Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Tuesday, April 27, 2021 1:13 PM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WQ
Subject: FW: Public comment on Permit Number WQ0015222001
Attachments: newWQ0015222001 to tecq2020.docx

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Attachment = H

From: spicerhousekaty@yahoo.com <spicerhousekaty@yahoo.com>
Sent: Friday, April 23, 2021 4:58 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number WQ0015222001

REGULATED ENTY NAME PULTE HOMES OF TEXAS WWTP

RN NUMBER: RN107117327

PERMIT NUMBER: WQ0015222001

DOCKET NUMBER:

COUNTY: HARRIS

PRINCIPAL NAME: HARRIS COUNTY MUD 495

CN NUMBER: CN604514943

FROM

NAME: Donnisha Spicer

E-MAIL: spicerhousekaty@yahoo.com

COMPANY: Home

ADDRESS: 23910 STOCKDICK SCHOOL RD
KATY TX 77493-6317

PHONE: 7134711123

FAX:

COMMENTS: Christopher and Donnisha Spicer 23910 Stockdick School Road Katy, Tx 77493 Ph: 713-471-1123 I want to request a contested case hearing on the consideration to amend permit no. WQ001522001. My concerns with the approval of this permit amendment are as follows: 1. Increase wastewater output beyond the current capacity will place my residence within a few 100 feet of the effluent of wastewater at high risk. My property will be at an exponentially higher risk of ingress of wastewater onto my property in medium to high rain events. Such was the case in hurricane Harvey where wastewater that egressed from the wastewater treatment plant trespassed onto my property when the water overcame the creek's banks. Water was mere inches from ingressing into our primary residence. 2. There are two plants nearby within 100's of feet of my property where wastewater effluent runs into the small creek running through the back of my property, increasing the opportunity of flooding and wastewater flowing onto my property cause a violation of my Texas property owners' bill of rights 3. When the wastewater effluent egressed into the creek overflows the banks and ingresses into my stocked pond and farmed vegetation, it impacts a natural resource of food provided to my family. 4. All effluent wastewater will be treated to meet Type 1 reclaimed water standard as defined by title 30, Chapter 210 of the Texas Administrative Code or by any other statute or administrative rule governing reclaimed water use to ensure the health and safety of my family 5. The original approved request phase III, " The Final phase" request, did not exceed 900,000 gallons of wastewater per day. If allowed to exceed this capacity, the permit was not approved in good faith, and the amendment should be dismissed. 6. Increasing the effluent will have a directly proportional effect on the safety and health of my family. Please refer to the attachment to the numerous impacts on my family's health and safety with the increase of effluent wastewater if the amendment is permitted. 7. Increasing effluent increases hazardous odorous discharges that will ingress onto my property. 8. The drainage ditches along the discharge are unable to carry the additional toxic run-off. 9. Many of us in the adjacent neighborhood have farm animals that will be affected by an increase in effluents flowing onto our property when floodwaters containing wastewater flow over the creek's banks. 10. The noise will significantly affect our quality of life and enjoyment of our property and violate the Texas land owners' bill of rights. Odorous pollutants, increase in pests and insects attracted to wastewater plants, increase in activity warranted and malicious around the facility, and increased luminescent produced by facility lighting is in direct violation of the Texas land owners' bill of rights and the enjoyment of our property. 11. Adding to the facility will remove land from the natural drainage basins. 12. The current wind studies are outdated and a significant distance from the facility's location. More updated and closer proximity wind studies need to be performed. Wind, proximity, equipment, and the way the facility is constructed contribute to the noise. The noise embankment of this facility needs to be studied and increased. 13. I do not and have not given the permit seeker permission to increase the wastewater effluent trespassing onto my property, violating my Texas property owners' bill of rights. 14. An independent environmental impact study must be performed, which studies the concerns the higher wastewater effluent will have on the environment, wildlife, and nearby bird sanctuary. Executive order 13186: Responsibilities of federal agencies to protect migratory birds, North American Waterfowl Management Plan, North American Wetlands Conservation Act, U.S Shorebird Conservation Plan, and the North American Waterbird Conservation Plan will need to be studied, taken into consideration, and adhered to before the approval of this amendment to permit WQ001522001. 15. The facility is located in the 100-year floodplain. Allowing the increase of the wastewater effluent will directly contribute to the 100-year floodplain 16. We are on a well water system, and the increased surface area of the wastewater effluent is directly proportional to the increased health and safety risk associated with this increase. 17. Wind will push pollutants onto our property, violating our property's enjoyment and the Texas property owners' bill of rights. 18. Does the increase in the effluent request contain contaminant provisions associated with the increase in effluent 19. The above concerns will adversely affect the enjoyment of my property, violate the Texas property owners' bill of rights and my property value. 20. Please see the photo attached for the distance of WWTP from my property. Thank you for your time and consideration in granting me a contested hearing on Permit WQ001522001. Based on my concerns that are not common to the general public, please find that I meet the OPIC requirements of an affected person. Sincerely, Christopher and Donnisha Spicer 23910 Stockdick School Road Katy, Tx 77493 713-471-1123

I am formally requesting a contested hearing and would like to add this information to my request for said Permit WQ0015222001 amendment. I feel the attached document on water/soil/groundwater contamination, along with the air Volatile Organic Compounds (VOC) contamination, will demonstrate that I will be significantly affected by the toxins/contamination of this WWTP. Furthermore, our property extremely close in proximity, and abutting South Mayde Creek (SMC) is in the 100-year flood plain. Discharged wastewater will run across and flow onto our property in a mild and heavy rain event such as the event in 2017 when Harvey hit Houston. This discharged wastewater will cross over my property and violate the Texas Property Owners Bill of Rights. These discharges' waters will be polluted and contain sewage.

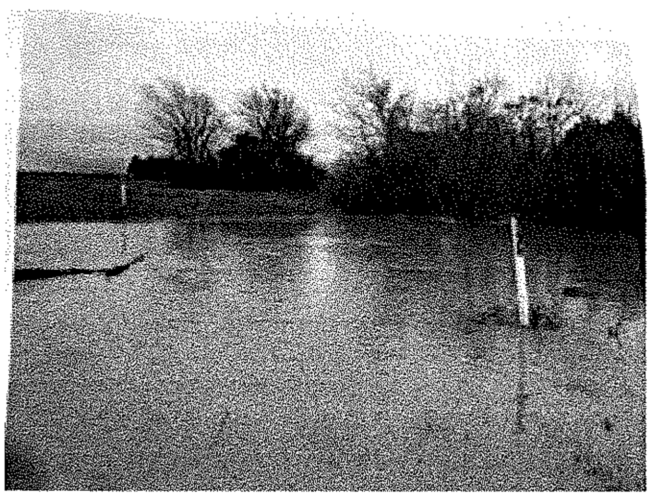
Winds carrying air contaminants and odorous smells have a high likelihood of seeping over onto my property, affecting my enjoyment of my property and in violation of the Texas Property Owners Bill of Rights. If the amendment is approved, this will only further exacerbate the WWTP effect on the enjoyment of my property. The last wind study cited in many of Harris county WWTP permit requests is many decades old. With all the environmental changes we have seen over the previous years, let alone decades, make this wind studies outdated and invalid at best. With the proximity of the WWTP to my property, noise pollution is a significant concern as well and will violate the Texas Property Owners Bill of Rights. If this amendment is permitted, it will only serve to increases the current violation to a much greater extent.

As a property owner already established before the request for a WWTP permit approval, I should be the one receiving the proof that the health of my family will not be affected by this WWTP. Instead, I find that I have to show the burden of proof as to why this WWTP permit would jeopardize my family's health and should NOT be allowed to be amended to increase the risk already imposed by its existence in such proximity to my home.

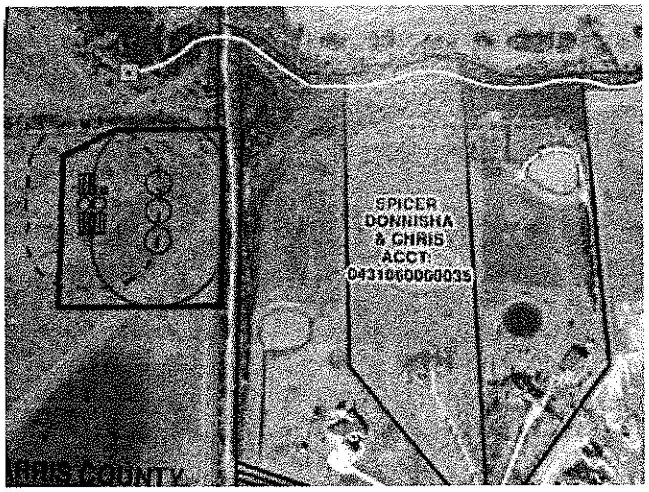
Please review all the Photos before going through this document/request. As they say, a photo is worth 1,000 words. I would like to show you what happens in medium to high rainfall to my property. I have included an aerial photo of South Mayde Creek Estates (my neighborhood) to illustrate the effect rainfall has on SMC and, in turn, the effect on our property. This is what this amended permit is asking you to exacerbate, an already challenging flooding situation. The permit amendment request asks you to allow additional wastewater to be released into SMC, which will cause severe hardships and affect one's enjoyment of one's property and health hazards. After viewing photos, one can see how allowing that much additional wastewater to flow into SMC is sure to flood over the SMC banks, causing property damage beyond comprehension.

Aerial view of my house and neighborhood after a medium/ heavy rainfall:

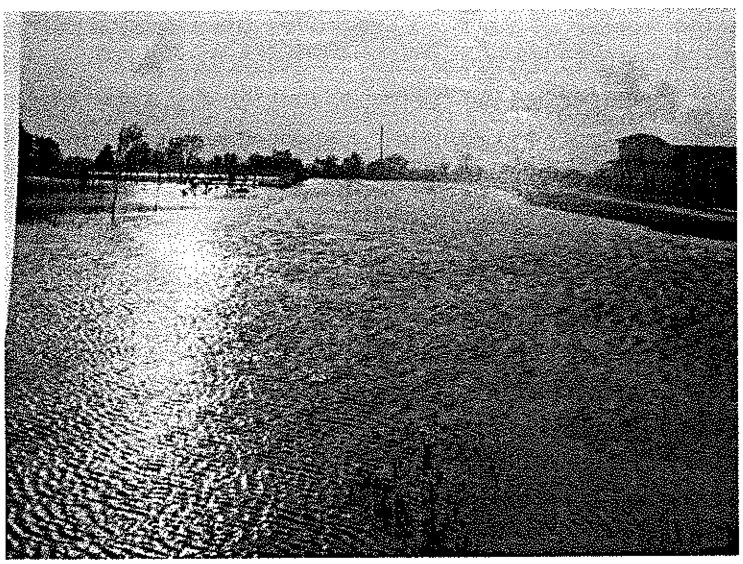
SMC after medium rainfall:



My Property location to the WWTP:



Part of my property:



The water ascended within inches from coming into the home. The floodwater came over and submerged our pond (which is stocked and fished and visited frequently by wildlife birds, rabbits, and deer) and right up to our private drinking water well/well pump.

As you can also see in one of the photos how close the effluent from the WWTPs into SMC is to our home and on our property, there is a high likely hood of SMC flooding out of its banks with a high percentage of contaminated effluent wastewater entering into our pond and privet drinking water well contaminating both not to mention contaminating our soil not only in flooding conditions but also daily (as we own the soil/creek up to the halfway mark of the creek) In a medium to high rainfall we will have a high likelihood of the WWTPs effluent water contamination entering our home, pond and privet drinking water well. Demonstration of this burden alone should be enough NOT to allow the amended permit to go forward with approval status on this amended permit request.

The amendment requestor will infringe on another's rights and health if the amendment is allowed to proceed. I ask, what value do you put on your family's health? My family and I will harbor most of the burden and gain no benefit, just a tremendous amount of health hazards from this WWTP.

I believe these issues will fall under environmental justice, which refers to the right to a safe, healthy, productive, and sustainable environment for all, where "environment" refers to the place where people live, work, and recreate. My family and I had owned our property long before the amendment applicant applied for a WWTP amended permit. New home buyers within the MUD will buy knowing of the WWTP and its location before the home purchase. At that time, the buyer will be able to weigh the health risk vs. lower cost of the home due to its location to the WWTP. If the TECQ approves this amended permit, it's putting my family at risk without the opportunity to weigh these options. Any affirmative decision on this amended permit means that the TECQ considers it acceptable to force a dangerous and undesirable expansion of this project into the health and lives of my family and neighbors.

In doing further research and investigating Sewage Treatment Plant (STP), aka Waste Water Treatment Plant (WWTP), I found that wastewater contaminants are varied and numerous. They include but are not limited to organic material, pathogens, metals, salt, ammonia, pesticides, pharmaceuticals, and endocrine disruptors. All of these are undesirable in WWTPs effluents; many of them are proven to be harmful to both humans and the environment. Total dissolved solids (TDS) comprise inorganic salts (principally calcium, magnesium, potassium, sodium, bicarbonates, chlorides, and sulfates) found in wastewater effluents. High levels of these TDS in WWTPs effluent are suitable for plants in WWTPs receiving waters because many plants are intolerant of the chlorides, and the TDS may leach into the groundwater. Pharmaceuticals are not wholly absorbed into the body. The excess is eliminated and enters the WWTPs. Besides, people dispose of unused medications down the toilet. These pharmaceuticals make their way to the WWTP, where little is done to remove them. They are then released via WWTPs effluent into the receiving waters dosing wildlife, domestic pets, and even humans with drugs they don't have a prescription for.

To demonstrate the water/soil, air toxins, health issues, contamination, and environmental toxins this WWTP permit approval will place on my family, I will reference independent studies proving the health hazard this will bring down upon my family. This is not just rhetoric coming from some property owner. This is unbiased and indisputable proof. A corresponding number will designate references, then list at the end of this request.

I have spent more hours than I want to count and have come across many published studies demonstrating the water and soil toxins/contamination from WWTP that I would like to share with you for your consideration. Many factors play a role in the effectiveness of a WWTP; unfortunately, this WWTP location will be hindered by them.

- Size: The size of the receiving waters for the WWTP effluent plays a significant role in the dilution/potency of toxins/contamination (1,2) and the effect on the environment, soil contamination along with seepage to the water table (3,4,5) of the many of chemicals that have been shown in the effluent of WWTP. The creek where the effluent for this WWTP will come over its bank with as little as 2-4 in rain and flood all of our back yards (see fig #). Due to this, our private water wells have a high chance of becoming contaminated with the toxins in wastewater effluents. Since the private water wells do not fall under the EPA and are not tested by the EPA, the cost and burden will fall on me. The price per test is 250.00 for one of the lower comprehensive tests, which will need to be done semi-annually. This is a cost that I should not burden but will if this amended permit is approved. I am getting no benefit from this WWTP, only forced burdens. I don't see how this is right or just. Suppose my soil becomes contaminated with toxic chemicals that make it through which less than 1% of know chemical compounds are even tested(6,7). In that case, the property owners are required under federal and state regulations to decontaminate the site or remove contaminated soil from a safe disposal facility. Decontamination or removal of dirt is costly and may exceed the value of the property. The sale of contaminated property is complex at best. I would be forced to abandon my contaminated property rather than sell or decontaminate due to the high cost. If the amended permit request is granted, my property risk is directly proportional to the increase in wastewater released.

