed as 0.1 NA NA 3622 Designed as NA NA NA NA NA	cubic feet e selected BMF Required in RG cubic feet acres Required in RG cubic feet cubic feet square feet square feet cubic feet square feet	-348 Enter determined p -348 -348 For minimum water	rmeability rate or assumed value of 0.1 Pages 3-46 to 3-51 Pages 3-58 to 3-63 depth of 2 feet depth of 8 feet	
Off-site Water Quality Volume = Storage for Sedment = Storage for Sedment = Storage for Sedment = storage for Sedment = to following sections are used to calculate the required water quality volume() st.20 = 1 for Sedment = Storage for Sedment = Indication Area Calculations = Sed infiltration/permeability rate = Indication Area Calculations = Sed infiltration Area Calculations = Sed infiltration Area Calculation = Sed infiltration and Filtration Area Calculation = Sed infiltration = Sed	0 604 3622 Imme(s) for th Designed as 3622 Designed as NA NA NA NA	cubic feet e selected BMF Required in RG cubic feet inftr souare feet acres Required in RG cubic feet Required in RG cubic feet square feet square feet square feet square feet square feet	-348 Enter determined p -348 -348	rmeability rate or assumed value of 0.1 Pages 3-46 to 3-51 Pages 3-56 to 3-63 depth of 2 feet depth of 2 feet	
Cif-site Water Quality Volume = Storage for Sediment = Storage for S	0 664 3522 3522 NA 0.1 NA 0.1 NA Designed as 3522 Designed as 3522 Designed as NA NA NA NA NA	cubic feet = selected BMF Required in RG cubic feet infly square feet square feet square feet square feet square feet square feet square feet	-348 Enter determined p -348 -348 For minimum water For maximum water For minimum water	ermeability rate or assumed value of 0.1 Pages 3-46 to 3-51 Pages 3-58 to 3-63 depth of 2 feet depth of 2 feet depth of 2 feet	
Off-site Water Cuality Volume i Storage for Sediment = Total Capture Volume (required water quality volume(s) x 120 = Storage for Sediment = Required Water Quality Volume for retention basin = Irritgation Areas Calculations: ended Detention Basin System Required Water Quality Volume for extended detention basin = Irritgation area = ended Detention Basin System Required Water Quality Volume for sedemded detention basin = er area for Sand Filters 9.4. Full Sedimentation and Filtration System Maximum sedimentation basin area = Minimum sedimentation basin area = Minimum sedimentation basin area = Maximum sedimentation basin area = Minimum Sedimentation basi	0 664 3522 3522 NA 0.1 NA 0.1 NA Designed as 3522 Designed as 3522 Designed as NA NA NA NA NA	cubic feet e selected BMF Required in RG cubic feet inftr souare feet acres Required in RG cubic feet Required in RG cubic feet square feet square feet square feet square feet square feet	-348 Enter determined p -348 -348 For minimum water For maximum water For minimum water	rmeability rate or assumed value of 0.1 Pages 3-46 to 3-51 Pages 3-56 to 3-63 depth of 2 feet depth of 2 feet	

1. Wet Basins Required capacity of Permanent Pool = Required capacity at WQV Elevation = 2. Constructed Wetlands Required Water Quality Volume for Constructed Wetlands 3. AquaLogic ¹⁴ Cartridge System 2005 Technical Guidance Manual (RG-348) does not exempt the require Required Sedimentation chamber capacity Filter capacity Filter capacity Filter bain area (RIA _V) 4. Stormwater Management StormFilter® by CONTECH	 NA Designed as F NA Designed as F ad 20% increase NA 	cubic feet cubic feet Required in R(cubic feet Required in R(Permanen Total Capi plus a sec G-348	t Pool Capa acity should cond WQV.	ages 3-66 to 3-7 city is 1.20 time be the Perman ages 3-71 to 3-7	s the WQV ent Pool Capacity
Required capacity at WQV Elevation = 2. Constructed Wetlands Required Water Quality Volume for Constructed Wetlands 3. AquaLogic ^{Ter} Cartridge System 2005 Technical Guidance Manusi (RG-345) does not exempt the require Required Sedimentation chamber capacity Filter canister (Fo) to test WQV Filter basin area (RIA ₂)	 NA Designed as F NA Designed as F ad 20% increase NA 	cubic feet Required in R(cubic feet Required in R(Total Capa plus a sec G-348	acity should ond WQV.	be the Perman	ent Pool Capacity
Required Water Quality Volume for Constructed Wetlands 3. AquaLogic ¹⁶ Cartridge System 2005 Technical Guidance Manual (RG-348) does not exempt the required Required Sedimentation chamber cassoly Filter canister (Fo) to test 4000 Filter basin area (RiAy)	 NA Designed as F 20% increase NA 	cubic feet Required in R(G-348		ages 3-71 to 3-7	'3
Required Water Quality Volume for Constructed Wetlands 3. AquaLogic ¹⁶ Cartridge System 2005 Technical Guidance Manual (RG-348) does not exempt the required Required Sedimentation chamber cassoly Filter canister (Fo) to test 4000 Filter basin area (RiAy)	 NA Designed as F 20% increase NA 	cubic feet Required in R(ages 3-71 to 3-7	3
3. AquaLogic ¹⁸ Cartridge System 2005 Technical Guidance Manual (RG-345) does not exempt the require Required Sedimentation chamber capacity Filter canistes (FCs) to text 4000 Filter basin area (RIA ₂)	Designed as F ed 20% increase = NA	Required in RO				
2005 Technical Guidance Manual (RG-345) does not exempt the required Required Sedimentation chamber capacity Filter canistes (FCs) to treat VCU Filter basin area (RU _v)	ed 20% increase					
2005 Technical Guidance Manual (RG-345) does not exempt the required Required Sedimentation chamber capacity Filter canistes (FCs) to treat VCU Filter basin area (RU _v)	= NA		G-348	P	ages 3-74 to 3-7	′ 8
Filter canisters (FCs) to treat WQV Filter basin area (RIA ₈)	= NA	with mainter	nance cont			
Filter basin area (RIA _F)		cubic feet				
4. Stormwater Management StormFilter® by CONTECH	= NA = NA	cartridges square feet				
Required Water Quality Volume for Contech StormFilter System	= NA	cubic feet				
HE SIZING REQUIREMENTS FOR THE FOLLOWING BMPs / LOAD REMO	VALS ARE BAS		OW RATES	NOT CALC		
5. Grassy Swales	Designed as F				ages 3-51 to 3-5	
Design parameters for the swale:						
Drainage Area to be Treated by the Swale = A : Impervious Cover in Drainage Area : Rainfall intensity = i :	= 0.20	acres acres in/hr				
Swale Slope (2): Side Slope (2):	= 0.025	ft/ft				
Design Water Depth = y Weighted Runoff Coefficient = C	= 0.33	ft				
	- 0.40	,				
A _{CS} = cross-sectional area of flow in Swale : P _w = Wetted Perimeter :	= 0.52 = 3.29					
R _H = hydraulic radius of flow cross-section = A _{CS} /P _W	= 0.16	5 feet				
n = Manning's roughness coefficient : SA. Using the Method Described in the RG-348	- 0.2					
Manning's Equation: Q = <u>1.49</u> A _{CS} R _H ²³ S ⁰ n	5					
$b = 0.134 \times Q$ $y^{157} S^{0.5}$ - zy	= -0.08	8 feet				
v S Q = CIA	= 0.29					
o calculate the flow velocity in the swale:	= 0.29	CIS				
V (Velocity of Flow in the swale) = Q/A_{Cs} :	= 0.54	ft/sec				
o calculate the resulting swale length:	- 0.00	10000				
L = Minimum Swale Length = V (ft/sec) * 300 (sec) :	= 168.42	foot				
If any of the resulting values do not meet the design requireme						
Design Q = CIA Manning's Equation Q: Swale Width	= 1.24	cfs		Error 1 =	-0.95	
Swale Widu	- 6.00	n n				
Instructions are provided to the right (green comments).						
Flow Velocit						
Minimum Length : Instructions are provided to the right (blue comments).	= 168.42	π				
Instructions are provided to the right (blue comments). Design Width	- 4	ft				
Design Widti - Design Discharge - Design Denth	= 1.26	6 cfs		Error 2 =	-0.97	
Flow Velocity Minimum Length	= 0.49) cfs				
any of the resulting values do not meet the design requirement set forth			ameters ma	v be modifie	d and the solve	r rerun.
f any of the resulting values still do not meet the design requirement set	forth in RG-348	, widening th	he swale bo	ttom value r	nay not be pos	sible.
6. Vegetated Filter Strips	Designed as F		G-348	P	ages 3-55 to 3-5	7
here are no calculations required for determining the load or size of veg he 80% removal is provided when the contributing drainage area does n he short flow leaving the importance source is directed access 15 fort of			of flow) and	d		
cross 50 feet of natural vegetation with a maximum slope of 10%. There	can be a break	in grade as l	long as no	slope exceed	is 20%.	
vegetative filter strips are proposed for an interim permanent BMP, they	y may be sized a	is described	on Page 3-	56 of RG-348	3.	
7. Wet Vaults	Designed as F	Required in R/	G-348	Р	ages 3-30 to 3-3	12 & 3-79
Required Load Removal Based upon Equation 3.3	= NA	lbs				
irst calculate the load removal at 1.1 in/hour						
RG-348 Page 3-30 Equation 3.4: Q = Ciu	A					
C = runoff coefficient for the drainage area i = design rainfall intensity	= 1.1	in/hour	C = Runof	f Coefficient	= 0.546 (IC) ² +	0.328 (IC) + 0.03
A = drainage area in acres	= 1	acres				
Q = flow rate in cubic feet per second :		cubic feet/s	ec			
	A					
RG-348 Page 3-31 Equation 3.5: Vor = Q/		3 cubic feet/s				
		s cubic feet/s square feet				
RG-348 Page 3-31 Equation 3.5: V _{OR} = Q/ Q = Runoff rate calculated above	= 150					
RG-348 Page 3-31 Equation 3.5: V _{GR} = Q/ Q = Runoff rate calculated above A = Water surface area in the wet vault	= 150 = 0.00) square feet				
RG-348 Page 3-31 Equation 3.5: Von; = Q/, Q = Runoff rate calculated above A = Water surface area in the wet vault Von; = Overflow Rate	= 150 = 0.00 = 53) square feet) feet/sec 8 percent				
RG-348 Page 3-31 Equation 3.5: Vor, = O/, Q = Runoff rate calculated above A = Water surface area in the vet vault Vor, = Overflow Rate Percent TSS Removal from Figure 3-1 (RG-348 Page 3-31) Load removed by Wet Vault 'a bypass occurs at a rainfall intensity of fees than 1.1 inhours	= 150 = 0.00 = 53) square feet) feet/sec 8 percent				
RG-348 Page 3-31 Equation 3.5: Vois = Q/, Q = Runoff rate calculated above: A = Water surface area in the vet vault: Vois = Overflow Rate Percent TSS Removal from Filoares -11 (RG-348 Page 3-31) Load removed by Wet Vault to bypass occurs at a rainfall intensity of test than -11 inhours alculate the efficiency reduction for the actual rainfall intensity rate	= 150 = 0.00 = 53 = #VALUE!) square feet) feet/sec) percent Ibs				
RG-348 Page 3-31 Equation 3.5: Vor, = Q/, Q = Runoff rate calculated above: A = Water surface area in the vet vault: Vor, = Overflow Rate: Percent TSS Removal from Figure 3-1 (RG-348 Page 3-31) Load removed by Wet Vault to bypass occurs at a rainfall intensity of less than 4.1 informar alculate the efficiency reduction for the actual rainfall intensity rate Actual Rainfall Intensity at which Wet Vault bypass Occurs	= 150 = 0.00 = 53 = #VALUE! = 0.5	 square feet feet/sec percent lbs in/hour 				
RG-348 Page 3-31 Equation 3.5: Vor, = Q/, Q = Runoff rate calculated above: A = Water surface area in the vet vault Vor, = Overflow Rate Percent TSS Removal from Figure 3-1 (RG-348 Page 3-31): Load removed by Wet Vault a bypass occurs at a rainfall intensity of less than 1.1 inhours factulate the efficiency reduction for the actual rainfall intensity rate Actual Rainfall Intensity at which Wet Vault bypass Occurs Fraction of rainfall reduct for Figure 3-2 RG-348 Page 3-2 Efficiency Reduction for Actual Rainfall Intensity	= 150 = 0.00 = 53 = #VALUE! = 0.5 = 0.75 = 0.83	 square feet feet/sec percent lbs in/hour percent percent 				
RG-348 Page 3-31 Equation 3.5: Von = Q/. Q = Runoff rate calculated above: A = Water surface area in the wet vault: Von = Overflow Rate Percent TSS Removal from Figure 3-11 (RG-348 Page 3-31) Load removed by Wet Vault a bygaes occurs at a rainfail intensity of less than 1.1 inflours alculate the efficiency reduction for the accual rainfail intensity rate Actual Rainfail Intensity at which Wet Vault bygaes Occurs Fraction of rainfail trade from Figure 3-26 RG-349 Reg 3-32	= 150 = 0.00 = 53 = #VALUE! = 0.5 = 0.75 = 0.83	 square feet feet/sec percent lbs in/hour percent percent 				

To solve for bottom width of the trapezoidal swale (b) using the Excel solver: Excel can simultaneously solve the "Design Q" (C211) vs "Manning's Q" (C219) by varying the "Swale Width" (C220). The required "Swale Width" occurs when the "Design Q" = "Manning's Q".

 First, highlight Cell F219 (Error 1 value). The equation showing in the fx screen for Cell F219 should be "= \$C\$217.\$C\$219"

 Then click on "Toole" and "Solver". The "Solver Parameters" screen poos up.

 The value in the "Se Target cell" should be \$F\$219

 "Error 1 ="

 The value in the "By Changing Cells" should be \$C\$220

 "Swale Width"

 Click on solve.

The resulting "Swale Width" must be less than 10 feet to meet the requirements of the TGM. If the resulting "Swale Width" exceeds 10 feet then the design parameters must be revised and the solver run again.

If there is not the option for "Solver" under "Tools" Click on "Tools" and "Add Ins" and then check "Solver Add-in" Then proceed as instructed above.

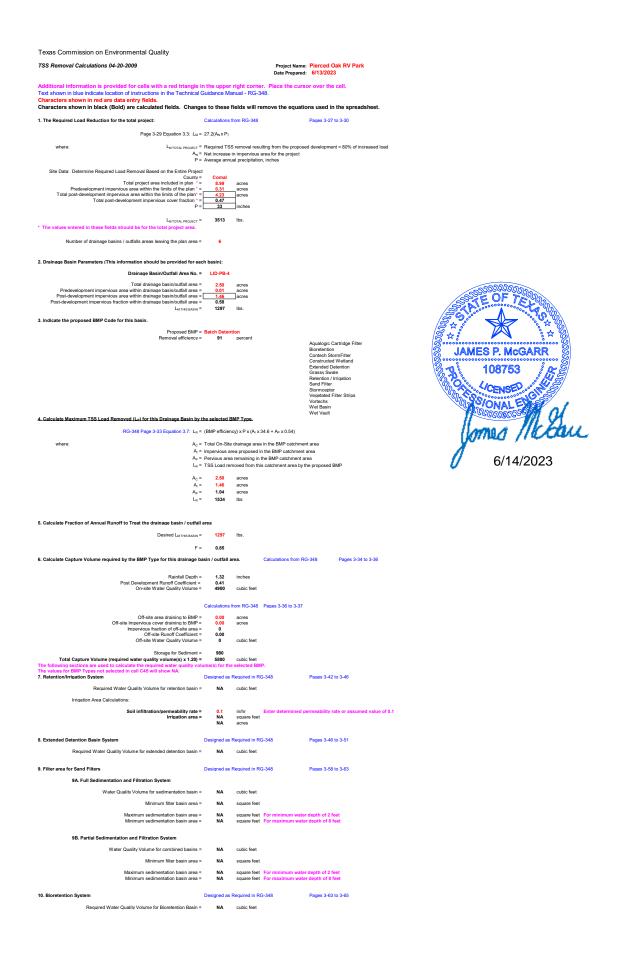
If you would like to increase the bottom width of the trapezoidal availe (b): Excel can simultaneously solve the "Design Or (C217) vs "Design Discharge" (C232) by varying the "Design Depth" (C233). The required "Design Depth" for a 1940b bottom with occurs when the "Design Of (C217) = the "Design Discharge" (C232).

First set the desired bottom width in Cell C231. Highlight Cell F232. The equation showing in the fx screen for Cell F232 should be "= \$C\$217-\$C\$232"

Click on "Tools" and "Solver". The "Solver Parameters" screen poos up. The value in the "Set Target cell" should be \$F\$232 "Error 2" The value in the "By Changing Cells" should be \$C\$233 "Design Depth" Click on solve.

The resulting "Design Depth" must be equal to or less than 0.33 feet to meet the requirements of the TGM. If the resulting "Design Depth" exceeds 0.33 feet than the design parameters must be revised and the solver run again. First set the desired bottom within to call C23. Highlight Call F232. The equation showing in the fx screen for Call F232 should be "= \$C\$217.4C\$232" Click on "Tools" and "Solver" The "Solver Parameters" screen poor 2. The value in the "Set Target call" should be \$F\$232. The value in the "Set Target call" should be \$F\$232. The value in the "Set Target call" should be \$C\$233. "Design Depth" Click on solve.

19. BMPs Installed in a Series	Designed as F	Required in RG-348		Pages 3-32	
Michael E. Barrett, Ph.D., P.E. recommended that the coeff	ficient for E ₂ be	changed from 0.5 to	0.65 on May 3	, 2006	
$E_{TOT} = [1 - ((1 - E_1) X (1 - 0.65E_2) x (1 - 0.25E_3))] X 100 =$	= 86.38	8 percent NET EF	FICIENCY OF	THE BMPs IN THE SERIE	s
EFFICIENCY OF FIRST BMP IN THE SERIES = E ₁ :	75.00	percent			
EFFICIENCY OF THE SECOND BMP IN THE SERIES = E2	70.00	percent			
EFFICIENCY OF THE THIRD BMP IN THE SERIES = E_3 :	= 0.00	percent			
THEREFORE, THE NET LOAD REMOVAL WOULD BE: (A ₁ AND A _P VALUES ARE FROM SECTION 3 ABOVE)					
L _R = E _{TOT} X P X (A ₁ X 34.6 X A _P X0.54) =	= 1010.56	bs			
20. Stormceptor					
Required TSS Removal in BMP Drainage Areas Impervious Cover Overtreatment		lbs ac			
TSS Removal for Uncaptured Area		lbs			
BMP Sizing Effective Area :	= NA	FA			
Calculated Model Size(s) :		EA			
Actual Model Size (if multiple values provided in Calculate					
Model Size or if you are choosing a larger model size)	- 0	Model Size			
Surface Area :	= #N/A	ft ²			
Overflow Rate :		Vor			
Rounded Overflow Rate :		V _{or}			
BMP Efficiency % =		%			
L _R Value :	= #VALUE!	Ibs			
TSS Load Credit	= #VALUE!	lbs			
Is Sufficient Treatment Available? (TSS Credit > TSS Uncapt.) #VALUE!				
TSS Treatment by BMP (LM + TSS Uncapt.) =	= #VALUE!				
21. Vortech					
Required TSS Removal in BMP Drainage Areas Impervious Cover Overtreatment		lbs			
TSS Removal for Uncaptured Area		lbs			
BMP Sizing					
Effective Area : Calculated Model Size(s) :		EA			
Actual Model Size (if choosing larger model size)	Vx1000	Pick Model Size			
Surface Area :	= 7.10	ft ²			
Overflow Rate :	= #VALUE!	Vor			
Rounded Overflow Rate :		V _{or}			
BMP Efficiency % =		%			
L _R Value :	= #VALUE!	Ibs			
TSS Load Credit	= #VALUE!	lbs			
Is Sufficient Treatment Available? (TSS Credit > TSS Uncapt.) #VALUE!				
TSS Treatment by BMP (LM + TSS Uncapt.) =	= #VALUE!				



<text>Note of the second s</text>	Note of the second se							
Name of a set of the second set of the second secon	Name of a constraint of the second	11. Wet Basins		Designed as R	equired in RO	3-348	Pages	3-66 to 3-71
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Automa and the second	<pre>read a control of the second sec</pre>							
Anyone" on the second secon	Apage and you have a part of the part	12. Constructed Wetlands		Designed as R	equired in RO	3-348	Pages	3-71 to 3-73
<form>Provide a constraint of a con</form>	Provide a constraint of the second	Required Water Quality Volume for	Constructed Wetlands =	NA	cubic feet			
<form>Provide a constraint of a con</form>	Provide a constraint of the second			Designed on D		2.240	D	0.74 - 0.70
<form><pre>Market market make and the mathematical market and the mathematical market make and the mathematical market market</pre></form>	<form>Network of the second secon</form>							
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A control with a co	A calculation of the second control of the second	Filter caniste	rs (FCs) to treat WQV =	NA	cartridges			
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 Automa de la construcción de la construcci	<pre> def de la de</pre>							
	Automatical and a problem a			Designed as R	equired in RC	3-348	Pages	3-51 to 3-54
	<text></text>	Design parameters for the swale.						
<form><pre>Remain and a set of a se</pre></form>	<text></text>	Drainage Area to be Tre Impervious C	ated by the Swale = A = Cover in Drainage Area =	0.55	acres			
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<text></text>	<text><text><text><text><text><text></text></text></text></text></text></text>	D	esign Water Depth = y =	0.33	ft			
	<complex-block>$\begin{aligned} \begin{array}{ccccccccccccccccccccccccccccccccccc$</complex-block>	Weighted	Runoff Coefficient = C =	0.48				
R ₁₁ R_111 R_111 R_111 R_111 R_111 R_111 R_111 <t< td=""><td><form> An a matrix and mark and m</form></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>	<form> An a matrix and mark and m</form>							
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	<text></text>	15A. Using the Method Described in the RG-348						
	<equation-block></equation-block>							
	y = y = 1 $y = 1$ $y = y = 1$ $y = 1$ <td></td> <td>n</td> <td></td> <td></td> <td></td> <td></td> <td></td>		n					
المعالية المعا	μ° μ° μ°Q = Q +Q + Q +A = Q +Q +		h = 0.134 x Q _ zv =	-0.08	feet			
A classifierClassif	A classed we want we w	,	y ¹⁸⁷ S ^{0.5}					
L (uiquid plan in a wale) = Que a isJ = Jamma Sama Langel = U (Uiquid plan in a sector			Q = CiA =	0.29	cfs			
A classifier of the second s	<text><text><text><text><text></text></text></text></text></text>							
L l min mi Sud L min de la min	<text><text></text></text>		v in the swale) = Q/A _{CS} =	0.56	ft/sec			
the variable and under the design requirement and the find a QL and a quant of the variable and the variable	<text><section-header></section-header></text>	To calculate the resulting swale length:						
19. Attenues tested between testes between tested	<section-header> 19. Jennes without submit submit</section-header>	L = Minimum Swale Length :	= V (ft/sec) * 300 (sec) =	168.42	feet			
neigh q = Q = 1 	Ling and a feat of a did didErr s	If any of the resulting values do not me	et the design requiremen	t set forth in RG	-348, the des	sign parameters	must be modi	fied and the solver rerun.
Figure 2015 10.58 12 15 Human Lands 10.58 12 15 Junce 1000 10.50 12 10 10 10 10 10 10 10 10 10 10 10 10 10	End of the second sec		Manning's Equation Q =	1.24	cfs	En	or 1 =	-0.95
Figure 2015 10.58 12 15 Human Lands 10.58 12 15 Junce 1000 10.50 12 10 10 10 10 10 10 10 10 10 10 10 10 10	End of the second sec	Instructions are provided to the righ	t (groop commonts)					
Minimu Length = 188.2 ft Instructions are provided to the right (blue communit). Design begins = 1.26 of the security of the security of the security = -0.97 Design begins = 0.03 ft Flow Velocity = 0.040 of the security of the security = -0.97 Provided to the resulting values at the design requirement at forth in RG-348, to design assemblers may be noted that of a bove result. 14 any of the resulting values at the design requirement at forth in RG-348, to design assemblers may be noted that the solver result are of the resulting values at the design requirement at forth in RG-348, to design assemblers may be noted that the solver result are of the security values at the design requirement at forth in RG-348, to design assemblers may be noted that the solver result are of the security values at the design requirement at forth in RG-348, to design assemblers may be noted that the solver result are of the security values at the design requirement at forth in RG-348, to design assemblers may be noted that at the one solution. 14 Available values at the design requirement at forth in RG-348, to design assemblers may be noted that at the solution result are one solution. 15 Available the solution resulted for determining the load or size of values are long and to solve or core of the design requirement are the solve result in grades as long as not solve exceeds 20%. 14 Available the solution result at a maximum slope of 10%. There are no a described on Page 3-580 ft RG-348. 15 Available the bad removal at 1.1 inhour 16 Are dating area in a describe the description with an area in a forth the dating area is on a not solve preceded in the solve result is a result in and the solve result is a result in the value at its indice description in the value at its indice description in the result is a result in and the solve result is a result	Minimu Length = 168.2 ft Instructions are provided to the right (blue comments). Design Design Design Design Comments - 120 cm Design Design Design Design Comments - 120 cm Design Design Design Design Comments - 120 cm Providently - 120		(green comments).					
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Design Depth 0.33 ft Minimum Longin 0.33 ft Velk 40 ft If any of the resulting values do not meet the design requirements set forth in RG-348, widening the swale bottom value may not be possible. Resulting values still do not meet the design requirements set forth in RG-348, widening the swale bottom value may not be possible. 16. Vector Strip Designed as Required in RG-348. Pages 3-55 to 3-57 There are not calculations requirements the forth in RG-348, widening the swale bottom value may not be possible. Pages 3-55 to 3-57 There are not calculations requirement the contributing drainage area does not acced 372 feet (direction of flow) and the setting with an maximum slope of 19%. There can be a break in grade as long at no slope areads 20%. If vegetation with a maximum slope of 19%. There can be a break in grade as long at no slope areads 20%. 17. We duals Designed as Required in RG-348 Pages 3-30 to 3-32 & 3.79 16. Required Load Removal Based upon Equation 3.3 = NA Ib First calculate the load removal 1.1 informage area in a care in it acces 1.1 inform 16. Ge unoff coefficient for the drainage area in a calculated above in it weet wale in the weet wale	Description Description 203 ft How Velocity 0.03 ft 0.03 ft How resulting values do not meet the design requirement set forth in RG-348, the design parameters must be word be not meet the design requirement set forth in RG-348, the design parameters must be word be not meet the design requirement set forth in RG-348, the design parameters must be word be not meet the design requirement set forth in RG-348, the design parameters must be modified and the solver remu. 16. Vectored Filter Stription Design das Required in RG-348, the design requirement set forth in RG-348, the design as not stope or codes 200. There are no calculation required in the bad or size of vecetative filter stription. The design das required in RG-348, the design as not stope or codes 200. 17. Vectored filter strips are proposed for an interim permanent BMP, they must be sized as described on Page 3-36 to 3-32 & 3-37 Required Load Removel Based upon Equation 3.1 Ma Des First calculation for determining the dealing area described on Required in RG-348, the dealing area in a result in interim permanent BMP, they must be sized as described on Fage 3-30 to 3-32 & 3-37 Required Load Removel Based upon Equation 3.1 Ma Des First calculation the load required in 3.2 Ma Des First calculation to coefficient in could feet per second 0.41 for or cannoff coefficient = 0.546 (C) ² + 0.328 (C) + 0.33 A = Rourd france calculated above = 0.45 cubic feet/sec A = draining area in a result in interim permanent BMP. Des areas feet A = draining area in a result in interim permanent BMP. Des areas feet A = draining area in a result in interim permanent BMP.		Design Width =	6		F -	0	0.07
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If any of the resulting values still do not inset the design requirement set forth in R0-348, videning the scatter value may not be possible. 16. Vocated Filter Strips Design Required In R0-348 Page 3-365 to 3-76 There are not calculations required for determining the load or size of vocatability filter trains. The scatter results with an animum slope of 10%, There can be a break in grade as long as no slope exceeds 20%. If we determine the importionation the incomponent BMP, they may be sized as described on Page 3-86 of R0-348. Pages 3-30 to 3-32 & 3-77 If we determine the scatter results are proposed for an interim permanent BMP, they may be sized as described on Page 3-86 of R0-348. Pages 3-30 to 3-32 & 3-77 If we determine the intervice are proposed for an interim permanent BMP, they may be sized as described on Page 3-86 of R0-348. Pages 3-30 to 3-32 & 3-77 If we determine the intervice are proposed for an interim permanent BMP. They may be sized as described on Page 3-86 of R0-348. Pages 3-30 to 3-32 & 3-77 If we determine the intervice are proposed for an interim permanent BMP. They may be sized as described on Page 3-86 of R0-348. Pages 3-30 to 3-32 & 3-77 If we determine the intervice are proposed for an interim permanent BMP. They may be sized as described on Page 3-86 of R0-348. Pages 3-30 to 3-32 & 3-77 If we determine the more all strate and anon Equation 3.8 may be intervice an excess 3.8 for all of anon 3.8 may be intervice and anon 3.8 may be intervice and anon 3.8 may be intervice and anon 3.8 may be intervice anon3.8 may be intervice anon3.8 may be intervice anon	If any other securiting values still do not inset the decign requirement set (ratin 16.9-48), identicing the value bottom the upper to the possible. 16. Year Park Calculations and the contributing drainage area does not exceed 72 fet (direction of flow) and is possible of the contributing drainage area does not exceed 72 fet (direction of sould and sould area of a sould area of		Minimum Length =	148.40	ft			
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Load removed by Wet Vault = #VALUE! Ibs If a bypass occurs at a rainfall intensity of less than 1.1 in/hours Calculate the efficiency reduction for the actual rainfall intensity rate Actual Rainfall Intensity at which Wet Vault bypass Occurs = 0.5 in/hour Fraction of rainfall reads form Figure 32: RG-348 Page 32: 2 0.75 percent Efficiency Reduction for Actual Rainfall Intensity = 0.83 percent	Load removed by Wet Vault = #VALUE! Ibs # a bypass occurr at a rainfall Intensity of less than 1.1 in/hours Galculate the efficiency reduction for the accual rainfall intensity rate Actual Rainfall Intensity at which Wet Vault bypass Occurs = 0.5 in/hour Fraction of rainfall treated rom Figure 3-2 RG-348 Page 3-32 = 0.75 percent Efficiency Reduction for Actual Rainfall Intensity = 0.83 percent Resultant TSS Load removed by Wet Vault = #VALUE! Ibs							
If a bypass occurs at a rainfall intensity of less than 1.1 infhours Calculate the efficiency reduction for the actual rainfall intensity rate Actual Rainfall Intensity at which Wet Vault bypass Occurs = 0.5 infhour Fraction of rainfall readed form Figure 3: 206-348 Page 3:32 = 0.75 percent Efficiency Reduction for Actual Rainfall Intensity = 0.83 percent	If a bypass occurs at a rainfall intensity of less than 1.1 infhours Calculate the efficiency reduction for the actual rainfall intensity rate Actual Rainfall Intensity at which Wet Vault bypass Occurs = 0.5 infhour Fraction of rainfall trades from Figure 3-2 RG-348 Page 3-32 = 0.75 percent Efficiency Reduction for Actual Rainfall Intensity = 0.83 percent Resultant TSS Load removed by Wet Vault = #VALUE! Ibs							
Calculate the efficiency reduction for the actual rainfall intensity rate Actual Rainfall Intensity at which Wet Vault bycass Occurs = 0.5 in/hour Fraction of rainfall traded foron Figure 3-2 (BC 434 Page 3-32 = 0.75 percent Efficiency Reduction for Actual Rainfall Intensity = 0.83 percent	Calculate the efficiency reduction for the actual rainfall intensity rate Actual Rainfall Intensity at which Wet Vault bypass Occurs = 0.5 in/hour Fraction of rainfall treated from Figure 3-2 RG-348 Page 3-32 = 0.75 percent Efficiency Reduction for Actual Rainfall Intensity = 0.83 percent Resultant TSS Load removed by Wet Vault = #VALUE! Ibs			#VALUE!	lbs			
Fraction of rainfail treated from Figure 3-2 RG-349 Page 3-32 = 0.75 percent Efficiency Reduction for Actual Rainfall Intensity = 0.83 percent	Fraction of rainfail treated from Figure 3-2 RG-348 Page 3-32 = 0.75 percent Efficiency: Reduction for Actual Rainfail Intensity = 0.83 percent Resultant TSS Load removed by Wet Vault = #VALUE! Ibs							
Efficiency Reduction for Actual Rainfall Intensity = 0.83 percent	Efficiency Reduction for Actual Rainfall Intensity = 0.83 percent Resultant TSS Load removed by Wet Vault = #VALUE! Ibs	Actual Rainfall Intensity at which We	t Vault bypass Occurs =	0.5	in/hour			
	Resultant TSS Load removed by Wet Vault = #VALUE! Ibs	Fraction of rainfall treated from Figure 3	3-2 RG-348 Page 3-32 =	0.75	percent			
Resultant I SS Load removed by wet vault = #VALUE! Ibs								
	18. Permeable Concrete Designed as Required in RG-348 Pages 3-79 to 3-83	Resultant TSS Load	removed by Wet Vault =	#VALUE!	IUS			

