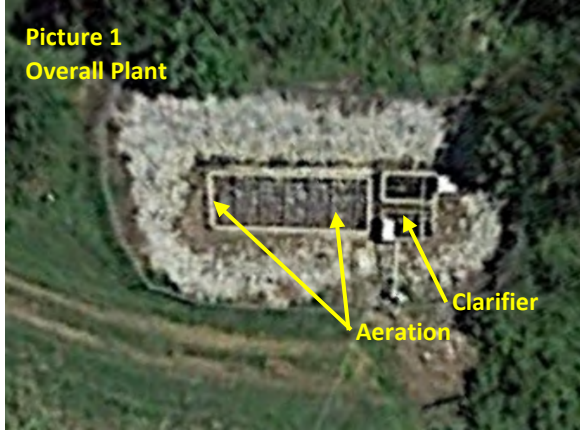


APPENDIX



This was the original estimate provided with the Engineering Memo
 Golden Acres

31 Customers

6,200 gpd

20190217

CONSTRUCTION ITEM	QUANTITY	UNIT	UNIT PRICE	EXTENDED PRICE
Regrade around perimeter of facility	1	Lump Sum	\$15,000	\$15,000
Install Mission Alarm and wiring with	1	Lump Sum	\$10,000	\$10,000
Replace diffusers in aeration tankage	1	Lump Sum	\$10,000	\$10,000
Contractor O & P	1	Lump Sum	\$10,000	\$10,000
Replace fencing	1	Lump Sum	\$15,000	\$15,000
Replace blower	1	Lump Sum	\$7,500	\$7,500
Install flow equalization tank and pun	1	Lump Sum	\$20,000	\$20,000
Collection system repair for I and I	1	Lump Sum	\$40,000	\$40,000
Dechlorination	1	Lump Sum	\$1,500	\$1,500
Smoke test system	1	Lump Sum	\$10,000	\$10,000
SUBTOTAL				\$139,000
Surveying Fees				\$17,500
Engineering (To be determined)				\$20,000
Contingency(10%)				\$13,900
TOTAL				\$190,400
This estimate was prepared without a site visit by the Engineer and utilizing information gathered by CSWR.				

Great Oaks-Kentucky (Wastewater, KY0080845)

Engineering Memorandum

Date: February 19, 2019

Wastewater Treatment Facility Understanding

The wastewater treatment facility is made up of a standard extended aeration activated sludge facility. It doesn't appear this system has an active permit to operate. The permit appears to have expired on May 1, 2012. The plant consists of an aeration tank, clarifier, and chlorine. (Appendix Picture 1) The facility most likely has dechlorination due to meeting past TRC limits but I could not determine if present from the information provided. The facility has not had any preventive maintenance in a number of years. This can be seen in the excessive flaking paint and rusted metal components. The air piping and sludge returns appear to be getting by but need to be replaced. Some of this piping is PVC and will not have a long useful life as they are installed. The plant appeared to have some treatment occurring. However, the videos only showed portions of the process actually operating while other sections of the aeration appeared stagnant. Additionally, I could not see if the sludge returns from the clarifier were actually functioning. You will also notice that the wastewater facility has some vegetation growing in various portions of the facility and these will need to be removed to avoid affecting the facility process. I performed a quick estimate of capacity. The facility's operating permit states it has capacity of 70,000 gpd. I believe the actual capacity is closer to around 65,000 gpd. It does appear that there are only about 161 houses that would be serviced by the facility. If this is the case, the facility does appear to have the capacity to treat for normal flows (without I and I problems) from the houses that are connected.

A review was performed of EPAs Echo compliance website which lists violations. Prior to 2018, the facility exceeded only ammonia, E. coli, and CBOD once during the 9 previous monthly quarters. However, the first quarter of 2018, the plant started to exceed limits on Ammonia, DO, E. Coli, TRC, and CBOD. Observing these results and if violations occurred in this manner, I would tend to believe an equipment failure occurred at the facility or the facility has been abandoned. I do not believe the facility was fully operating and so it would most likely be one of these two items.