- Temperature: Increased temperature (Houston summer) allows for Increase tolerance to reduced rates from the treatment process (8). Gene transfer rates are temperature sensitive, i.e., the transfer rate increases 1000 times at 25 degrees C compared to 5 degrees C in a study of multi-resistant coliforms from sewage (9). The humidity in the hot Houston summer weather is also not conducive to the efficiency of a WWTP or to the harmful odors/VOCs that will come from a WWTP.

- High Precipitation: According to the EPA Handbook, vol. 1: Excessive stormwater can cause a WWTP system to overflow. In this event, excess flow can be directed into the waterways untreated, resulting in contamination. In urban areas, sewage is carried separately in sanitary sewers, and runoff from streets is held in storm drains. Access to either of these is typically through a maintenance hole. During high precipitation periods, a combined sewer overflow can occur, forcing untreated sewage to flow back into the environment. This can pose a severe threat to public health and the surrounding environment

- Low Precipitation: when rainfall is low and receiving water flows are low. The WWTP discharged effluent can have up to 50% higher concentration. Any unidentified residual contaminants will only be diluted 2-fold at best. (1). In the creek where the effluent from this WWTP is dispersing, it will be almost 100% WWTP effluent for extended periods due to low flows. My property is at the very most upstream of the creek will have a higher concentration than others property owners downstream.

It has been estimated that as many as 100,000 chemicals are in commerce and can potentially enter the wastewater. Besides, about a thousand new compounds are introduced annually, making static environmental regulations untenable (7)—the EPA only test for less than 1% of these chemicals. As will be shown throughout the remainder of this plea for a contested hearing, WWTP will be allowing a very high amount of contaminants/toxins into the effluent if it approves this amendment.

Risk assessment is a logical framework for policy development. However, its validity depends on the availability and incorporation of complete data (7). Under current EPA guidelines, they are dealing with incomplete data at best. As will be demonstrated, there is a severe lack of EPA oversight in many areas of viral, bacterial, organic, and chemical compounds in the influent and effluent of WWTP. Detrimental health effects are a function of all of the chemicals to which organisms are exposed, not just those on the regulatory lists or for which detection is convenient using available technology or analytical standards. Most risk assessments also consider only the "worst-case" single chemical exposure, not simultaneous exposure pathways or coincident exposure to multiple chemicals (7). Recently, it has been observed that simultaneous exposure to several endocrine-disrupting chemicals was capable of generating an observable effect, even though each was present below its respective effects threshold (10). Some proponents have used the paucity of demonstrated, documented detrimental impacts of sewage as a rationale not to fill gaps in the database critical to the risk assessment. This is unsatisfying and undermines the contention of the same proponents that risk assessment is superior to alternative strategies as it is based on "sound science."
It also transfers the burden of proof from those who benefit from the action to those who might be damaged by an erroneous conclusion as to safety. Regardless, considering our past track record of recognizing harmful effects in the field due to synthetic chemicals is not encouraging. For example, diethyl-stilbestrol, individual organic pollutants or groups of compounds (PCBs), dichlorodiphenyltrichloroethane (DDT), and chlorofluorocarbons were all assumed to be harmless after initial testing and were used for years before their consequences were fully realized (7).

EPA (103)- WWTPs have high loads of nitrogen and phosphorus in the effluent. It's costly and takes enhanced treatment equipment, which very few WWTPs have, to reduce nitrogen and phosphorus levels in the WWTPs effluent. Too much nitrogen and phosphorus in the water can have diverse and far-reaching impacts on public health, the environment, and the economy.

EPA (103)-Too much nitrogen and phosphorus in the water causes algae to grow faster than ecosystems can handle. Significant increases in algae harm water quality. Large growths of algae called algal blooms can severely reduce or eliminate oxygen in the water, leading to illnesses. Some algal blooms are harmful to humans because they produce elevated toxins and bacterial growth that can make people sick if they come into contact with polluted water or drink contaminated water.

EPA (103)-WWTPs are responsible for treating large quantities of waste, and these systems do not continuously operate properly or remove enough nitrogen and phosphorus before discharging into waterways. Nutrient pollution and harmful algal blooms create toxins and compounds that are dangerous for your health.

EPA (103)-There are several ways people (and pets) can be exposed to these compounds. Drinking, accidentally swallowing, or swimming in water affected by a harmful algal bloom can cause serious health problems, including Rashes, Stomach or liver illness, Respiratory problems, and Neurological effects.

EPA (103)-Some of these waters are impaired or affected by excessive amounts of nitrogen and phosphorus. Groundwater is water that soaks into the soil and the water table, and close to 90 million people rely on groundwater as a drinking water supply. As groundwater works its way through the ground, it can pick up nitrogen and phosphorus and transport them to the water table. This polluted water then reaches public drinking water systems and private wells, where it can pose serious public health threats. EPA's 2010 report on nutrients in the nation's streams and groundwater found that nitrate contamination of groundwater used for drinking water, exceptionally shallow domestic wells, is a growing concern.

Contamination of water and soil by WWTPS can occur from many sources, raw sewage overflow leaking sewer lines, and partially treated wastewater. Sewage itself is a complex mixture and can contain many types of contaminants. The greatest threats posed to water resources arise from contamination by bacteria, nitrates, metals, trace quantities of toxic materials, and salts. Seepage overflow into drinking water sources can cause disease from the ingestion of microorganisms such as *E coli*, *Giardia*, Cryptosporidium, Hepatitis A, and helminths.

Effluent that leaks from sewer lines are generally untreated raw sewage. When leaking sewer lines are located deep underground below the biologically active portion of the soil, the sewage can enter groundwater directly. This can result in introducing chlorides, microorganisms, organics, trace metals, and other chemicals that may cause disease and foul tastes or odors in drinking water (101). Sewer leaks can occur from tree root invasion, soil slippage, seismic activity, loss of foundation due to washout, flooding, and sewage backup, among other events (102).

Known wastewater constituents (11) (12)

The composition of wastewater varies widely. This is a partial list of what it may contain:

- Water (more than 95 percent), which is often added during flushing_to carry waste down a drain;
- Pathogens such as bacteria, viruses, prions, and parasitic worms;
- Non-pathogenic bacteria;
- Organic particles such as feces, hairs, food, vomit, paper fibers, plant material, humus, etc.;
- Soluble organic material such as urea, fruit sugars, soluble proteins, drugs, pharmaceuticals, etc.;
- Inorganic particles such as sand, grit, metal particles, ceramics, etc.;
- Soluble inorganic material such as ammonia, road-salt, sea-salt, cyanide, hydrogen sulfide, thiocyanates, thiosulfates, etc.;
- Animals such as protozoa, insects, arthropods, small fish, etc.;
- Macro-solids such as sanitary napkins, nappies/diapers, condoms, needles, children's toys, dead animals or plants, etc.;
- Gases such as hydrogen sulfide, carbon dioxide, methane, etc.;
- Emulsions such as paints, adhesives, mayonnaise, hair colorants, emulsified oils, etc.;
- Toxins such as pesticides, poisons, herbicides, etc.
- Pharmaceuticals and hormones.

One of the first and most diverse groups of bioactive chemicals receiving comparatively little attention as potential environmental pollutants includes the pharmaceuticals and active ingredients in personal care products (PPCPs), both human and veterinary, including not just prescription drugs and biologics but also diagnostic agents, "nutraceuticals," fragrances, sun-screen agents, and numerous others. These compounds and their bioactive metabolites can be continually introduced to the aquatic environment as complex mixtures via several routes. Still, the significant sources of PPCPs in the environment are primarily WWTP effluent. New pharmaceuticals are adding exponentially to the already extensive array of chemical classes, each with distinct modes of biochemical action, many of which are poorly understood. Most of these products are disposed of or discharged into the
environment continually via domestic/industrial sewage systems. The bioactive ingredients are first subjected to metabolism by the dosed user; the excreted metabolites

and unaltered parent compounds can then be subjected to further transformations in sewage treatment facilities. However, the literature shows that many of these compounds survive biodegradation, eventually being discharged into receiving waters; metabolic conjugates can even be converted back to their free parent forms. Additionally, by way of continuous infusion into the aquatic environment, those PPCPs with low persistence can display the same exposure potential as truly persistent pollutants since their transformation/removal rates can be compensated by their replacement rates (1).

Current comprehensive environmental risk assessments and epidemiologic studies do not factor in exposures/body burdens from PPCPs and may be flawed by over simplicity. The presence of numerous drugs sharing a specific mode of action could significantly affect additive exposures. It is also significant that medicines, unlike pesticides, have not been subjected to the same scrutiny regarding possible adverse environmental effects. They have been discharged into the environment, mainly via WWTP. This is surprising, especially since certain pharmaceuticals are designed to modulate endocrine and immune systems and cellular signal transduction. As such (as opposed to pesticides and other industrial chemicals already undergoing scrutiny as endocrine disruptors) have prominent potential endocrine disruptors in the environment. The number of biologics approved by the U.S. Food and Drug Administration (FDA) is growing, and their fate in the environment is unknown (1).

Many new drugs are introduced to the market each year; some of these drugs are from entirely new classes never seen before by the microbiota of a WWTP. Each of these presents a new challenge to biodegradation. Drug classes that will experience huge usage rates (e.g., impotence drugs such as sildenafil citrate) have no associated environmental occurrence or exposure data. Although the genotoxic potency of industrial wastewaters is often the highest, the overall loadings of genotoxic compounds to surface waters are far greater (up to several orders of magnitude) from municipal treatment plants (WWTP) and antineoplastic drugs might play the largest role (1).

A worst-case scenario may not be unusual, the concentration of a drug leaving a WWTP in the effluent could essentially be the same as that entering. Only the several-fold to multiple order of magnitude dilution when the effluent is mixed into the receiving water, assuming a sufficiently high natural flow, serves to reduce the concentration; obviously, smaller streams have increased potential for having higher concentrations of any PPCP that has been introduced (13). Other transients that could affect the removal of toxins/contamination include transitions between seasons and the sporadic plug-flow influx of toxicants from various sources. Overflows from STW failure or overcapacity events (e.g., floods, excessive water use) lead to the direct, untreated introduction of sewage into the environment (1).

Evidence that the persistence and bio-accumulative potential of at least some PPCPs can be similar to the problematic organohalogen POPs (persistent organic pollutants) should necessitate their consideration in comprehensive risk assessments. Over the decades, innumerable epidemiologic studies have purported correlations of various disease states with the body burdens of particular pesticides/industrial pollutants.

The findings of these studies may well be flawed, as they did not attempt to also consider the possible effects of PPCP body burdens. Any comprehensive risk assessment must factor in the exposures/body burdens of all pollutants, regardless of origin-and PPCPs are perhaps the most ignored remaining major class of pollutants (1)

PPCPs identified in WWTP effluents:

- Acetaminophen- Analgesic/anti- inflammatory -e.g., Tylenol (6)
- Acetylsalicylic acid- Analgesic/anti- inflammatory (6)
- Betaxolol- Beta-blocker-e.g., Betoptic (14)
- Bezafibrate-Lipid regulator –e.g,Befizal (14)
- Biphenylol-Antiseptic,- e.g., Dowicide A (15)
- Bisoprolol-Beta-blocker-e.g., Concor (14)
- Carazolol-Beta-blocker-e.g., Conducton (14)
- Carbamazepine-Analgesic-e.g., Tegratal (6)
- Chloroxylenol- Antiseptic-e.g., Benzytol (15)
- Chlorophene- Antiseptic-e.g., Santophen 1 (15)
- Clenbuterol-bronchodilator-e.g., Monores (6)
- Clofibric acid-lipid regulators-(6,16,17,18,19)
- Cyclophosphamide-Antineoplastic-Oxazaphosphorine(6,20,21)
- Diatrizoate-X-Ray contrast-e.g., Hypaque Sodium; (22,23)
- Diazepam-Psychiatric drug-e.g., Valium;(6,24)
- Diclofenac-Na-Analgesic-e.g., Voitaren-(6,19,)
- Dimethylamino-phenazone-anti-inflammatory-e.g., Piridol (6)
- 17a-Ethinyl estradiol-Oral contraceptive-estrogenic (25,26)
- Etofibrate-Lipid regulator-e.g., Lipo-Merz;(6)
- Fenofibrate-metabolite of fenofibrate-(6)
- Fenoterol- bronchodilator- e.g., Airum (6)
- Gemfibrozil- Lipid regulator- e.g., Lopid (6)
- Ibuprofen- anti-inflammatory- e.g., Advil; (6,19,27)
- Ifosfamide- Antineoplastic- Oxazaphosphorine (6,28)
- Indomethacine- anti-inflammatory- e.g., Amuno (6,19)
- Lopamidol- X-Ray contrast- (23)
- Lopromide- X-Ray contrast- (23)
- Ketoprofen-anti-inflammatory-e.g., Oruvail (6,19)
- Meclofenamic acid- anti-inflammatory (6,19)
- Methylbenzylidene camphor- Sunscreen agent(29)
- Metoprolol- Beta-blocker- e.g., Lopressor;(6)
- Musk ambrette- fragrances/cosmetics& personal care products (30,31)
- Musk xylene- fragrances/cosmetics& personal care products(30,31)
- Musk ketone- fragrances/cosmetics& personal care products(30,31)
- Musk moskene- fragrances/cosmetics& personal care products (30,31)

- Musk tibetene- fragrances/cosmetics& personal care products(32)
- Galaxolide (HHCB)- fragrances/cosmetics& personal care products (33,34)
- Tonalide (AHTN)- fragrances/cosmetics& personal care products (33,34)
- Celestolide (ADBI)- fragrances/cosmetics& personal care products (35)
- Musk xylene- fragrances/cosmetics& personal care products(36)
- Nadolol- Beta-blocker- e.g., Corgard (6)
- Naproxen- anti-inflammatory- e.g., Naprosyn (6,19)
- Phenazone- Analgesic- e.g., Parodyne (6)
- Propranolol Beta-blocker- e.g., Avlocardyl (6)
- Albuterol- bronchodilator- e.g., sulfate: Ventolin (6)
- Terbutaline- bronchodilator- e.g., sulfate: Brethaire (6)
- 3,4,5,6-Tetrabromo- Antiseptic, fungicide-(37)
- Timolol- Beta-blocker- e.g., hemihydrate: (6)
- Tolfenamic acid- anti-inflammatory- e.g., Tolfedine (6,19)
- Triclosan- Antiseptic- e.g., Irgasan DP 300(38)
- Verapamil- Cardiac drug-(39)

As you can see there are many PPCPs in the effluent of WWTP. The ones listed are just some of the PPCPs that come out of WWTP effluent and into surface waters, soil, and groundwater seepage. I would think no one would knowingly allow this contamination into our healthy lives, via air, soil, and water well contamination. It's a downright injustice to force all the toxins on my family and I. We are not asking for all these PPCP to be bought into our healthy environment, if the amended permit is approved the TECQ this will increase the likelihood these toxins on my family and I. These PPCPs are proven to be within the effluent, there is no maybe, the toxins are in the effluent the studies references show beyond a shadow of a doubt they are in the effluent and that they will have a cumulative effect on my family's health. Even with a better screening of waste effluents and receiving waters for toxicological effects can at best be only partially effective because the range of physiologic effects is too broad(1). Knowing this I implore the TECQ to NOT approve of this WWTP amended permit.

