TEXAS STATE UNIVERSITY

The rising STAR *of Texas*

Memorandum

January 5, 2015

To: Don Ferguson/City Council

From: Dr. Thomas Hardy

Subject: Independent Review of Proposed Wastewater Collection and Treatment System Project

I have reviewed the Environmental Information Document and related materials provided by the City as well as the August 25, 2014 letter by the Wimberley Valley Watershed Association. I have also reviewed the City of Wimberley Wastewater Project Frequently Asked Questions document which accurately represents the material provided in support of the TCEQ permit application.

First, it is apparent that the existing condition of the septic systems in the downtown Wimberley area pose a real and continuing threat to the aquatic environment of Cypress Creek and the Blanco River. This is evident from the water quality monitoring data showing elevated levels of E. coli. The proposed action appears to represent a logical and environmentally sound alternative to existing conditions that meets the environmental challenges and provides foresight to accommodate expected increases in treatment needs due to projected increased populations. Issues and concerns raised by the WVWA are generally valid from a broad perspective but I believe they have been adequately addressed by the proposed project design and TCEQ discharge permit requirements. I have provided my commentary relative to the WVWA concerns in light of the permit application materials provided by the City below.

<u>One concern that has been raised is the potential for the effluent discharge to enter the Edwards Aquifer</u>. This is always a concern in the recharge and/or contributing zones of the Edwards Aquifer. The proposed facilities would be located over the Trinity Aquifer, is on the Contributing Zone and 9 miles upstream of the recharge zone to the Edwards Aquifer. Under existing conditions, the leakage from the septic systems are entering the Trinity Aquifer and once reaching Cypress Creek, contaminants are transported downstream into the Edwards Aquifer contributing zone in the Blanco River. The proposed project would function in much the same way, however, at better treatment end product (i.e., fewer contaminants) and therefore represents an improvement. It is noted that under conditions of extended wet periods in which surface irrigation would not be possible, surface water discharge of the effluent would occur via Deer Creek into the Blanco River. The maximum discharge would be 75,000 gallons per day (gpd) with a maximum 2-hour peak flow of 300,000 gpd. That is equivalent to approximately 0.87 and 3.5 gallons per second. Putting that into perspective, a standard 5/8-inch garden hose delivers about 0.3 gallons per second.

A flow magnitude of 75,000 gpd (0.12 cfs) is approximately 0.21 percent of the 7-day low flow of the Blanco River and approximately 2.1 percent of the single lowest recorded daily flow. However, concurrent wet periods within the project area correspond to wet periods (i.e., higher flows) in the Blanco River. The magnitude of effluent discharge under these conditions would represent a significantly smaller percent of the total Blanco River flow and at a practical level, would not contribute a meaningful increase in ambient Blanco River concentrations downstream after turbulent mixing. The 2-hour peak effluent discharge (300,000 gpd or 0.46 cfs) would be approximately 0.79 percent of the total Blanco River flow during the 7-day low flow conditions.

It is my opinion that the risk of discernable contamination of the Edwards Aquifer to have a very low probability and in fact would likely be less than under existing conditions given the septic system leakage into receiving waters especially under continued sustained drought conditions.

Effluent discharge to irrigate Blue Hole Regional Park, lack of adequate soil cover to prevent infiltration of elevated nutrients into the shallow groundwater. The proposed effluent would meet Federal and State Type I reclaimed water standards and permit limits for surface irrigation discharges. Additional treatment will be achieved via microbial process in the vadose zone of the soil horizon in application areas. The treatment process will remove nutrients (i.e. phosphorus and to a lesser extent nitrification of ammonia) to levels that specifically target adequate reduction of these nutrient species. The treatment process also results in substantive reduction in nitrogen species via conversion of nutrients into the activated sludge biomass and residual solids that are transported offsite.

Full discharge into Deep Creek and the Blanco River. Effluent discharge into Deep Creek and the Blanco River are to be expected only during periods of excessive rain and likely confined to periods associated with frontal rain events over several days where irrigation is not practical and maximum storage capacity is finally reached. As noted in the application materials and analyses, this is expected to occur very infrequently and during these periods, the flow in the Blanco River will be of sufficient magnitude relative to the outflow discharge that effective dilution will occur. The magnitude of effluent discharge under these conditions would represent a fraction of the total Blanco River flow and at a practical level, effluent concentrations would not likely be detectible over ambient Blanco River concentrations downstream after turbulent mixing.