To solve for bottom width of the trapezoidal swale (b) using the Excel solver: Excel can simultaneously solve the "Design Q" (C211) vs "Manning's Q" (C219) by varying the "Swale Width" (C220). The required "Swale Width" occurs when the "Design Q" = "Manning's Q".

 First, highlight Cell F219 (Error 1 value). The equation showing in the fx screen for Cell F219 should be "= \$C\$217.\$C\$219"

 Then click on "Toole" and "Solver". The "Solver Parameters" screen poos up.

 The value in the "Se Target cell" should be \$F\$219

 "Error 1 ="

 The value in the "By Changing Cells" should be \$C\$220

 "Swale Width"

 Click on solve.

The resulting "Swale Width" must be less than 10 feet to meet the requirements of the TGM. If the resulting "Swale Width" exceeds 10 feet then the design parameters must be revised and the solver run again.

If there is not the option for "Solver" under "Tools" Click on "Tools" and "Add Ins" and then check "Solver Add-in" Then proceed as instructed above.

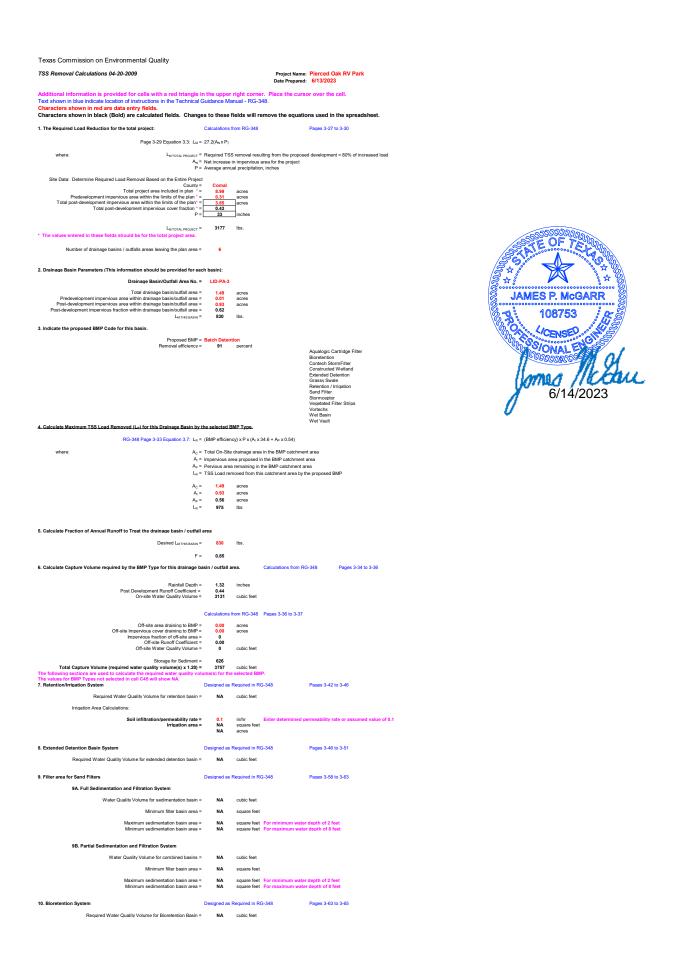
If you would like to increase the bottom width of the trapezoidal availe (b): Excel can simultaneously solve the "Design Or (C217) vs "Design Discharge" (C232) by varying the "Design Depth" (C233). The required "Design Depth" for a 1940b bottom with occurs when the "Design Of (C217) = the "Design Discharge" (C232).

First set the desired bottom width in Cell C231. Highlight Cell F232. The equation showing in the fx screen for Cell F232 should be "= \$C\$217-\$C\$232"

Click on "Tools" and "Solver". The "Solver Parameters" screen poos up. The value in the "Set Target cell" should be \$F\$232 "Error 2" The value in the "By Changing Cells" should be \$C\$233 "Design Depth" Click on solve.

The resulting "Design Depth" must be equal to or less than 0.33 feet to meet the requirements of the TGM. If the resulting "Design Depth" exceeds 0.33 feet than the design parameters must be revised and the solver run again. First set the desired bottom within to call C23. Highlight Call F232. The equation showing in the fx screen for Call F232 should be "= \$C\$217.4C\$232" Click on "Tools" and "Solver" The "Solver Parameters" screen poor 2. The value in the "Set Target call" should be \$F\$232. The value in the "Set Target call" should be \$F\$232. The value in the "Set Target call" should be \$C\$233. "Design Depth" Click on solve.

19. BMPs Installed in a Series	1	Designed as R	Required in RG-348 Pages 3-32	
Michael E. Ba	rrett, Ph.D., P.E. recommended that the coeffic	ient for E ₂ be	changed from 0.5 to 0.65 on May 3, 2006	
E _{TOT} = [1 - ((1 - E ₁) X (1 - 0.65E ₂) x (1 - 0.25E ₃))] X 100 =	86.38	percent NET EFFICIENCY OF THE BMPs IN THE SE	ERIES
EFF	ICIENCY OF FIRST BMP IN THE SERIES = E ₁ =	75.00	percent	
EFFICIENCY	OF THE SECOND BMP IN THE SERIES = E_2 =	70.00	percent	
EFFICIEN	CY OF THE THIRD BMP IN THE SERIES = $E_3 =$	0.00	percent	
	THE NET LOAD REMOVAL WOULD BE: LUES ARE FROM SECTION 3 ABOVE)			
	$L_R = E_{TOT} X P X (A_1 X 34.6 X A_p X0.54) =$	1455.90) Ibs	
20. Stormceptor				
	Required TSS Removal in BMP Drainage Area= Impervious Cover Overtreatment= TSS Removal for Uncaptured Area =	NA 0.0000 0.00	lbs ac lbs	
	Effective Area = Calculated Model Size(s) = del Size (if multiple values provided in Calculated	NA #N/A	EA	
Model	Size or if you are choosing a larger model size) =	0	Model Size	
	Surface Area =	#N/A	ft ²	
	Overflow Rate =	#VALUE!	V _{or}	
	Rounded Overflow Rate =	#VALUE!	V _{or}	
	BMP Efficiency % =	#VALUE!	%	
	L _R Value =	#VALUE!	lbs	
	TSS Load Credit =	#VALUE!	lbs	
Is Sufficient T	reatment Available? (TSS Credit > TSS Uncapt.)	#VALUE!		
	TSS Treatment by BMP (LM + TSS Uncapt.) =	#VALUE!		
21. Vortech				
	Required TSS Removal in BMP Drainage Area=	NA	lbs	
	Impervious Cover Overtreatment= TSS Removal for Uncaptured Area =	0.000	ac Ibs	
BMP Sizing	135 Removal for Uncaptured Area -	0.00	IDS	
	Effective Area = Calculated Model Size(s) =	NA #N/A	EA	
Ac	tual Model Size (if choosing larger model size) =	Vx1000	Pick Model Size	
	Surface Area =	7.10	ft ²	
	Overflow Rate =	#VALUE!	V _{or}	
	Rounded Overflow Rate =	#VALUE!	V _{or}	
	BMP Efficiency % =	#VALUE!	%	
	L _R Value =	#VALUE!	lbs	
	TSS Load Credit =	#VALUE!	lbs	
Is Sufficient T	reatment Available? (TSS Credit > TSS Uncapt.)	#VALUE!		
	TSS Treatment by BMP (LM + TSS Uncapt.) =	#VALUE!		



<text>Note of the second s</text>	11. Wet Basins							
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3. concertationDescrite standingDescrite standingDescrite standingDescrite standing1. standing standingDescrite standingDescrite standing1. standing standingDescrite standingDescrite standing1. standing standingDescrite standingDescrite standing1.		Required capacity of Permanent Pool = Required capacity at WQV Elevation =		cubic feet cubic feet	Total Capa	city should	city is 1. I be the F	20 times the WQV Permanent Pool Capacity
Automa and the service of the servic								
Anyone" on the second secon	12. Constructed Wetlands		Designed as R	equired in R	G-348	f	Pages 3-7	'1 to 3-73
<form>Provide a constraint of a con</form>	Required Water C	uality Volume for Constructed Wetlands =	NA	cubic feet				
<form>Provide a constraint of a con</form>	42 Annual a site TM Constraint on Supreme		Designed on D		0.040			4 - 0.70
<form>Result of the set of the se</form>		L/RG 249) does not exempt the required						
							uurogio	
A control with a co		Filter canisters (FCs) to treat WQV =	NA	cartridges				
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A classical de la classica			NA	cubic feet				
<text>1. (append)(app at a log at a l</text>								
 Automa de la construit de la construi		THE FOLLOWING BMPs / LOAD REMOV						
		an dan annala.	Designed as R	equired in R	G-348		ages 3-5	1 to 3-54
	Design parameters i	or the swale.						
<form><pre>Remain and a set of a se</pre></form>	Drain	age Area to be Treated by the Swale = A = Impervious Cover in Drainage Area =	0.55	acres				
<pre> Prove the set of the set of</pre>		Rainfall intensity = i = Swale Slope =	1.1 0.025	in/hr				
<text></text>		Design Water Depth = y =	0.33	ft				
 		Weighted Runoff Coefficient = C =	0.48					
An end of the care and of the	Ac							
<pre>i = Namida e nongel e e e e e e e e e e e e e e e e e e</pre>	R _H = hydrau		0.16	feet				
<text>Hencige Space : $r = 1 = 2 + 2 + 2 + 2 = 2$</text>		n = Manning's roughness coefficient =	0.2					
	15A. Using the Method Described i	n the RG-348						
	Mar							
		n						
المعالية المعا		$b = 0.134 \times Q_{-7V} =$	-0.08	feet				
A classifier </td <td></td> <td>v^{1.67} S^{0.5}</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>		v ^{1.67} S ^{0.5}						
L (uiquid plan in a wale) = Que a isJ = Jamma Sama Langel = U (Uiquid plan in a sub a lange Langel = U (Uiquid plan in a sub a lange Langel = Uiquid plan in a sub a lange Langel = Uiquid plan in a sub a lange Langel = Uiquid plan in a sub a lange Langel = Uiquid plan in a sub a lange Langel = Uiquid plan in a sub a lange Langel = Uiquid plan in a sub a lange Langel = Uiquid plan in a sub a langel = Uiquid pla			0.29	cfs				
A classifier of the second s								
L l min mi Sud L min de la min			0.56	ft/sec				
the variable and under the design requirement and the first Add Add and and and and and and and and and a								
19. Attenues tested between testes between tested	L = Minim	um Swale Length = V (ft/sec) * 300 (sec) =	168.42	feet				
neigh q = Q = 1 	If any of the resulting	values do not meet the design requirement	it set forth in RG	i-348, the de	sign paramet	ers must be	modified	and the solver rerun.
Fire Velocity 0.55 fb Minimum Length 0.55 fb Junctions are provided to the right life commention		Manning's Equation Q =	1.24	cfs		Error 1 =	-0	.95
Fire Velocity 0.55 fb Minimum Length 0.55 fb Junctions are provided to the right life commention	Instructions are pro	vided to the right (green comments)						
Minimu Length = 188.2 ft Instructions are provided to the right (blue communit). Design begins = 1.26 of Design begins = 0.33 ft File Velocity = 0.49 of Minimu Length = 1.26 of Design begins = 0.33 ft File Velocity = 0.49 of Minimu Length = 1.48 dt ft are of the resulting values do not meet the design requirement at forth in RG-348, the design parameters may be modified and the solver neru. If any of the resulting values do not meet the design requirement at forth in RG-348, the design requirementers may be modified and the solver neru. If any of the resulting values do not meet the design requirement at forth in RG-348, the design requirementers may be modified and the solver neru. If any of the resulting values do not meet the design requirement at forth in RG-348, the dusing the swale bottom value may not be norable. If vectore of file drive and provided to determining the load or sale of vectors of file of relations. If vectore of file drive and provided to determining the load or sale of vectors file drive at the sole of results. If vectore and calculations required in the sole of sale of the calculate differ strips. If we do no calculations required and access 15 fort of enderered filer drips with meaninum slope of 270 or calculate the design required norable. If yees and provided for the drainage area in a Ma inte First calculate the load ennoval at 1.1 inhour If AG-348 Page 3-30 Equation 3.4 C = CM If a G-348 Page 3-30 Equation 3.4 C = CM If a G-348 Page 3-30 Equation 3.5 V or = CM If a G-348 Page 3-30 Equation 3.5 V or = CM If a G-348 Page 3-30 Equation 3.5 V or = CM If a G-348 Page 3-30 Equation 3.5 V or = CM If a G-348 Page 3-30 Equation 3.5 V or = CM If a G-348 Page 3-30 Equation 3.5 V or = CM If a G-348 Page 3-31 Equation 3.5 V or = CM If a G-348 Page 3-31 Equation 3.5 V or = CM If a G-348 Page 3-31 Equation 3.5 V or = CM If a G-348 Page 3-31 Equation 3.5 V or = CM If a G-348 Page 3-31 Equation 3.5 V or = CM If a G-348 Page 3-31 Equation 3.5 V or = CM If a G-348 Page 3-31 Equation 3.5 V or = C								
$ \begin{array}{c} \begin{array}{c} \text{Design With} \\ \text{Design Darkares} \\ \text{Design Charters} \\ \text{Design Darkares} \\ \text{Darkares} \\ \text{Darkares} \\ \text{Darkares} \\ $								
Design Design Design Design 1.26 of s Error 2 = 0.97 Pisor Velocity = 0.48 of s 0.48 of s If any of the resulting values do not meet the design requirement set forth in R0.348, the design parameters may be modified and the solver result. 16 yoo of the resulting values do not meet the design requirement set forth in R0.348, the design parameters may be modified and the solver result. 16 yoo on the eth design requirement set forth in R0.348, the design parameters may be modified and the solver result. 17 we an on calculations required in R0.348 Pages 3.56 to 3.57 There are no calculations required in R0.348 Pages 3.56 to 3.57 The avenue the controlution design of the carced 172 feed fractions of the maximum slope of 20%. Or access 50 feed of avenue the solver design of the carced 172 feed fractices the flact set solver are		Flow Velocity Minimum Length =	0.56	ft/s ft				
Being Depth 0.33 ft Minimum Longin 0.33 ft Velk 40 ft If any of the resulting values do not meet the design requirements set forth in RG-348, widening the swale bottom value may not be possible. Resulting values still do not meet the design requirements set forth in RG-348, widening the swale bottom value may not be possible. 16. Vector Strip Designed as Required in RG-348. Pages 3-55 to 3-57 There are not calculations requirements the forth in RG-348, widening the swale bottom value may not be possible. Pages 3-55 to 3-57 There are not calculations requirement the contributing drainage area does not acced 372 feet (direction of flow) and the setting with an maximum slope of 19%. There can be a break in grade as long at no slope areads 20%. Pages 3-55 to 3-52 & 57 17. We doub Designed as Required in RG-348 Pages 3-30 to 3-32 & 3.79 Required Load Removal Based upon Equation 3.3 = MA Ib First calculate the load removal at 1.1 inform 1.1 inform 1.1 inform RG-348 Page 3-30 Equation 3.4: 0 = C/A C = Runoff Coefficient = 0.546 (IC) ² + 0.328 (IC) + 0.03 G = numoff coefficient for the drainage area in core in the value area in a calculate above area in the value	Instructions are pro	Minimum Length =	0.56 168.42	ft/s ft				
Minimum Langth = 144.80 ft If any of the resulting values do not meet the design requirement set forth in RG-344, the design parameters bottom value may not be possible. Pages 3.55 to 3.57 16. Vegotated Filter Strips Designed as Required in RG-348 Pages 3.55 to 3.57 There are no calculations requirement set of the traines. Pages 3.55 to 3.57 Pages 3.55 to 3.57 There are no calculations required in the Calculation access 71 feet of engineered filter strips. Pages 3.55 to 3.57 There are no calculations cover is directed access 15 feet of engineered filter strips. Pages 3.55 to 3.57 The value are no calculations required in RG-348 Pages 3.50 to 3.52 & 3.79 The value are no calculations cover is directed access 15 feet of engineered filter strips. Pages 3.30 to 3.52 & 3.79 The value are no calculation access 35 feet of engineered filter strips. Pages 3.30 to 3.52 & 3.79 The value are no calculation access 35 feet of engineered filter strips. Pages 3.30 to 3.52 & 3.79 The value Designed as Required in RG-348 Pages 3.30 to 3.52 & 3.79 Required Load Removal Based upon Equation 3.3 : 0 = 0.45 C = Runoff Coefficient = 0.546 (IC) ² + 0.328 (IC) + 0.33 Reg-348 Page 3.30 Equation 3.4: 0 = 0.45 C = Runoff Coefficient = 0.546 (IC) ² + 0.328 (IC) + 0.33 Reg-348 Page 3.31 Equation 3.5: Vor, = 0(A C = Runoff Coefficient = 0.546 (IC) ² + 0.328 (IC) + 0.33 Reg-348 Page 3.31 Equation 3.5: Vor, = 0(A <	Instructions are pro	Minimum Length = ovided to the right (blue comments). Design Width =	168.42	ft		Error 2 -		07
If any of the resulting values still do not inset the design requirement set forth in R0-348, videning the scatter values may not be possible. 16. Vocated Filter Strips Design Required In R0-348 Page 3-365 to 3-76 There are not calculations required for determining the load or size of vocatability filter trains. The scatter results with an animum slope of 10%, There can be a break in grade as long as no slope exceeds 20%. If we determine the importionation the intermine memanent BMP, they may be sized as described on Page 3-86 of R0-348. Pages 3-30 to 3-32 & 3-77 If we determine the importionation of the scatter of	Instructions are pro	Minimum Length = ovided to the right (blue comments). Design Width = Design Discharge = Design Depth = Design Depth =	168.42 6 1.26 0.33	ft ft cfs ft		Error 2 =	-0	.97
The sea non calculations required for determining the load or size of vegetative filter strips. The Sea non-valie provided when the contribution drainage area does not acceed 72 feet (direction of fore) and the steet of our strips are problem of the contribution drainage area does not acceed 72 feet (direction of fore) and the strips are problem of the analysis of the strips are problem of the strips are p		Minimum Length = ovided to the right (blue comments). Design Width = Design Discharge = Design Death = Flow Velocity = Minimum Length =	168.42 6 1.26 0.33 0.49 148.40	ft cfs ft cfs ft ft				
The 80% removal is provided when the contributing drainage area does not acced 72 feet (direction of tow) and the based flow levels down is bloop downs. There can be a break in grade as long as no slope acceds 20%. of direction of the drainage area in access 15 feet of natural vegetation with a maximum slope of 10%, or access 20 feet of natural vegetation with a maximum slope of 10%. There can be a break in grade as long as no slope access 20%. If vegetative filter strips are proposed for an interim permanent BMP, they may be sized as described on Page 3-56 of RG-348. 17. We Vaults Designed a Required in RG-348 Page 3-30 to 3-32 & 3-70 Required Load Removel Based upon Equation 3.4 C = CM Required Load Removel Based upon Equation 3.4 C = CM C = nunoff coefficient for the drainage area in acres 1 i acres C = nunoff coefficient for the drainage area in acres 1 i acres C = nunoff coefficient for the drainage area in acres 1 i acres C = nunoff coefficient for the drainage area in acres 1 i acres C = nunoff coefficient for the drainage area in acres 1 i acres C = nunoff coefficient for the drainage area in acres 1 i acres C = nunoff coefficient for the drainage area in acres 1 i acres C = nunoff coefficient for the drainage area in acres 2 i acres C = 0 = flow rate in cubic feet per second = 0.40 cubic feet/sec C = C = 0.40 cubic feet/sec C = 0 = flow rate in cubic feet per second = 0.40 cubic feet/sec C = 0 = flow rate in cubic feet per second = 0.40 cubic feet/sec C = 0 = flow rate in cubic feet per second = 0.40 cubic feet/sec C = 0 = flow rate in cubic feet per second = 0.40 cubic feet/sec C = 0 = flow rate in cubic feet per second = 0.40 cubic feet/sec C = 0 = flow rate in cubic feet per second = 0.40 cubic feet/sec C = 0 = flow rate in cubic feet per second = 0.40 cubic feet/sec C = 0 = flow rate in cubic feet per second = 0.40 cubic feet/sec C = 0 = flow rate in the wet watt = 150 square feet C = 0 = flow rate in cubic feet per second = 0.40 for the second = 0.40 cubic feet/sec C = 0 = flow rate in cubic feet	If any of the resulting values do no	Minimum Length = ovided to the right (blue comments). Design Discharge = Design Discharge = Design Depth = Fiow Velocity = Minimum Length = t meet the design requirement set forth	168.42 6 1.26 0.33 0.49 148.40 in RG-348 , the	ft cfs ft cfs ft design para	ameters mav	be modifie	d and th	e solver rerun.
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If vegetative filter strips are proposed for an interim permanent BMP, they may be sized as described on Page 3-S8 of RG-348. 17. Yet Yauts Provide Load Removal Based upon Equation 3.3 Provide Load Removal Based upon Equation 3.4 Provide Load Removal Based upon Equation 3.4 Provide Load Removal II.1 Inhour Provide Provide Page 3-30 Equation 3.5 Provide Page 3-31 Prov	If any of the resulting values do no if any of the resulting values still of 16. Vegetated Filter Strips There are no calculations required	Minimum Length = svided to the right (blue comments). Design Width = Design Dechne = Design Dechne = Design Dechne = Minimum Length = t meet the design requirement set forth o not meet the design requirement set forth o not meet the design requirement set forth the determining the load or size of vage	168.42 6 1.26 0.33 0.49 148.40 in RG-348, the orth in RG-348. Designed as R tative filter stri	ft cfs ft cfs ft design para widening ti equired in Ro ps.	ameters may he swale bot G-348	be modifie tom value	d and th may not	e solver rerun. be possible.
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Fraction of rainfail treated from Figure 3-2 RG-348 Page 3-32 = 0.75 percent Efficiency Reduction for Actual Rainfail Intensity = 0.83 percent	If any of the resulting values do no if any of the resulting values and in 16. Vegetated Filter Strips There are no calculations required the 80% removal is provided when the sheet flow leaving the impervi- access 50 feet of anitral vegetation If vegetative filter strips are propor 17. Wet Vaults Required First calculate the load removal at C Percent TSS Removal If a bypass occurs at a rainfall inter	Minimum Length = wided to the right (blue comments). Design Width = Design Width = Design Width = Design Discharge = Design Discharge = Design Discharge = Design Discharge = Nintimum Length =	168.42 6 1.26 0.33 0.49 148.40 In RG-348, the Orth in RG-348, the Designed as R Rative filter stri t exceed 72 fef and be a break may be sized a NA 0.45 1.1 1 1 0.49 150 0.49 150 0.00 0.00 53	ft ft cfs cfs cfs cfs ft cfs cfs cfs cfs cfs cfs cfs cfs	ameters may he swale bot G-348 of flow) and maximum si long as no s i on Page 3-5 G-348 C = Runoff ec	be modifie tom value pope of 20% lope excee 6 of RG-34	d and th may not Pages 3-5 or ds 20%. 8. Pages 3-3	e solver rerun. be possible. 5 to 3-57 0 to 3-32 & 3-79
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Resultant TSS Load removed by Wet Vault = #VALUE! Ibs	If any of the resulting values do no if any of the resulting values still of 16. Vegetated Filter Strips There are no calculations required the sheet flow leaving the impervix access 50 feet of antrul vegetation if vegetative filter strips are propor 17. Wet Vaults Required First calculate the load removal at First calculate the load removal at C R Percent TSS Remove If a bypass occurs at a rainfall inte Calculate the efficiency reduction Actual Rainfall inte Calculate the efficiency reduction	Minimum Length = Wided to the right (blue comments). Design Width = Design Width = Design Width = Design Discharge = Hintimum Length =	168.42 6 1.26 0.33 1.86.046 1.86.346.the ordth in RG-346.the ordth in RG-346.the oncines of the start is accessf 27 access and a start NA 0.455 1.1 1 0.49 0.49 0.00 53 #VALUE!	ft ft cfs cfs cfs cfs cfs cfs cfs cfs	ameters may he swale bot G-348 of flow) and maximum si long as no s i on Page 3-5 G-348 C = Runoff ec	be modifie tom value pope of 20% lope excee 6 of RG-34	d and th may not Pages 3-5 or ds 20%. 8. Pages 3-3	e solver rerun. be possible. 5 to 3-57 0 to 3-32 & 3-79
	If any of the resulting values do no if any of the resulting values do no after of the resulting values and the version of the resulting values and the diversion of the impervix access 50 feet of valural vegetation if vegetative filter strips are proport 17. Wet Vaults Required First calculate the load removal at C Percent TSS Remove If a bypass occurs at a rainfall inter Calculate the efficiency reduction of Actual Rainfall Inter Fraction of rainfall inter Efficiency	Minimum Length = vivided to the right (blue comments). Design With + Design With + Design With + Design Discharge - Nimmum Length = in meet the design requirement set forth o not meet the design requirement set of the o not meet the design requirement set of the o not meet the design requirement set of the o not meet the design requirement set of the o not meet the design requirement set of the o not meet the design requirement set of the o not meet the design requirement set of the o not meet the design requirement set of the one over is dimeted across 15 feet of a ny with a maximum along on 19%. There: Load Removal Based upon Equation 3.3 = 1.1 inhear RG-348 Page 3-30 Equation 3.4: Q = CIA = runoff coefficient for the drainage area i a i drainage area in acres = Q = flow rate in cubic feet per second = G-348 Page 3-31 Equation 3.5: Von = Old Q = Runoff ace calculate above = A = Vaeter surface area in the wet watt = Von = Overflow Rate = von = Coefficient 1.1 inhears I Lead removed by Wet Vaut = naity of leas than 1.1 inhears Section For Actual Rainfall Intensity = von Reduction for Act	168.42 6 1.26 0.33 1.86.45 1.26 0.49 1.88.40 1.86.348, the order in RG-348, the order in RG-3	ft ft cfs cfs cfs ft ft cfs ft cfs ft cfs ft cfs ft ft cfs ft ft cfs ft ft cfs ft ft cfs ft ft ft ft ft ft ft ft ft ft	ameters may he swale bot G-348 of flow) and maximum si long as no s i on Page 3-5 G-348 C = Runoff ec	be modifie tom value pope of 20% lope excee 6 of RG-34	d and th may not Pages 3-5 or ds 20%. 8. Pages 3-3	e solver rerun. be possible. 5 to 3-57 0 to 3-32 & 3-79