Here are documented case studies of PPCPs, legal and over the counter (OTC) Drugs showing little to no effect from the WWTP treatment process and being discharged in the WWTPs effluent. Any illegal drugs such as crystal methamphetamine, cocaine, and other illicit drugs entering the WWTP, either flushed or excreted through the body, would have greater toxic ramifications and were not taken into account in these studies. The focus of these studies is on residential waste influent and effluent only. Any commercial, medical or industrial waste is not represented in the summary of these studies as it's out of the scope of the amended permit request. The amended permit request is for residential use only and will not cover/permit any other waste entering the WWTP. I have included only a small sample size of studies that more than illustrate the cause of concern over contaminations/toxins enter my family's lives and way of living:

- Hignite and Azarnoff (16) reported salicylic acid and clofibric acid in the influent and effluent from a Kansas City, Missouri, municipal sewage treatment plant. Clofibric acid was routinely detected in the effluent of this Missouri WWTP at an average effluent rate of 2.1 kg/day; over 10 months its loading remained in the tight range of 0.76-2.92 kg/day. Similarly, salicylic acid, a hydrolytic metabolite of aspirin, averaged 8.6 kg/day but ranged more widely from 0.55 to 28.7 kg/day. Stan and Heberer(40) also observed that the influent concentrations of clofibric acid were only 20% higher than the effluent concentrations, showing that this chemical resisted removal by the WWTP.

- Ternes(6) found The occurrence of 32 drug residues belonging to different medicinal classes like antiphlogistics, lipid regulators, psychiatric drugs, antiepileptic drugs, beta-blockers, and □$_2$-sympathomimetics as well as five metabolites has been investigated in WWTPs discharges, river and stream waters. Due to the incomplete removal of drug residues during passage through a WWTP, above 80% of the selected drugs were detectable in WWTP effluent with concentration levels up to 6.3 ugl^{-1} (carbamazepine) and thus resulting in the contamination of the receiving waters. Acidic drugs like the lipid regulators bezafibrate, gemfibrozil, the antiphlogistics diclofenac, ibuprofen, indometacine, naproxen, phenazone and the metabolites clofibric acid, fenofibric acid, and salicylic acid as well as neutral or weak basic drugs like the beta-blockers metoprolol, propranolol, and the antiepileptic drug carbamazepine were also found in WWTP effluents and receiving waters. The elimination rates of some drugs like bezafibrate, diclofenac, naproxen, and clofibric acid, showed significantly decrease drug elimination rate on the rainfall day. (6)

  The detected antiphlogistics and lipid regulators arise predominately from human application underlined by the ubiquitous contamination of WWTPs effluents. In WWTP effluents detection of acetylsalicylic acid, acetaminophen and dimethylaminophenazone were also found with maximum concentrations exceeding 1ug. The psychiatric drug Diazepam was found in the WWTPs effluent as well. Carbamazepine concentrations reduction rate was extremely low in WWTPs with only a 7% reduction rate in the effluent of WWTPs. Since WWTP's discharge effluents are highly contaminated by these drugs which were found to be present in WWTPs receiving waters it can be assumed that WWTPs effluents are responsible for the elevated concentrations of the drugs (eg lipid regulating agents and beta-blockers) in streams and rivers. (6)

  Pharmacokinetical studies have indicated that drugs are mainly excreted as metabolites, Due to their enhanced polarity, it can be assumed that the metabolites were often poorly eliminated during passage through a WWTP process. Hence, drug metabolites are expected to be present in the aquatic environment sometimes is comparable or even higher concentrations to the original (unchanged) drugs indicated to be the environmental concentration of clofibric acid and fenotibric acid. (6)

The WWTP process is insufficient to completely eliminate these drugs residues. Additionally, metabolites formed by conjugation (eg with glucuronic acid. Sulfate) within phase II reactions are likely to be cleaved in the environment into the original (unchanged) pharmaceuticals (58). The investigated 32 drugs and 5 metabolites in this study represents only about 1% of approved pharmaceutical compounds when considering human and veterinary drugs. It can be assumed that many other drugs and especially polar metabolites were present in the aquatic environment at concentrations up to the ugl range. (6)

- Chad (59)- A study of sites in the Front Range of Colorado, USA, was monitored from May through September 2003 to assess the presence and distribution of pharmaceuticals in soil irrigated with reclaimed water derived from urban WWTPs. Soil cores were collected monthly, and 19 pharmaceuticals, all of which were detected during the present study, were measured in 5-cm increments of the 30-cm cores. The four most commonly detected pharmaceuticals were erythromycin, carbamazepine, fluoxetine, and diphenhydramine. (59)

  The bioactive properties of pharmaceuticals and other wastewater contaminants introduced into surface water and groundwater, which might lead to adverse effects on humans and ecosystems, has yet to be screened and removed adequately by WWTPs (59)

  WWTPs are not designed nor are they able to completely remove micro-contaminants or pharmaceuticals from WWTPs effluent discharge. Therefore, the mixtures, composition, and individual concentrations of pharmaceuticals from WWTPs discharges have the potential to vary continuously. However, some trends have been identified, and surface water and sediment exposed to WWTPs effluent and, to a lesser extent, soil and groundwater that might be affected by WWTPs effluent into the environment (1,60,61,62).

  Reclaimed water is the liquid end product of a WWTF effluent that undergoes additional treatment, including additional disinfection, to ensure its safe use in public areas. Even after additional treatment, the reclaimed water typically contains nitrogen and phosphorus and is considered to be non-potable water(59). Even with this additional treatment to the WTP Effluent, the study still shows contamination of soil that came in contact with WWTPs effluent. (59)

  Reclaimed water distributed by the city is effluent from its WWTP, additional treatment includes coagulation and filtration to remove remaining suspended solids and disinfection with chlorine. Soil cores (depth, 0–30 cm) from each location were collected before the onset of irrigation in the spring of 2003. Once irrigation started for the season, soil cores were collected monthly from May or June until September 2003. Duplicate cores from each field site were collected on each sampling date. A soil corer with a diameter of 5.08 cm was used, and each core was subdivided into six 5-cm segments. After collection and segmentation, the core sections were stored frozen (15degC) until extraction and analysis. Contaminations from WWTPs effluent reclaim water in the soil samples were; Cotinine, Salbutamol, Cimetidine, Acetaminophen, 7-Dimethylxanthine, Trimethoprim, Diltiazem, Fluoxetine, Warfarin, Gemfibrozil, Caffeine, Sulfamethoxazole, Dehydronifedipine, Codeine, Thiabendazole, Diphenhydramine, Erythromycin, Carbamazepine, Miconazole. (59)

The WWTP reclaimed effluent water soil contaminations from the tested pharmaceuticals in this study were determined for each field location and ranged between 39 and 94% for all compounds at all three sites. The mean recoveries of soil matrix spikes ranged between 69 and 71% at all three sites. The four most frequently detected pharmaceuticals in the soils; erythromycin, carbamazepine, fluoxetine, and diphenhydramine—have lower water solubility or larger log Kow values than most of the other pharmaceuticals in this study. Some compounds, such as carbamazepine and acetaminophen, generally showed an increase in total mass accumulating in the
to 30-cm soil interval throughout the present study, suggesting that these compounds could accumulate in soil environments exposed to wastewater. (59)

The 30-cm soil cores were segmented into 5-cm increments to evaluate the vertical distributions of pharmaceuticals through surficial soil at the three sites. Concentration differences within the soil profiles may indicate the potential for these WWTPs effluent water–derived pharmaceuticals to be transported from the soil surface to groundwater. Two of the pharmaceuticals measured in soils in the present study, carbamazepine, and sulfamethoxazole, have been determined to leach through soil to groundwater. Soil concentrations increased throughout the present study for several compounds, in-
including acetaminophen, caffeine, carbamazepine, dehydroni-fedipine, and sulfamethoxazole. (59)

The results of the present research demonstrate that WWTP's effluent wastewater can result in the presence and accumulation of pharmaceuticals in soil. The present study also suggests that some of the pharmaceuticals measured may be sufficiently mobile to leach through the top 30 cm of soil and, potentially, into deeper soil layers to groundwater. Accumulation of pharmaceuticals in soil, such as carbamazepine, may be of concern, especially in areas where year-round irrigation is used. (59)

- Kolpin et al (61)- Did a study on organic wastewater contaminants (OWCs). OWCs were prevalent during this study, being found in 80% of the streams sampled. The compounds detected represent a wide range of residential, industrial, and agricultural origins and use with 82 of the 95 OWCs being found during this study. The most frequently detected compounds were coprostanol (fecal steroid), cholesterol (plant and animal steroid), N, N-diethyltoluamide(insect repellant), caffeine (a stimulant), triclosan (antimicrobial disinfectant), tri(2-Chloroethyl)phosphate (fire retardant), and 4-nonylphenol (nonionic detergent metabolite).

Household chemicals, pharmaceuticals, and other consumables as well as biogenic hormones are released directly to the environment after passing through WWTP processes, which often are not designed to remove them from the effluent. Potential concerns from the environmental presence of these compounds include abnormal physiological processes and reproductive impairment (64-70), increased incidences of cancer (76), the development of antibiotic-resistant bacteria (71-74), and the potential increased toxicity of chemical mixtures (77). For many substances, there are potentially harmful effects on humans and aquatic ecosystems (1, 63, 75).

Here is a list of the 95 Organic Wastewater Contaminants (OWC):

Antibiotics:

carbodox, chlortetracycline, chlortetracycline (2), ciprofloxacin, doxycycline, enrofloxacin, erythromycin-H_2O, lincomycin, Norfloxacin, oxytetracycline, oxytetracycline (2), roxithromycin, sarafloxacin, sulfachloropyridazine (2), Sulfadimethoxine, sulfadimethoxine (2), sulfamerazine, sulfamerazine (2), sulfamethazine,sulfamethazine (2), sulfamethizole, sulfamethoxazole, sulfamethoxazole (3),sulfathiazole, sulfathiazole (2),tetracycline, tetracycline (2), trimethoprim, trimethoprim (3), tylosin, virginiamycin,

Prescription Drugs:

albuterol (salbutamol) (3), cimetidine (3), codeine (3),codeine (4),dehydronifedipine (3),digoxin (3) ,
digoxigenin (3),diltiazem (3), enalaprilat (3), fluoxetine(3) , gemfibrozil (3), metformin (3), paroxetine metabolite (3), ranitidine (3), warfarin (3)

Nonprescription Drugs:

, acetaminophen (3) ,caffeine (3), caffeine (4), cotinine (3),cotinine (4), 1,7-dimethylxanthine (3), Ibuprofen (3)

Other Wastewater-Related Compounds:

1,4-dichlorobenzene (4) ,2,6-di-tert-butylphenol(4),2,6-di-tert-butyl-1,4-benzoquinone (4), 5-methyl-1H-benzotriazole (4),acetophenone (4), anthracene (4),benzo[a]pyrene(4), 3-tert-butyl-4-hydroxy anisole (4), butylated hydroxy toluene (4),bis(2-ethylhexyl) adipate (4), bis(2-ethylhexyl) phthalate(4), bisphenol A(4), carbaryl(4),cis-chlordane(4),chlorpyrifos(4), diazinon(4),dieldrin(4), diethylphthalate(4),ethanol,2-butoxy-phosphate (4), fluoranthene (4), lindane(4), methyl parathion(4) . 4-methyl phenol (4),naphthalene (4),N,N-diethyltoluamide (4),4-nonylphenol(4), 4-nonylphenol monoethoxylate(4), 4-nonylphenol diethoxylate(4),4-octylphenol monoethoxylate(4),4-octylphenol diethoxylate(4), phenanthrene (4), phenol (4), phthalic anhydride (4), pyrene (4), tetrachloroethylene (4),triclosan(4), tri(2-chloroethyl) phosphate (4), tri(dichlorisopropyl) phosphate (4),triphenyl phosphate (4),

Steroids and Hormones:

cis-androsterone(5), cholesterol (4), cholesterol (5), coprostanol (4),coprostanol (5), equilenin(5), equilin(5),17r-ethynyl estradiol(5), 17r-estradiol(5),17,-estradiol(4),17,-estradiol(5),estriol(5), estrone

(5), mestranol(5), 19-norethisterone(5),progesterone(5),stigmastanol (4), testosterone(5)

A previous investigation of streams downstream of WWTPs also found a high occurrence of OWCs (78). A large number of OWCs (82 out of 95) were detected at least once during this study. Only eight antibiotics and five other prescription drugs were not detected in the samples analyzed (61). Over 60% of these higher concentrations were derived from cholesterol and three detergent metabolites (4-nonyphenol, 4-nonylphenol monoethoxylate, and 4-nonylphenol diethoxylate). The frequent detection of cotinine, 1,7-dimethylxanthine, erythromycin-H2O, and other OWC metabolites demonstrate the importance of obtaining data on degradates to fully understand the fate and transport of OWCs in the WWTPs system. Also, their presence suggests that to accurately determine the overall effect on human and environmental health (such as pathogen resistance and genotoxicity) from OWCs, their degradates should also be considered.

To obtain a broader view of the results for this study, the 95 OWCs were divided into 15 groups based on their general uses and/or origins. The data show two environmental determinations: frequency of detection and percent of total measured concentration for each group of compounds. These two views show a vastly different representation of the data. Concerning the frequency of detection, several groups were frequently detected, with seven of the 15 groups being found in over 60% of the stream samples. However, three groups (detergent metabolites, plasticizers, and steroids) contributed to almost 80% of the total measured concentration (61).

Mixtures of various OWCs were prevalent during this study, with most (75%) of the streams sampled having more than one OWC identified. In fact, a median of seven OWCs was detected in these streams, with as many as 38 compounds found in a given streamwater sample. Because only a subset of the 95 OWCs was measured at most sites collected during the first year of study, it is suspected that the median number of OWCs for this study is likely underestimated (61). Also, 33 of the 95 targets OWCs are known or suspected to exhibit at least weak hormonal activity with the potential to disrupt normal endocrine function (64,66,68,70,79-84).