While the plant appears adequate, there are a few items of concern for the facility. The facility looks to have the capacity to serve the current customer base but has gone unmaintained for an extended period of time. The tankage will need to be sand blasted and painted to extend the life of the facility. (See Picture 2)

The influent pump station should receive some investment. The structure appears to be a manhole without the cone section and manhole lid. The actual lid is a rusted metal cap that is serving the purpose, but is failing. I'm also concerned about the emergency storage volume of this influent station. I question that if power goes out or a pump goes down, how long will your operator have to respond to the call before the station is overflowing. If I and I is bad, you could also over top the station which would also become a liability for the owner. I will recommend additional flow equalization volume at

the head of the facility and connected to the manhole. It will also be recommended to raise the top of this manhole structure and provide a property lid. (See Picture 3)

The aeration process of the treatment facility appears to be in reasonable shape. However, some portions of the tankage was either on a timer based situation or not functioning. The current owner has PVC piping installed for aeration that some of the components have already failed and have been removed. Additionally, some of the aeration piping and diffusers might be fouled up and should be replaced with a metal header to provide a more secure system. Blowers should be evaluated as well to determine if they have the capacity to provide the aeration needed. Again, seeing the facility meet limits for 9 quarters prior to the issues of 2018, I would believe the blowers have the capacity if they will function. But I will assume blower replacement in the budget. (Appendix Picture 4)

The clarifier appears to be adequate in size to provide treatment for the current customer base. While limits are not being met over the last 12 months, I feel the track record before 2018 shows the clarifier can produce a quality effluent. However, I feel the clarifier can be further evaluated after operational control is acquired. I will recommend replacing the sludge returns while the contractor is on site replacing the air header system of the aeration. (Appendix Picture 5)

Minimal pictures were provided of the chlorination system that would aid in 21DG providing an opinion of its state. However, the system was meeting limits prior to the last quarter of 2017. Therefore, I feel the system will be adequate but may need some investment to repair anything that might be damaged.

No pictures were provided of the stream or effluent but in review of the clarifier, I do not believe the facility was meeting limits during your visit.

It did not appear any monitoring was in place for this facility. I recommend Mission monitoring be installed for improvement control and access.

Improvements: Provide flow equalization, replace diffusers, replace return sludge lines, install mission monitoring, replace blowers, sand blast and repaint tankage and all metal components.

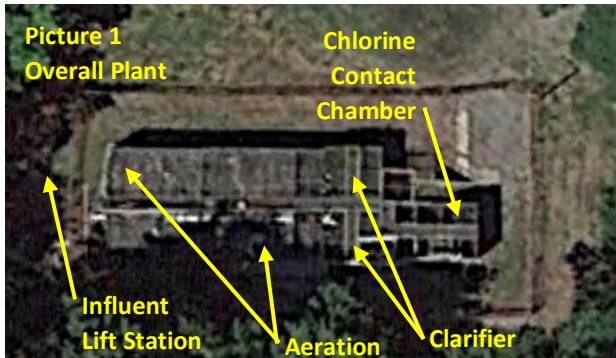
Wastewater Collection System Understanding

No information in regards to the collection system was provided to the Engineer for review to drafting this memo. It is recommended to obtain actual DMRS and/or flow data for the facility from the current owner to evaluate how bad I and I is a problem. It was discussed with CSWR that there doesn't appear to be an excessive I and I problem. Additionally, and if there were I and I problems, I would also expect to see remnants outside the influent pump station. While the influent pumps might be oversized for there use, only further investigation can provide a true recommendation to the influent flow and I and I situation at this facility.

No maps of the system were provided. The system will need to be mapped for future operation as it appeared nothing has been compiled for our review or operational maintenance purposes. The Engineer was not informed if this system was all gravity, pressure, or had any pump stations. The system should also be smoke tested. Video inspection is anticipated on parts of the system as well.

Improvements Required: Map the system. Install a flow meter. Smoke test and video inspect the collection system.