To solve for bottom width of the trapezoidal swale (b) using the Excel solver: Excel can simultaneously solve the "Design Q" (C211) vs "Manning's Q" (C219) by varying the "Swale Width" (C220). The required "Swale Width" occurs when the "Design Q" = "Manning's Q".

 First, highlight Cell F219 (Error 1 value). The equation showing in the fx screen for Cell F219 should be "= \$C\$217.\$C\$219"

 Then click on "Toole" and "Solver". The "Solver Parameters" screen poos up.

 The value in the "Se Target cell" should be \$F\$219

 "Error 1 ="

 The value in the "By Changing Cells" should be \$C\$220

 "Swale Width"

 Click on solve.

The resulting "Swale Width" must be less than 10 feet to meet the requirements of the TGM. If the resulting "Swale Width" exceeds 10 feet then the design parameters must be revised and the solver run again.

If there is not the option for "Solver" under "Tools" Click on "Tools" and "Add Ins" and then check "Solver Add-in" Then proceed as instructed above.

If you would like to increase the bottom width of the trapezoidal availe (b): Excel can simultaneously solve the "Design Or (C217) vs "Design Discharge" (C232) by varying the "Design Depth" (C233). The required "Design Depth" for a 1940b bottom with occurs when the "Design Of (C217) = the "Design Discharge" (C232).

First set the desired bottom width in Cell C231. Highlight Cell F232. The equation showing in the fx screen for Cell F232 should be "= \$C\$217-\$C\$232"

Click on "Tools" and "Solver". The "Solver Parameters" screen poos up. The value in the "Set Target cell" should be \$F\$232 "Error 2" The value in the "By Changing Cells" should be \$C\$233 "Design Depth" Click on solve.

The resulting "Design Depth" must be equal to or less than 0.33 feet to meet the requirements of the TGM. If the resulting "Design Depth" exceeds 0.33 feet than the design parameters must be revised and the solver run again. First set the desired bottom within to call C23. Highlight Call F232. The equation showing in the fx screen for Call F232 should be "= \$C\$217.4C\$232" Click on "Tools" and "Solver" The "Solver Parameters" screen poor 2. The value in the "Set Target call" should be \$F\$232. The value in the "Set Target call" should be \$F\$232. The value in the "Set Target call" should be \$C\$233. "Design Depth" Click on solve.

19. BMPs Installed in a	Series	Designed as R	equired in RG-348	Pages 3-32
Michae	E. Barrett, Ph.D., P.E. recommended that the coeffi	cient for E ₂ be	changed from 0.5 to 0	65 on May 3, 2006
E	TOT = [1 - ((1 - E ₁) X (1 - 0.65E ₂) x (1 - 0.25E ₃))] X 100 =	86.38	percent NET EFF	ICIENCY OF THE BMPs IN THE SERIES
	EFFICIENCY OF FIRST BMP IN THE SERIES = E1 =	75.00	percent	
EFFIC	IENCY OF THE SECOND BMP IN THE SERIES = E_2 =	70.00	percent	
EFF	FICIENCY OF THE THIRD BMP IN THE SERIES = $E_3 =$	0.00	percent	
	FORE, THE NET LOAD REMOVAL WOULD BE: AP VALUES ARE FROM SECTION 3 ABOVE)			
	L _R = E _{TOT} X P X (A ₁ X 34.6 X A _P X0.54) =	925.81	lbs	
20. Stormceptor				
	Required TSS Removal in BMP Drainage Area= Impervious Cover Overtreatment= TSS Removal for Uncaptured Area =	NA 0.0000 0.00	lbs ac lbs	
BMP Si Acti	zing Effective Area = Calculated Model Size(s) = Jal Model Size (if multiple values provided in Calculated	NA #N/A	EA	
1	Model Size or if you are choosing a larger model size) =	0	Model Size	
	Surface Area =	#N/A	ft ²	
	Overflow Rate =	#VALUE!	Vor	
	Rounded Overflow Rate =	#VALUE!	Vor	
	BMP Efficiency % =	#VALUE!	%	
	L _R Value =	#VALUE!	lbs	
	TSS Load Credit =	#VALUE!	lbs	
Is Suffi	cient Treatment Available? (TSS Credit > TSS Uncapt.)	#VALUE!		
	TSS Treatment by BMP (LM + TSS Uncapt.) =	#VALUE!		
21. Vortech				
	Required TSS Removal in BMP Drainage Area= Impervious Cover Overtreatment=	NA 0.0000	lbs ac	
	TSS Removal for Uncaptured Area =	0.00	lbs	
BMP Si		0.00	100	
	Effective Area = Calculated Model Size(s) =	NA #N/A	EA	
	Actual Model Size (if choosing larger model size) =	Vx1000	Pick Model Size	
	Surface Area =	7.10	ft ²	
	Overflow Rate =	#VALUE!	V _{or}	
	Rounded Overflow Rate =	#VALUE!	Ver	
	BMP Efficiency % =	#VALUE!	%	
	L _R Value =	#VALUE!	lbs	
	TSS Load Credit =	#VALUE!	lbs	
Is Suffi	cient Treatment Available? (TSS Credit > TSS Uncapt.)	#VALUE!		
	TSS Treatment by BMP (LM + TSS Uncapt.) =	#VALUE!		

ATTACHMENT L

BMP's for Surface Stream

Not Applicable

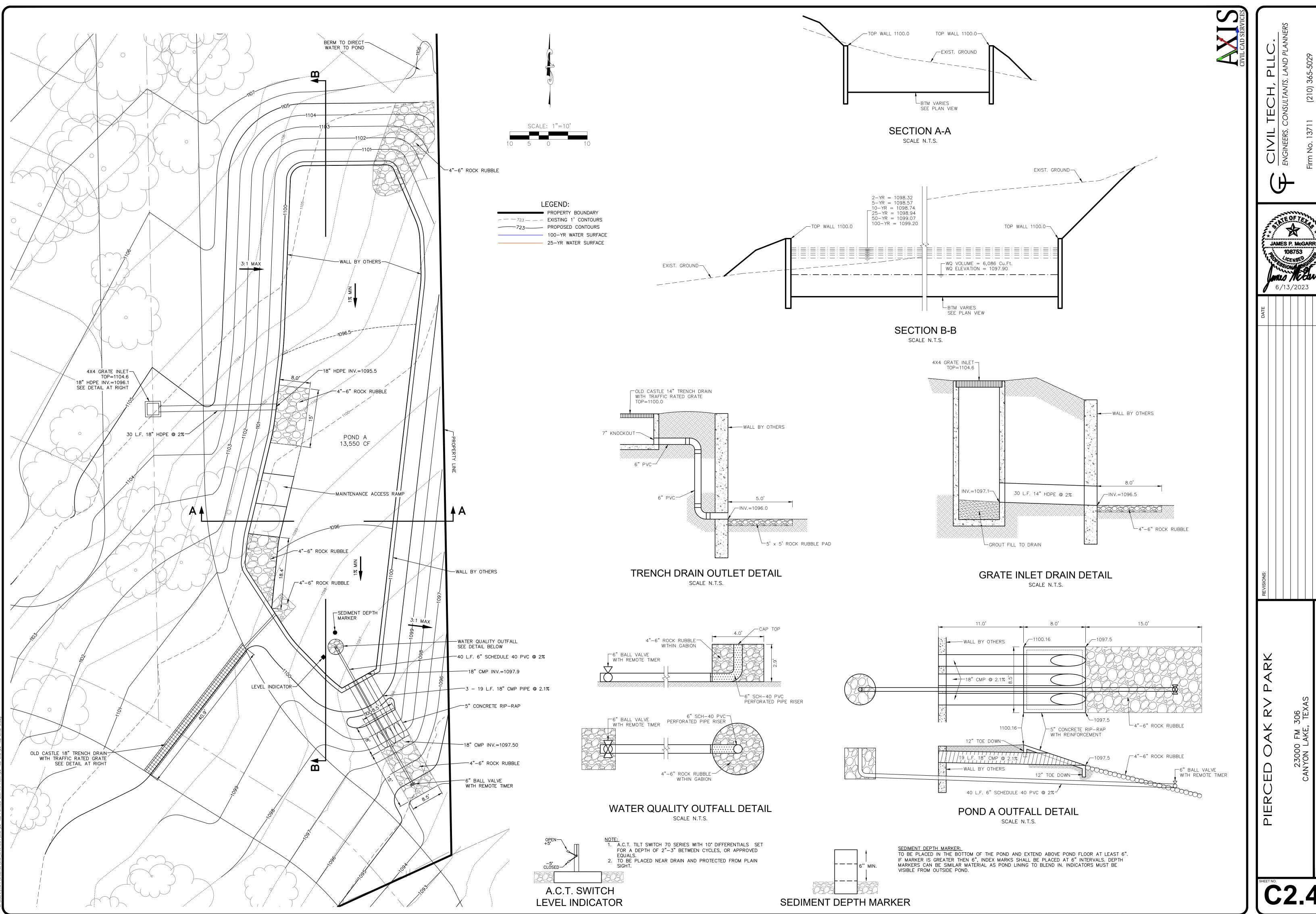
ATTACHMENT M

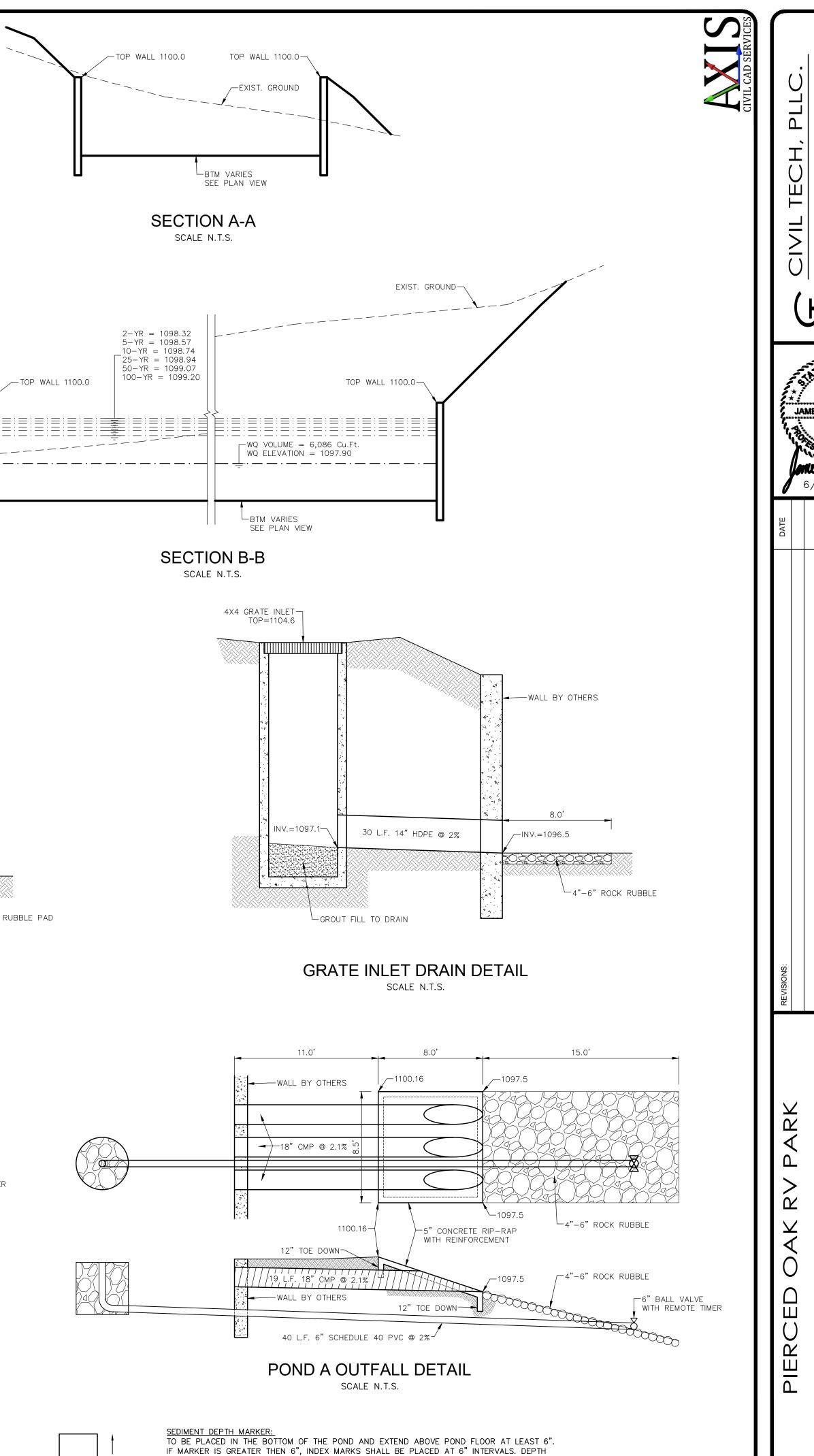
Construction Plans

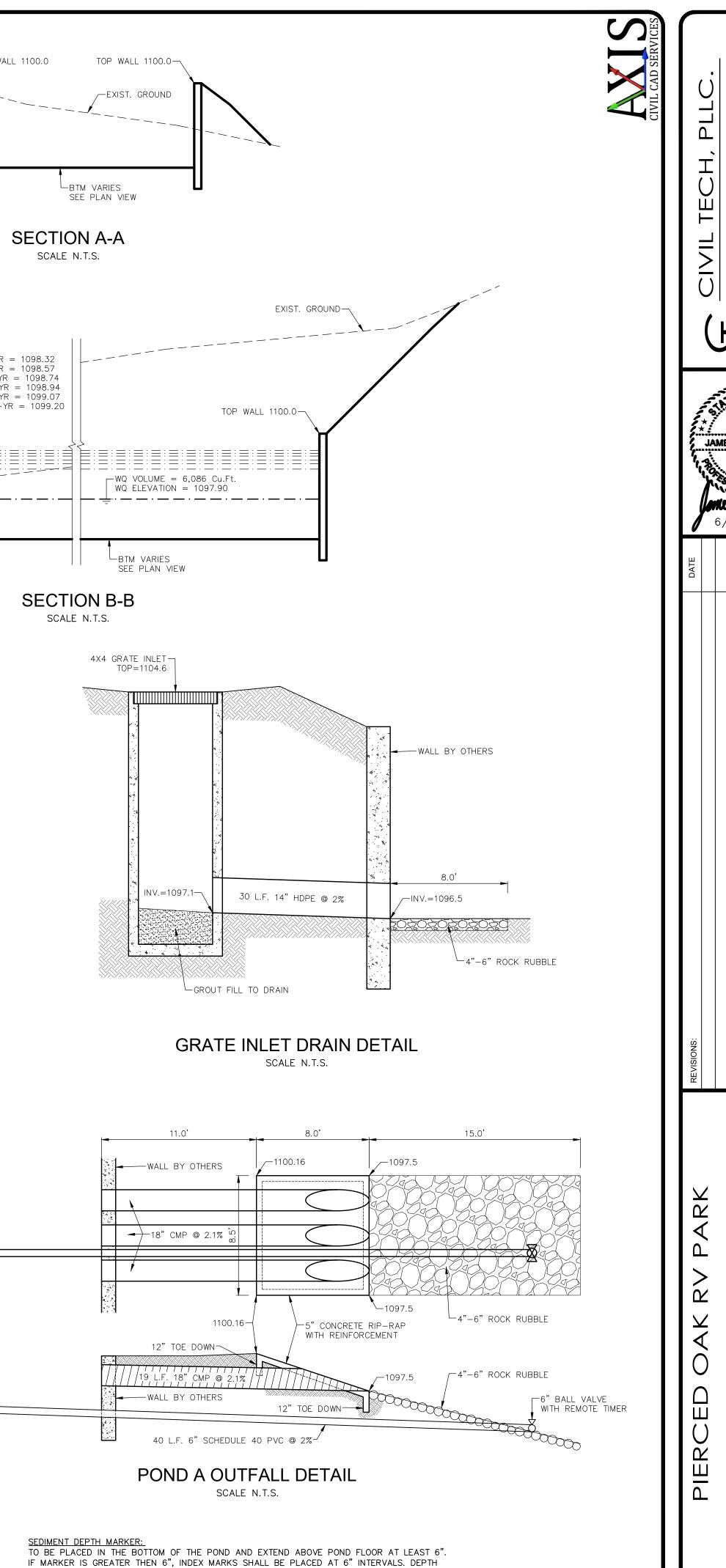
Attachment M – Construction Plans

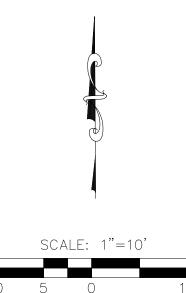
Construction Plans and TSS design calculations for proposed permanent BMPs are included in this section as follows:

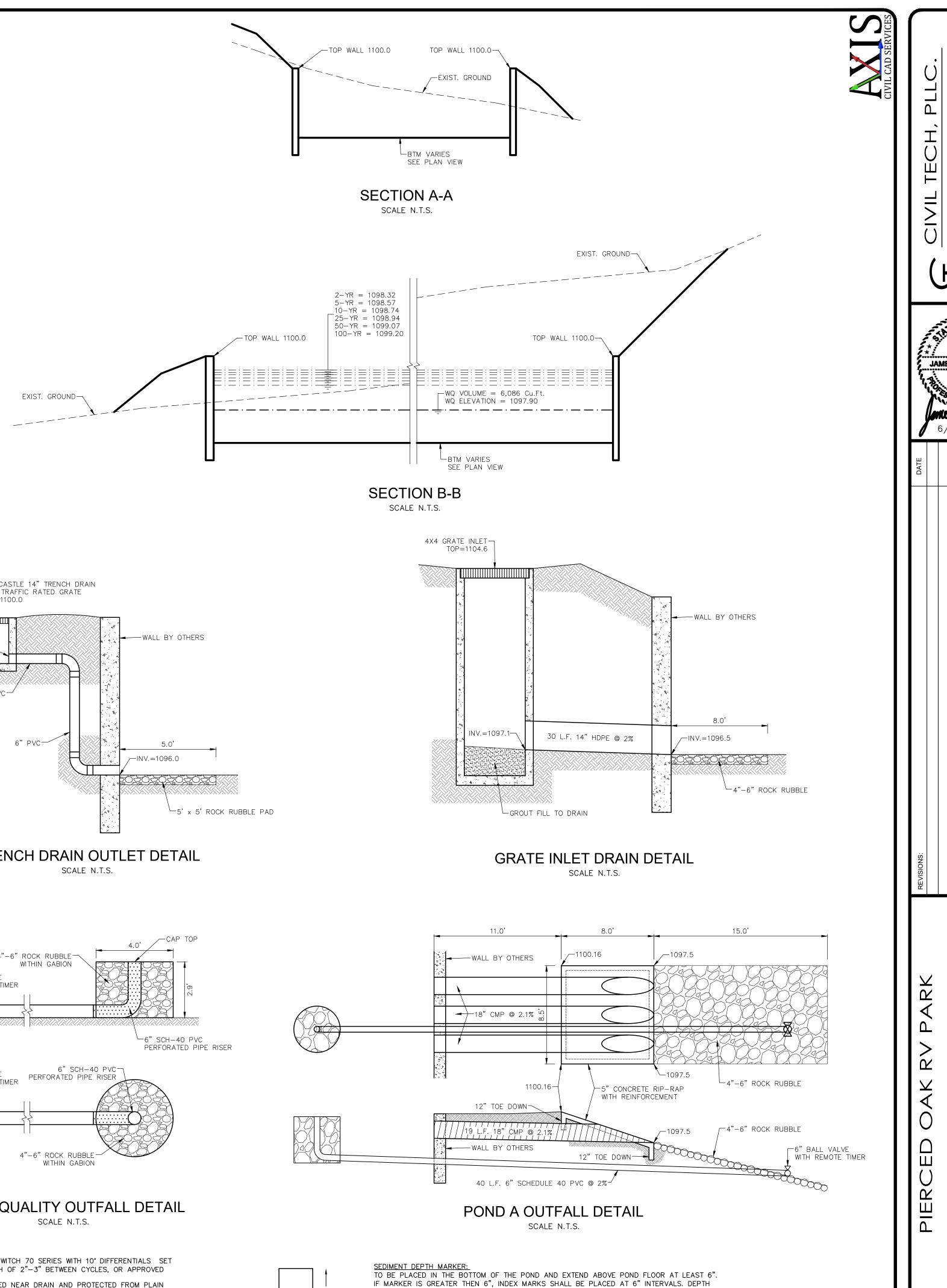
• LID Construction Plans

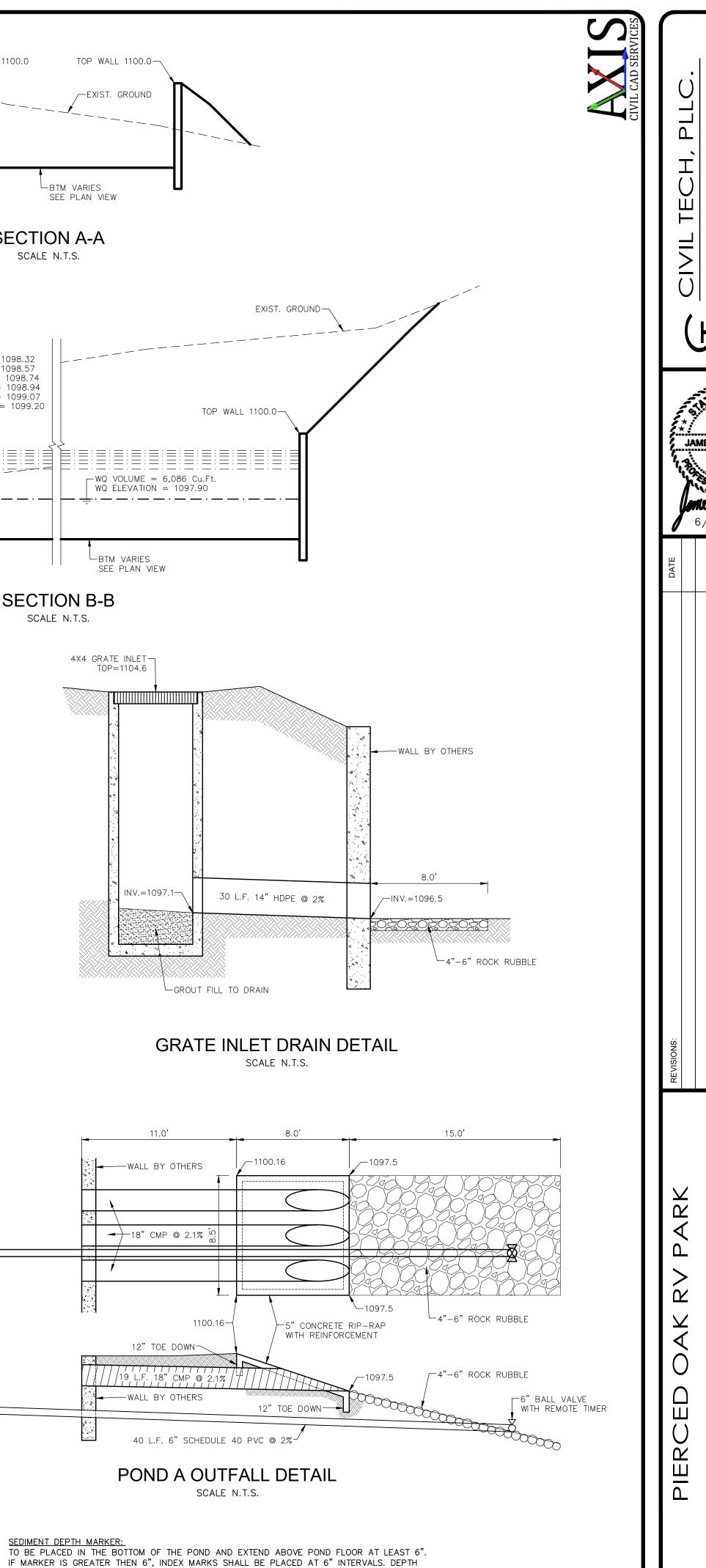












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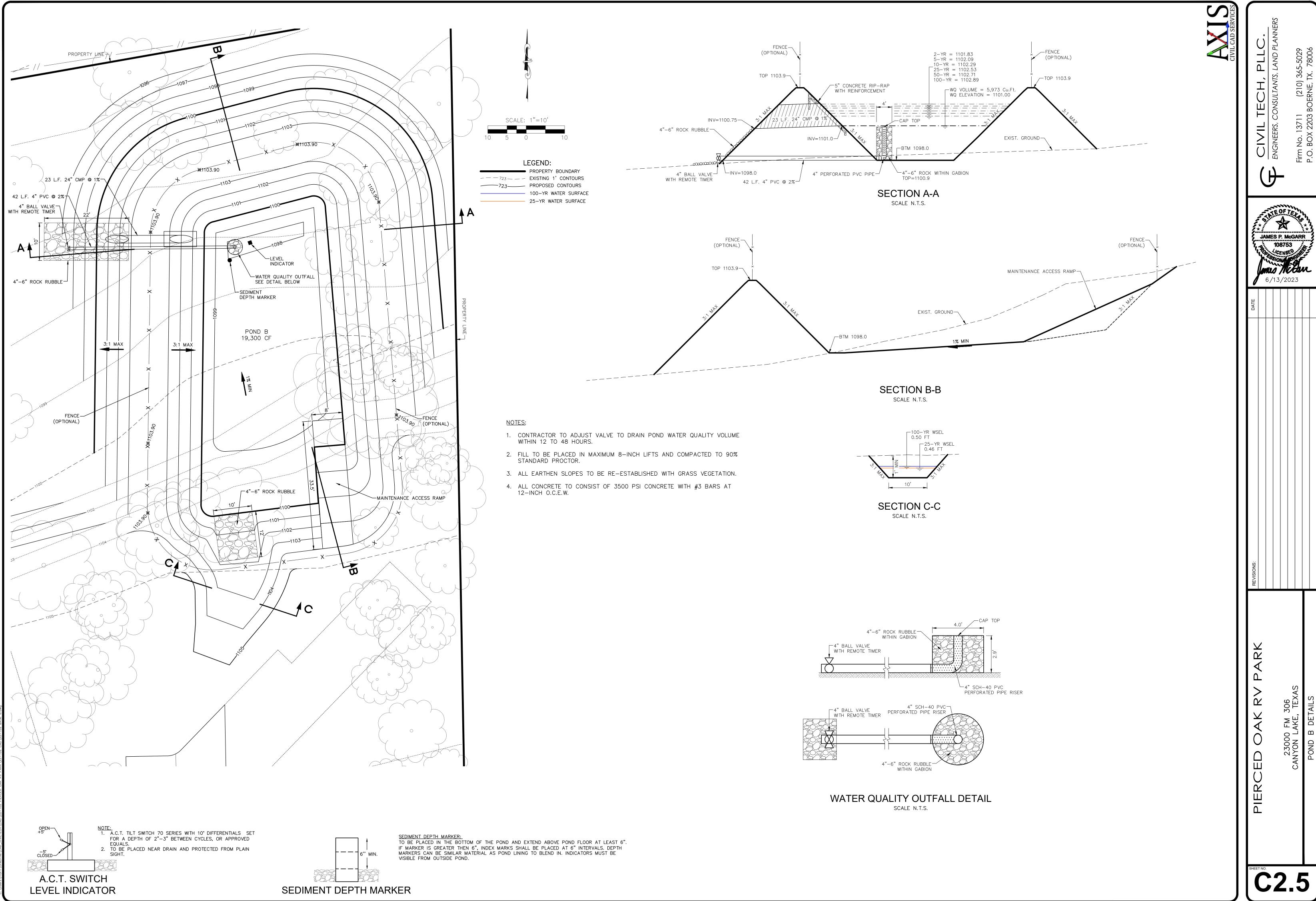
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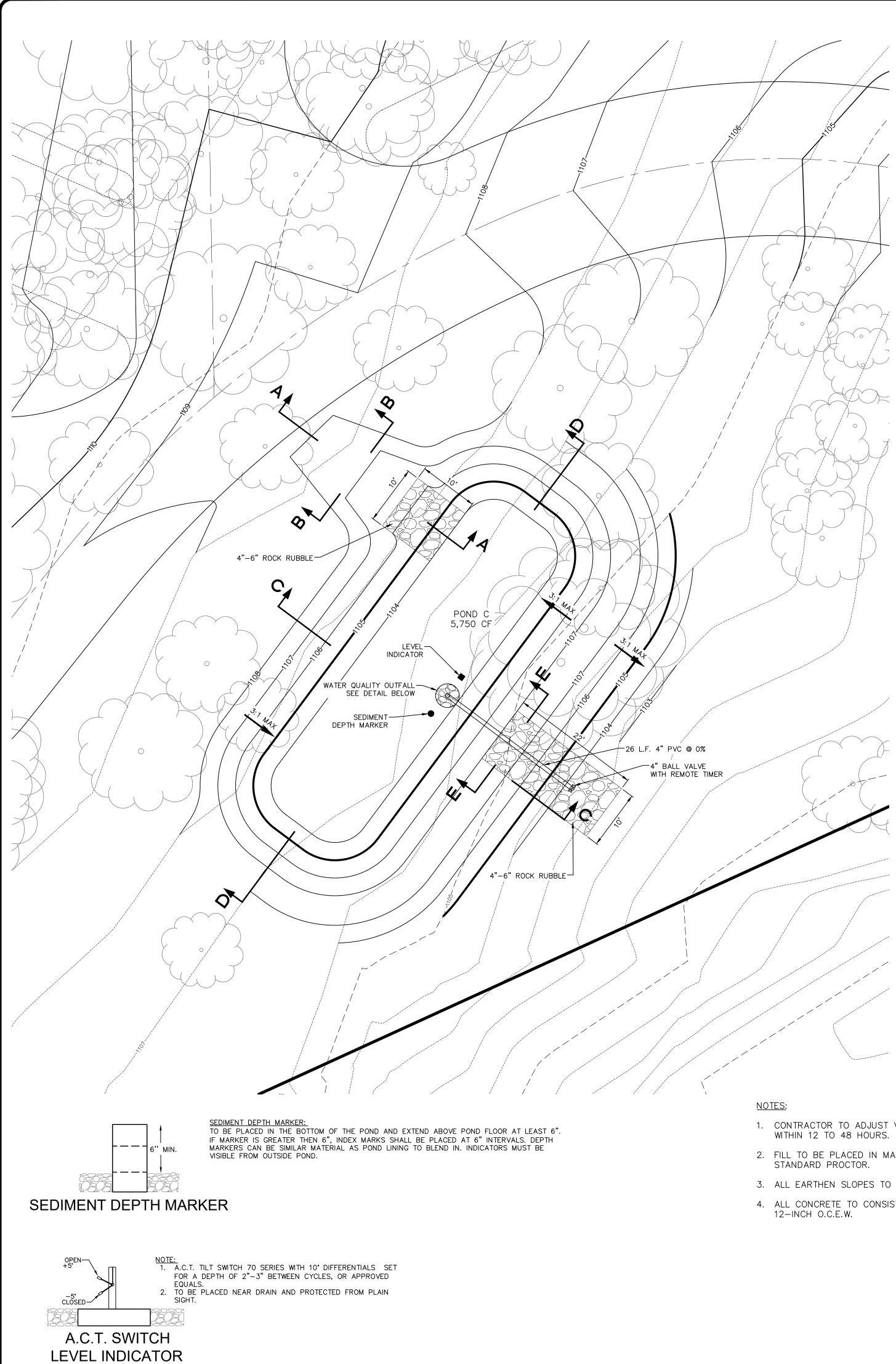
37

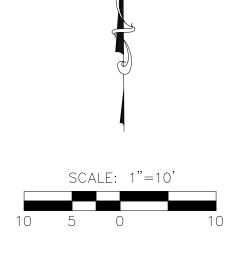
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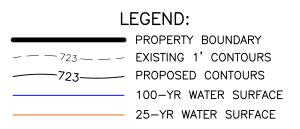
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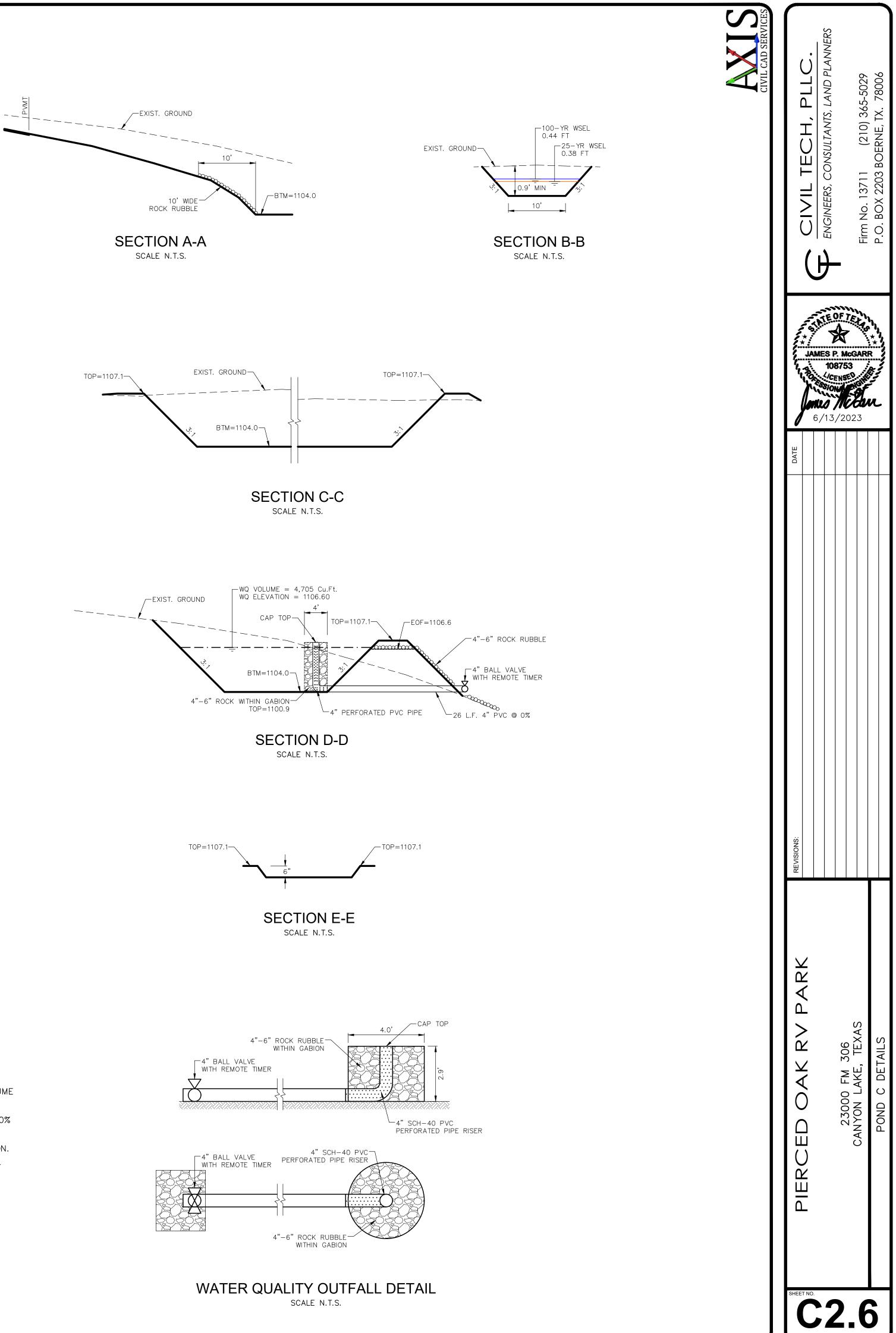
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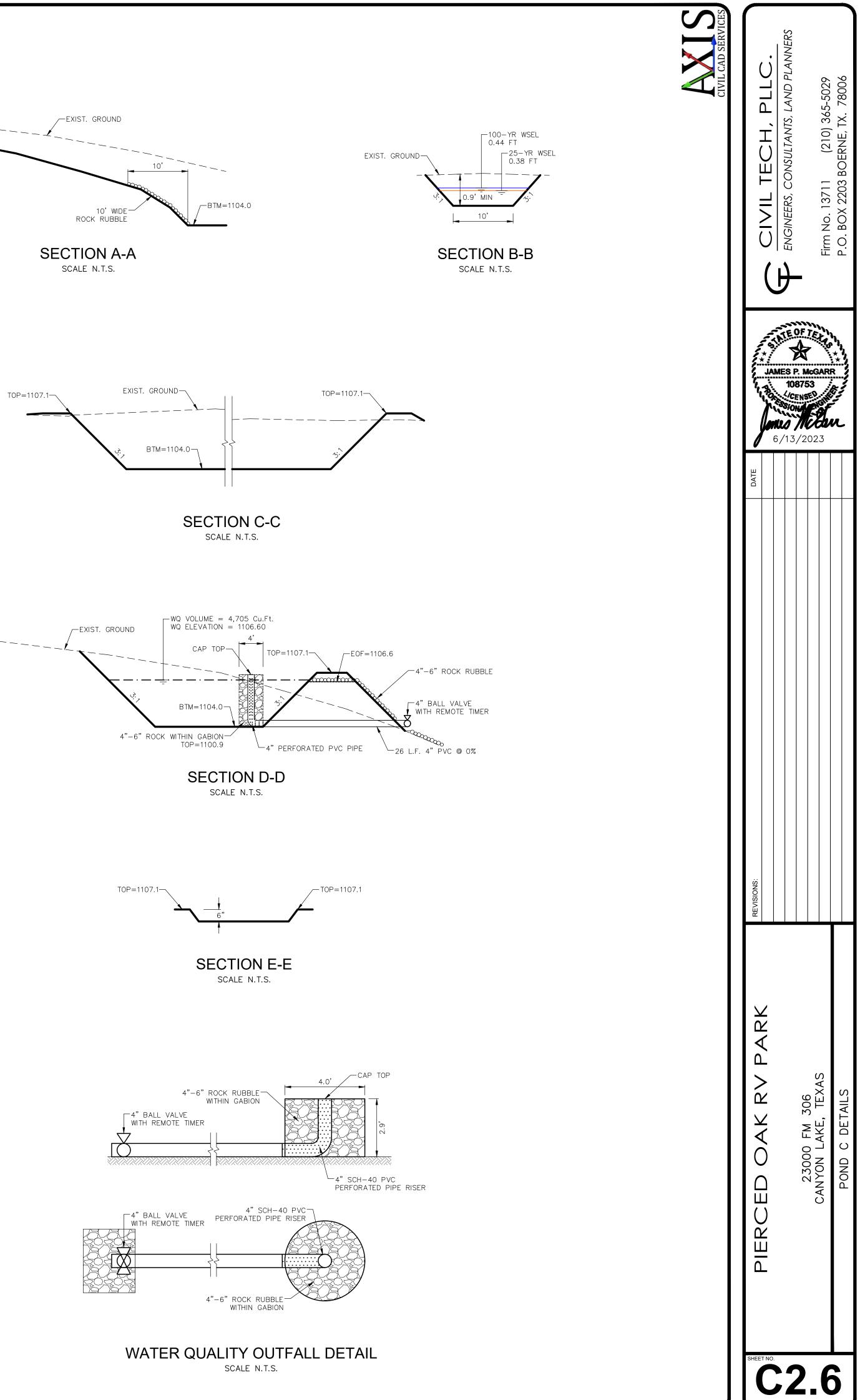