The results of this study document that detectable quantities of OWCs occur in U.S. streams at the national scale. This implies that many such compounds survive WWTPs treatment (1, 85, 86) and biodegradation (87).

- Thomas et al(8)- Did a study on WWTPS effluents and antibiotic-resistant bacteria and their resistance genes. Antibiotic-resistant bacteria, biofilms were investigated using enterococci, staphylococci, Enterobacteriaceae, and heterotrophic bacteria as indicator organisms. The emergence of bacteria resistant to antibiotics is common in areas where antibiotics are used, but antibiotic-resistant bacteria also increasingly occur in aquatic environments (88,89) along with vancomycin-resistant enterococci (VRE) (8).

High bacterial density and diversity are found in biofilms from wastewater systems, especially from activated sludge of sewage treatment plants. Two biofilm sampling points were located in the WWTP, one in the biological sludge facilities, and the other at the effluent discharge of the WWTP. The bacterial densities of the biofilms from wastewater effluent and receiving surface water as measured by DAPI (4P,6-diamidin-2P-phenylindole-dihydro-chloride, Merck)-staining according to Schwartz et al.[90] were approx. 10 to the 6th power 10 to the 7th power bacteria cm-2.(8)

Biofilms from WWTP showed colony counts for enterococci/streptococci. 16 (+/ - 6.5)%; at the discharge effluent, 12.5 (+/- 5.5)%; and in the receiving surface water biofilms. Specific DNA amplicons were detected after the first Polymerase Chain Reaction (PCR) in biofilms from WWTPs sampling points. These results indicated that the concentration of vanA resistance genes in wastewater systems was higher than that at the other sampling points. Similar to the results obtained for enterococci/streptococci, the high load of Enterobacteriaceae was observed in biofilms from WWTPs. A large number of cefazolin-resistant Enterobacteriaceae was measured in biofilms from the WWTP effluent discharge with 11 (+/- 4.1%.) The percentage of resistance in receiving surface water biofilms was 27 (+/-10%.).The percentage of cefotaxime resistance at the WWTPs effluent discharge was 1.9 (+/- 0.4%). All of the 23 ampC-positive bacteria were identified as Citrobacter, Enterobacter, and E. coli. (8)

Heterotrophic bacteria resistant to vancomycin, ceftazidime, cefazolin, and penicillin G were cultivated from all biofilms. As well as Enterococci and Enterobacteriaceae were found in all biofilms. Enterococci and Enterobacteriaceae are naturally occurring microorganisms from human and animal intestines (8). Enterococci have an advantage in terms of persistence and multiplication because of their tolerance to various environmental factors, such as alkaline pH, increased temperature, and sodium chloride concentrations [91,92]. Enterococci are nosocomial pathogens able to cause urinary tract infections, surgical wound infections, endocarditis, and bacteremia [93]. Resistance to antibiotics, such as glycopeptides, is a problem in the therapy of these Infections. Studies showed that Avoparcin-selected glycopeptide-resistant enterococci are cross-resistant to vancomycin and teicoplanin, two antibiotics used in the therapy of humans (8). Sewage in Sweden was screened for VRE. VRE was still isolated from 19% of WWTP's effluent discharge (94).

Recent studies demonstrated the occurrence of various antimicrobial compounds in water treatment plants and in WWTPs discharge effluents [14,95-97]. The main results of this study can be summarized as follows; Vancomycin-resistant enterococci and L-lactam-hydrolysing Enterobacteriaceae were cultivated from all wastewater biofilms. VanA genes and ampC genes were also detected in all other wastewater and environmental biofilms.

- Haruhiko (98)- In this study, The occurrence of quinolone antibiotics (QAs) was investigated in wastewater effluents and surface river/lake waters in the US and Canada by using solid-phase extraction with mixed-phase cation exchange disk cartridge and liquid chromatography–mass spectrometry (LC–MS) and liquid chromatography fluorescence detection (LC-FLD). Ofloxacin (OFL) was detected in secondary and final effluents of a wastewater treatment plant (WWTP) in East Lansing, Michigan.

  The quinolone antibiotics (QAs), such as pipemidic acid (PIP), ofloxacin (OFL), norfloxacin (NOR), ciprofloxacin (CIP), lomefloxacin (LOM), enrofloxacin (ENR), difloxacin (DIF), sarafloxacin (SAR), and tosufloxacin (TOS), comprise an important class of pharmaceuticals, which have been widely used for the last 20 years in Europe and the United States (99).

  Ofloxacin (OFL) was detected in the secondary and final effluents of the WWTP. OFL has been used to treat various bacterial infections such as bronchitis, gonorrhea, skin infections, and urinary tract infections, etc. The US FDA has classified OFL as a pregnancy category C drug. High concentrations of OFL have been found in the effluents from sewage treatment plants in European countries, such as France (330–510ng/l), Italy (290–580ng/l), and Greece (460ng/l) (98). Ciprofloxacin (CIP) and norfloxacin (NOR) were detected in the effluents of WWTPs in Switzerland (100)

Drug Classes and Environmental Occurrences:

- Hormones/Mimics- Steroids were the first physiologic compounds to be reported in sewage effluent (41-44) and as such were the first pharmaceuticals to capture the attention of environmental scientists. Estrogenic drugs, primarily synthetic xenoestrogens, are used extensively in estrogen-replacement therapy and oral contraceptives.

- Antibiotics- In addition to pathogen resistance, genotoxicity may be a concern. A large body of literature exists on antibiotics in the environment. In one study of WWTP effluent, fluoroquinolones were the chemical class contributing the major portion to overall DNA toxicity (45); ciprofloxacin, for example, was identified at 3-87 pg/L. Hirsch et al. (14) analyzed German WWTP effluents and groundwaters/surface waters for 18 antibiotics representing macrolides, sulfonamides, penicillins, and tetracyclines. Although the penicillins (susceptible to hydrolysis) and the tetracyclines (can precipitate with calcium and similar cations) were not found, the others were detected in the microgram per liter range. Indeed, the rampant, widespread (and sometimes indiscriminate) use of antibiotics, coupled with their subsequent release into the environment, is the leading proposed cause of accelerated/spreading resistance among bacterial pathogens, which is exacerbated by the fact that resistance is maintained even in the absence of continued selective pressure (an irreversible occurrence).

- Blood Lipid Regulators- Fibrates-high usage. Fibric acid metabolites- ubiquitous, persistent pollutants. Clofibric acid was the first prescription drug (actually an SRS) reported in a sewage effluent (17,40), and it continues to be one of the most frequently reported PPCPs in monitoring studies. Clofibric acid (2-[41-chlorophenoxy-2-methyl propanoic acid), the active metabolite from a series of widely used blood lipid regulators, and which also happens to be structurally related to the phenylalkanoic acid herbicide mecoprop (the methylphenoxy structural analog), has captured much attention from investigators. Stan et al. (46) first reported clofibric acid in water at concentrations between 10 and 165 ng/L. Heberer and Stan (47) found clofibric acid at levels up to 4 pg/L in groundwater under a sewage treatment farm; they also found clofibric acid concentrations up to 270 ng/L in drinking water samples. They concluded that it is not removed by sewage/water treatment processes. Stumpf et al. (19) reported that the removal efficiencies from WWTPs for clofibric/fenofibric acids, bezafibrate, and gemfibrozil ranged from only 6-50%, verifying extremely limited degradation for these compounds. This chemical class is ubiquitous because daily human dosages are generally high (grams per day).

- Nonopioid Analgesics/Nonsteroidal Anti-Inflammatory Drugs- Stumpf et al. (48) were the first to identify diclofenac, ibuprofen, acetylsalicylic acid, and ketoprofen in sewage and river water. Ternes (6) reported levels of diclofenac, indometacine, ibuprofen, naproxen, ketoprofen, and phenazone in WWTP effluent exceeding 1 pg/L;. In another study, Ternes et al. (37) reported average concentrations of acetylsalicylic acid in WWTP effluents as well as in rivers. They also reported salicylic acid concentrations in WWTP influents, with two other acetylsalicylic metabolites, gentisic acid, and o-hydroxyhippuric acid, while salicylic acid also appeared in the effluents. Ternes et al. (37) also found naproxen in all WWTP effluents examined and in river waters. In their screening of WWTP waters, Heberer et al. (18) found that the most prevalent drugs, other than clofibric acid, were the NSAIDs diclofenac, ibuprofen, and propyphenazone. In the influent to WWTPs,Buser et al. (49) found diclofenac at concentrations of 0.5-1.8 pg/L, whereas the concentrations in the respective effluents were only moderately reduced (at most 50%)

- Beta-Blockers/B2-Sympathomimetics- Hirsch et al. (50) and Ternes (6) identified the beta-blockers metoprolol and propranolol, with lesser amounts of betaxolol, bisoprolol, and nadolol, in WWTPs effluent. The P2-sympathomimetics (bronchodilators) terbutalin and salbutamol (albuterol in the United States), were detected in WWTPs effluent.

- Antiepileptics- Antiepileptics are ubiquitous and prevalent due to poor WWTPs removal. Carbamazepine was the drug detected most frequently and in the highest concentrations during a study by Ternes (6). This drug was detected in all

WWTPs and receiving waters, with a maximum concentration of 6.3 pig/L. Ternes (6) hypothesized that the ubiquitous occurrence resulted from the very low removal efficiency from WWTPs, which was calculated to be only 7%

- Antineoplastics- Antineoplastics are highly [geno] toxic compounds, with poor removal from WWTPs. These compounds act as nonspecific alkylating agents (i.e., specific receptors are not involved) and therefore have the potential to act as either acute or long-felt stressors (mutagens/carcinogens/teratogens/embryotoxins) in any organism. The fact that two oxazaphosphorines, ifosfamide, and cyclophosphamide, were found in certain effluents in the low microgram-per-liter range indicates that these highly toxic compounds, which are probably refractory to microbial degradation at WWTPs (51), can find their way into the environment. Indeed, Steger-Hartmann et al. (51) found levels of cyclophosphamide in sewage influent. Additional evidence pointing to the refractory nature of ifosfamide is presented by Kummerer et al. (28), who found that concentrations of ifosfamide in effluents of WWTPs. Kummerer et al. (28) found ifosfamide to be totally refractory to removal by WWTPs and to totally resist alteration during a 2-month bench-scale WWTPs simulation. Falter and Wilken (52) showed that while these compounds are difficult to determine analytically, their potential to remain in the aqueous phase after sewage treatment is high. White and Rasmussen (53), in the most detailed overview to date on the genotoxicity of wastewaters, elaborate that the overall loading of genotoxic compounds to surface waters is far greater, up to several orders of magnitude, from municipal treatment plants. They present a striking correlation between the occurrence of direct-acting mutagens in surface waters and the human population served by the discharging WWTPs.

- Diagnostic Contrast Media- Diagnostic contrast media have very high usage rates, display considerable persistence, show no evidence for mineralization, and have low physiologic activity. Some of the more widely used members of contrast media are highly substituted and sterically hindered amidated, iodinated aromatics such as diatrizoate and iopromide (22), which are used worldwide at annual rates exceeding 3,000 tons. Kalsch (22) found these compounds to be quite resistant to transformation in WWTPs In municipal WWTPs effluents, Ternes et al. (23) found high concentrations of iopamidol iopromide. In a WWTP they found two other contrast agents, diatrizoate and iomeprol, as well as iothalamic acid and ioxithalamic acid. Five iodinated diagnostics were repeatedly detected, iopamidol, diatrizoate. diatrizoate and indicated that relatively high local concentrations can occur, especially in small streams containing a high percentage of WWTP discharges. Individual contrast agents can experience annual usage rates of 100 tonnes. Such high usage, coupled with inefficient human metabolism (95% unmetabolized) and ineffective elimination of iodinated contrast agents by WWTPs, can lead to very high environmental accumulations and persistence.

- Personal Care Products (eg food Supplements, products that alter odor, appearance, touch or taste, such as preservatives, cosmetics, toiletries, fragrances, sunscreen Bath additives, Shampoos, hair tonic, Skincare products, Hair sprays, setting lotions, hair dyes, Oral hygiene products, Soaps, Perfumes, aftershaves (1))- Yamagishi et al. (30) Musk xylene were found in all samples, and musk ketone was found in 80% of the 74 samples analyzed. Concentrations in WWTPs effluents ranged from 25 to 36 ng/L for musk xylene and from 140 to 410 ng/L for musk ketone. Concentrations of musk Xylene and musk ketone with the highest values occurring downstream of WWTPs. Heberer et al. (18) investigated the contamination of surface waters receiving high percentages of treated sewage and found concentrations above 10 pg/L for the polycyclic musks Galaxolide, Tonalide, and Celestolide. Nitro musks can be highly toxic; recently, the amino transformation products of nitro musks were identified in sewage treatment effluent Gatermann et al. (36) identified musk xylene and musk ketone together with their amino derivatives 4- and 2-amino musk xylenes and 2-amino musk ketone in WWTPs effluent. Synthetic musks are ubiquitous, used in large quantities, introduced into the environment almost exclusively via WWTPs effluent, and are persistent and bioconcentratable, they are prime candidates for monitoring in both water and biota as indicators for the presence of other PPCPs Gatermann et al. (36). Triclosan (Irgasan DP 300, a chlorinated diphenyl ether: 2,4,4'-trichloro-2'-hydroxydiphenyl ether) an antiseptic has many household uses eg. Colgate's Total toothpaste, the first toothpaste approved by the FDA to fight gingivitis. (While triclosan is registered with the U.S. EPA as a pesticide, it is freely available OTC), footwear (in hosiery and insoles of shoes called Odor-Eaters), hospital handsoap, acne creams (e.g., Clearasil), and rather recently as a slow-release product called Microban, which is incorporated into a wide variety of plastic products from children's toys to kitchen utensils such as cutting boards. Many of these uses can result in the direct discharge of triclosan to WWTPs, and as such, this compound can find its way into receiving waters (1). Disinfectants are used in rather large amounts. Disinfectants such as triclosan, Biphenylol, 4-chlorocresol, chlorophene, bromophene, 4-chloroxylenol, and tetrabromo-ocresol (37) are some of the active ingredients, at percentage volumes of < 1-20%. A survey of 49 WWTP (37) routinely found biphenylol and chlorophene in both influents, up to 2.6 pg/L for biphenylol and up to 0.71 pg/L for chlorophene, and effluents. The removal of chlorophene from the effluent was less extensive than for biphenylol, with surface waters having concentrations similar to that of the effluents.