APPENDIX



Civil Engineering
Surveying & Mapping
Potable Water
Wastewater Treatment

21 DESIGN

Civil Site Design
Construction Support
Transportation
Wastewater Collection



CONFIDENTIAL TO CSWR

This was the original estimate provided with the Engineering Memo

20190219

Great Oaks

161 Customers

32,200 gpd

CONSTRUCTION ITEM	QUANTITY	UNIT	UNIT PRICE	EXTENDED PRICE
Install flow equalization storage (20,000 gal)	1	Lump Sum	\$30,000	\$30,000
Raise Influent pump station and replace lid	1	Lump Sum	\$2,500	\$2,500
Install Mission Alarm and wiring with meter	1	Lump Sum	\$10,000	\$10,000
Replace diffusers in aeration tankage	1	Lump Sum	\$20,000	\$20,000
Replace RAS lines from clarifier	1	Lump Sum	\$15,000	\$15,000
Contractor O & P	1	Lump Sum	\$15,000	\$15,000
Replace blower	2	Lump Sum	\$7,500	\$15,000
Sand blast and repaint tankage, cat walk and railing	1	Lump Sum	\$40,000	\$40,000
Smoke test system	1	Lump Sum	\$10,000	\$15,000
Collection system repair for I and I	1	Lump Sum	\$20,000	\$20,000
SUBTOTAL				\$182,500
Surveying Fees				\$20,000
Engineering (To be determined)				\$20,000
Contingency(10%)				\$18,250
TOTAL				\$240,750

This estimate was prepared without a site visit by the Engineer and utilizing information gathered by CSWR.

Herrington Haven Subdivision – Herrington Haven WWTP KY0053431
Kentucky
Engineering Memorandum
Date: September 11, 2020

Introduction

The Herrington Haven wastewater treatment facility is located in Lancaster, Kentucky approximately 5 miles northeast of Danville, Kentucky. This facility services 21 parcels. The system operates under Kentucky DEP Permit number KY0053531 and Agency ID number 3901.

Wastewater Treatment Facility Existing Conditions

The plant is authorized to discharge up to 9,800 gallons per day (gpd) by the KDEP per the operating permit.

A summary of the existing permit limits are described below:

- BOD5 – 30/45 mg/L (Monthly average/Maximum Weekly Average)
- TSS – 30/45 mg/L
- NH3-N – 20/30 mg/L
- E-Coli – 130/240 mpn/100 ml
- Total Residual Chlorine – 0.011/0.019 mg/L
- Total Phosphorus – Report Only
- Total Nitrogen – Report Only
- Dissolved Oxygen – 2.0 mg/L minimum

The subdivision has 19 occupied residences out of the 21 parcels, so little additional growth in flow or loading is expected. Based off of the number of possible connections and assuming 375 gpd of flow per customer, we expect to reach the 7,875 gpd when the entire subdivision is occupied, so the 9,800 gpd of capacity would seem to be adequate.



A review was performed of EPAs Echo compliance website which lists violations of wastewater treatment plants across the country. The Herrington Haven wastewater treatment plant has exceeded permit limitations several times in recent

months and years for E-Coli, Total Residual Chlorine and Total Phosphorus. Note that the permit shown on the KYDEP website indicates that Total Phosphorus levels are to be reported but there is no limit; however, the EPA Echo website describes effluent limit exceedances for Total Phosphorus. Additional research will be required to understand this discrepancy.

The existing facility includes an extended aeration package plant including a mechanically cleaned bar rack screen, a single aeration basin, two hopper bottomed clarifiers, and a chlorine contact tank. Downstream of the packaged plant there is a V-notched weir box that is used for dechlorination contact time and flow monitoring.

The packaged plant has aged and shows significant signs of wear and corrosion. The blowers and diffusers are in need of replacement, and one of the two RAS lines has broken off into the aeration basin. The access platform became dangerous to use and has since been removed. The basin does not include handrail needed to protect operators or visitors from falling into the package plant.