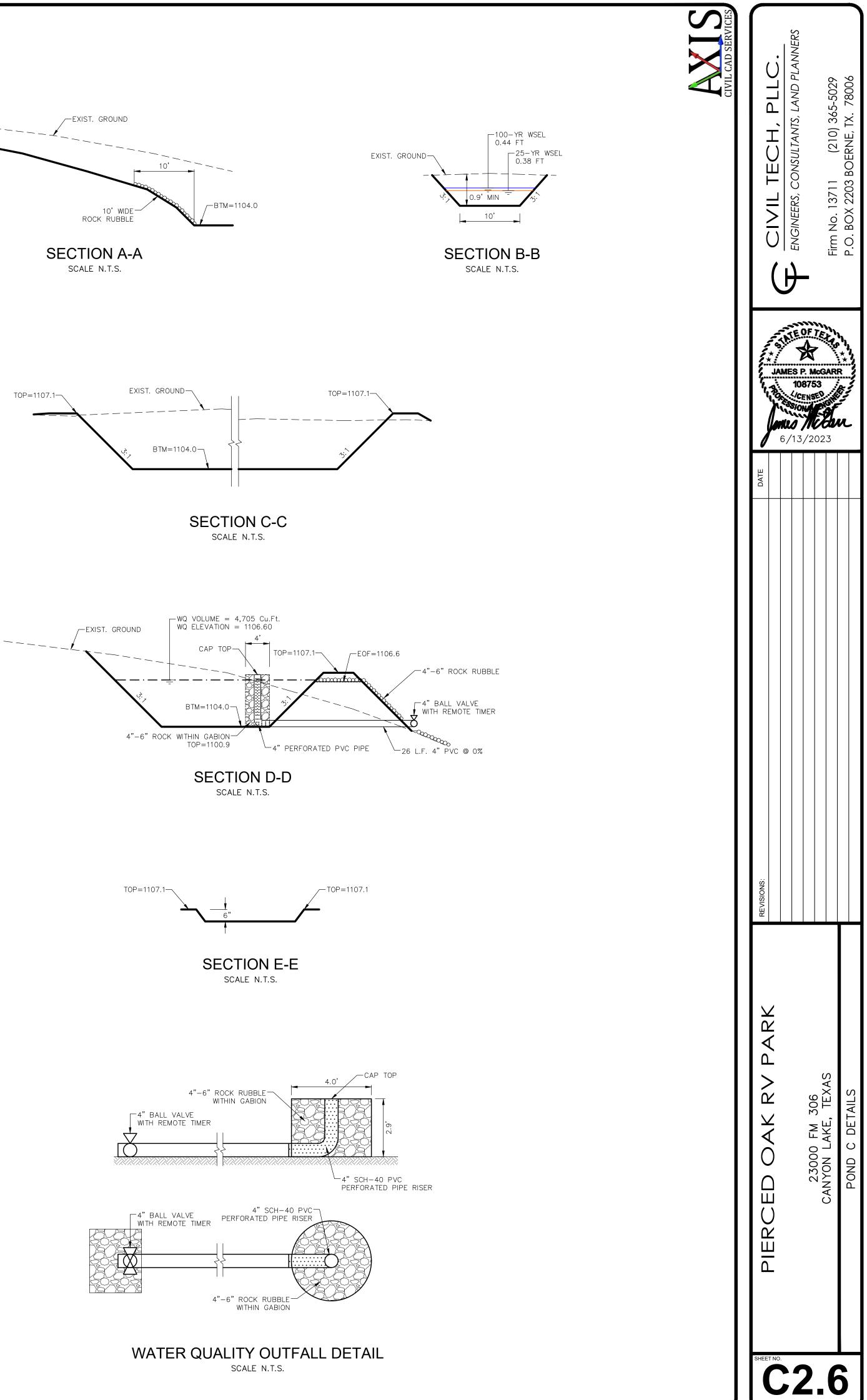


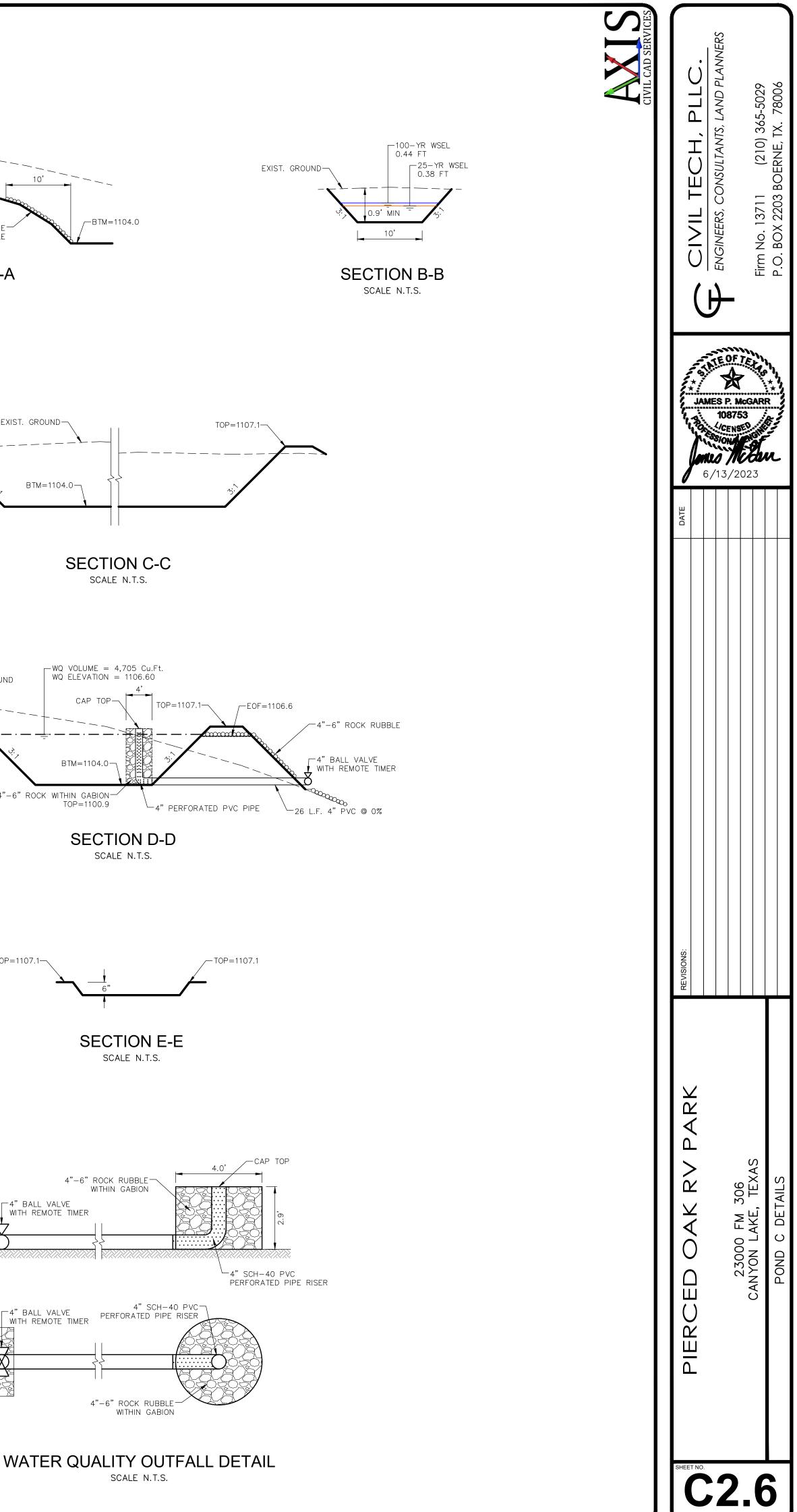


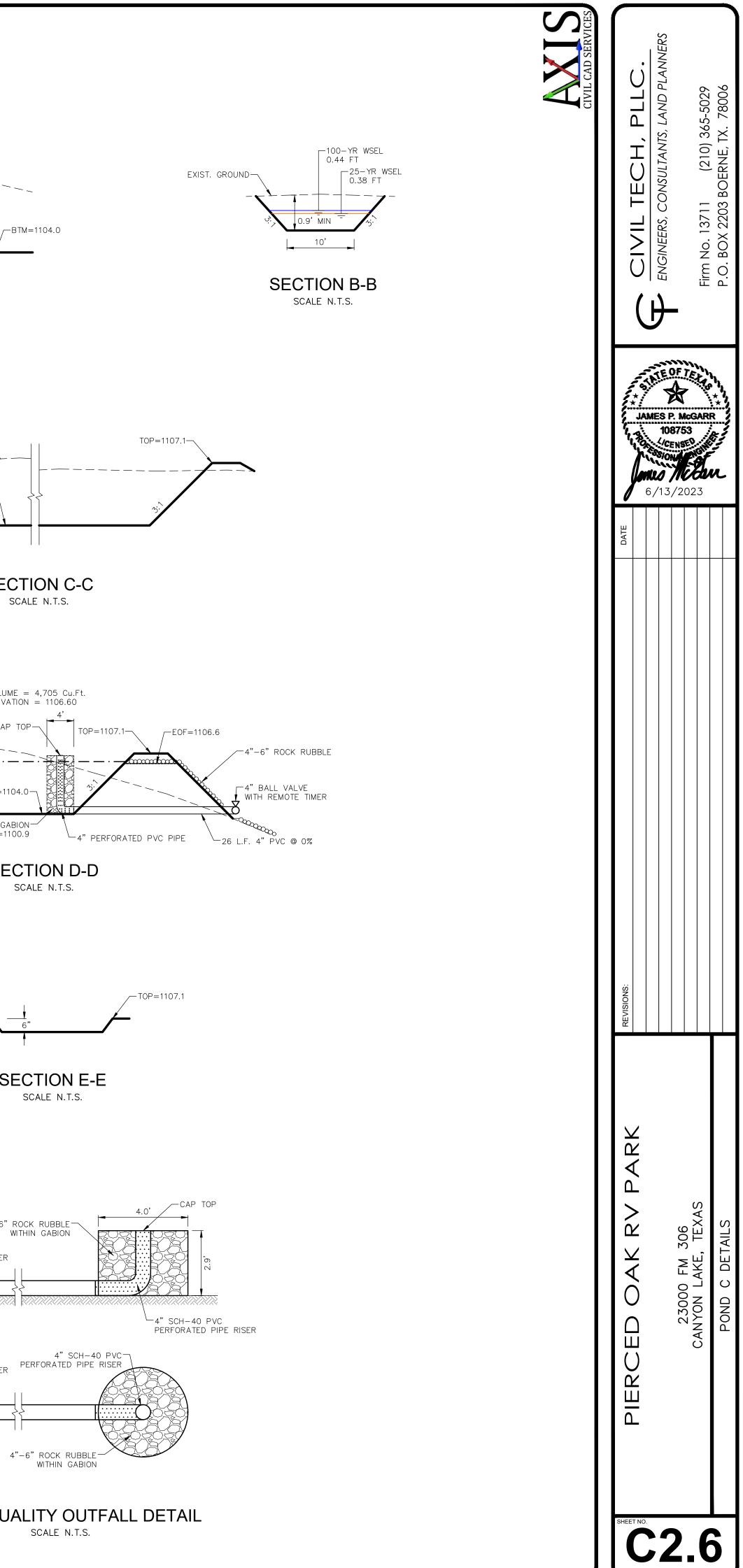


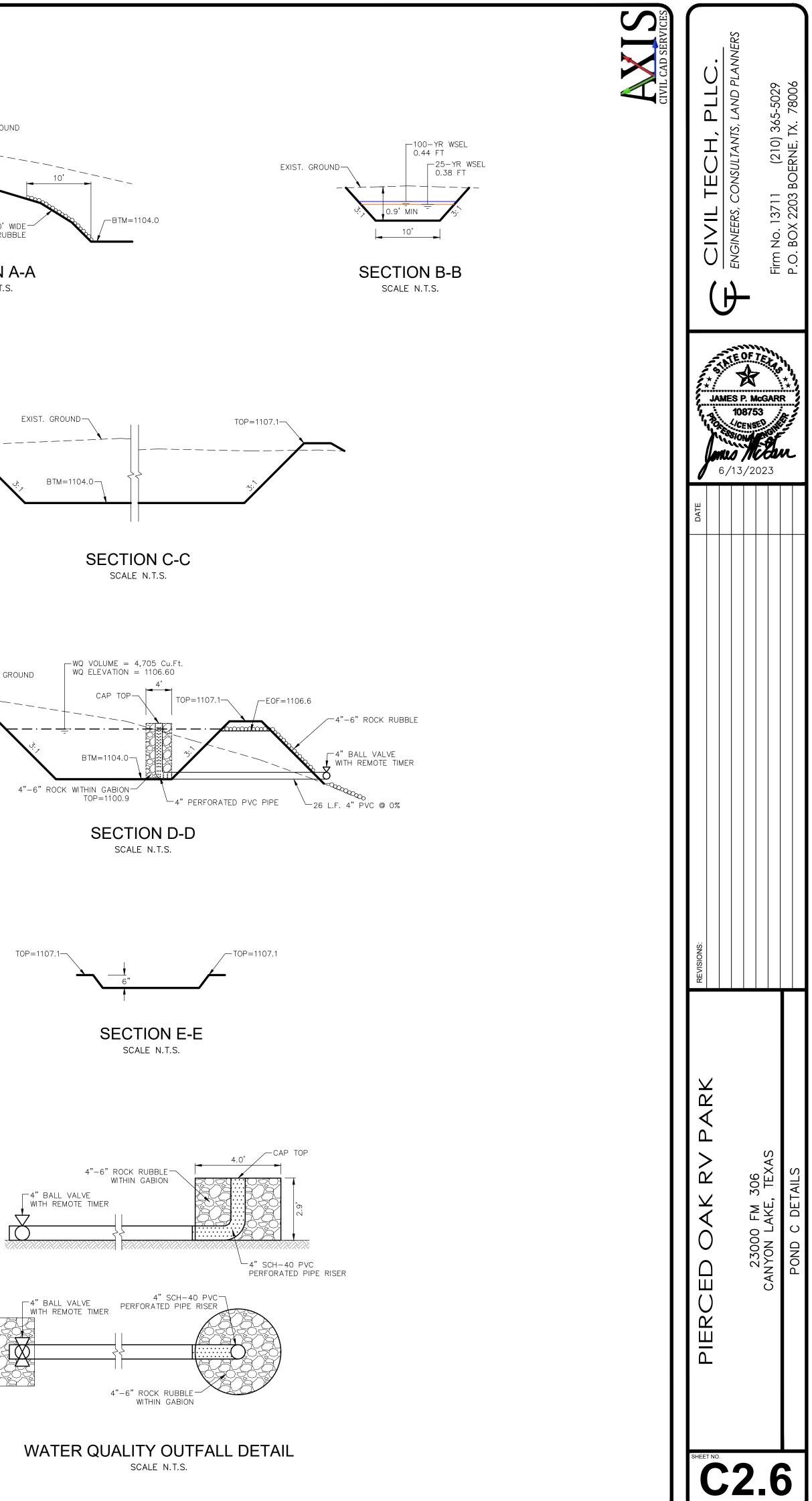


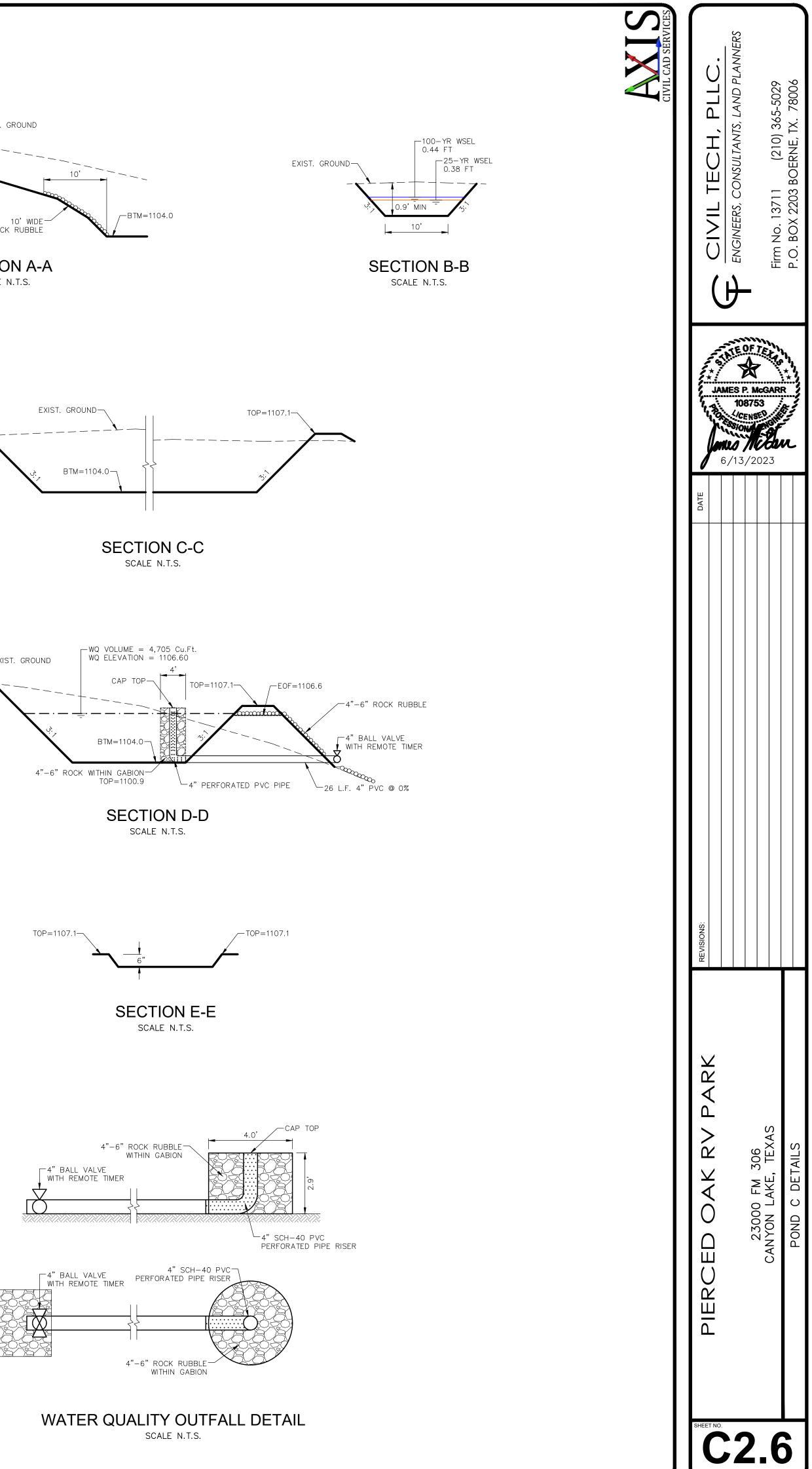




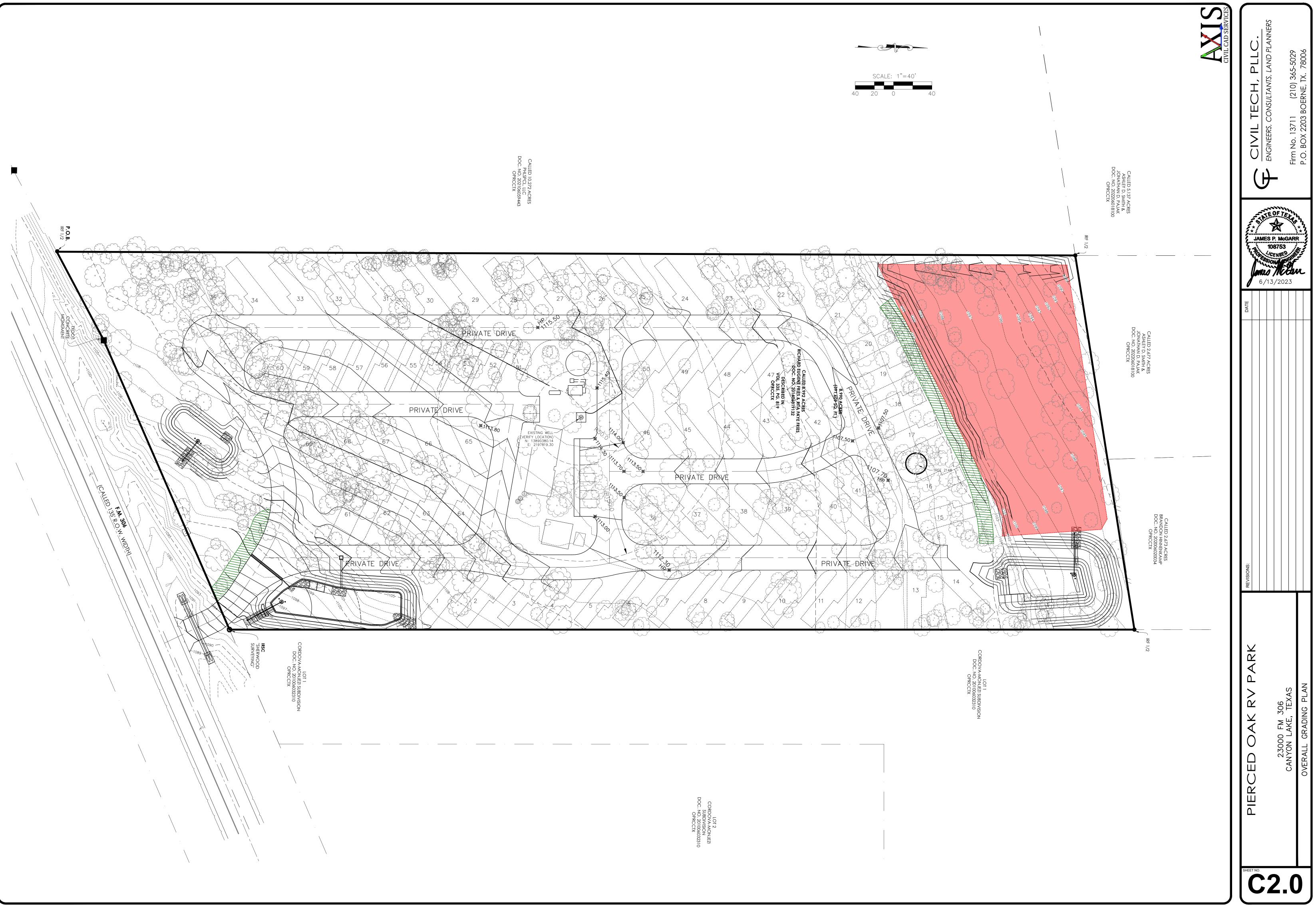






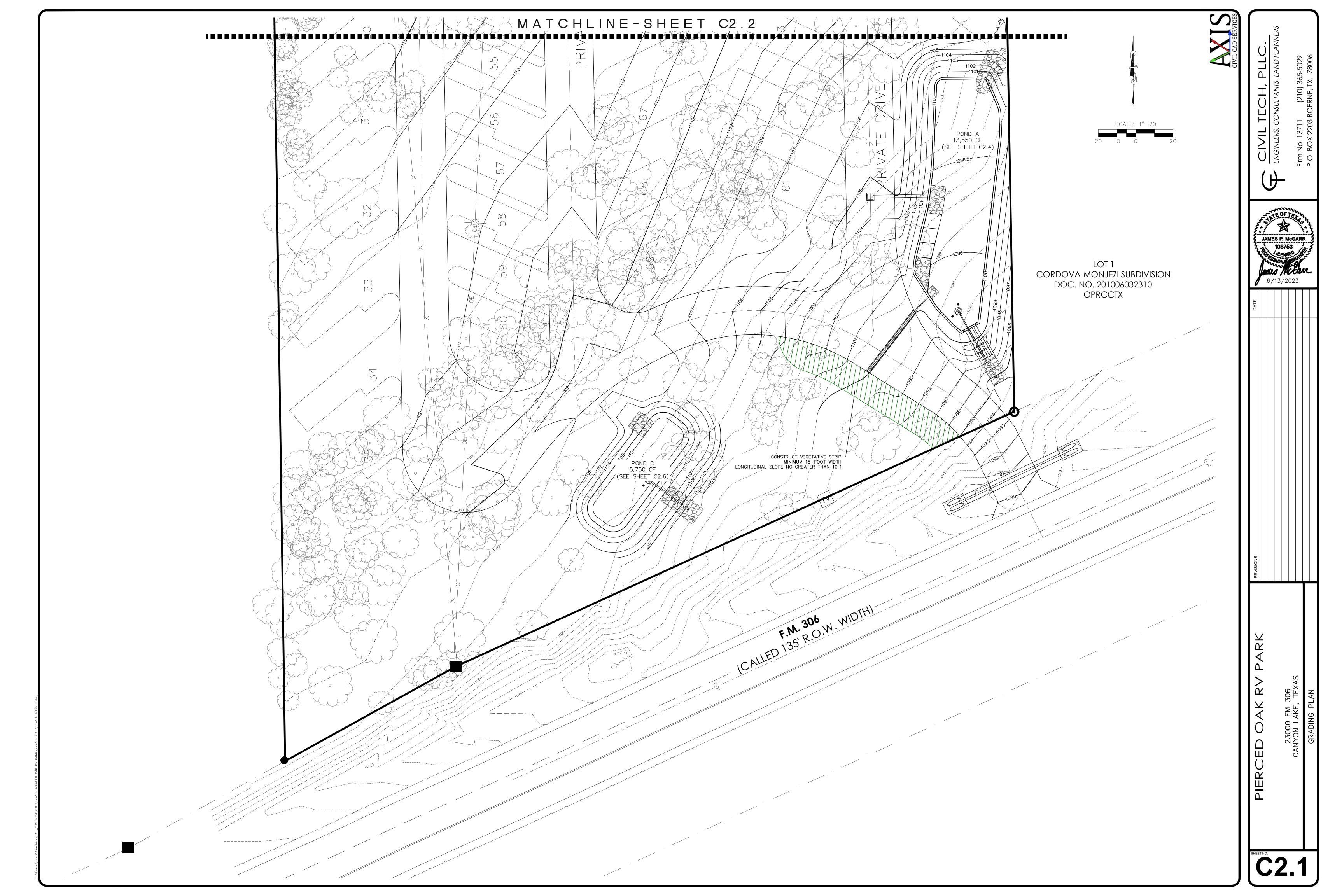


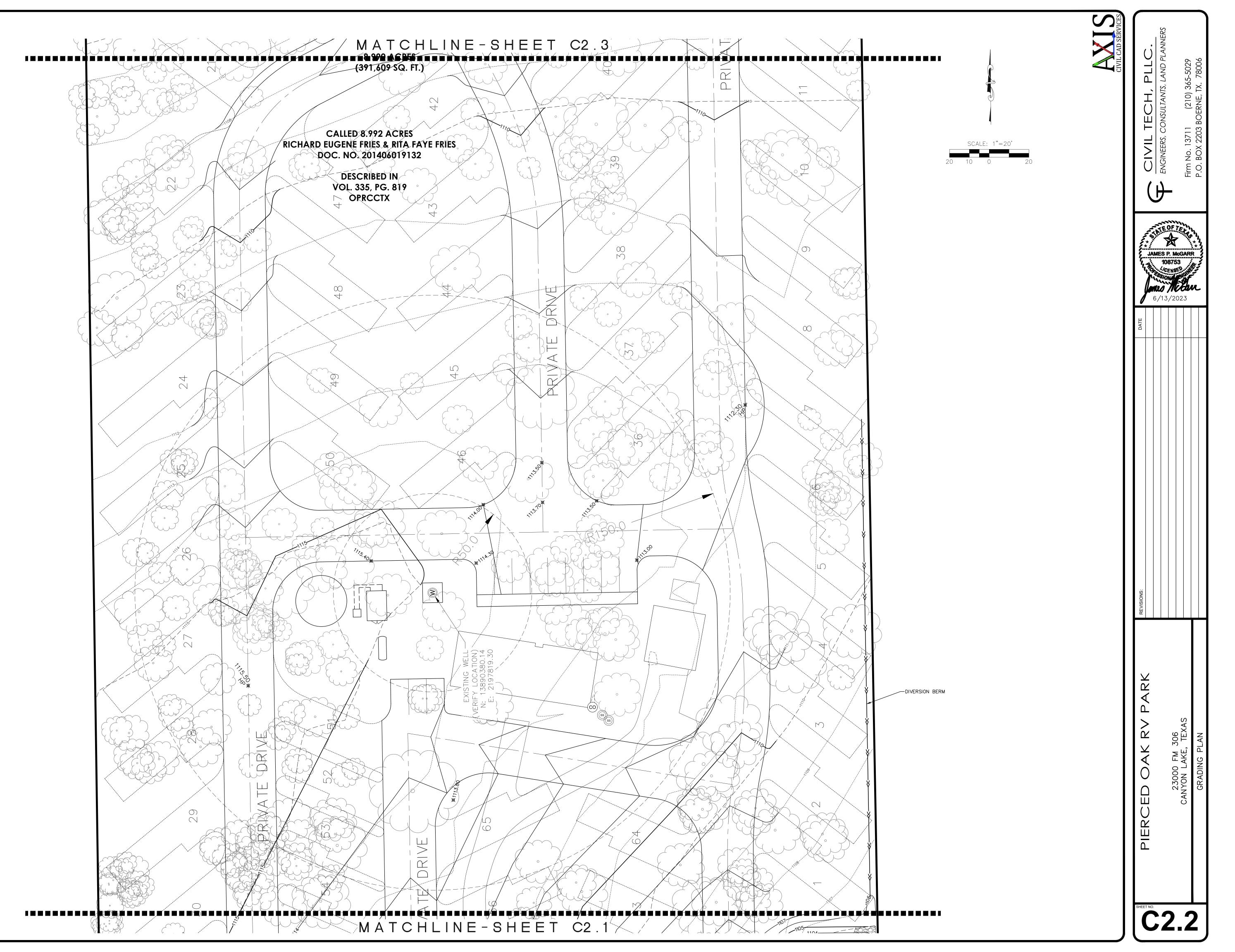
- 1. CONTRACTOR TO ADJUST VALVE TO DRAIN POND WATER QUALITY VOLUME
- 2. FILL TO BE PLACED IN MAXIMUM 8-INCH LIFTS AND COMPACTED TO 90%
- 3. ALL EARTHEN SLOPES TO BE RE-ESTABLISHED WITH GRASS VEGETATION.
- 4. ALL CONCRETE TO CONSIST OF 3500 PSI CONCRETE WITH #3 BARS AT



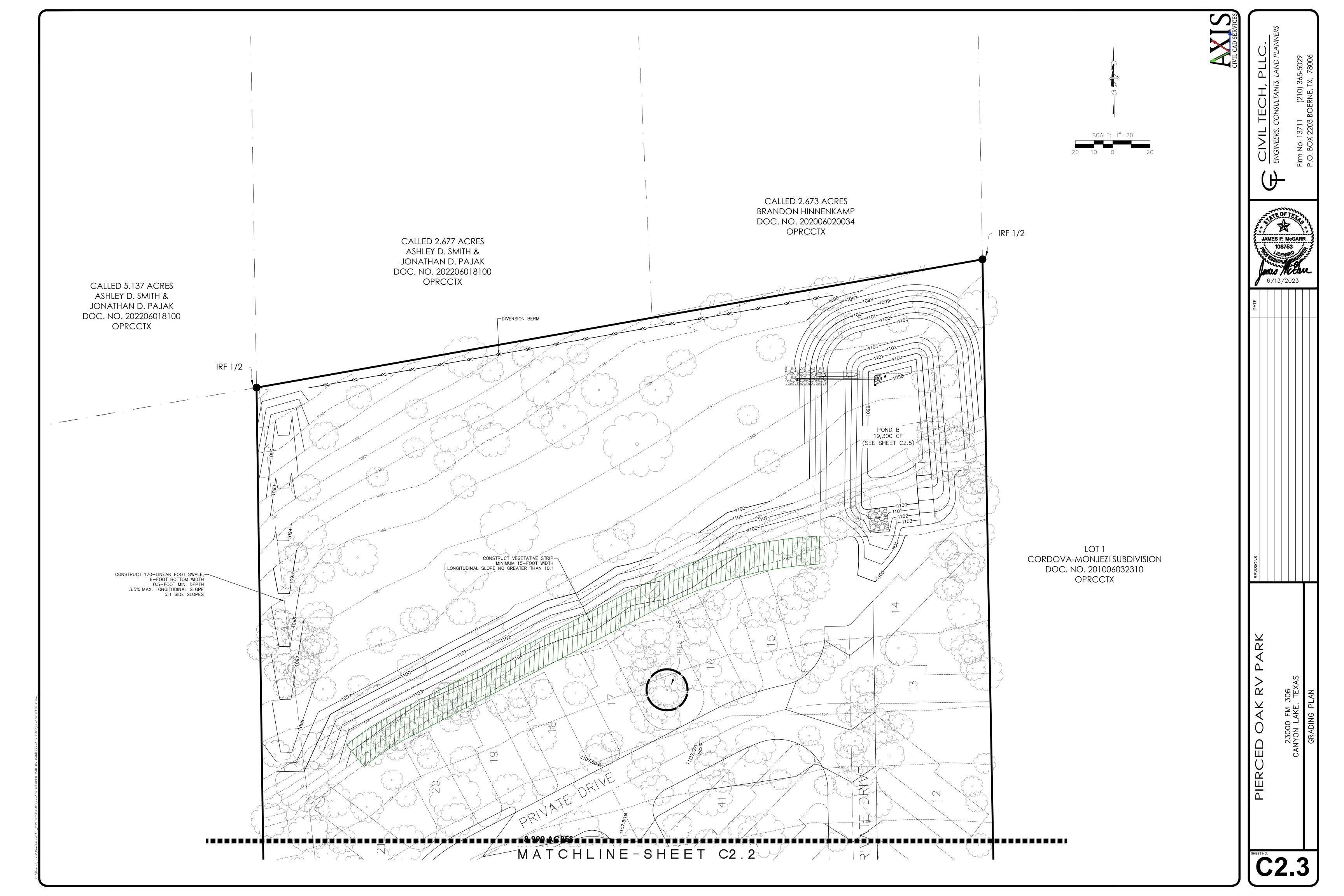








CALLED 10.272 ACRES PHLSPCL, LLC DOC. NO. 202106059443 OPRCCTX



ATTACHMENT N

Inspection, Maintenance, Repair and Retrofit Plan

Attachment N – Inspection, Maintenance, Repair and Retrofit Plan

Batch Detention Facilities

Project Name: Pierced Oak RV Park

Address: 23000 FM 306

City, State, Zip: Canyon Lake, Texas, 78133

Regular and routine maintenance is essential to effective, long lasting performance of batch detention facilities. Neglect or failure to service batch detention facilities on a regular basis will lead to poor performance and eventually costly repairs. It is recommended that batch detention Best Management Practices (BMPs) be inspected on a quarterly basis and after large storm events for the first year of operation. This intensive monitoring is intended to ensure proper operation and provide maintenance personnel with a basis for the operational characteristics of the filter. Subsequent inspections may be limited to semi-annually or more often if deemed necessary. The bottom of the batch detention pond should be maintained level. The bottom of the batch detention pond shall be visually inspected for any areas of excessive surface deposits and/or disruptions in the uniformity of the batch detention area. Such problem areas shall be promptly repaired or corrected.