The enormous array of PPCPs, over the counter (OTC) and prescribed (RX) pharmaceuticals will continue to diversify and grow as the human genome is mapped. It will be very difficult for WWTPs to match the progress and amount/complexity of new compounds being introduced into the market. U.S. private R&D investment in new pharmaceuticals will be nearly $18 billion yearly. The number of targets is expected to increase up to 20-fold (yielding 3,000-10,000 drug targets) in the near future according to the Pharmaceutical Research & Manufacturers Association (54). The FDA approved 30 new nonbiologic drugs, one of which was Viagra (55) which environmental effects are yet unknown. The FDA Modernization Act FDA(56) will also help to accelerate this growth. Most of the new drugs have unpublished environmental transformation/fate/effects properties; "significantly affect the quality of the human environment" FDA(57). This notion includes not just toxicity to environmental organisms but also "environmental effects other than toxicity, such as lasting effects on ecological dynamics" FDA (57). The WWTPs will not be able to keep up with the screening methods required to ensure safe, toxin-free, and environmentally friendly discharge effluents. Would these hazardous/toxic risks to your family from this WWTPS be worth it to you? I think not, so I implore you to not impose these hazardous/toxic risks onto my family. Thank you in advance for your time and consideration of this very important life-changing decision.

Respectfully,

Christopher Spicer

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Elisa Guerra

From: PUBCOMMENT-OCC
Sent: Tuesday, July 7, 2020 10:46 AM
To: PUBCOMMENT-OCC2; PUBCOMMENT-OPIC; PUBCOMMENT-ELD; PUBCOMMENT-WQ
Subject: FW: Public comment on Permit Number WQ0015222001
Attachments: WQ0015222001 to tecq2020.docx

H

From: spicerhousekaty@yahoo.com <spicerhousekaty@yahoo.com>
Sent: Monday, July 6, 2020 10:48 PM
To: PUBCOMMENT-OCC <PUBCOMMENT-OCC@tceq.texas.gov>
Subject: Public comment on Permit Number WQ0015222001

REGULATED ENTY NAME PULTE HOMES OF TEXAS WWTP

RN NUMBER: RN107117327

PERMIT NUMBER: WQ0015222001

DOCKET NUMBER:

COUNTY: HARRIS

PRINCIPAL NAME: HARRIS COUNTY MUD 495

CN NUMBER: CN604514943

FROM

NAME: Chris Spicer

E-MAIL: spicerhousekaty@yahoo.com

COMPANY: Home

ADDRESS: 23910 STOCKDICK SCHOOL RD
KATY TX 77493-6317

PHONE: 7134711123

FAX:

COMMENTS: I am formally requesting a contested hearing and would like to add this information to my request, of said Permit WQ0015222001 amendment. I feel the attached document on water/soil/groundwater contamination, along with the air Volatile Organic Compounds (VOC) contamination, will demonstrate that I will be greatly affected by the toxins/contamination of this WWTP. Furthermore, our property extremely close in proximity and abutting South Mayde Creek (SMC) is in the 100-year flood plain. Discharged wastewater will run across and flow onto our property in a mild and heavy rain event such as the event in 2017 when Harvey hit Houston. This discharged wastewater will cross over my property and violate the Texas Property Owners Bill of Rights. These discharges' waters will be polluted and contain sewage. The permit amendment request is asking you to allow additional wastewater to be released into SMC which will cause serious hardships, affect one's enjoyment of one's property and health hazards. One can understand how allowing that much additional wastewater to flow into SMC is sure to flood over the SMC banks, causing property damage to be beyond comprehension. Winds carrying air contaminants and odorous smells have a high likelihood of seeping over onto my property affecting my enjoyment of my property and in violation of the Texas Property Owners Bill of Rights. If the amendment is approved this will only further exacerbate the WWTP effect on the enjoyment of my property. The last wind study cited in many of Harris county WWTP permit requests is many decades old and with all the environmental changes we have seen over the last years, let alone decades, make these wind studies outdated and invalid at best. With the proximity of the WWTP to my property, noise pollution is a major concern as well and will violate the Texas Property Owners Bill of Rights, if this amendment is permitted it will only serve to increases the current violation to a much greater extent.

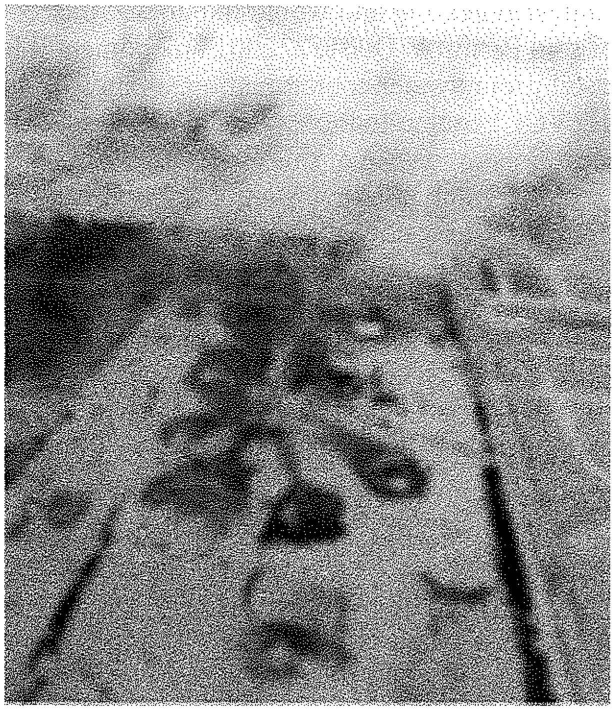
I am formally requesting a contested hearing and would like to add this information to my request, of said Permit WQ0015222001 amendment. I feel the attached document on water/soil/groundwater contamination, along with the air Volatile Organic Compounds (VOC) contamination, will demonstrate that I will be greatly affected by the toxins/contamination of this WWTP. Furthermore, our property extremely close in proximity and abutting South Mayde Creek (SMC) is in the 100-year flood plain. Discharged wastewater will run across and flow onto our property in a mild and heavy rain event such as the event in 2017 when Harvey hit Houston. This discharged wastewater will cross over my property and violate the Texas Property Owners Bill of Rights. These discharges' waters will be polluted and contain sewage.

Winds carrying air contaminants and odorous smells have a high likelihood of seeping over onto my property affecting my enjoyment of my property and in violation of the Texas Property Owners Bill of Rights. If the amendment is approved this will only further exacerbate the WWTP effect on the enjoyment of my property. The last wind study cited in many of Harris county WWTP permit requests is many decades old and with all the environmental changes we have seen over the last years, let alone decades, make these wind studies outdated and invalid at best. With the proximity of the WWTP to my property, noise pollution is a major concern as well and will violate the Texas Property Owners Bill of Rights, if this amendment is permitted it will only serve to increases the current violation to a much greater extent.

As a property owner already established before the request for a WWTP permit approval, I should be the one receiving the proof that the health of my family will not be affected by this WWTP. Instead, I find, I am the one having to show the burden of proof as to why this WWTP permit would affect my family's health and should NOT be allowed to be amended to increase the risk already imposed by its existence in such proximity to my home.

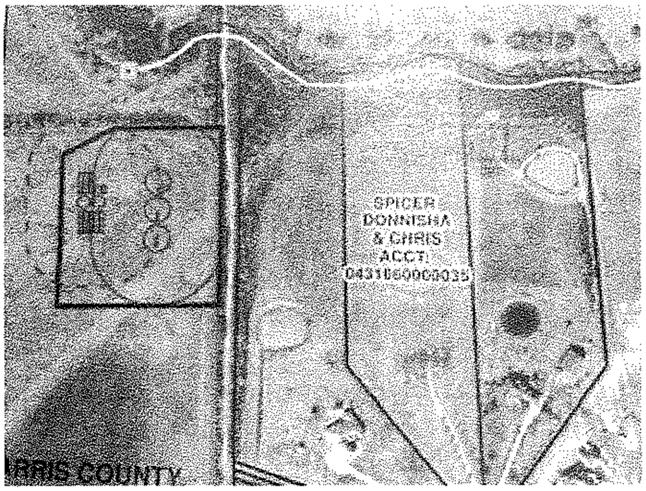
Please review all the Photos before going through this document/request. As they say, a photo is worth a 1,000 words. I would like to show you what happens in medium to high rainfall to my property. I have included an aerial photo of South Mayde Creek Estates (my neighborhood) to illustrate the effect rainfall has on SMC and in turn the effect on our property. This is what this amended permit is asking you to exacerbate, an already challenging flooding situation. The permit amendment request is asking you to allow, additional wastewater to be released into SMC which **will** cause serious hardships, affect one's enjoyment of one's property and health hazards. After viewing photos, one can see how allowing that much additional wastewater to flow into SMC is sure to flood over the SMC banks, causing property damage to be beyond comprehension.

Aerial view of my house and neighborhood after a medium/ heavy rainfall:

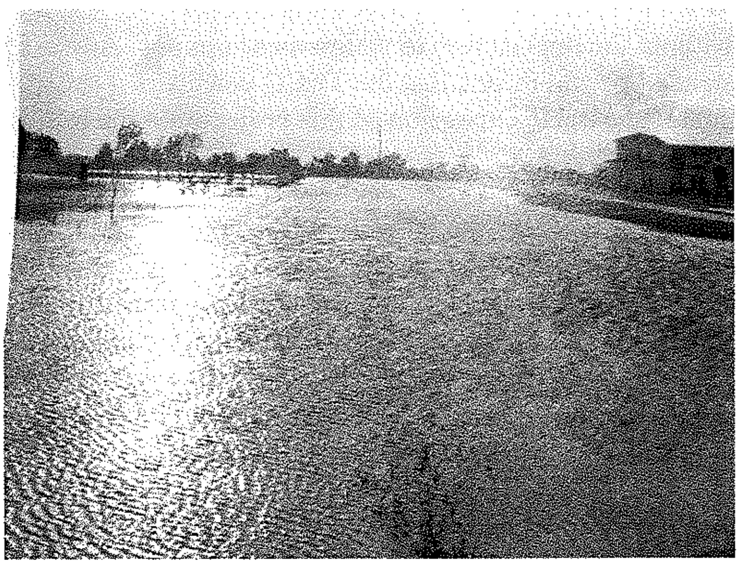


SMC after medium rainfall:

My Property location to the WWTP:



Part of my property:



The water ascended within inches from coming into the home. The floodwater came over and submerged our pond (which is stocked and fished and visited frequently by wildlife birds, rabbits, and deer) and right up to our privet drinking water well/well pump.

As you can also see in one of the photos how close the effluent from the WWTPs into SMC is to our home and on our property, there is a high likely hood of SMC flooding out of its banks with a high percentage of contaminated effluent wastewater entering into our pond and privet drinking water well contaminating both not to mention contaminating our soil not only in flooding conditions but also daily (as we own the soil/creek up to the halfway mark of the creek) In a medium to high rainfall we will have a high likelihood of the WWTPs effluent water contamination entering our home, pond and privet drinking water well. Demonstration of this burden alone should be enough to NOT allow the amended permit to go forward with approval status on this amended permit request.

The amendment requestor will infringe on another's rights and health if the amendment is allowed to proceed. I ask, what value do you put on your family's health? My family and I will harbor the majority of the burden and gain no benefit, just a tremendous amount of health hazards from this WWTP.

I believe these issues will fall under environmental justice, which refers to the right to a safe, healthy, productive, and sustainable environment for all. Where "environment" refers to the place where people live, work, and recreate. My family and I have owned our property long before the amendment applicant applied for a WWTP amended permit, new home buyers within the MUD will buy knowing of the WWTP and its location before the home purchase. At that time the buyer will be able to weight the health risk vs lower cost of home due to its location to the WWTP. If the TECQ approves this amended permit, it's putting my family at risk without the opportunity to weigh these options. Any affirmative decision on this amended permit means that the TECQ considers it acceptable to force a dangerous and undesirable expansion of this project into the health and lives of my family and neighbors.

In doing further research and investigating Sewage Treatment Plant (STP) aka Waste Water Treatment Plant (WWTP), I found that wastewater contaminants are varied and numerous. They include but are not limited to organic material, pathogens, metals, salt, ammonia, pesticides, pharmaceuticals, and endocrine disruptors. All of these are undesirable in WWTPs effluents, a lot of them are proven to be harmful to both humans and the environment. Total dissolved solids (TDS) comprise inorganic salts (principally calcium, magnesium, potassium, sodium, bicarbonates, chlorides, and sulfates) found in wastewater effluents. High levels of these TDS in WWTPs effluent are suitable for plants in WWTPs receiving waters because many plants are intolerant of the chlorides and the TDS may leach into the groundwater. Pharmaceuticals are not wholly absorbed into the body, the excess is eliminated and enters the WWTPs. Besides people dispose of unused medications down the toilet. These pharmaceuticals make their way to the WWTPS where little is done to remove them. They are then released via WWTPs effluent into the receiving waters dosing wildlife, domestic pets, and even humans with drugs they don't have a prescription for.

To demonstrate the water/soil, air toxins, health issues, contamination, and environmental toxins this WWTP permit approval will place on my family, I will give reference to independent studies proving the health hazard this will bring down upon my family. This is not just rhetoric coming from some property owner, this is unbiased and indisputable proof. References will be designated by a corresponding number, then list at the end of this request.

I have spent more hours then I want to count and have come across many published studies demonstrating the water and soil toxins/contamination from WWTP that I would like to share with you for your consideration. Many factors play a role in the effectiveness of a WWTP; unfortunately, this WWTP location will be hindered by them all.

- Size: The size of the receiving waters for the WWTP effluent plays a big role in the dilution/potency of toxins/contamination (1,2) and the effect on the environment, soil contamination along with seepage to the water table (3,4,5) of the many of chemicals that have been shown in the effluent of WWTP. The creek where the effluent for this WWTP will come over its bank with as little as 2-4 in of rain, and flood all of our back yards (see fig #). Due to this, our private water wells have a high chance of becoming contaminated with the toxins in wastewater effluents. Since the private water wells do not fall under the EPA and are not tested by the EPA, the cost and burden will now fall on me. The cost per test is 250.00 for one of the lower comprehensive tests which will need to be done semi-annually. This is a cost that I should not the burden of, but will if this amended permit is approved. I am getting no benefit from this WWTP only forced burdens, I don't see how this is right or just. If my soil becomes contaminated with toxic chemicals that make it through the process of which less than 1% of know chemical compounds are even tested(6,7) The owners of the property are required under federal and state regulations to decontaminate the site or remove contaminated soil to a safe disposal facility. Decontamination or removal of soil is costly and may exceed the value of the property. The sale of contaminated property is difficult at best. I would be forced to abandon my contaminated property rather than try and sell or decontaminate due to the high cost to do so. If the amended permit request is granted, my property risk is directly proportional to the increase in wastewater released.

- Temperature: Increased temperature (Houston summer) allows for Increase tolerance to reduced rates from the treatment process (8).Gene transfer rates are temperature sensitive, i.e. the transfer rate increases 1000 times at 25 degrease C compared to 5 degrease C in a study of multi-resistant coliforms from sewage (9). The humidity in the hot Houston summer weather is also not conducive to the efficiency of a WWTP or to the harmful odors/VOCs that will come from a WWTP.