Functionally, the system also has some limitations:

- The plant was installed behind retaining walls on 3 of 4 sides and includes very limited perimeter property boundary, with little room to work or add improvements.
- The plant is theoretically above the flood elevation (which exists just southwest of the plant), but the plant has historically flooded several times according to operators.
- The facility has somewhat limited site access for bringing in drums of liquid chemicals (if metal salt addition or disinfection chemicals are required).
- According to operators, the all gravity collection system results in significant I&I, impacting system performance.
- The system does not include aerobic digestion / sludge storage to allow for routine wasting or maintenance of a healthy mixed liquor concentration throughout the year.
- The blower has reached the end of its useful life.
- The operator believes it is necessary to turn off aeration during wet weather events to minimize the loss of solids and to retain a healthy biomass.
- The clarifier influent and effluent each enter/exit through a single pipe, and the clarifier level control is with a horizontally placed pipe (no weir), so there's poor flow distribution through the clarifier surface area that exists.
- There is no ideal place for chlorine tablet addition or dechlorination tablet addition.
- The apex of the V-notch weir used for flow monitoring was submerged during the site visit, making any reading from it inaccurate. (The ultrasonic flow meter was also located downstream of the V, so the system installation is incorrect).
- The V-notch weir structure is located offsite (outside of the property limits) and within the flood zone.

The wood fencing around most of the site is generally in good shape.

Currently no remote monitoring is in place at the site. This makes it difficult for the operators to know when the facility is failing. Operational monitoring should be completed to monitor the quality of effluent, which should then be compared to the operating permit.

Wastewater Treatment Facility Recommended Improvements

- The condition of the tank calls for taking the facility off line for structural repair, at a minimum to include the addition of either supplemental or replacement stiffeners, safety handrail, welding repairs, and the addition of a new RAS line from one of the hopper bottomed clarifiers to the front end of the plant.
- A new roughing MBBR in the form of a 4-foot diameter, 11-foot deep manhole will be installed upstream of the existing influent manhole to remove BOD, reducing the load and in turn stabilizing the existing system and improving nitrification.
- The new system will generate significantly less sludge than previously, so sludge handling needs will significantly decrease.
- The 10' foot deep clarifier will function much better in this application than with only the existing activated sludge system, as the roughing MBBR will reduce the amount of activated sludge mixed liquor required to meet effluent objectives. This will reduce the risk of solids carry over during wet weather significantly.
- The effluent from the aeration basin will be evenly distributed into and through the clarifier, and the level control in the clarifier will be maintained with the addition of a weir trough and weir.
- Aluminum sulfate (alum) will be introduced in the extended aeration effluent, upstream of the influent into the clarifier.
- A flow meter will be installed in the clarifier effluent piping, in route to the contact tank.
- Peroxyacetic acid will be introduced directly into the contact tank in lieu of attempting to install chlorination and dechlorination tablet feeders in the limited hydraulic profile. The PAA chemical requires less contact time, and will more consistently achieve the necessary disinfection objectives.
- The existing chlorine contact tank will be equipped with diffusers to help in meeting the dissolved oxygen effluent limit.

The blowers will be replaced and serve the roughing MBBR, extended aeration system, and post-aeration system. [Wastewater Collection System Understanding](#)

While no mapping was provided, the collection system consists of only gravity collection.

According to the operator, the collection system consists of 8" and 10" gravity sewers, and the high groundwater table results in significant peak flow events at the facility. Wastewater enters the wastewater treatment plant through a gravity sewer.

REVISED CAPITAL ESTIMATE - NOV. 5, 2021

Herrington Haven (9,900 GPD ADF)