Inspections: Inspections should take place a minimum of twice a year. One inspection should take place during wet weather to determine if the basin is meeting the target detention time of 12 hours and a drawdown time of no more than 48 hours. The remaining inspections should occur between storm events so that manual operation of the valve and controller can be verified. The level sensor in the basin should be inspected and any debris or sediment in the area should be removed. The outlet structure and the trash screen should be inspected for signs of clogging. Debris and sediment should be removed from the orifice and outlet(s) as described in previous sections. Debris obstructing the valve should be removed. During each inspection, erosion areas inside and downstream of this BMP should be identified and repaired/revegetated immediately.

Mowing: The basin, basin side-slopes, and embankment of the basin must be mowed to prevent woody growth and control weeds. A mulching mower should be used, or the grass clippings should be caught and removed. Mowing should take place at least twice a year, or more frequently if vegetation exceeds 18 inches in height. More frequent mowing to maintain aesthetic appeal may be necessary in landscaped areas.

Litter and Debris Removal: Litter and debris removal should take place at least twice a year, as part of the periodic mowing operations and inspections. Debris and litter should be removed from the surface of the basin. Particular attention should be paid to floatable debris around the outlet structure. The outlet should be checked for possible clogging or obstructions and any debris removed. Erosion control. The basin side slopes and embankment all may periodically suffer from slumping and erosion. To correct these problems, corrective action, such as regrading and revegetation, may be necessary. Correction of erosion control should take place whenever required based on the periodic inspections.

Nuisance Control: Standing water or soggy conditions may occur in the basin. Some standing water may occur after a storm event since the valve may close with 2 to 3 inches of water in the basin. Some flow into the basin may also occur between storms due to spring flow and residential water use that enters the storm sewer system. Twice a year, the facility should be evaluated in terms of nuisance control (insects, weeds, odors, algae, etc.).

Structural Repairs and Replacement: With each inspection, any damage to structural elements of the basin (pipes, concrete drainage structures, retaining walls, etc.) should be identified and repaired immediately. An example of this type of repair can include patching of cracked concrete, sealing of voids, removal of vegetation from cracks and joints. The various inlet/outlet structures in a basin will eventually deteriorate and must be replaced.

Sediment Removal: A properly designed batch detention basin will accumulate quantities of sediment over time. The accumulated sediment can detract from the appearance of the facility and reduce the pollutant removal performance of the facility. The sediment also tends to accumulate near the outlet structure and can interfere with the level sensor operation. Sediment shall be removed from the basin at least every 5 years, when sediment depth exceeds 6 inches, when the sediment interferes with the level sensor or when the basin does not drain within 48 hours. Care should be taken not to compromise the basin lining during maintenance.

Logic Controller: The Logic Controller should be inspected as part of the twice yearly investigations. Verify that the external indicators (active, cycle in progress) are operating properly by turning the controller off and on, and by initiating a cycle by triggering the level sensor in the basin. The valve should be manually opened and closed using the open/close switch to verify valve operation and to assist in inspecting the valve for debris. The solar panel should be inspected and any dust or debris on the panel should be carefully removed. The controller and all other circuitry and wiring should be inspected for signs of corrosion, damage from insects, water leaks, or other damage. At the end of the inspection, the controller should be reset.

Following any required maintenance, the surface of the filtration basin shall be raked and leveled to restore the system to its designed condition. With each inspection, any damage to the structural elements of the system (pipes, retaining walls, etc.) must be identified and repaired immediately. "Proper" disposal of accumulated silt shall be accomplished following the Texas Commission on Environmental Quality (TCEQ) and City of San Antonio guidelines (if within jurisdiction of City of San Antonio) and specifications.

After all inspections, results shall be recorded and maintained. Records should be made available on request by TCEQ and/or SAWS officials. Upon transfer of ownership or maintenance responsibility: The seller must inform the buyer of all requirements of the BMP maintenance. TCEQ must be notified and receive the form "TCEQ-10623 change in responsibility for maintenance on permanent Best Management Practices and Measures." In addition, TCEQ and SAWS Resource Protection Division shall receive a signed, dated copy of this maintenance plan from the new owner.

The applicant is responsible for maintaining the permanent BMPs after construction until such time as the maintenance obligation is either assumed in writing by another's entity having ownership or control of the property (such as without limitation, an owner's association, new property owner or lessee, a district, or municipality) or the ownership of the property is transferred to the entity assumes such an obligation in writing or ownership is transferred.

An amended copy of this document will be provided to the Texas Commission on Environmental Quality within thirty (30) days of any changes in the following information.

Owner / Responsible Party:

Contact Person:OwnerEntity:Pierced Oak, LLCMailing Address:1885 FM 2673City, State and Zip:Canyon Lake, Texas, 78133Telephone:817-713-6510Email:Wilker.ae@gmail.com

Apillithe Date: 6/27/23

Extended Detention Facilities

Project Name: Pierced Oak RV Park

Address: 23000 FM 306

City, State, Zip: Canyon Lake, Texas, 78133

Regular and routine maintenance is essential to effective, long lasting performance of extended detention facilities. Neglect or failure to service batch detention facilities on a regular basis will lead to poor performance and eventually costly repairs. It is recommended that batch detention Best Management Practices (BMPs) be inspected on a quarterly basis and after large storm events for the first year of operation. This intensive monitoring is intended to ensure proper operation and provide maintenance personnel with a basis for the operational characteristics of the filter. Subsequent inspections may be limited to semi-annually or more often if deemed necessary. The bottom of the batch detention pond should be maintained level. The bottom of the extended detention pond shall be visually inspected for any areas of excessive surface deposits and/or disruptions in the uniformity of the batch detention area. Such problem areas shall be promptly repaired or corrected.

Inspections: Inspections should take place a minimum of twice a year. One inspection should take place during wet weather to determine if the basin is meeting the target detention time of 12 hours and a drawdown time of no more than 48 hours. The remaining inspections should occur between storm events so that manual operation of the valve and controller can be verified. The level sensor in the basin should be inspected and any debris or sediment in the area should be removed. The outlet structure and the trash screen should be inspected for signs of clogging. Debris and sediment should be removed from the orifice and outlet(s) as described in previous sections. Debris obstructing the valve should be removed. During each inspection, erosion areas inside and downstream of this BMP should be identified and repaired/revegetated immediately.

Mowing: The basin, basin side-slopes, and embankment of the basin must be mowed to prevent woody growth and control weeds. A mulching mower should be used, or the grass clippings should be caught and removed. Mowing should take place at least twice a year, or more frequently if vegetation exceeds 18 inches in height. More frequent mowing to maintain aesthetic appeal may be necessary in landscaped areas.

Litter and Debris Removal: Litter and debris removal should take place at least twice a year, as part of the periodic mowing operations and inspections. Debris and litter should be removed from the surface of the basin. Particular attention should be paid to floatable debris around the outlet structure. The outlet should be checked for possible clogging or obstructions and any debris removed. Erosion control. The basin side slopes and embankment all may periodically suffer from slumping and erosion. To correct these problems, corrective action, such as regrading and revegetation, may be necessary. Correction of erosion control should take place whenever required based on the periodic inspections.

Nuisance Control: Standing water or soggy conditions may occur in the basin. Some standing water may occur after a storm event since the valve may close with 2 to 3 inches of water in the basin. Some flow into the basin may also occur between storms due to spring flow and residential water use that enters the storm sewer system. Twice a year, the facility should be evaluated in terms of nuisance control (insects, weeds, odors, algae, etc.).

Structural Repairs and Replacement: With each inspection, any damage to structural elements of the basin (pipes, concrete drainage structures, retaining walls, etc.) should be identified and repaired immediately. An example of this type of repair can include patching of cracked concrete, sealing of voids, removal of

vegetation from cracks and joints. The various inlet/outlet structures in a basin will eventually deteriorate and must be replaced.

Sediment Removal: A properly designed batch detention basin will accumulate quantities of sediment over time. The accumulated sediment can detract from the appearance of the facility and reduce the pollutant removal performance of the facility. The sediment also tends to accumulate near the outlet structure and can interfere with the level sensor operation. Sediment shall be removed from the basin at least every 5 years, when sediment depth exceeds 6 inches, when the sediment interferes with the level sensor or when the basin does not drain within 48 hours. Care should be taken not to compromise the basin lining during maintenance.

Following any required maintenance, the surface of the filtration basin shall be raked and leveled to restore the system to its designed condition. With each inspection, any damage to the structural elements of the system (pipes, retaining walls, etc.) must be identified and repaired immediately. "Proper" disposal of accumulated silt shall be accomplished following the Texas Commission on Environmental Quality (TCEQ) and City of San Antonio guidelines (if within jurisdiction of City of San Antonio) and specifications.

After all inspections, results shall be recorded and maintained. Records should be made available on request by TCEQ and/or SAWS officials. Upon transfer of ownership or maintenance responsibility: The seller must inform the buyer of all requirements of the BMP maintenance. TCEQ must be notified and receive the form "TCEQ-10623 change in responsibility for maintenance on permanent Best Management Practices and Measures." In addition, TCEQ and SAWS Resource Protection Division shall receive a signed, dated copy of this maintenance plan from the new owner.

The applicant is responsible for maintaining the permanent BMPs after construction until such time as the maintenance obligation is either assumed in writing by another's entity having ownership or control of the property (such as without limitation, an owner's association, new property owner or lessee, a district, or municipality) or the ownership of the property is transferred to the entity assumes such an obligation in writing or ownership is transferred.

An amended copy of this document will be provided to the Texas Commission on Environmental Quality within thirty (30) days of any changes in the following information.

Owner / Responsible Party:

Contact Person:	Owner
Entity:	Pierced Oak, LLC
Mailing Address:	1885 FM 2673
City, State and Zip:	Canyon Lake, Texas, 78133
Telephone:	817-713-6510
Email:	Wilker.ae@gmail.com

Azituito Date: 6/27/23

Vegetative Filter Strips

Project Name: Pierced Oak RV Park

Address: 23000 FM 306

City, State, Zip: Canyon Lake, Texas, 78133

The care and maintenance a vegetated filter strip receives in the first few months are keys to establishing the viability of the filter strips. Once a vegetated area is well established, little additional maintenance is generally necessary, however, all vegetated Best Management Practices (BMPs) require some basic maintenance including:

Pest Management: An Integrated Pest Management Plan (IPM) should be developed for vegetated areas. This plan should specify how problem insects and weeds will be controlled with minimal or no use of insecticides and herbicides.

Seasonal Mowing and Lawn Care: If the filter strip is made of turf grass, it should be mowed as needed to limit vegetation height to 18 inches, using a mulching mower (or removal of clipping). If native grasses are used, the filter may require less frequent mowing, but a minimum of twice annually. Grass clipping and brush debris should not be deposited on vegetated filter strip areas. Regular mowing should also include weed control practices, however herbicide use should be kept to a minimum. Healthy grass may be maintained without using fertilizers because runoff usually contains sufficient nutrients. Irrigation of the site may also help assure a dense and healthy vegetative cover.

Inspection: Inspection of filter strips should be done at least twice annually for erosion or damage to vegetation; however, additional inspections after periods of heavy runoff are most desirable. The strip should be checked for uniformity of grass cover, debris and litter, and areas of sediment accumulation. More frequent inspections of grass cover will be made during the first few years after establishment to determine if any problems are developing, and to plan for long-term restorative maintenance needs. Bare spots and areas of erosion identified during semi-annual inspections should be replanted and restored to meet specifications. Construction of a level spreader device may be necessary to reestablish shallow overland flow.

Debris and Litter Removal: Any filter strip or filter strip structures (i.e. leveled spreaders) should be kept free of obstructions to reduce floatables from being flushed downstream, and for aesthetic reasons. The need for this practice will be determined through periodic inspection, but will be performed no less than four (4) times per year.

Sediment Removal: Sediment removal is not normally required in filter strips. However, sediment may accumulate along the upstream boundary of the strip preventing uniform overland flow. Excess sediment should be removed by hand, with flat-bottomed shovels, or light construction equipment.

Grass Re-seeding and Mulching: A healthy dense grass should be maintained on the filter strip. If areas are eroded, they should be filled, compacted and reseeded so that the final grade is level. Grass damaged during the sediment removal process should be promptly replaced using the same seed mix used during filter strip establishment. Flow should be diverted, if possible, from the damaged areas until the grass is firmly established. Bare spots and areas of erosion identified during semi-annual inspections must be replanted and restored to meet specifications. Corrective maintenance, such as weeding or replanting should be done more frequently in the first two to three years after installation to ensure stabilization. Dense vegetation may require irrigation immediately after planting, and during dry periods, particularly as the vegetation is initially established.

"Proper" disposal of accumulated silt shall be accomplished following the Texas Commission on Environmental Quality (TCEQ) and City of San Antonio guidelines (if within jurisdiction of City of San Antonio) and specifications.

After all inspections, results shall be recorded and maintained. Records should be made available on request by TCEQ and/or SAWS officials. Upon transfer of ownership or maintenance responsibility: The seller must inform the buyer of all requirements of the BMP maintenance. TCEQ must be notified and receive the form "TCEQ-10623 change in responsibility for maintenance on permanent Best Management Practices and Measures." In addition, TCEQ and SAWS Resource Protection Division shall receive a signed, dated copy of this maintenance plan from the new owner.

The applicant is responsible for maintaining the permanent BMPs after construction until such time as the maintenance obligation is either assumed in writing by another's entity having ownership or control of the property (such as without limitation, an owner's association, new property owner or lessee, a district, or municipality) or the ownership of the property is transferred to the entity assumes such an obligation in writing or ownership is transferred.

An amended copy of this document will be provided to the Texas Commission on Environmental Quality within thirty (30) days of any changes in the following information.

Owner / Responsible Party:

Owner
Pierced Oak, LLC
1885 FM 2673
Canyon Lake, Texas, 78133
817-713-6510
Wilker.ae@gmail.com

ADW10115 Date: 4/27/23.

Grassy Swales

Project Name: Pierced Oak RV Park

Address: 23000 FM 306

City, State, Zip: Canyon Lake, Texas, 78133

The care and maintenance a grassy swale receives in the first few months are keys to establishing its long term viability. Once the swale vegetation is well established, little additional maintenance is generally necessary, however, all vegetated Best Management Practices (BMPs) require some basic maintenance including:

Pest Management: An Integrated Pest Management Plan (IPM) should be developed for vegetated areas. This plan should specify how problem insects and weeds will be controlled with minimal or no use of insecticides and herbicides.

Seasonal Mowing and Lawn Care: Mowing will be performed routinely as needed throughout the growing season. Grass will be mowed as needed to limit vegetation height to 2 inches, above the design water depth using a mulching mower (or removal of clipping). If native grasses are used, the swale may require less frequent mowing, but a minimum of twice annually. Grass clipping and brush debris will not be deposited within the channel. Regular mowing will also include weed control practices, however herbicide use should be kept to a minimum. Healthy grass may be maintained without using fertilizers because runoff usually contains sufficient nutrients. Irrigation of the site may also help assure a dense and healthy vegetative cover.

Inspection: Inspection of swales should be done at least twice annually for erosion or damage to vegetation. Additional inspections after periods of heavy runoff will also be made. The swale will be checked for uniformity of grass cover, debris and litter, and areas of sediment accumulation. More frequent inspections of grass cover will be made during the first few years after establishment to determine if any problems are developing, and to plan for long-term restorative maintenance needs. Bare spots and areas of erosion identified during semi-annual inspections will be replanted and restored to meet specifications. Construction of a level spreader device may be necessary to reestablish shallow overland flow.

Debris and Litter Removal: All swales or swale structures (i.e. check dams) will be kept free of obstructions to reduce floatables from being flushed downstream, and for aesthetic reasons. The need for this practice will be determined through periodic inspection, but will be performed no less than two (2) times per year.

Sediment Removal: Sediment accumulating near culverts and in channels will be removed when sediment build up exceeds three (3) inches, or when vegetation is covered. Excess sediment should be removed by hand, with flat-bottomed shovels, or light construction equipment. Areas that are significantly eroded will be filled, compacted, and reseeded so that the final grade is level with the bottom of the swale. Sediments will be removed in accordance with TCEQ guidelines.

Grass Re-seeding and Mulching: A healthy dense grass will be maintained on within the channel and side slopes. If areas are eroded, they will be filled, compacted and reseeded so that the final grade is level. Grass damaged during the sediment removal process will be promptly replaced using the same seed mix used during filter strip establishment. Bare spots and areas of erosion identified during semi-annual inspections must be replanted and restored to meet specifications. Corrective maintenance, such as weeding or replanting will be done more frequently in the first two to three years after installation to ensure stabilization. Dense vegetation may require irrigation immediately after planting, and during dry periods, particularly as the vegetation is initially established.

"Proper" disposal of accumulated silt shall be accomplished following the Texas Commission on Environmental Quality (TCEQ) and City of San Antonio guidelines (if within jurisdiction of City of San Antonio) and specifications.

After all inspections, results shall be recorded and maintained. Records should be made available on request by TCEQ and/or SAWS officials. Upon transfer of ownership or maintenance responsibility: The seller must inform the buyer of all requirements of the BMP maintenance. TCEQ must be notified and receive the form "TCEQ-10623 change in responsibility for maintenance on permanent Best Management Practices and Measures." In addition, TCEQ and SAWS Resource Protection Division shall receive a signed, dated copy of this maintenance plan from the new owner.

The applicant is responsible for maintaining the permanent BMPs after construction until such time as the maintenance obligation is either assumed in writing by another's entity having ownership or control of the property (such as without limitation, an owner's association, new property owner or lessee, a district, or municipality) or the ownership of the property is transferred to the entity assumes such an obligation in writing or ownership is transferred.

An amended copy of this document will be provided to the Texas Commission on Environmental Quality within thirty (30) days of any changes in the following information.

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Mailing Address:	1885 FM 2673
City, State and Zip:	Canyon Lake, Texas, 78133
Telephone:	817-713-6510
Email:	Wilker.ae@gmail.com

Aplul 15 Date: 4/27/23

ATTACHMENT O

Pilot-Scale Field Testing Plan

Not Applicable

ATTACHMENT P

Measures for Minimizing Surface Stream Contamination

Not Applicable

Storm Water Pollution Prevention Plan

(SWPPP)

STABILIZED CONSTRUCTION ENTRANCE SCALE N.T.S.

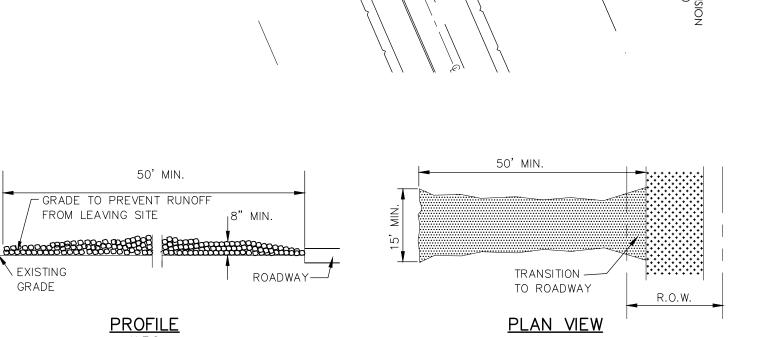
- 7. DRAINAGE- ENTRANCE MUST BE PROPERLY GRADED OR INCORPORATE A DRAINAGE SWALE TO PREVENT RUNOFF FROM LEAVING THE CONSTRUCTION SITE.
- 6. MAINTENANCE THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC ROADWAYS. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND, AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC ROADWAY MUST BE REMOVED
- 5. WASHING- WHEN NECESSARY, WHEELS SHALL BE CLEANED TO REMOVE SEDIMENT PRIOR TO ENTRANCE ONTO PUBLIC ROADWAY. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH CRUSHED STONE WHICH DRAINS INTO AN APPROVED TRAP OR SEDIMENT BASIN. ALL SEDIMENT SHALL BE PREVENTED FROM ENTERING ANY STORM DRAIN, DITCH, OR WATERCOURSE USING APPROVED METHODS.
- 4. WIDTH- NOT LESS THAN FULL WIDTH OF ALL POINTS OF INGRESS OR EGRESS.
- 3. THICKNESS- NOT LESS THAN 8 INCHES.

IMMEDIATELY.

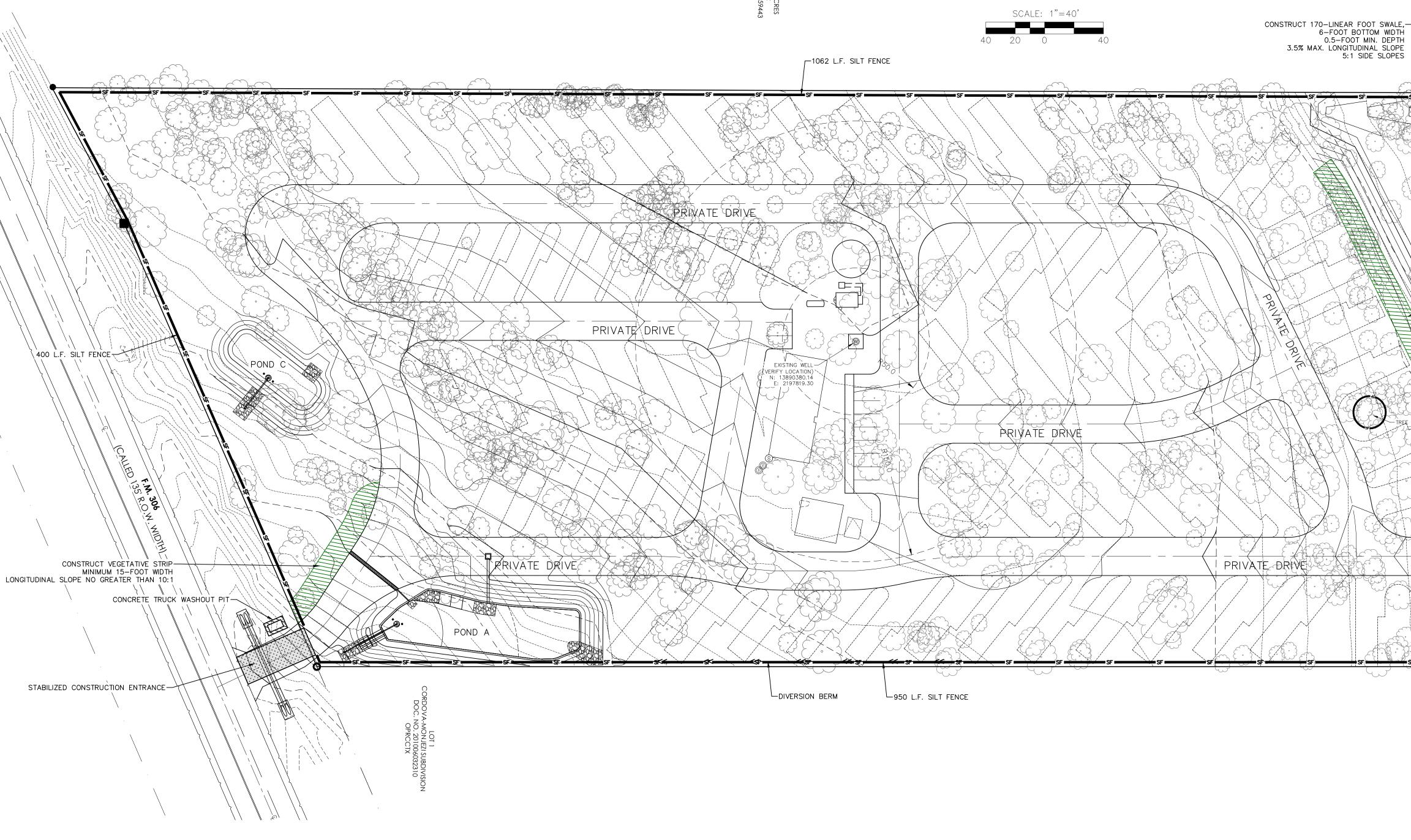
N.T.S.

- 2. LENGTH- AS EFFECTIVE, BUT NOT LESS THAN 50 FEET.





N.T.S.



- RUNOFF SOURCE. POST MUST BE EMBEDDED A MINIMUM OF ONE FOOT.

SILT FENCE

GEOTEXTILE FABRIC

- FENCE.

- TURN ATTACHED TO THE STEEL FENCE POST.
- 6. SILT FENCE SHALL BE REMOVED WHEN THE SITE IS COMPLETELY STABILIZED SO AS NOT TO BLOCK OR IMPEDE STORM FLOW OR DRAINAGE.

SILT FENCE SCALE N.T.S.

7. ACCUMULATED SILT SHALL BE REMOVED WHEN IT REACHES A DEPTH OF 6 INCHES. THE SILT SHALL BE DISPOSED OF IN AN APPROVED SITE AND IN SUCH A MANNER AS TO NOT CONTRIBUTE TO ADDITIONAL SILTATION.

5. INSPECTION SHALL BE MADE WEEKLY OR AFTER EACH RAINFALL EVENT AND REPAIR OR REPLACEMENT SHALL BE MADE PROMPTLY AS NEEDED.

4. SILT FENCE SHOULD BE SECURELY FASTENED TO EACH STEEL SUPPORT POSTS OR TO WOVEN WIRE, WHICH IS IN

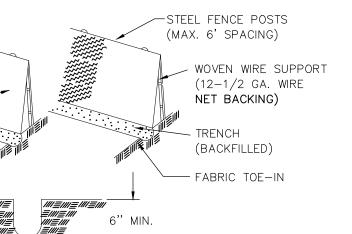
3. THE TRENCH MUST BE A MINIMUM OF 6 INCHES DEEP AND 6 INCHES WIDE TO ALLOW FOR THE SILT FENCE FABRIC TO BE LAID IN THE GROUND AND BACKFILLED WITH COMPACTED MATERIAL.