- High Precipitation: According to the EPA Handbook, vol. 1: Excessive stormwater can cause a WWTP system to overflow. In this event, excess flow can be directed into waterways untreated, resulting in contamination. In urban areas sewage is carried separately in sanitary sewers and runoff from streets is carried in storm drains. Access to either of these is typically through a manhole. During high precipitation periods, a combined sewer overflow can occur, forcing untreated sewage to flow back into the environment. This can pose a serious threat to public health and the surrounding environment

- Low Precipitation: when rainfall is low and receiving waters flows are low. The WWTP discharged effluent can have up to 50% higher in concentration. Any residual unidentified contaminants will only be diluted 2-fold at best. (1). In the creek where the effluent from this WWTP is dispersing it will be almost 100% WWTP effluent for extended periods due to low flows and my property being at the very most upstream of the creek will have a higher concentration than others property owner downstream.

It has been estimated that as many as 100,000 chemicals are in commerce and thus can potentially enter the wastewater. Besides about a thousand new compounds are introduced annually, making static environmental regulations untenable (7). The EPA only test for less than 1% of these chemicals. As will be shown throughout the remainder of this plea for a contested hearing, WWTP will be allowing a very high amount of contaminants/toxins into the effluent if it approves this amendment.

Risk assessment is a logical framework for policy development. However, its validity depends on the availability and incorporation of complete data (7). Under current EPA guidelines, they are dealing with incomplete data at best. As will be demonstrated there is a serious lack of EPA oversight in many areas of viral, bacterial, organic, and chemical compounds that are in the influent and effluent of WWTP. Detrimental health effects are a function of all of the chemicals to which organisms are exposed, not just those on the regulatory lists or for which detection is convenient using available technology or analytical standards. Most risk assessments also consider only the "worst-case" single chemical exposure, not simultaneous exposure pathways or coincident exposure to multiple chemicals (7). Recently, it has been observed that simultaneous exposure to several endocrine-disrupting chemicals was capable of generating an observable effect, even though each was present below its respective effects threshold (10). Some proponents have used the paucity of demonstrated, documented detrimental impacts of sewage as a rationale not to fill gaps in the database critical to the risk assessment. This is unsatisfying and undermines the contention of the same proponents that risk assessment is superior to alternative strategies as it is based on "sound science."
It also transfers the burden of proof from those who benefit from the action to those who might be damaged by an erroneous conclusion as to safety. Regardless, consideration of our past track record of recognizing deleterious effects in the field due to synthetic chemicals is not encouraging. For example, diethyl-stilbestrol, individual organic pollutants or groups of compounds (PCBs), dichlorodiphenyltrichloroethane (DDT), and chlorofluorocarbons were all assumed to be harmless after initial testing and were used for years before their consequences were fully realized (7).

EPA (103)- WWTPs have high loads of nitrogen and phosphorus in the effluent. It's very expensive and takes enhanced treatment equipment of which very few WWTPs have, to reduce nitrogen and phosphorus levels in the WWTPs effluent. Too much nitrogen and phosphorus in the water can have diverse and far-reaching impacts on public health, the environment, and the economy.

EPA (103)-Too much nitrogen and phosphorus in the water causes algae to grow faster than ecosystems can handle. Significant increases in algae harm water quality. Large growths of algae called algal blooms can severely reduce or eliminate oxygen in the water, leading to illnesses. Some algal blooms are harmful to humans because they produce elevated toxins and bacterial growth that can make people sick if they come into contact with polluted water, or drink contaminated water.

EPA (103)-WWTPs are responsible for treating large quantities of waste, and these systems do not always operate properly or remove enough nitrogen and phosphorus before discharging into waterways. Nutrient pollution and harmful algal blooms create toxins and compounds that are dangerous for your health.

EPA (103)-There are several ways that people (and pets) can be exposed to these compounds. Drinking, accidentally swallowing, or swimming in water affected by a harmful algal bloom can cause serious health problems including Rashes, Stomach or liver illness, Respiratory problems, and Neurological effects.

EPA (103)-Some of these waters are impaired or affected by excessive amounts of nitrogen and phosphorus. Groundwater is water that soaks into the soil and the water table, and close to 90 million people rely on groundwater as a drinking water supply. As groundwater works its way through the soil, it can pick up nitrogen and phosphorus and transport them to the water table. This polluted water then reaches public drinking water systems and private wells, where it can pose serious public health threats. EPA's 2010 report on nutrients in the nation's streams and groundwater found that nitrate contamination of groundwater used for drinking water, particularly shallow domestic wells is a growing concern.

Contamination of water and soil by WWTPS can occur from many sources, raw sewage overflow leaking sewer lines, and partially treated wastewater. Sewage itself is a complex mixture and can contain many types of contaminants. The greatest threats posed to water resources arise from contamination by bacteria, nitrates, metals, trace quantities of toxic materials, and salts. Seepage overflow into drinking water sources can cause disease from the ingestion of microorganisms such as *E coli*, *Giardia*, Cryptosporidium, Hepatitis A, and helminths.

Effluent that leaks from sewer lines are generally untreated raw sewage. When leaking sewer lines are located deep underground below the biologically active portion of the soil, the sewage can enter groundwater directly. This can result in the introduction of chlorides, microorganisms, organics, trace metals, and other chemicals that may cause disease and foul tastes or odors in drinking water (101). Sewer leaks can occur from tree root invasion, soil slippage, seismic activity, loss of foundation due to washout, flooding, and sewage back up, among other events (102).

Known wastewater constituents (11) (12)

The composition of wastewater varies widely. This is a partial list of what it may contain:

- Water (more than 95 percent), which is often added during flushing_to carry waste down a drain;
- Pathogens such as bacteria, viruses, prions, and parasitic worms;
- Non-pathogenic bacteria;
- Organic particles such as feces, hairs, food, vomit, paper fibers, plant material, humus, etc.;
- Soluble organic material such as urea, fruit sugars, soluble proteins, drugs, pharmaceuticals, etc.;
- Inorganic particles such as sand, grit, metal particles, ceramics, etc.;
- Soluble inorganic material such as ammonia, road-salt, sea-salt, cyanide, hydrogen sulfide, thiocyanates, thiosulfates, etc.;
- Animals such as protozoa, insects, arthropods, small fish, etc.;
- Macro-solids such as sanitary napkins, nappies/diapers, condoms, needles, children's toys, dead animals or plants, etc.;
- Gases such as hydrogen sulfide, carbon dioxide, methane, etc.;
- Emulsions such as paints, adhesives, mayonnaise, hair colorants, emulsified oils, etc.;
- Toxins such as pesticides, poisons, herbicides, etc.
- Pharmaceuticals and hormones.

One of the first and most diverse groups of bioactive chemicals receiving comparatively little attention as potential environmental pollutants includes the pharmaceuticals and active ingredients in personal care products (PPCPs), both human and veterinary, including not just prescription drugs and biologics, but also diagnostic agents, "nutraceuticals," fragrances, sun-screen agents, and numerous others. These compounds and their bioactive metabolites can be continually introduced to the aquatic environment as complex mixtures via several routes, but the major sources of PPCPs in the environment are primarily WWTP effluent. New pharmaceuticals are adding exponentially to the already large array of chemical classes, each with distinct modes of biochemical action, many of which are poorly understood. Most of these products are disposed of or discharged into the environment continually via domestic/industrial sewage systems. The bioactive ingredients are first subjected to metabolism by the dosed user; the excreted metabolites and unaltered parent compounds can then be subjected to further transformations in sewage treatment facilities. The literature shows, however, that many of these compounds survive biodegradation, eventually being discharged into receiving waters; metabolic conjugates can even be converted back to their free parent forms. Additionally, by way of continuous infusion into the aquatic environment, those PPCPs that might have low persistence can display the same exposure potential as truly persistent pollutants since their transformation/removal rates can be compensated by their replacement rates (1).

Current comprehensive environmental risk assessments and epidemiologic studies do not factor in exposures/body burdens from PPCPs and therefore may be flawed by over simplicity. The presence of numerous drugs sharing a specific mode of action could lead to significant effects through additive exposures. It is also significant that drugs, unlike pesticides, have not been subjected to the same scrutiny regarding possible adverse environmental effects, they have been discharged into the environment, mainly via WWTP. This is surprising especially since certain pharmaceuticals are designed to modulate endocrine and immune systems and cellular signal transduction and as such (as opposed to pesticides and other industrial chemicals already undergoing scrutiny as endocrine disruptors) have obvious potential as endocrine disruptors in the environment. The number of biologics approved by the U.S. Food and Drug Administration (FDA) is growing, and their fate in the environment is unknown (1).

Many new drugs are introduced to the market each year; some of these drugs are from entirely new classes never seen before by the microbiota of a WWTP. Each of these presents a new challenge to biodegradation. Drug classes that will experience huge usage rates (e.g., impotence drugs such as sildenafil citrate) have no associated environmental occurrence or exposure data. Although the genotoxic potency of industrial wastewaters is often the highest, the overall loadings of genotoxic compounds to surface waters are far greater (up to several orders of magnitude) from municipal treatment plants (WWTP) and antineoplastic drugs might play the largest role (1).

A worst-case scenario may not be unusual, the concentration of a drug leaving a WWTP in the effluent could essentially be the same as that entering. Only the several-fold to multiple order of magnitude dilution when the effluent is mixed into the receiving water, assuming a sufficiently high natural flow, serves to reduce the concentration; obviously, smaller streams have increased potential for having higher concentrations of any PPCP that has been introduced (13). Other transients that could affect the removal of toxins/contamination include transitions between seasons and the sporadic plug-flow influx of toxicants from various sources. Overflows from STW failure or overcapacity events (e.g., floods, excessive water use) lead to the direct, untreated introduction of sewage into the environment (1).

Evidence that the persistence and bio-accumulative potential of at least some PPCPs can be similar to the problematic organohalogen POPs (persistent organic pollutants) should necessitate their consideration in comprehensive risk assessments. Over the decades, innumerable epidemiologic studies have purported correlations of various disease states with the body burdens of particular pesticides/industrial pollutants. The findings of these studies may well be flawed, as they did not attempt to also consider the possible effects of PPCP body burdens. Any comprehensive risk assessment must factor in the exposures/body burdens of all pollutants, regardless of origin-and PPCPs are perhaps the most ignored remaining major class of pollutants (1)

PPCPs identified in WWTP effluents:

- Acetaminophen- Analgesic/anti- inflammatory -e.g., Tylenol (6)
- Acetylsalicylic acid- Analgesic/anti- inflammatory (6)
- Betaxolol- Beta-blocker-e.g., Betoptic (14)
- Bezafibrate-Lipid regulator -e.g,Befizal (14)
- Biphenylol-Antiseptic,- e.g., Dowicide A (15)
- Bisoprolol-Beta-blocker-e.g., Concor (14)
- Carazolol-Beta-blocker-e.g., Conducton (14)
- Carbamazepine-Analgesic-e.g., Tegratal (6)
- Chloroxylenol- Antiseptic-e.g., Benzytol (15)
- Chlorophene- Antiseptic-e.g., Santophen 1 (15)
- Clenbuterol-bronchodilator-e.g., Monores (6)
- Clofibric acid-lipid regulators-(6,16,17,18,19)
- Cyclophosphamide-Antineoplastic-Oxazaphosphorine(6,20,21)
- Diatrizoate-X-Ray contrast-e.g., Hypaque Sodium; (22,23)
- Diazepam-Psychiatric drug-e.g., Valium;(6,24)
- Diclofenac-Na-Analgesic-e.g., Voitaren-(6,19,)
- Dimethylamino-phenazone-anti-inflammatory-e.g., Piridol (6)
- 17a-Ethinyl estradiol-Oral contraceptive-estrogenic (25,26)
- Etofibrate-Lipid regulator-e.g., Lipo-Merz;(6)
- Fenofibrate-metabolite of fenofibrate-(6)
- Fenoterol- bronchodilator- e.g., Airum (6)
- Gemfibrozil- Lipid regulator- e.g., Lopid (6)
- Ibuprofen- anti-inflammatory- e.g., Advil; (6,19,27)
- Ifosfamide- Antineoplastic- Oxazaphosphorine (6,28)
- Indomethacine- anti-inflammatory- e.g., Amuno (6,19)
- Lopamidol- X-Ray contrast- (23)
- Lopromide- X-Ray contrast- (23)
- Ketoprofen-anti-inflammatory-e.g., Oruvail (6,19)
- Meclofenamic acid- anti-inflammatory (6,19)
- Methylbenzylidene camphor- Sunscreen agent(29)
- Metoprolol- Beta-blocker- e.g., Lopressor;(6)
- Musk ambrette- fragrances/cosmetics& personal care products (30,31)
- Musk xylene- fragrances/cosmetics& personal care products(30,31)

- Musk ketone- fragrances/cosmetics& personal care products(30,31)
- Musk moskene- fragrances/cosmetics& personal care products (30,31)
- Musk tibetene- fragrances/cosmetics& personal care products(32)
- Galaxolide (HHCB)- fragrances/cosmetics& personal care products (33,34)
- Tonalide (AHTN)- fragrances/cosmetics& personal care products (33,34)
- Celestolide (ADBI)- fragrances/cosmetics& personal care products (35)
- Musk xylene- fragrances/cosmetics& personal care products(36)
- Nadolol- Beta-blocker- e.g., Corgard (6)
- Naproxen- anti-inflammatory- e.g., Naprosyn (6,19)
- Phenazone- Analgesic- e.g., Parodyne (6)
- Propranolol Beta-blocker- e.g., Avlocardyl (6)
- Albuterol- bronchodilator- e.g., sulfate: Ventolin (6)
- Terbutaline- bronchodilator- e.g., sulfate: Brethaire (6)
- 3,4,5,6-Tetrabromo- Antiseptic, fungicide-(37)
- Timolol- Beta-blocker- e.g., hemihydrate: (6)
- Tolfenamic acid- anti-inflammatory- e.g., Tolfedine (6,19)
- Triclosan- Antiseptic- e.g., Irgasan DP 300(38)
- Verapamil- Cardiac drug-(39)

As you can see there are many PPCPs in the effluent of WWTP. The ones listed are just some of the PPCPs that come out of WWTP effluent and into surface waters, soil, and groundwater seepage. I would think no one would knowingly allow this contamination into our healthy lives, via air, soil, and water well contamination. It's a downright injustice to force all the toxins on my family and I. We are not asking for all these PPCP to be bought into our healthy environment, if the amended permit is approved the TECQ this will increase the likelihood these toxins on my family and I. These PPCPs are proven to be within the effluent, there is no maybe, the toxins are in the effluent the studies references show beyond a shadow of a doubt they are in the effluent and that they will have a cumulative effect on my family's health. Even with a better screening of waste effluents and receiving waters for toxicological effects can at best be only partially effective because the range of physiologic effects is too broad(1). Knowing this I implore the TECQ to NOT approve of this WWTP amended permit.