Proposed phosphorus limits of 1.0 mg/l causing algal blooms. Algal blooms are associated with both adequate concentration of nitrogen and phosphorus. Treatment targets removal of phosphorus to a level that represents a limiting nutrient to control algal blooms.

No limits on total nitrogen. The proposed treatment process is expected to result in substantial total nitrogen reduction due to the nitrification/de-nitrification inherent in the process.

TCEQ precedent for more stringent standards. This is primarily a regulatory question better addressed to TCEQ. The analyses presented in support of the permit application meet established discharge requirements and adequate environmental protection of the receiving waters.

Degrade water quality downstream due to enriched nutrients. The potential for this is extremely small given the proposed treatment process, plant operations, and dynamics of proposed wastewater reuse or in rare instances, wastewater discharge to Deer Creek and Blanco River.

Wastewater effluent chemistry is different than receiving waters. This is a fact of any wastewater treatment process and in reality true of every WWTP discharge in any aquatic system. The fact that the discharge is different, in and of itself, does not constitute a basis for environmental degradation. This is primarily a function of the fact that the discharge to the receiving waters (e.g., Blanco River) will only occur during periods when the ambient discharge in the Blanco River system is expected to be of sufficient volume to dilute the effluent discharge and water chemistry differences.

Areas of proposed application or application rates. This should be resolved in response to the draft permit language where clarification can be requested. My reading is that the green spaces are within the Blue Hole Park, soccer fields, and in the future potential green spaces within the downtown area. Again, relative to existing conditions, the proposed action is likely more environmentally benign and well within standard practice.

Water quality will alter aquatic ecology. I can find no evidence that this statement is supported by any material in the proposed permit application or by specific studies within the system given the expected effluent characteristics, land application or discharge characteristics.

Plant will not remove pharmaceuticals. Very few if any existing WWTP are designed to remove this class of compounds and have varying degrees of treatment effectiveness depending on the pharmaceuticals. There is an increasing concern on the potential impacts of pharmaceuticals on human and aquatic ecosystem components. A recent report (2013) by the International Joint Commission, a consortium of officials from the United States and Canada concerned with effluent discharge from over 1,400 wastewater treatment plants in the Great Lakes used 10 years of data worldwide to assess removal of 42 compounds. They found that "The weight of evidence suggests that at least half of the 42 substances examined in the present study are likely to be removed in municipal wastewater treatment plants". Compounds typically show up in parts per billion or parts per trillion. Some compounds have been implicated in affects to algae and fish but the impact of most of these "chemicals of emerging concern" on the health of people and aquatic life remains unclear. In other work, Gros et al., (2010) examined the removal of pharmaceuticals during wastewater treatment and environmental risk assessment using hazard indexes. An important finding of this work at 7 different wastewater treatment plants was: "*The wide spectrum of substances detected in receiving river waters indicates that WWTP outlets are major contributors of pharmaceuticals in the aquatic environment. However, municipal wastewater treatment represents an obligatory and final treatment step prior to their release into the aquatic media, since load of pharmaceuticals in outlets were considerably reduced after treatment. Finally, hazard posed by pharmaceuticals in both surface and effluent wastewaters was assessed toward different aquatic organisms, (algae, daphnids and fish). The overall relative order of susceptibility was estimated to be algae>daphnia>fish. Results indicate that no significant risks could be associated to the presence of pharmaceuticals in those matrices, indicating that reduction of compound concentration after wastewater treatment as well as dilution factor once pharmaceuticals are discharged in receiving river water efficiently mitigate possible environmental hazards.*"

Research is clear that use of septic systems require advanced treatment options for effective removal of pharmaceuticals when compared to tertiary WWTP processes using existing technologies. Retrofitting of the existing systems would likely be both structurally difficult and cost prohibited. In context, the proposed direction of the City of Wimberley for the proposed WWTP plant is in the best interests of the environment.

Gros, M, Petrović M, Ginebreda A, Barceló D. 2010. Removal of pharmaceuticals during wastewater treatment and environmental risk assessment using hazard indexes. Environ Int. 2010 Jan; 36(1):15-26. doi: 10.1016/j.envint.2009.09.002. Epub 2009 Oct 12.
No decholorinaiton or UV disinfection. The proposed treatment process will use disinfection (chlorination) as part of the treatment process.

Conclusion:
It is my opinion that the proposed action by the City represents an environmentally sound approach that will provide adequate protection for the sensitive environments not afforded under existing conditions. The proposed action also affords an important critical step forward that provides for the necessary increased treatment capacity associated with future demands.