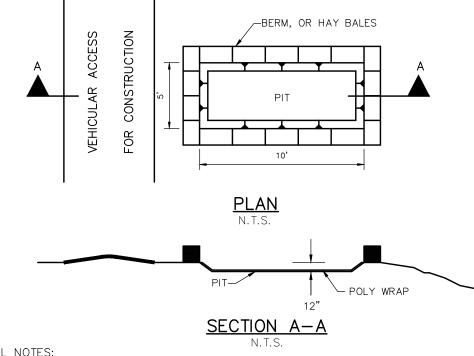
TREATED IN (e.g. pavement) WEIGHT FABRIC FLAP WITH WASHED GRAVEL ON UPHILL SIDE TO PREVENT FLOW UNDER

2. THE TOE OF THE SILT FENCE SHALL BE TRENCHED IN WITH A SPADE OR MECHANICAL TRENCHER, SO THAT THE DOWNSLOPE FACE OF THE TRENCH IS FLAT AND PERPENDICULAR TO THE LINE OF FLOW. WHERE FENCE CAN NOT BE

GENERAL NOTES: 1. STEEL POSTS WHICH SUPPORT THE SILT FENCE SHALL BE INSTALLED ON A SLIGHT ANGLE TOWARD THE ANTICIPATED

- FABRIC TOE-IN |||=|||=||||=|||| =|||=||| |||=||| =|||= III = III = III = 6" MIN 6" MIN. TRENCH CROSS-SECTION N.T.S.





GENERAL NOTES: 1. DETAIL ILLUSTRATES MINIMUM DIMENSIONS. PIT CAN BE INCREASED IN SIZE DEPENDING ON EXPECTED FREQUENCY OF USE.

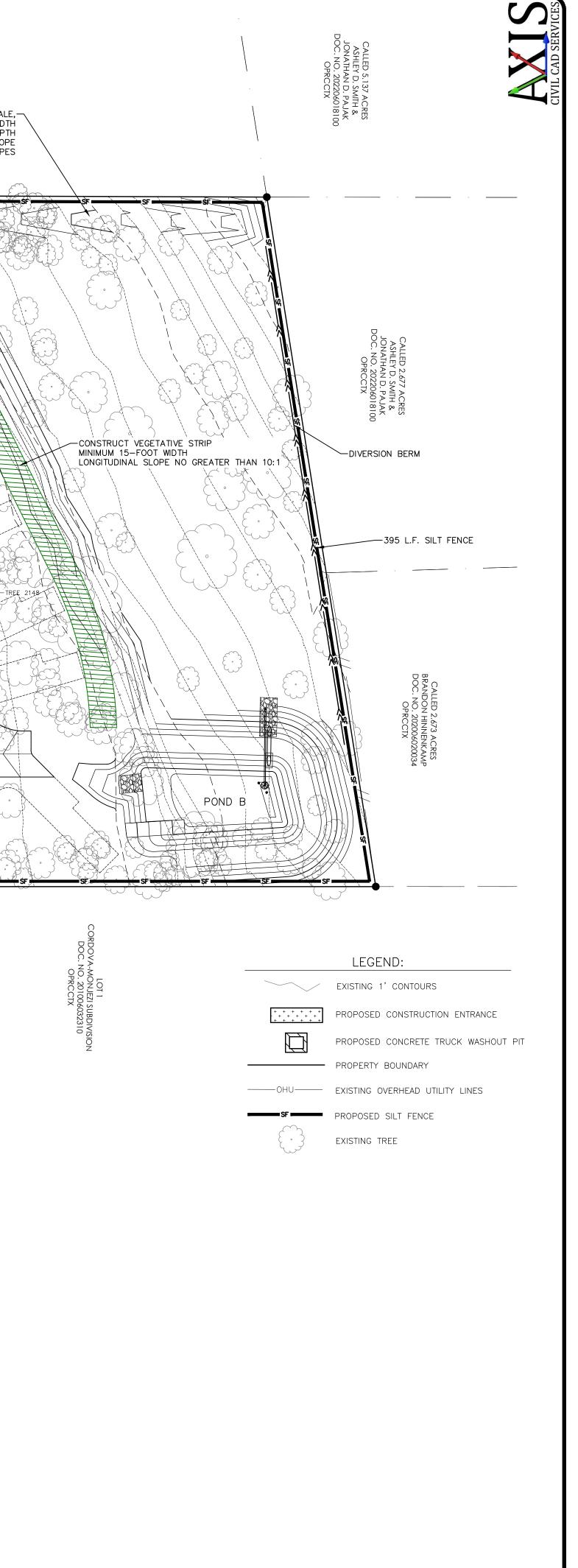
2. IF HAY BALES ARE USED, THEY SHALL BE PLACED IN ACCORDANCE WITH DETAILS SHOWN ON EXHIBIT FOR HAY BALES.

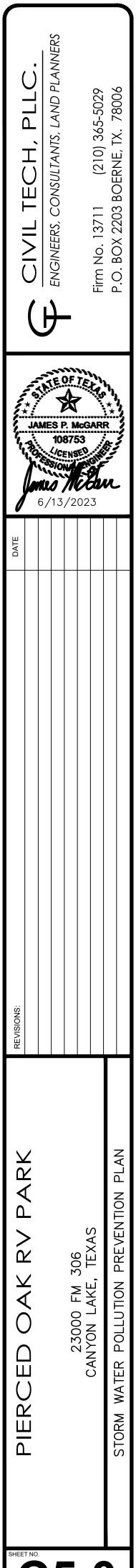
3. POLY WRAP TO CONSIST OF 8 MIL. OR GREATER AND PLACED ON TOP OF VIRGIN SOIL. 4. WASHOUT PIT SHALL BE LOCATED IN AN AREA EASILY ACCESSIBLE TO CONSTRUCTION

TRAFFIC.

5. WASHOUT PIT SHALL NOT BE LOCATED IN AREAS SUBJECT TO INUNDATION FROM STORM WATER RUNOFF.

CONCRETE TRUCK WASHOUT PIT SCALE N.T.S.





Temporary Stormwater Section

Texas Commission on Environmental Quality

for Regulated Activities on the Edwards Aquifer Recharge Zone and Relating to 30 TAC §213.5(b)(4)(A), (B), (D)(I) and (G); Effective June 1, 1999

To ensure that the application is administratively complete, confirm that all fields in the form are complete, verify that all requested information is provided, consistently reference the same site and contact person in all forms in the application, and ensure forms are signed by the appropriate party.

Note: Including all the information requested in the form and attachments contributes to more streamlined technical reviews.

Signature

To the best of my knowledge, the responses to this form accurately reflect all information requested concerning the proposed regulated activities and methods to protect the Edwards Aquifer. This **Temporary Stormwater Section** is hereby submitted for TCEQ review and executive director approval. The application was prepared by:

Print Name of Customer/Agent: James McGarr, PE

Date: <u>6/1/2023</u>

Signature of Customer/Agent:

Regulated Entity Name: 23000 FM 306, Canyon Lake, Texas

Project Information

Potential Sources of Contamination

Examples: Fuel storage and use, chemical storage and use, use of asphaltic products, construction vehicles tracking onto public roads, and existing solid waste.

1. Fuels for construction equipment and hazardous substances which will be used during construction:

The following fuels and/or hazardous substances will be stored on the site: _____

These fuels and/or hazardous substances will be stored in:

Aboveground storage tanks with a cumulative storage capacity of less than 250 gallons will be stored on the site for less than one (1) year.

Aboveground storage tanks with a cumulative storage capacity between 250 gallons and 499 gallons will be stored on the site for less than one (1) year.

- Aboveground storage tanks with a cumulative storage capacity of 500 gallons or more will be stored on the site. An Aboveground Storage Tank Facility Plan application must be submitted to the appropriate regional office of the TCEQ prior to moving the tanks onto the project.
- Fuels and hazardous substances will not be stored on the site.
- 2. Attachment A Spill Response Actions. A site specific description of the measures to be taken to contain any spill of hydrocarbons or hazardous substances is attached.
- 3. Temporary aboveground storage tank systems of 250 gallons or more cumulative storage capacity must be located a minimum horizontal distance of 150 feet from any domestic, industrial, irrigation, or public water supply well, or other sensitive feature.
- 4. Attachment B Potential Sources of Contamination. A description of any activities or processes which may be a potential source of contamination affecting surface water quality is attached.

Sequence of Construction

5. Attachment C - Sequence of Major Activities. A description of the sequence of major activities which will disturb soils for major portions of the site (grubbing, excavation, grading, utilities, and infrastructure installation) is attached.

For each activity described, an estimate (in acres) of the total area of the site to be disturbed by each activity is given.

- For each activity described, include a description of appropriate temporary control measures and the general timing (or sequence) during the construction process that the measures will be implemented.
- 6. Name the receiving water(s) at or near the site which will be disturbed or which will receive discharges from disturbed areas of the project: <u>Potters Creek</u>

Temporary Best Management Practices (TBMPs)

Erosion control examples: tree protection, interceptor swales, level spreaders, outlet stabilization, blankets or matting, mulch, and sod. Sediment control examples: stabilized construction exit, silt fence, filter dikes, rock berms, buffer strips, sediment traps, and sediment basins. Please refer to the Technical Guidance Manual for guidelines and specifications. All structural BMPs must be shown on the site plan.

7. Attachment D – Temporary Best Management Practices and Measures. TBMPs and measures will prevent pollution of surface water, groundwater, and stormwater. The construction-phase BMPs for erosion and sediment controls have been designed to retain sediment on site to the extent practicable. The following information is attached:

 A description of how BMPs and measures will prevent pollution of surface water, groundwater or stormwater that originates upgradient from the site and flows across the site. A description of how BMPs and measures will prevent pollution of surface water or groundwater that originates on-site or flows off site, including pollution caused by contaminated stormwater runoff from the site. A description of how BMPs and measures will prevent pollutants from entering surface streams, sensitive features, or the aquifer. A description of how, to the maximum extent practicable, BMPs and measures will maintain flow to naturally-occurring sensitive features identified in either the geologic assessment, TCEQ inspections, or during excavation, blasting, or construction.
The temporary sealing of a naturally-occurring sensitive feature which accepts recharge to the Edwards Aquifer as a temporary pollution abatement measure during active construction should be avoided.
 Attachment E - Request to Temporarily Seal a Feature. A request to temporarily seal a feature is attached. The request includes justification as to why no reasonable and practicable alternative exists for each feature. There will be no temporary sealing of naturally-occurring sensitive features on the site.
Attachment F - Structural Practices. A description of the structural practices that will be used to divert flows away from exposed soils, to store flows, or to otherwise limit runoff discharge of pollutants from exposed areas of the site is attached. Placement of structural practices in floodplains has been avoided.
Attachment G - Drainage Area Map. A drainage area map supporting the following requirements is attached:
 For areas that will have more than 10 acres within a common drainage area disturbed at one time, a sediment basin will be provided. For areas that will have more than 10 acres within a common drainage area disturbed at one time, a smaller sediment basin and/or sediment trap(s) will be used. For areas that will have more than 10 acres within a common drainage area disturbed at one time, a sediment basin or other equivalent controls are not attainable, but other TBMPs and measures will be used in combination to protect down slope and side slope boundaries of the construction area. There are no areas greater than 10 acres within a common drainage area that will be used in combination with other erosion and sediment controls within each disturbed at one time. A smaller sediment basin and/or sediment trap(s) will be used in combination with other erosion and sediment controls within each disturbed area.

There are no areas greater than 10 acres within a common drainage area that will be disturbed at one time. Erosion and sediment controls other than sediment basins or sediment traps within each disturbed drainage area will be used.

- 11. Attachment H Temporary Sediment Pond(s) Plans and Calculations. Temporary sediment pond or basin construction plans and design calculations for a proposed temporary BMP or measure have been prepared by or under the direct supervision of a Texas Licensed Professional Engineer. All construction plans and design information must be signed, sealed, and dated by the Texas Licensed Professional Engineer. Construction plans for the proposed temporary BMPs and measures are attached.
 - 🛛 N/A
- 12. Attachment I Inspection and Maintenance for BMPs. A plan for the inspection of each temporary BMP(s) and measure(s) and for their timely maintenance, repairs, and, if necessary, retrofit is attached. A description of the documentation procedures, recordkeeping practices, and inspection frequency are included in the plan and are specific to the site and/or BMP.
- 13. All control measures must be properly selected, installed, and maintained in accordance with the manufacturer's specifications and good engineering practices. If periodic inspections by the applicant or the executive director, or other information indicate a control has been used inappropriately, or incorrectly, the applicant must replace or modify the control for site situations.
- 14. If sediment escapes the construction site, off-site accumulations of sediment must be removed at a frequency sufficient to minimize offsite impacts to water quality (e.g., fugitive sediment in street being washed into surface streams or sensitive features by the next rain).
- 15. Sediment must be removed from sediment traps or sedimentation ponds not later than when design capacity has been reduced by 50%. A permanent stake will be provided that can indicate when the sediment occupies 50% of the basin volume.
- 16. 🖂 Litter, construction debris, and construction chemicals exposed to stormwater shall be prevented from becoming a pollutant source for stormwater discharges (e.g., screening outfalls, picked up daily).

Soil Stabilization Practices

Examples: establishment of temporary vegetation, establishment of permanent vegetation, mulching, geotextiles, sod stabilization, vegetative buffer strips, protection of trees, or preservation of mature vegetation.

17. Attachment J - Schedule of Interim and Permanent Soil Stabilization Practices. A schedule of the interim and permanent soil stabilization practices for the site is attached.

- 18. Records must be kept at the site of the dates when major grading activities occur, the dates when construction activities temporarily or permanently cease on a portion of the site, and the dates when stabilization measures are initiated.
- 19. Stabilization practices must be initiated as soon as practicable where construction activities have temporarily or permanently ceased.

Administrative Information

- 20. \square All structural controls will be inspected and maintained according to the submitted and approved operation and maintenance plan for the project.
- 21. If any geologic or manmade features, such as caves, faults, sinkholes, etc., are discovered, all regulated activities near the feature will be immediately suspended. The appropriate TCEQ Regional Office shall be immediately notified. Regulated activities must cease and not continue until the TCEQ has reviewed and approved the methods proposed to protect the aquifer from any adverse impacts.
- 22. Silt fences, diversion berms, and other temporary erosion and sediment controls will be constructed and maintained as appropriate to prevent pollutants from entering sensitive features discovered during construction.

ATTACHMENT A

Spill Response Actions

Attachment A – Spill Response Actions

Site Specific Measures that will be taken to contain any spill of hydrocarbons or hazardous substances will include:

- 1. Immediate isolation of the substance source to keep additional spill or possible infiltration from occurring. Action will be taken to block the down gradient side using native earth material, absorbent blankets or absorbent socks.
- 2. The substance and contaminated materials will be excavated and placed within an impervious container or impervious-lined area that is protected from storm water runoff. Excavated materials will be covered to protect against rain.
- 3. The hazardous substance will be positively identified.
- 4. The spill area, after the excavation, will be sampled to verify that the hazardous substance has been properly and adequately remediated.
- 5. The excavated materials will be disposed of at an approved facility licensed to accept the substance identified. All transporting and disposal will follow State requirements for hazardous substances.
- 6. Fuels and Hazardous Substances are not to be stored on site.
- 7. Contractor shall become familiar with the Site Plan and confine activities with fuels and hazardous substances to locations that are adequate for the isolation and prevention of contamination in the event of a spill.

In addition to the above site specific measures, the following recommended measures from the Edwards Aquifer Technical Guidance Manual (RG-348, 2005); Section 1.4.16, Significant/Hazardous Spills section should also be followed and are provided herein. These measures are to prevent or reduce the discharge of pollutants to drainage systems or watercourses from leaks and spills by reducing the chance for spills, stopping the source of spills, containing and cleaning up spills, properly disposing of spill materials, and training employees.

The following steps will help reduce the storm water impacts of leaks and spills:

Education

- 1. Be aware that different materials pollute in different amounts. Make sure that each employee knows what a "significant spill" is for each material they use, and what is the appropriate response for "significant" and "insignificant" spills. Employees should also be aware of when spill must be reported to the TCEQ. Information available in 30 TAC 327.4 and 40 CFR 302.4.
- 2. Educate employees and subcontractors on potential dangers to humans and the environment from spills and leaks.
- 3. Hold regular meetings to discuss and reinforce appropriate disposal procedures (incorporate into regular safety meetings).
- 4. Establish a continuing education program to indoctrinate new employees.
- 5. Have contractor's superintendent or representative oversee and enforce proper spill prevention and control measures.

General Measures

- 1. To the extent that the work can be accomplished safely, spills of oil, petroleum products, and substances listed under 40 CFR parts 110,117, and 302, and sanitary and septic wastes should be contained and cleaned up immediately.
- 2. Store hazardous materials and wastes in covered containers and protect from vandalism.
- 3. Place a stockpile of spill cleanup materials where it will be readily accessible.
- 4. Train employees in spill prevention and cleanup.
- 5. Designate responsible individuals to oversee and enforce control measures.

- 6. Spills should be covered and protected from storm water run-on during rainfall to the extent that it doesn't compromise cleanup activities.
- 7. Do not bury or wash spills with water.
- 8. Store and dispose of used clean up materials, contaminated materials, and recovered spill material that is no longer suitable for the intended purpose in conformance with the provisions in applicable BMPs.
- 9. Do not allow water used for cleaning and decontamination to enter storm drains or watercourses. Collect and dispose of contaminated water in accordance with applicable regulations.
- 10. Contain water overflow or minor water spillage and do not allow it to discharge into drainage facilities or watercourses.
- 11. Place Material Safety Data Sheets (MSDS), as well as proper storage, cleanup, and spill reporting instructions for hazardous materials stored or used on the project site in an open, conspicuous, and accessible location.
- 12. Keep waste storage areas clean, well-organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.

Cleanup

- 1. Clean up leaks and spills immediately.
- 2. Use a rag for small spills on paved surfaces, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be disposed of as hazardous waste.
- 3. Never hose down or bury dry material spills. Clean up as much of the material as possible and dispose of properly.

Minor Spills

- 1. Minor spills typically involve small quantities of oil, gasoline, paint, etc. which can be controlled by the first responder at the discovery of the spill.
- 2. Use absorbent materials on small spills rather than hosing down or burying the spill.
- 3. Absorbent materials should be promptly removed and disposed of properly.
- 4. Follow the practice below for a minor spill:
 - a. Contain the spread of the spill.
 - b. Recover spilled materials.
 - c. Clean the contaminated area and properly dispose of contaminated materials.

Semi-Significant Spills

Semi-significant spills still can be controlled by the first responder along with the aid of other personnel such as laborers and the foreman, etc. This response may require the cessation of all other activities. Spills should be cleaned up immediately:

- 1. Contain spread of the spill.
- 2. Notify the project foreman immediately.
- 3. If the spill occurs on paved or impermeable surfaces, clean up using "dry" methods (absorbent materials, cat litter and/or rags). Contain the spill by encircling with absorbent materials and do not let the spill spread widely.
- 4. If the spill occurs in dirt areas, immediately contain the spill by constructing an earthen dike. Dig up and properly dispose of contaminated soil.
- 5. If the spill occurs during rain, cover spill with tarps or other material to prevent contaminating runoff.

Significant/Hazardous Spills

For significant or hazardous spills that are in reportable quantities:

- 1. Notify the TCEQ by telephone as soon as possible and within 24 hours at 512-339-2929 (Austin) or 210-490-3096 (San Antonio) between 8 AM and 5 PM. After hours, contact the Environmental Release Hotline at 1-800-832-8224. It is the contractor's responsibility to have all emergency phone numbers at the construction site.
- 2. For spills of federal reportable quantities, in conformance with the requirements in 40 CFR parts 110,119, and 302, the contractor should notify the National Response Center at (800) 424-8802.
- 3. Notification should first be made by telephone and followed up with a written report.
- 4. The services of a spills contractor or a Haz-Mat team should be obtained immediately. Construction personnel should not attempt to clean up until the appropriate and qualified staffs have arrived at the job site.
- 5. Other agencies which may need to be consulted include, but are not limited to, the City Police Department, County Sheriff Office, Fire Departments, etc.

More information on spill rules and appropriate responses is available on the TCEQ website at: http://www.tnrcc.state.tx.us/enforcement/emergency_response.html

Vehicle and Equipment Maintenance

- 1. If maintenance must occur onsite, use a designated area and a secondary containment, located away from drainage courses, to prevent the run-on of storm water and the runoff of spills.
- 2. Regularly inspect onsite vehicles and equipment for leaks and repair immediately
- 3. Check incoming vehicles and equipment (including delivery trucks, and employee and subcontractor vehicles) for leaking oil and fluids. Do not allow leaking vehicles or equipment onsite.
- 4. Always use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- 5. Place drip pans or absorbent materials under paving equipment when not in use.
- 6. Use absorbent materials on small spills rather than hosing down or burying the spill. Remove the absorbent materials promptly and dispose of properly.
- 7. Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around.
- 8. Oil filters disposed of in trashcans or dumpsters can leak oil and pollute storm water. Place the oil filter in a funnel over a waste oil-recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask the oil supplier or recycler about recycling oil filters.
- 9. Store cracked batteries in a non- leaking secondary container. Do this with all cracked batteries even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Vehicle and Equipment Fueling

- 1. If fueling must occur on site, use designated areas, located away from drainage courses, to prevent the run-on of storm water and the runoff of spills.
- 2. Discourage "topping off" of fuel tanks.
- 3. Always use secondary containment, such as a drain pan, when fueling to catch spills/ leaks.

ATTACHMENT B

Potential Sources of Contamination

Attachment B – Potential Sources of Contamination

- 1. Contaminants and fluids may be dropped from the use of construction equipment
- 2. Contaminants and fluids may be dropped from vehicles entering the site during construction
- 3. Contaminants and fluids may be dropped or spilled by workers during construction
- 4. Mud or dirt may be tracked onto streets from construction areas
- 5. Fine particles may be washed from non-stabilized areas
- 6. Contaminants and fluids may be spilled with the use of chemical / portable toilets during construction
- 7. Contaminants and fluids may be spilled during the connection to the existing SCS

During construction of the infrastructure contamination could come from oil, grease and fuel drippings from construction equipment and also from the process of excavating materials and grading. Additionally, the use of chemical / portable toilets is a potential source of contamination.

If fuel or a hazardous substance spill occurs, the contaminants and contaminated soil will be removed and placed in an impervious container to be disposed of off-site at an approved disposal site. The placement of excavated materials will have appropriately sized erosion and sedimentation controls placed down gradient to prevent debris from the construction activity from washing down gradient of the site. The construction site will be cleaned of materials and debris at the end of each workday and/or at the completion of the infrastructure. The application of the prime coat and/or tack coat will be timed to avoid any occurrence of a rain event before placement of the HMAC, which would provide permanent soil stabilization for the street areas. Any concrete structures, flatwork, and formwork would also be similarly timed to avoid any occurrence of a rain event.

In any case of a spill or contamination, the Spill Response Actions identified in **ATTACHMENT A** of this section should be followed.

ATTACHMENT C

Sequence of Major Activities

Attachment C – Sequence of Major Activities

The project site will be constructed using the following general activities and sequences. Construction activities and order of construction is anticipated as follows:

- 1. Temporary BMPs Installation of temporary control measures such as silt fence, rock berms, etc. (Disturbs approx. 0.065 acres)
- 2. Grubbing & Clearing Underbrush & Trees removed as necessary: ROWs, utility easements, and drains. (Disturbs approx. 0.47 acres)
- 3. Drainage and Water Quality Excavation and construction of drainage infrastructure and Water Quality permanent BMPs. (Disturbs approx. 0.88 acres)
- 4. Rough Grading and Excavation The building pads, parking lots, and driveways will be brought to sub grade. (Disturbs approx. 2.5 acres)
- 5. Utilities Trenching and installation of sanitary sewer lines, water lines, then Electric and dry utilities. Upon installation, the trenches will be backfilled. (Disturbs approx. 0.10 acres)
- 6. Asphalt and Curbs Concrete curbs and street surfaces will be brought to final grade and installed. (Disturbs approx. 0.75 acres)
- 7. Final Utility Meters Installation of water, electric meters, and other final utility terminations, as needed. (Disturbs approx. 0.03 acres)

Note: The excavated material from the trenches will be placed on the up-gradient side of the trench. The trench would serve as a temporary sedimentation and erosion control measure.

ATTACHMENT D

Temporary Best Management Practices and Measures

Attachment D – Temporary Best Management Practices and Measures

The Temporary Best Management Practices (TBMPs) and Measures that will be used:

- Silt Fences (Sediment Control Rolls may be substituted where appropriate)
- Stabilized Construction Entrances
- Equipment Staging Area
- Concrete Wash Out
- Inlet Protection
- Rock Berm or Gabion
- Preservation of Natural Areas
- Placement of Excavated Material on Up Gradient Side of Trench (Except in Floodplain)
- Permanent Planting, Sodding, and/or Re-seeding
- Regular Inspection & Maintenance
- Stabilization

All structural TBMPs will be installed prior to the beginning of construction as per the Sedimentation & Erosion Control Plan and Storm Water Pollution Prevention Plan. The TBMPs will remain in place and will be maintained until all construction has ceased and perennial vegetative cover with a density of 70 percent has occurred.

- 1. Install stabilized construction entrance; Establish equipment staging area and concrete washout
- 2. Installation of TBMPs rock berm, inlet protection and silt fences as appropriate
- 3. Grubbing & Clearing
- 4. Excavation
- 5. Grading
- 6. Infrastructure Construction
- 7. Establish 70 percent vegetative cover
- 8. Remove TBMPs

The temporary measures to be used during construction to prevent pollution of surface water, groundwater, and storm water runoff will be the use of silt fencing, inlet protection, and rock berm, as necessary, generally located along the down gradient side of the project area as indicated in the Water Pollution Abatement Plan. The stabilized construction entrance, concrete wash out and equipment staging area will be located as practicable. The equipment staging area and concrete washout should be in the proximity of the construction entrance / exit and not located near a well, floodplain, or other potential sources of contamination. Structural practices, as applicable, will be installed prior to each phase of the project and will be maintained during the construction of that phase. Disturbed areas will be stabilized, re-vegetated if denuded, within 14 days after temporary (21 days) or permanent cessation of construction activities.

The weather will need to be monitored and the application of the prime coat and/or tack coat emulsions will be timed to avoid any occurrence of a rain event before placement of the HMAC on the streets. Any concrete, flatwork, and formwork would also be similarly timed to avoid any occurrence of a rain event.