Here are documented case studies of PPCPs, legal and over the counter (OTC) Drugs showing little to no effect from the WWTP treatment process and being discharged in the WWTPs effluent. Any illegal drugs such as crystal methamphetamine, cocaine, and other illicit drugs entering the WWTP, either flushed or excreted through the body, would have greater toxic ramifications and were not taken into account in these studies. The focus of these studies is on residential waste influent and effluent only. Any commercial, medical or industrial waste is not represented in the summary of these studies as it's out of the scope of the amended permit request. The amended permit request is for residential use only and will not cover/permit any other waste entering the WWTP. I have included only a small sample size of studies that more than illustrate the cause of concern over contaminations/toxins enter my family's lives and way of living:

- Hignite and Azarnoff (16) reported salicylic acid and clofibric acid in the influent and effluent from a Kansas City, Missouri, municipal sewage treatment plant. Clofibric acid was routinely detected in the effluent of this Missouri WWTP at an average effluent rate of 2.1 kg/day; over 10 months its loading remained in the tight range of 0.76-2.92 kg/day. Similarly, salicylic acid, a hydrolytic metabolite of aspirin, averaged 8.6 kg/day but ranged more widely from 0.55 to 28.7 kg/day. Stan and Heberer(40) also observed that the influent concentrations of clofibric acid were only 20% higher than the effluent concentrations, showing that this chemical resisted removal by the WWTP.

- Ternes(6) found The occurrence of 32 drug residues belonging to different medicinal classes like antiphlogistics, lipid regulators, psychiatric drugs, antiepileptic drugs, beta-blockers, and □$_2$-sympathomimetics as well as five metabolites has been investigated in WWTPs discharges, river and stream waters. Due to the incomplete removal of drug residues during passage through a WWTP, above 80% of the selected drugs were detectable in WWTP effluent with concentration levels up to 6.3 ugl^{-1} (carbamazepine) and thus resulting in the contamination of the receiving waters. Acidic drugs like the lipid regulators bezafibrate, gemfibrozil, the antiphlogistics diclofenac, ibuprofen, indometacine, naproxen, phenazone and the metabolites clofibric acid, fenofibric acid, and salicylic acid as well as neutral or weak basic drugs like the beta-blockers metoprolol, propranolol, and the antiepileptic drug carbamazepine were also found in WWTP effluents and receiving waters. The elimination rates of some drugs like bezafibrate, diclofenac, naproxen, and clofibric acid, showed significantly decrease drug elimination rate on the rainfall day. (6)

  The detected antiphlogistics and lipid regulators arise predominately from human application underlined by the ubiquitous contamination of WWTPs effluents. In WWTP effluents detection of acetylsalicylic acid, acetaminophen and dimethylaminophenazone were also found with maximum concentrations exceeding 1ug. The psychiatric drug Diazepam was found in the WWTPs effluent as well. Carbamazepine concentrations reduction rate was extremely low in WWTPs with only a 7% reduction rate in the effluent of WWTPs. Since WWTP's discharge effluents are highly contaminated by these drugs which were found to be present in WWTPs receiving waters it can be assumed that WWTPs effluents are responsible for the elevated concentrations of the drugs (eg lipid regulating agents and beta-blockers) in streams and rivers. (6)

  Pharmacokinetical studies have indicated that drugs are mainly excreted as metabolites, Due to their enhanced polarity, it can be assumed that the metabolites were often poorly eliminated during passage through a WWTP process. Hence, drug metabolites are expected to be present in the aquatic environment sometimes is comparable or even higher concentrations to the original (unchanged) drugs indicated to be the environmental concentration of clofibric acid and fenotibric acid. (6)

The WWTP process is insufficient to completely eliminate these drugs residues. Additionally, metabolites formed by conjugation (eg with glucuronic acid. Sulfate) within phase II reactions are likely to be cleaved in the environment into the original (unchanged) pharmaceuticals (58). The investigated 32 drugs and 5 metabolites in this study represents only about 1% of approved pharmaceutical compounds when considering human and veterinary drugs. It can be assumed that many other drugs and especially polar metabolites were present in the aquatic environment at concentrations up to the ug1 range. (6)

- Chad (59)- A study of sites in the Front Range of Colorado, USA, was monitored from May through September 2003 to assess the presence and distribution of pharmaceuticals in soil irrigated with reclaimed water derived from urban WWTPs. Soil cores were collected monthly, and 19 pharmaceuticals, all of which were detected during the present study, were measured in 5-cm increments of the 30-cm cores. The four most commonly detected pharmaceuticals were erythromycin, carbamazepine, fluoxetine, and diphenhydramine. (59)

The bioactive properties of pharmaceuticals and other wastewater contaminants introduced into surface water and groundwater, which might lead to adverse effects on humans and ecosystems, has yet to be screened and removed adequately by WWTPs (59)

WWTPs are not designed nor are they able to completely remove micro-contaminants or pharmaceuticals from WWTPs effluent discharge. Therefore, the mixtures, composition, and individual concentrations of pharmaceuticals from WWTPs discharges have the potential to vary continuously. However, some trends have been identified, and surface water and sediment exposed to WWTPs effluent and, to a lesser extent, soil and groundwater that might be affected by WWTPs effluent into the environment (1,60,61,62).

Reclaimed water is the liquid end product of a WWTF effluent that undergoes additional treatment, including additional disinfection, to ensure its safe use in public areas. Even after additional treatment, the reclaimed water typically contains nitrogen and phosphorus and is considered to be non-potable water(59). Even with this additional treatment to the WTP Effluent, the study still shows contamination of soil that came in contact with WWTPs effluent. (59)

Reclaimed water distributed by the city is effluent from its WWTP, additional treatment includes coagulation and filtration to remove remaining suspended solids and disinfection with chlorine. Soil cores (depth, 0–30 cm) from each location were collected before the onset of irrigation in the spring of 2003. Once irrigation started for the season, soil cores were collected monthly from May or

June until September 2003. Duplicate cores from each field site were collected on each sampling date. A soil corer with a diameter of 5.08 cm was used, and each core was subdivided into six 5-cm segments. After collection and segmentation, the core sections were stored frozen (15degC) until extraction and analysis. Contaminations from WWTPs effluent reclaim water in the soil samples were; Cotinine, Salbutamol, Cimetidine, Acetaminophen, 7-Dimethylxanthine, Trimethoprim, Diltiazem, Fluoxetine, Warfarin, Gemfibrozil, Caffeine, Sulfamethoxazole, Dehydronifedipine, Codeine, Thiabendazole, Diphenhydramine, Erythromycin, Carbamazepine, Miconazole. (59)

The WWTP reclaimed effluent water soil contaminations from the tested pharmaceuticals in this study were determined for each field location and ranged between 39 and 94% for all compounds at all three sites. The mean recoveries of soil matrix spikes ranged between 69 and 71% at all three sites. The four most frequently detected pharmaceuticals in the soils; erythromycin, carbamazepine, fluoxetine, and diphenhydramine—have lower water solubility or larger log Kow values than most of the other pharmaceuticals in this study. Some compounds, such as carbamazepine and acetaminophen, generally showed an increase in total mass accumulating in the
to 30-cm soil interval throughout the present study, suggesting that these compounds could accumulate in soil environments exposed to wastewater. (59)

The 30-cm soil cores were segmented into 5-cm increments to evaluate the vertical distributions of pharmaceuticals through surficial soil at the three sites. Concentration differences within the soil profiles may indicate the potential for these WWTPs effluent water–derived pharmaceuticals to be transported from the soil surface to groundwater. Two of the pharmaceuticals measured in soils in the present study, carbamazepine, and sulfamethoxazole, have been determined to leach through soil to groundwater. Soil concentrations increased throughout the present study for several compounds, in-
including acetaminophen, caffeine, carbamazepine, dehydroni-fedipine, and sulfamethoxazole. (59)

The results of the present research demonstrate that WWTP's effluent wastewater can result in the presence and accumulation of pharmaceuticals in soil. The present study also suggests that some of the pharmaceuticals measured may be sufficiently mobile to leach through the top 30 cm of soil and, potentially, into deeper soil layers to groundwater. Accumulation of pharmaceuticals in soil, such as carbamazepine, may be of concern, especially in areas where year-round irrigation is used. (59)

- Kolpin et al (61)- Did a study on organic wastewater contaminants (OWCs). OWCs were prevalent during this study, being found in 80% of the streams sampled. The compounds detected represent a wide range of residential, industrial, and agricultural origins and use with 82 of the 95 OWCs being found during this study. The most frequently detected compounds were coprostanol (fecal steroid), cholesterol (plant and animal steroid), N, N-diethyltoluamide(insect repellant), caffeine (a stimulant), triclosan (antimicrobial disinfectant), tri(2-Chloroethyl)phosphate (fire retardant), and 4-nonylphenol (nonionic detergent metabolite).

Household chemicals, pharmaceuticals, and other consumables as well as biogenic hormones are released directly to the environment after passing through WWTP processes, which often are not designed to remove them from the effluent. Potential concerns from the environmental presence of these compounds include abnormal physiological processes and reproductive impairment (64-70), increased incidences of cancer (76), the development of antibiotic-resistant bacteria (71-74), and the potential increased toxicity of chemical mixtures (77). For many substances, there are potentially harmful effects on humans and aquatic ecosystems (1, 63, 75).

Here is a list of the 95 Organic Wastewater Contaminants (OWC):

Antibiotics:

carbodox, chlortetracycline, chlortetracycline (2), ciprofloxacin, doxycycline, enrofloxacin, erythromycin-H_2O, lincomycin, Norfloxacin, oxytetracycline, oxytetracycline (2), roxithromycin, sarafloxacin, sulfachloropyridazine (2), Sulfadimethoxine, sulfadimethoxine (2), sulfamerazine, sulfamerazine (2), sulfamethazine,sulfamethazine (2), sulfamethizole, sulfamethoxazole, sulfamethoxazole (3),sulfathiazole, sulfathiazole (2),tetracycline, tetracycline (2), trimethoprim, trimethoprim (3), tylosin, virginiamycin,

Prescription Drugs:

albuterol (salbutamol) (3), cimetidine (3), codeine (3),codeine (4),dehydronifedipine (3),digoxin (3) ,
digoxigenin (3),diltiazem (3), enalaprilat (3), fluoxetine(3) , gemfibrozil (3), metformin (3), paroxetine metabolite (3), ranitidine (3), warfarin (3)

Nonprescription Drugs:

, acetaminophen (3) ,caffeine (3), caffeine (4), cotinine (3),cotinine (4), 1,7-dimethylxanthine (3), Ibuprofen (3)

Other Wastewater-Related Compounds:

1,4-dichlorobenzene (4) ,2,6-di-tert-butylphenol(4),2,6-di-tert-butyl-1,4-benzoquinone (4), 5-methyl-1H-benzotriazole (4),acetophenone (4), anthracene (4),benzo[a]pyrene(4), 3-tert-butyl-4-hydroxy anisole (4), butylated hydroxy toluene (4),bis(2-ethylhexyl) adipate (4), bis(2-ethylhexyl) phthalate(4), bisphenol A(4), carbaryl(4),cis-chlordane(4),chlorpyrifos(4), diazinon(4),dieldrin(4), diethylphthalate(4),ethanol,2-butoxy-phosphate (4), fluoranthene (4), lindane(4), methyl parathion(4) . 4-methyl phenol (4),naphthalene (4),N,N-diethyltoluamide (4),4-nonylphenol(4), 4-nonylphenol monoethoxylate(4), 4-nonylphenol diethoxylate(4),4-octylphenol monoethoxylate(4),4-octylphenol diethoxylate(4), phenanthrene (4), phenol (4), phthalic anhydride (4), pyrene (4), tetrachloroethylene (4),triclosan(4), tri(2-chloroethyl) phosphate (4), tri(dichlorisopropyl) phosphate (4),triphenyl phosphate (4),

Steroids and Hormones:

cis-androsterone(5), cholesterol (4), cholesterol (5), coprostanol (4),coprostanol (5), equilenin(5), equilin(5),17r-ethynyl estradiol(5), 17r-estradiol(5),17,-estradiol(4),17,-estradiol(5),estriol(5), estrone
(5), mestranol(5), 19-norethisterone(5),progesterone(5),stigmastanol (4), testosterone(5)

A previous investigation of streams downstream of WWTPs also found a high occurrence of OWCs (78). A large number of OWCs (82 out of 95) were detected at least once during this study. Only eight antibiotics and five other prescription drugs were not detected in the samples analyzed (61). Over 60% of these higher concentrations were derived from cholesterol and three detergent metabolites (4-nonyphenol, 4-nonylphenol monoethoxylate, and 4-nonylphenol diethoxylate). The frequent detection of cotinine, 1,7-dimethylxanthine, erythromycin-H2O, and other OWC metabolites demonstrate the importance of obtaining data on degradates to fully understand the fate and transport
of OWCs in the WWTPs system. Also, their presence suggests that to accurately determine the overall effect on human and environmental health (such as pathogen resistance and genotoxicity) from OWCs, their degradates should also be considered.

To obtain a broader view of the results for this study, the 95 OWCs were divided into 15 groups based on their general uses and/or origins. The data show two environmental determinations: frequency of detection and percent of total measured concentration for each group of compounds. These two views show a vastly different representation of the data. Concerning the frequency of detection, several groups were frequently detected, with seven of the 15 groups being found in over 60% of the stream samples. However, three groups (detergent metabolites, plasticizers, and steroids) contributed to almost 80% of the total measured concentration (61).

Mixtures of various OWCs were prevalent during this study, with most (75%) of the streams sampled having more than one OWC identified. In fact, a median of seven OWCs was detected in these streams, with as many as 38 compounds found in a given streamwater sample. Because only a subset of the 95 OWCs was measured at most sites collected during the first year of study, it is suspected that the median number of OWCs for this study is likely underestimated (61). Also, 33 of the 95 targets OWCs are known or suspected to exhibit at least weak hormonal activity with the potential to disrupt normal endocrine function (64,66,68,70,79-84).

The results of this study document that detectable quantities of OWCs occur in U.S. streams at the national scale. This implies that many such compounds survive WWTPs treatment (1, 85, 86) and biodegradation (87).

- Thomas et al(8)- Did a study on WWTPS effluents and antibiotic-resistant bacteria and their resistance genes. Antibiotic-resistant bacteria, biofilms were investigated using enterococci, staphylococci, Enterobacteriaceae, and heterotrophic bacteria as indicator organisms. The emergence of bacteria resistant to antibiotics is common in areas where antibiotics are used, but antibiotic-resistant bacteria also increasingly occur in aquatic environments (88,89) along with vancomycin-resistant enterococci (VRE) (8).