Item	NARUC Category	EXPENSES	FIXED ASSETS	TOTAL
Blowers and Blower Controls for New MBBR Blowers (2, 3 HP)	Sewer - Treatment and Disposal	\$0	\$22,500	\$22,500
Installation of Blowers	Sewer - Treatment and Disposal	\$0	\$7,900	\$7,900
Blower Pad	Sewer - Treatment and Disposal	\$0	\$1,500	\$1,500
Blower Discharge Header Piping, Valves, Etc. (Installed)	Sewer - Treatment and Disposal	\$0	\$3,500	\$3,500
Cages w/Diffusers (18) and MBBR Media (6 Cubic Mtrs)(2, 4'x6'x11')	Sewer - Treatment and Disposal	\$0	\$0	\$0
Cage Materials (w/Shipping, Tax)	Sewer - Treatment and Disposal	\$0	\$8,000	\$8,000
Cage Fabrication	Sewer - Treatment and Disposal	\$0	\$20,000	\$20,000
Painting for Carbon Steel	Sewer - Treatment and Disposal	\$0	\$1,850	\$1,850
Media	Sewer - Treatment and Disposal	\$0	\$7,300	\$7,300
Diffusers & Diffuser Piping	Sewer - Treatment and Disposal	\$0	\$8,500	\$8,500
Installation of Cages	Sewer - Treatment and Disposal	\$0	\$22,800	\$22,800
PAA Equipment	Sewer - Treatment and Disposal	\$0	\$12,000	\$12,000
PAA Pad Addition	Sewer - Treatment and Disposal	\$0	\$1,250	\$1,250
PAA Equipment Installation	Sewer - Treatment and Disposal	\$0	\$4,000	\$4,000
Digester Tank	Sewer - Treatment and Disposal	\$0	\$15,200	\$15,200
Digester Decant Valves, Decant Piping, Air Piping	Sewer - Treatment and Disposal	\$0	\$15,000	\$15,000
Digester Diffusers Installed	Sewer - Treatment and Disposal	\$0	\$6,000	\$6,000
Digester Pad	Sewer - Treatment and Disposal	\$0	\$1,250	\$1,250
Digester Blower (1) and Blower Pad	Sewer - Treatment and Disposal	\$0	\$10,000	\$10,000
WAS/RAS Piping Modifications	Sewer - Treatment and Disposal	\$0	\$5,000	\$5,000
WAS Grinder Station	Sewer - Treatment and Disposal	\$0	\$5,000	\$5,000
Add/Upgrade Mission Monitoring System	Sewer - Treatment and Disposal	\$0	\$7,000	\$7,000
Replace the Existing Ultrasonic (and Relocate Position to Function)	Sewer - General Plant	\$0	\$5,000	\$5,000
Electrical Distribution for MBBR Blowers	Sewer - General Plant	\$0	\$7,500	\$7,500
Electrical Distribution for Digester Blowers, PAA and Grinder Pumps	Sewer - General Plant	\$0	\$17,500	\$17,500
Gravel Access Road for Construction	Sewer - General Plant	\$0	\$3,000	\$3,000
Fence Replacement (Approximatey 125 feet Wood Fence)	Sewer - General Plant	\$0	\$9,000	\$9,000
TOTAL		\$0	\$227,550	\$227,550

APPENDIX



Aeration Tank, Clarifier, Contact Tank



Clarifier and Contact Tank



Manually Cleaned Bar Screen



WWTP Electrical Meter

Kingswood Kentucky (Wastewater, KY00101419)

Engineering Memorandum

Date: April 2, 2019

Wastewater Treatment Facility Understanding

The wastewater treatment facility is made up of a standard extended aeration activated sludge facility. The permit does have an active permit that authorizes to discharge until midnight, July 31, 2019. The facility appears to consist of an aeration tank, comminutors at the influent for breaking down solids, aerobic digestion in the sludge digester, clarifier, ultraviolet disinfection followed by post aeration. The facility appears to have a good quality structure with adequate capacity to serve the customers. I performed a quick estimate of capacity and it appears the structures are adequate for the 124 customers currently connected to the system.

A review was performed of EPA's Echo compliance website which lists violations. Prior to July 1, 2017, the system appeared to be a regular offender of violations in regards to effluent limits. It does appear that the facility has improved but am unaware if this was due to improvements made or possibly a new operational service taking over at the facility. Again, the system still appears to be exceeding limits but violations are more sporadic. Since July 1, the facility has had violations in 4 of the 7 quarters, which consisted of violations of TSS, Ammonia, E. coli, and BOD. Understanding that the tankage and piping appear to be adequately sized, I would tend to believe that the system violations may be more from operational issues rather than capacity of facility.