ATTACHMENT E

Request to Temporarily Seal a Feature

Not Applicable

ATTACHMENT F

Structural Practices

Attachment F – Structural Practices

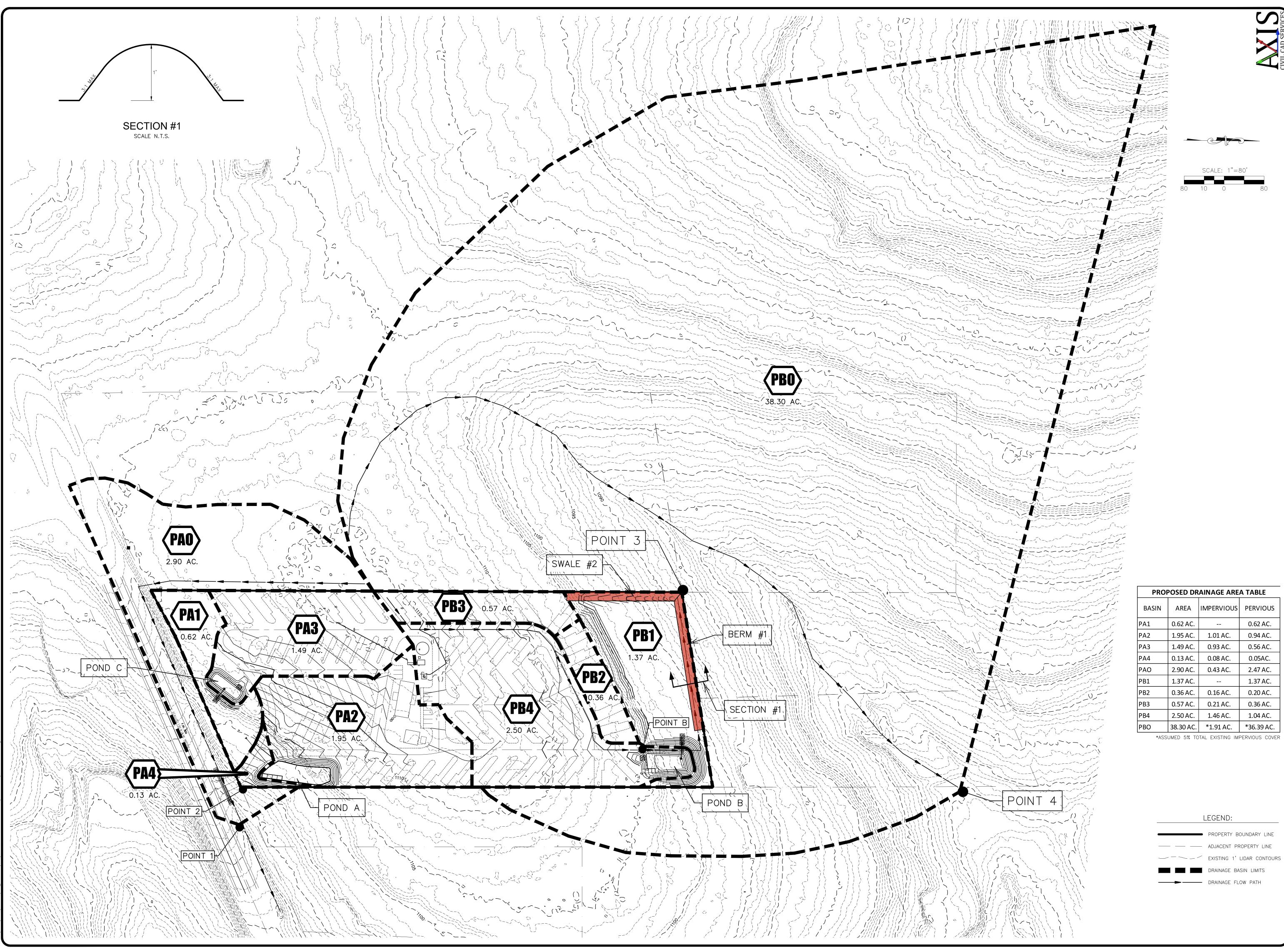
The structural practices proposed that will limit runoff discharge of pollutants from exposed areas of the site will be the use of silt fences (sediment control rolls may be substituted where appropriate), rock berms or gabions, inlet protection, concrete wash out, equipment staging area, and stabilized construction entrances to prevent the suspended solids and sediments from washing across the site.

- 1. A stabilized construction entrance with washout pit will be constructed at all locations where vehicular traffic enters and leaves the site. This will reduce tracking of sediments onto adjacent roadways and provide a stable area for entrance or exit from the construction site.
- 2. An equipment staging area will be established. This should be located in the proximity of the construction entrance / exit. This will provide a controlled and stable area to set-up materials and equipment.
- 3. Silt fencing will be installed adjacent to any drainage way which receives sheet flow from up gradientdisturbed areas and along the side slope perimeter of disturbed areas when no other TBMPs / Structural Practices are available.
- 4. Excavation for the permanent pond will be used to trap sediment until completion and acceptance of permanent storm drain piping.
- 5. Silt fencing will be installed in areas where up gradient flow from disturbed areas is concentrated, Washout of silt fencing may occur and should be monitored. Rock berms or gabions may also be installed along the side slope perimeter of disturbed areas if the up gradient flow is concentrated to prevent washout of silt fencing.
- 6. Sandbags filled with washed pea gravel will be used at storm drainage inlets prior to stabilization of the drainage areas. Alternative inlet protection may be utilized as appropriate.
- 7. Rock berms or gabions will be installed at points of concentrated flow to trap sediment prior to exiting the site and prevent down gradient erosion.

Although not anticipated, earthen berm/dikes may be constructed in some areas to divert up gradient flows around disturbed areas and onto natural drainage ways.

ATTACHMENT G

Drainage Area Map



PROPOSED DRAINAGE AREA TABLE							
BASIN	AREA	IMPERVIOUS	PERVIOUS				
PA1	0.62 AC.		0.62 AC.				
PA2	1.95 AC.	1.01 AC.	0.94 AC.				
PA3	1.49 AC.	0.93 AC.	0.56 AC.				
PA4	0.13 AC.	0.08 AC.	0.05AC.				
ΡΑΟ	2.90 AC.	0.43 AC.	2.47 AC.				
PB1	1.37 AC.		1.37 AC.				
PB2	0.36 AC.	0.16 AC.	0.20 AC.				
PB3	0.57 AC.	0.21 AC.	0.36 AC.				
PB4	2.50 AC.	1.46 AC.	1.04 AC.				
РВО	38.30 AC.	*1.91 AC.	*36.39 AC.				

PIERCED OAK RV PARK Revisions: 23000 FM 306 23000 FM 306 Canyon Lake, TEXAS 23000 FM 306 PROPOSED DRAINAGE AREA MAP PROPOSED DRAINAGE AREA MAP
Revisions: S06 TEXAS SAEA MAP
RV PARK 306 Texas : Area Map



ATTACHMENT H

Temporary Sediment Pond(s) Plans and Calculations

Not Applicable

ATTACHMENT I

Inspection and Maintenance for BMPs

Attachment I – Inspection and Maintenance for BMPs

Following are recommended minimum site specific inspection and maintenance measures for the BMPs proposed with this project. The recommended measures are derived from the Edwards Aquifer Technical Guidance Manual (RG-348, 2005); *Section 1.3, Temporary Erosion Control BMPs* and *Section 1.4, Temporary Sediment Control BMPs*. More detailed guidance is contained within the sections referenced.

The following steps will help prevent or reduce the sediment transported by storm water runoff in areas of disturbance:

General

- 1. Silt fences (sediment control rolls may be substituted where appropriate), rock berms, gabions, inlet protection, and stabilized construction entrances must be in place prior to the start of construction and will remain in place until construction has been completed and the site stabilized from further erosion.
- 2. The contractor will keep a record of the inspections, noting the condition of the BMPs and any corrective action taken to maintain the erosion control structures. In addition to the inspection and maintenance reports, the operator should keep records of the construction activity on site. In particular the following information should be kept:
 - The dates when major grading activities occur in a particular area.
 - The dates when construction activity ceases in an area, temporarily or permanently.
 - The dates when an area is stabilized, temporarily or permanently.
- 3. All soil, sand, gravel, and excavated material stockpiled on-site will have appropriately sized silt fencing placed up gradient and down gradient.

Inspection

- 1. A qualified E & S inspector (representing the discharger) shall inspect the following items once every seven (7) days, and within 24 hours after storm event of a ¹/₂-inch or greater rainfall:
 - Disturbed areas of the construction site that have not been finally stabilized
 - Areas used for storage of materials that are exposed to precipitation
 - Structural and stabilization control measures
 - Construction entrance/exits
- 2. The E & S inspector shall have authority to require immediate action on the part of the Contractor to correct any nonconforming items found during inspections or to require revisions to the E & S controls if appropriate. If revisions are needed, they shall be implemented within 7 calendar days after the date of inspection.
- 3. The E & S inspector will provide written reports covering all items/areas inspected and outlining corrective measures if any.

Maintenance

- 1. All erosion and sedimentation (E & S) measures/controls shall be maintained in good working order by the Contractor. Written maintenance reports shall be prepared covering all inspections and maintenance affecting E & S controls. If repair(s) are necessary, they shall be initiated within 24 hours after report.
- 2. The *temporary construction entrance* maintenance guidelines are listed below:
 - Prevent/minimize tracking or flowing of sediments onto public roadways.
 - Sediments spilled, dropped, washed or tracked onto public roadways must be removed immediately.
 - Vehicle tires should be cleaned to remove sediment prior to entrance onto public right-ofway.

- If washing is required, it should be done on an area stabilized with crushed stone that drains to an approved sediment trap or basin.
- All sediment should be prevented from entering any storm drain, bar ditch, or water course by using approved methods.
- 3. *Temporary vegetation* inspection/maintenance guidelines are listed below:
 - Inspected weekly and after each rain event to locate and repair any erosion
 - Erosion from storms of other damage should be repaired immediately by regarding the area and applying new seed.
 - If vegetated cover is less than 80%, the area should be reseeded.
- 4. *Rock berm* inspection/maintenance guidelines are listed below:
 - Inspection should be done weekly and after each rainfall. For installations in streambeds, additional daily inspections should be conducted.
 - Remove sediment and other debris when buildup reaches 6 inches and dispose of the accumulated silt in an approved method that will not additional siltation.
 - Repair any loose wire sheathing.
 - Reshape the berm as needed during inspection.
 - The berm should be replaced when the structure is not functioning as intended due to silt accumulation among the rocks, washout, construction traffic damage, etc.
- 5. *Silt fence* inspection/maintenance guidelines are listed below:
 - Inspect silt fencing weekly, and after every rainfall.
 - Remove sediment when buildup reaches 6 inches.
 - Replace any torn fabric or install a second line of fencing parallel to the torn section.
 - Replace or repair any crushed or collapsed in the course of construction activity. If a section of fencing obstructs vehicular access, relocate the fencing to a place where it will provide equal protection without obstructing vehicles. A triangular filter dike may be preferred to a silt fence at common vehicle access points.
 - When construction is complete, sediment should be disposed of in a manner that doesn't cause additional siltation and the prior location of the silt fencing should be revegetated. The fence itself should be disposed of in an approved landfill.
- 6. Curb Inlet Protection (Gravel Filter Bags) inspection/maintenance guidelines are listed below:
 - Inspection should be conducted weekly and after each rainfall. Repair or replacement should be done promptly as needed by the contractor.
 - Remove sediment when buildup reaches a depth of 3 inches. Removed sediment should be deposited in a suitable area in a manner that will not erode.
 - Check placement of device to prevent gaps between device and curb.
 - Inspect filter fabric and patch or replace if torn or missing.
 - Structures should be removed and the area stabilized only after the remaining drainage area has been properly stabilized.
- 7. Trash receptacles will be placed onsite for the use of workmen.
- 8. Documentation of maintenance/inspection activities will be kept on site.

An example log sheet for the inspection, maintenance and repair of the BMPs follows. The sample document is as provided by the Environmental Protection Agency (EPA). The sample can be found and is available for download at <u>www.epa.gov/</u>. It should be modified for the project specific conditions and BMPs. At a minimum, the Inspection Log / Report utilized by the qualified E&S inspector should provide details related to the inspection, maintenance and repair of the BMPs including observations on the site conditions.

ATTACHMENT J

Schedule of Interim and Permanent Soil Stabilization Practices

Attachment J – BMPs for Upgradient Stormwater

The schedule of interim and permanent soil stabilization will be as follows:

- 1. Interim/permanent stabilization will be performed on denuded and/or disturbed areas within 14 days after temporary (21 days) or permanent cessation of construction activities.
- 2. Permanent stabilization will be done with the completion of the infrastructure construction and with the completion of the construction of the main building structure.

Refer to ATTACHMENT C in the TEMPORARY STORMWATER SECTION for a schedule summary.

The soil stabilization practices for this project may include: establishment of temporary vegetation, establishment of permanent vegetation, mulching, geotextiles, sod stabilization, vegetative buffer strips, protection of trees, and preservation of mature vegetation. Use of drought resistant wildflowers should be considered as a supplement to existing vegetation in appropriate areas. Permanent stabilization of the soil within the roadway is completed with the final pavement course and completion of the sidewalks.

The primary practice will be the establishment of vegetation and the protection of existing vegetation including trees. Seeding and/or sod will be done in areas ready for final landscaping, areas to final grade, and in areas that are otherwise practicable. Areas where final grading is not complete will either be revegetated or allowed to re-vegetate naturally. Blankets and matting along with mulch may be used to aid in the establishment of vegetation and/or provide erosion stops.

The Edwards Aquifer Technical Guidance Manual (RG-348, 2005); *Section 1.2, General Guidelines* recommends the following practice for soil stabilization in periods of drought or when vegetation cannot be established.

"During times of year when vegetation cannot be established, soil mulching should be applied to moderate slopes and soils that are not highly erodible. On steep slopes or highly erodible soils, multiple mulching treatments should be used. Interlocking ceramic materials, filter fabric, and netting are available for this purpose..."

"Because of the hardy drought-resistant nature of wildflowers, they may be more beneficial as an erosion control practice than turf grass. While not as dense as turfgrass wildflower thatches and associated grasses are expected to be as effective in erosion control and contaminant absorption. Because thatches of wildflowers do not need fertilizers, pesticides, or herbicides, and the need for watering is minimal, implementation of this practice may result in cost savings... A wildflower stand requires several years to become established; however, maintenance requirements are minimal once the area is established."

The recommended soil stabilization practices are derived from the Edwards Aquifer Technical Guidance Manual (RG-348, 2005); *Section 1.2, General Guidelines, Section 1.3, Temporary Erosion Control BMPs, Section 1.4, Temporary Sediment Control BMPs, and Section 2.5, Landscaping and Vegetative Practices.* More detailed guidance is contained within the sections referenced.

Agent Authorization Form For Required Signature

Edwards Aquifer Protection Program Relating to 30 TAC Chapter 213 Effective June 1, 1999

1	April Wilkerson	,
	Print Name	
	Owner	,
	Title - Owner/President/Other	
of	Pierced Oak, LLC Corporation/Partnership/Entity Name	
have authorized	James McGarr, PE Print Name of Agent/Engineer	
of	Civil Tech, LLC Print Name of Firm	

to represent and act on the behalf of the above named Corporation, Partnership, or Entity for the purpose of preparing and submitting this plan application to the Texas Commission on Environmental Quality (TCEQ) for the review and approval consideration of regulated activities.

I also understand that:

- 1. The applicant is responsible for compliance with 30 Texas Administrative Code Chapter 213 and any condition of the TCEQ's approval letter. The TCEQ is authorized to assess administrative penalties of up to \$10,000 per day per violation.
- 2. For those submitting an application who are not the property owner, but who have the right to control and possess the property, additional authorization is required from the owner.
- Application fees are due and payable at the time the application is submitted. The application fee must be sent to the TCEQ cashier or to the appropriate regional office. The application will not be considered until the correct fee is received by the commission.
- 4. A notarized copy of the Agent Authorization Form must be provided for the person preparing the application, and this form must accompany the completed application.
- 5. No person shall commence any regulated activity on the Edwards Aquifer Recharge Zone, Contributing Zone or Transition Zone until the appropriate application for the activity has been filed with and approved by the Executive Director.

TCEQ-0599 (Rev.04/01/2010)

Page 1 of 2

SIGNATURE PAGE:

Applicant's Signature

THE STATE OF LEXAS § County of Cond §

BEFORE ME, the undersigned authority, on this day personally appeared <u>April Wilkersom</u> nown to me to be the person whose name is subscribed to the foregoing instrument, and acknowledged to me that (s)he executed same for the purpose and consideration therein expressed.

GIVEN under my hand and seal of office on this 5^{+} day of \overline{July} , 2023.

NOTARY PUBLIC

ANNETTE BROUSSARD Notary ID #125410606 My Commission Expires August 24, 2025

Annette Broussard Typed or Printed Name of Notary

24/2025 MY COMMISSION EXPIRES: 8

TCEQ-0599 (Rev.04/01/2010)

Page 2 of 2

Application Fee Form

Texas Commission on Environmental Quality	*							
Name of Proposed Regulated Entity: 23000 FM 306								
Regulated Entity Location: 23000 FM 306, Canyon Lake, TX, 78133								
Name of Customer: Pierced Oak, LLC								
Contact Person: April Wilkerson Phone: 817-713-6510								
Customer Reference Number (if issued):CN								
Regulated Entity Reference Number (if issued):RN								
Austin Regional Office (3373)								
Hays Travis Williamson								
San Antonio Regional Office (3362)								
Bexar Medina Uvalde								
Comal Kinney								
Application fees must be paid by check, certified check, or money order, payable to the Texa	IS							
Commission on Environmental Quality. Your canceled check will serve as your receipt. This								
form must be submitted with your fee payment. This payment is being submitted to:								
Austin Regional Office San Antonio Regional Office								
Mailed to: TCEQ - Cashier Overnight Delivery to: TCEQ - Cashie	r							
Revenues Section 12100 Park 35 Circle								
Mail Code 214 Building A, 3rd Floor								
P.O. Box 13088 Austin, TX 78753								
Austin, TX 78711-3088 (512)239-0357								
Site Location (Check All That Apply):								
Type of Plan Size Fee Du	Ie							
Water Pollution Abatement Plan, Contributing Zone								
Plan: One Single Family Residential Dwelling Acres \$								
Water Pollution Abatement Plan, Contributing Zone								
Plan: Multiple Single Family Residential and Parks Acres \$								
Water Pollution Abatement Plan, Contributing Zone								
Plan: Non-residential 8.99 Acres \$ 5,000								
Sewage Collection System L.F. \$								
Lift Stations without sewer lines Acres \$								
Underground or Aboveground Storage Tank Facility Tanks \$								
Piping System(s)(only) Each \$								

Signature: Apillille

TCEQ-0574 (Rev. 02-24-15)

Pd. \$5,000,00 7/3/23 Ck# 1074 1 of 2



TCEQ Core Data Form

For detailed instructions on completing this form, please read the Core Data Form Instructions or call 512-239-5175.

SECTION I: General Information

1. Reason for Submission (If other is checked please describe in space provided.)								
New Permit, Registration or Authorization (Core Data Form should be submitted with the program application.)								
Renewal (Core Data Form should be submitted with the	e renewal form)	Other						
2. Customer Reference Number (if issued)	Follow this link to search							
CN 606159051 for CN or RN numbers in Central Registry** RN 111770277								

SECTION II: Customer Information

4. General Cu	ustomer Information5. Effective Date for Customer Information Updates (mm/dd/yyyy)4/20/2023								4/20/2023				
New Customer Update to Customer Information Change in Regulated Entity Ownership Change in Legal Name (Verifiable with the Texas Secretary of State or Texas Comptroller of Public Accounts)													
The Custome	r Name sı	ubmittea	l here may l	be updated a	utomatical	ly base	ed on	ו what is כנ	urrent	and active	with th	e Texas Secr	etary of State
(SOS) or Texa	s Comptro	oller of F	Public Accou	nts (CPA).									
6. Customer	Legal Nam	าe (If an i	ndividual, prii	nt last name fir	st: eg: Doe, J	lohn)			<u>If new</u>	v Customer, o	enter pre	evious Custom	er below:
Pierced Oak IN	с.												
7. TX SOS/CP	A Filing N	umber		8. TX State	Tax ID (11 d	igits)			9. Fe	deral Tax II	D	10. DUNS I	Number (if
804412985				3208298231	8				(9 dig	its)		applicable)	
11. Type of C	ustomer:		Corporat	ion				🗌 Individ	ual		Partne	ership: 🗌 Gen	eral 🔀 Limited
Government:	City 🗌 🤇	County 🗌] Federal 🗌	Local 🗌 State	🛛 Other			🗌 Sole Pr	roprieto	orship	🗌 Otl	her:	
12. Number o	of Employ	ees							13. lı	ndepender	tly Ow	ned and Ope	erated?
⊠ 0-20 □ 2	21-100 [101-25	50 🗌 251-	500 🗌 501	and higher				🛛 Ye	es [] No		
14. Customer	Role (Pro	posed or	Actual) – <i>as i</i>	t relates to the	Regulated Ei	ntity list	ted or	n this form. I	Please c	check one of	the follo	owing	
Owner		🗌 Ope	erator	🗌 Ov	vner & Opera	ator				Other:			
	al Licensee	🗌 Re	esponsible Pai	rty 🔲	VCP/BSA App	licant							
	1885 FM	2673											
15. Mailing													
Address:													
	City	Canyor	n Lake		State	тх		ZIP	78133	3		ZIP + 4	
16. Country M	Mailing In	formatic	on (if outside	USA)			17	. E-Mail Ac	ldress	(if applicable	e)		
							wil	lker.ae@gma	ail.com				
18. Telephone Number 19. Extension or C					ode			20. Fax N	umber	(if applicable)			

() -

SECTION III: Regulated Entity Information

21. General Regulated Entity Information (If 'New Regulated Entity" is selected, a new permit application is also required.)									
🔀 New Regulated Entity 🔄 Update to Regulated Entity Name 📄 Update to Regulated Entity Information									
The Regulated Entity Name submitted may be updated, in order to meet TCEQ Core Data Standards (removal of organizational endings such as Inc, LP, or LLC).									
22. Regulated Entity Nam	ie (Enter name	e of the site where the	e regulated action	is taking pla	ce.)				
Pierced Oak RV Park									
23. Street Address of	23000 FM 3	06							
the Regulated Entity:									
<u>(No PO Boxes)</u>	City	Canyon Lake	State	ТХ	ZIP	78133	3	ZIP + 4	
24. County	Comal								
		If no Street A	ddress is provid	ed, fields 2	5-28 are rec	quired.			
25. Description to									
Physical Location:									
26. Nearest City						State		Nea	rest ZIP Code
Latitude/Longitude are r used to supply coordinate	-				ata Standaı	rds. (Ge	eocoding of th	e Physical .	Address may be
27. Latitude (N) In Decim	27. Latitude (N) In Decimal: 29.940916 28. Longitude (W) In Decimal: 98.275944								
					U .	•			4
Degrees	Minutes		onds	Degre			Minutes		Seconds
Degrees 29	Minutes		27.2970				Minutes 16		
	Minutes	Seco	27.2970	Degre	es		16	ndary NAIC	Seconds 33.4036
29	Minutes	56 Secondary SIC Code	27.2970	Degre	98 98 y NAICS Cod		16	-	Seconds 33.4036
29 29. Primary SIC Code	Minutes	56 Secondary SIC Code gits)	27.2970	Degre 31. Primar	98 98 y NAICS Cod		16 32. Seco i	-	Seconds 33.4036
29 29. Primary SIC Code (4 digits)	Minutes 30. 1 (4 di 6515	56 Secondary SIC Code gits)	27.2970 e	31. Primar (5 or 6 digit 721211	98 98 y NAICS Coc s)		16 32. Seco (5 or 6 dig	-	Seconds 33.4036
29 29. Primary SIC Code (4 digits) 7033	Minutes 30. 1 (4 di 6515 Business of th	56 Secondary SIC Code gits)	27.2970 e	31. Primar (5 or 6 digit 721211	98 98 y NAICS Coc s)		16 32. Seco (5 or 6 dig	-	Seconds 33.4036
29 29. Primary SIC Code (4 digits) 7033 33. What is the Primary E Recreational Vehicle Rental S	Minutes 30. 1 (4 di 6515 Business of th	Secondary SIC Code gits) bis entity? (Do not	27.2970 e	31. Primar (5 or 6 digit 721211	98 98 y NAICS Coc s)		16 32. Seco (5 or 6 dig	-	Seconds 33.4036
29 29. Primary SIC Code (4 digits) 7033 33. What is the Primary E Recreational Vehicle Rental S 34. Mailing	Minutes 30. : (4 di 6515 Business of th paces	Secondary SIC Code gits) bis entity? (Do not	27.2970 e	31. Primar (5 or 6 digit 721211	98 98 y NAICS Coc s)		16 32. Seco (5 or 6 dig	-	Seconds 33.4036
29 29. Primary SIC Code (4 digits) 7033 33. What is the Primary E Recreational Vehicle Rental S	Minutes 30. : (4 di 6515 Business of th paces	Secondary SIC Code gits) bis entity? (Do not	27.2970 e	31. Primar (5 or 6 digit 721211	98 98 y NAICS Coc s)		16 32. Seco r (5 or 6 dig 722330	-	Seconds 33.4036
29 29. Primary SIC Code (4 digits) 7033 33. What is the Primary E Recreational Vehicle Rental S 34. Mailing	Minutes 30. 1 (4 di 6515 Business of the paces 1885 FM 20 City	Secondary SIC Code gits) is nis entity? (Do not	27.2970	31. Primar (5 or 6 digit 721211 NAICS descri	98 98 y NAICS Coo s)	de	16 32. Seco r (5 or 6 dig 722330	its)	Seconds 33.4036

39. TCEQ Programs and ID Numbers Check all Programs and write in the permits/registration numbers that will be affected by the updates submitted on this form. See the Core Data Form instructions for additional guidance.

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(817) 713-6510

Dam Safety	Districts	Edwards Aquifer	Emissions Inventory Air	Industrial Hazardous Waste
Municipal Solid Waste	New Source Review Air	☐ OSSF	Petroleum Storage Tank	D PWS
Sludge	Storm Water	🔲 Title V Air	Tires	Used Oil
Voluntary Cleanup	U Wastewater	Wastewater Agriculture	Water Rights	Other:

SECTION IV: Preparer Information

40. Name:	James McGarr,	. P.E.		41. Title:	Engineer
42. Telephone	Number	43. Ext./Code	44. Fax Number	45. E-Mail A	Address
(210) 365-5029			() -	jmcgarr@civi	iltechmc.com

SECTION V: Authorized Signature

46. By my signature below, I certify, to the best of my knowledge, that the information provided in this form is true and complete, and that I have signature authority to submit this form on behalf of the entity specified in Section II, Field 6 and/or as required for the updates to the ID numbers identified in field 39.

Company:	CivilTech, PLLC	Job Title:	Engineer			
Name (In Print):	James McGarr, P.E.			Phone:	(210) 365- 5029	
Signature:	Jomes McDare			Date:	5/9/2023	