High bacterial density and diversity are found in biofilms from wastewater systems, especially from activated sludge of sewage treatment plants. Two biofilm sampling points were located in the WWTP, one in the biological sludge facilities, and the other at the effluent discharge of the WWTP. The bacterial densities of the biofilms from wastewater effluent and receiving surface water as measured by DAPI (4P,6-diamidin-2P-phenylindole-dihydro-chloride, Merck)-staining according to Schwartz et al.[90] were approx. 10 to the 6^{th} power 10 to the 7^{th} power bacteria cm-2.(8)

Biofilms from WWTP showed colony counts for enterococci/streptococci. 16 (+/ - 6.5)%; at the discharge effluent, 12.5 (+/- 5.5)%; and in the receiving surface water biofilms. Specific DNA amplicons were detected after the first Polymerase Chain Reaction (PCR) in biofilms from WWTPs sampling points. These results indicated that the concentration of vanA resistance genes in wastewater systems was higher than that at the other sampling points. Similar to the results obtained for enterococci/streptococci, the high load of Enterobacteriaceae was observed in biofilms from WWTPs. A large number of cefazolin-resistant Enterobacteriaceae was measured in biofilms from the WWTP effluent discharge with 11 (+/- 4.1%.) The percentage of resistance in receiving surface water biofilms was 27 (+/-10%.).The percentage of cefotaxime resistance at the WWTPs effluent discharge was 1.9 (+/- 0.4%). All of the 23 ampC-positive bacteria were identified as Citrobacter, Enterobacter, and E. coli. (8)

Heterotrophic bacteria resistant to vancomycin, ceftazidime, cefazolin, and penicillin G were cultivated from all biofilms. As well as Enterococci and Enterobacteriaceae were found in all biofilms. Enterococci and Enterobacteriaceae are naturally occurring microorganisms from human and animal intestines (8). Enterococci have an advantage in terms of persistence and multiplication because of their tolerance to various environmental factors, such as alkaline pH, increased temperature, and sodium chloride concentrations [91,92]. Enterococci are nosocomial pathogens able to cause urinary tract infections, surgical wound infections, endocarditis, and bacteremia [93]. Resistance to antibiotics, such as glycopeptides, is a problem in the therapy of these Infections. Studies showed that Avoparcin-selected glycopeptide-resistant enterococci are cross-resistant to vancomycin and teicoplanin, two antibiotics used in the therapy of humans (8). Sewage in Sweden was screened for VRE. VRE was still isolated from 19% of WWTP's effluent discharge (94).

Recent studies demonstrated the occurrence of various antimicrobial compounds in water treatment plants and in WWTPs discharge effluents [14,95-97]. The main results of this study can be summarized as follows; Vancomycin-resistant enterococci and L-lactam-hydrolysing Enterobacteriaceae were cultivated from all wastewater biofilms. VanA genes and ampC genes were also detected in all other wastewater and environmental biofilms.

- Haruhiko (98)- In this study, The occurrence of quinolone antibiotics (QAs) was investigated in wastewater effluents and surface river/lake waters in the US and Canada by using solid-phase extraction with mixed-phase cation exchange disk cartridge and liquid chromatography–mass spectrometry (LC–MS) and liquid chromatography fluorescence detection (LC-FLD). Ofloxacin (OFL) was detected in secondary and final effluents of a wastewater treatment plant (WWTP) in East Lansing, Michigan.

  The quinolone antibiotics (QAs), such as pipemidic acid (PIP), ofloxacin (OFL), norfloxacin (NOR), ciprofloxacin (CIP), lomefloxacin (LOM), enrofloxacin (ENR), difloxacin (DIF), sarafloxacin (SAR), and tosufloxacin (TOS), comprise an important class of pharmaceuticals, which have been widely used for the last 20 years in Europe and the United States (99).

  Ofloxacin (OFL) was detected in the secondary and final effluents of the WWTP. OFL has been used to treat various bacterial infections such as bronchitis, gonorrhea, skin infections, and urinary tract infections, etc. The US FDA has classified OFL as a pregnancy category C drug. High concentrations of OFL have been found in the effluents from sewage treatment plants in European countries, such as France (330–510ng/l), Italy (290–580ng/l), and Greece (460ng/l) (98). Ciprofloxacin (CIP) and norfloxacin (NOR) were detected in the effluents of WWTPs in Switzerland (100)

Drug Classes and Environmental Occurrences:

- Hormones/Mimics- Steroids were the first physiologic compounds to be reported in sewage effluent (41-44) and as such were the first pharmaceuticals to capture the attention of environmental scientists. Estrogenic drugs, primarily synthetic xenoestrogens, are used extensively in estrogen-replacement therapy and oral contraceptives.

- Antibiotics- In addition to pathogen resistance, genotoxicity may be a concern. A large body of literature exists on antibiotics in the environment. In one study of WWTP effluent, fluoroquinolones were the chemical class contributing the major portion to overall DNA toxicity (45); ciprofloxacin, for example, was identified at 3-87 pg/L. Hirsch et al. (14) analyzed German WWTP effluents and groundwaters/surface waters for 18 antibiotics representing macrolides, sulfonamides, penicillins, and tetracyclines. Although the penicillins (susceptible to hydrolysis) and the tetracyclines (can precipitate with calcium and similar cations) were not found, the others were detected in the microgram per liter range. Indeed, the rampant, widespread (and sometimes indiscriminate) use of antibiotics, coupled with their subsequent release into the environment, is the leading proposed cause of accelerated/spreading resistance among bacterial pathogens, which is exacerbated by the fact that resistance is maintained even in the absence of continued selective pressure (an irreversible occurrence).

- Blood Lipid Regulators- Fibrates-high usage. Fibric acid metabolites- ubiquitous, persistent pollutants. Clofibric acid was the first prescription drug (actually an SRS) reported in a sewage effluent (17,40), and it continues to be one of the most frequently reported PPCPs in monitoring studies. Clofibric acid (2-[41-chlorophenoxy-2-methyl propanoic acid), the active metabolite from a series of widely used blood lipid regulators, and which also happens to be structurally related to the phenylalkanoic acid herbicide mecoprop (the methylphenoxy structural analog), has captured much attention from investigators. Stan et al. (46) first reported clofibric acid in water at concentrations between 10 and 165 ng/L. Heberer and Stan (47) found clofibric acid at levels up to 4 pg/L in groundwater under a sewage treatment farm; they also found clofibric acid concentrations up to 270 ng/L in drinking water samples. They concluded that it is not removed by sewage/water treatment processes. Stumpf et al. (19) reported that the removal efficiencies from WWTPs for clofibric/fenofibric acids, bezafibrate, and gemfibrozil ranged from only 6-50%, verifying extremely limited degradation for these compounds. This chemical class is ubiquitous because daily human dosages are generally high (grams per day).

- Nonopioid Analgesics/Nonsteroidal Anti-Inflammatory Drugs- Stumpf et al. (48) were the first to identify diclofenac, ibuprofen, acetylsalicylic acid, and ketoprofen in sewage and river water. Ternes (6) reported levels of diclofenac, indometacine, ibuprofen, naproxen, ketoprofen, and phenazone in WWTP effluent exceeding 1 pg/L;. In another study, Ternes et al. (37) reported average concentrations of acetylsalicylic acid in WWTP effluents as well as in rivers. They also reported salicylic acid concentrations in WWTP influents, with two other acetylsalicylic metabolites, gentisic acid, and o-hydroxyhippuric acid, while salicylic acid also appeared in the effluents. Ternes et al. (37) also found naproxen in all WWTP effluents examined and in river waters. In their screening of WWTP waters, Heberer et al. (18) found that the most prevalent drugs, other than clofibric acid, were the NSAIDs diclofenac, ibuprofen, and propyphenazone. In the influent to WWTPs,Buser et al. (49) found diclofenac at concentrations of 0.5-1.8 pg/L, whereas the concentrations in the respective effluents were only moderately reduced (at most 50%)

- Beta-Blockers/B2-Sympathomimetics- Hirsch et al. (50) and Ternes (6) identified the beta-blockers metoprolol and propranolol, with lesser amounts of betaxolol, bisoprolol, and nadolol, in WWTPs effluent. The P2-sympathomimetics (bronchodilators) terbutalin and salbutamol (albuterol in the United States), were detected in WWTPs effluent.

- Antiepileptics- Antiepileptics are ubiquitous and prevalent due to poor WWTPs removal. Carbamazepine was the drug detected most frequently and in the highest concentrations during a study by Ternes (6). This drug was detected in all WWTPs and receiving waters, with a maximum concentration of 6.3 pig/L. Ternes (6) hypothesized that the ubiquitous occurrence resulted from the very low removal efficiency from WWTPs, which was calculated to be only 7%

- Antineoplastics- Antineoplastics are highly [geno] toxic compounds, with poor removal from WWTPs. These compounds act as nonspecific alkylating agents (i.e., specific receptors are not involved) and therefore have the potential to act as either acute or long-felt stressors (mutagens/carcinogens/teratogens/embryotoxins) in any organism. The fact that two oxazaphosphorines, ifosfamide, and cyclophosphamide, were found in certain effluents in the low microgram-per-liter range indicates that these highly toxic compounds, which are probably refractory to microbial degradation at WWTPs (51), can find their way into the environment. Indeed, Steger-Hartmann et al. (51) found levels of cyclophosphamide in sewage influent. Additional evidence pointing to the refractory nature of ifosfamide is presented by Kummerer et al. (28), who found that concentrations of ifosfamide in effluents of WWTPs. Kummerer et al. (28) found ifosfamide to be totally refractory to removal by WWTPs and to totally resist alteration during a 2-month bench-scale WWTPs simulation. Falter and Wilken (52) showed that while these compounds are difficult to determine analytically, their potential to remain in the aqueous phase after sewage treatment is high. White and Rasmussen (53), in the most detailed overview to date on the genotoxicity of wastewaters, elaborate that the overall loading of genotoxic compounds to surface waters is far greater, up to several orders of magnitude, from municipal treatment plants. They present a striking correlation between the occurrence of direct-acting mutagens in surface waters and the human population served by the discharging WWTPs.

- Diagnostic Contrast Media- Diagnostic contrast media have very high usage rates, display considerable persistence, show no evidence for mineralization, and have low physiologic activity. Some of the more widely used members of contrast media are highly substituted and sterically hindered amidated, iodinated aromatics such as diatrizoate and iopromide (22), which are used worldwide at annual rates exceeding 3,000 tons. Kalsch (22) found these compounds to be quite resistant to transformation in WWTPs In municipal WWTPs effluents, Ternes et al. (23) found high concentrations of iopamidol iopromide. In a WWTP they found two other contrast agents, diatrizoate and iomeprol, as well as iothalamic acid and ioxithalamic acid. Five iodinated diagnostics were repeatedly detected, iopamidol, diatrizoate. diatrizoate and indicated that relatively high local concentrations can occur, especially in small streams containing a high percentage of WWTP discharges. Individual contrast agents can experience annual usage rates of 100 tonnes. Such high usage, coupled with inefficient human metabolism (95% unmetabolized) and ineffective elimination of iodinated contrast agents by WWTPs, can lead to very high environmental accumulations and persistence.

- Personal Care Products (eg food Supplements, products that alter odor, appearance, touch or taste, such as preservatives, cosmetics, toiletries, fragrances, sunscreen Bath additives, Shampoos, hair tonic, Skincare products, Hair sprays, setting lotions, hair dyes, Oral hygiene products, Soaps, Perfumes, aftershaves (1))- Yamagishi et al. (30) Musk xylene were found in all samples, and musk ketone was found in 80% of the 74 samples analyzed. Concentrations in WWTPs effluents ranged from 25 to 36 ng/L for musk xylene and from 140 to 410 ng/L for musk ketone. Concentrations of musk Xylene and musk ketone with the highest values occurring downstream of WWTPs. Heberer et al. (18) investigated the contamination of surface waters receiving high percentages of treated sewage and found concentrations above 10 pg/L for the polycyclic musks Galaxolide, Tonalide, and Celestolide. Nitro musks can be highly toxic; recently, the amino transformation products of nitro musks were identified in sewage treatment effluent Gatermann et al. (36) identified musk xylene and musk ketone together with their amino derivatives 4- and 2-amino musk xylenes and 2-amino musk ketone in WWTPs effluent. Synthetic musks are ubiquitous, used in large quantities, introduced into the environment almost exclusively via WWTPs effluent, and are persistent and bioconcentratable, they are prime candidates for monitoring in both water and biota as indicators for the presence of other PPCPs Gatermann et al. (36). Triclosan (Irgasan DP 300, a chlorinated diphenyl ether: 2,4,4'-trichloro-2'-hydroxydiphenyl ether) an antiseptic has many household uses eg. Colgate's Total toothpaste, the first toothpaste approved by the FDA to fight gingivitis. (While triclosan is registered with the U.S. EPA as a pesticide, it is freely available OTC), footwear (in hosiery and insoles of shoes called Odor-Eaters), hospital handsoap, acne creams (e.g., Clearasil), and rather recently as a slow-release product called Microban, which is incorporated into a wide variety of plastic products from children's toys to kitchen utensils such as cutting boards. Many of these uses can result in the direct discharge of triclosan to WWTPs, and as such, this compound can find its way into receiving waters (1). Disinfectants are used in rather large amounts. Disinfectants such as triclosan, Biphenylol, 4-chlorocresol, chlorophene, bromophene, 4-chloroxylenol, and tetrabromo-ocresol (37) are some of the active ingredients, at percentage volumes of < 1-20%. A survey of 49 WWTP (37) routinely found biphenylol and chlorophene in both influents, up to 2.6 pg/L for biphenylol and up to 0.71 pg/L for chlorophene, and effluents. The removal of chlorophene from the effluent was less extensive than for biphenylol, with surface waters having concentrations similar to that of the effluents.

The enormous array of PPCPs, over the counter (OTC) and prescribed (RX) pharmaceuticals will continue to diversify and grow as the human genome is mapped. It will be very difficult for WWTPs to match the progress and amount/complexity of new compounds being introduced into the market. U.S. private R&D investment in new pharmaceuticals will be nearly $18 billion yearly. The number of targets is expected to increase up to 20-fold (yielding 3,000-10,000 drug targets) in the near future according to the Pharmaceutical Research & Manufacturers Association (54). The FDA approved 30 new nonbiologic drugs, one of which was Viagra (55) which environmental effects are yet unknown. The FDA Modernization Act FDA(56) will also help to accelerate this growth. Most of the new drugs have unpublished environmental transformation/fate/effects properties; "significantly affect the quality of the human environment" FDA(57). This notion includes not just toxicity to environmental organisms but also "environmental effects other than toxicity, such as lasting effects on ecological dynamics" FDA (57). The WWTPs will not be able to keep up with the screening methods required to ensure safe, toxin-free, and environmentally friendly discharge effluents. Would these hazardous/toxic risks to your family from this WWTPS be worth it to you? I think not, so I implore you to not impose these hazardous/toxic risks onto my family. Thank you in advance for your time and consideration of this very important life-changing decision.

Respectfully,

Christopher Spicer

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