Further evaluating the facility capacity, the operating permit states 40,000 gpd capacity. Estimating sizes of the units from photos, I would believe the facility has this capacity. Lastly and from our experience on facilities this size, I would tend to believe the typical user has a daily flow rate between 150 gpd to 200 gpd. Using 200 gpd as a conservative number, I would estimate the daily flow from 124 customers to be around 24,800 gpd. Keep in mind that some permitting entities recommend a design flow rate of anywhere from 350 gpd to 400 gpd per home for new systems. If existing flow is available, that can typically be used and I recommend a new magnetic flow meter to track this flow. However, the system is believed to have excess capacity and should not have a problem meeting limits on a more consistent basis if properly maintained.

The aeration tankage appears to be adequately sized from the preliminary investigation discussed above. Furthermore, it is standard for CSWR operators to regularly verify the aeration diffusers are clean. Additionally, daily monitoring and testing is completed to further confirm their facilities are operating where desired. No data was provided but I can only assume the standard CSWR operator protocols are not being completed.

The clarifier appears to be working properly. The facility has only violated TSS limits in two of the last 7 quarters. While this might also be an operational issue in regards to control of the mixed liquor and

clarifier maintenance/cleanliness, the clarifier is not operating at an optimal level. The clarifier should be cleaned as well as evaluated for size after actual dimensions and/or as-built drawings are provided.

Minimal pictures were provided of the facility that would aid in 21DG providing an opinion of its state. I recommend that an additional site visit be completed prior to finalizing evaluation and improvements necessary. While it does appear the area inside the fence and the around the facility is reasonably maintained during the site visit by CSWR, the treatment facility inconsistency at meeting limits would again make me believe this facility has an operational issue that can be overcome.

The effluent quality looks clean as it was discharging to the stream. There was minimal signs of residue in the stream that can most likely be eliminated with better quality control on the operational side of the facility. (Appendix Picture 4)

It did not appear any monitoring was in place for this facility. I recommend Mission monitoring be installed for improvement control and access.

The shed appears to be all brick with asphaltic shingles. It appears it is in reasonable shape but will need a roof and gutter inspection on the next site visit. At a minimum, it looks like the roof will need replaced in the near future. The structure appears to be acting as the blower housing to keep them out of the weather as well as sound reduction for the adjacent homes.

Access appears to be in good shape and will allow ease of maintenance and upgrades in the future.

Improvements: Pull and inspect diffusers and possible replacement. Install Mission monitoring and a new magnetic flow meter. Minor cleanup and repair of roof on storage/blower house. Perform various operational improvements that will likely allow the facility to return to meeting effluent limits.

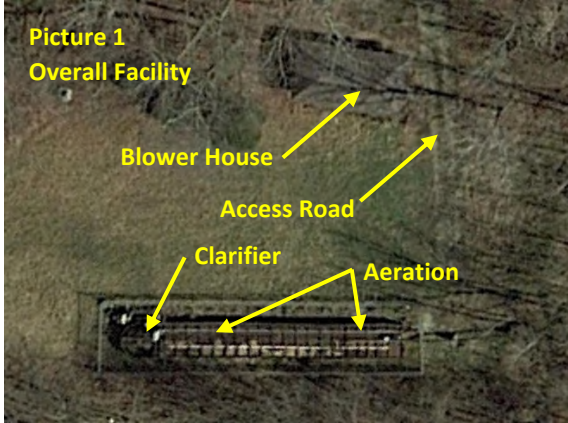
Wastewater Collection System Understanding

No information in regards to the collection system was provided to the Engineer for review to drafting this memo. It is recommended to obtain DMRS and/or flow data for the facility from the current owner to evaluate if I and I is a problem. If the owner is knowledgeable on wastewater systems, they may also be able to shed some light on if I and I is a problem. This would be adequate to start our evaluation period until actual flow monitoring and smoke testing of the system is completed.

No maps of the system were provided. The system will need to be mapped for future operation as it appeared nothing has been compiled for our review or operational maintenance purposes. The Engineer was not informed if this system was all gravity, pressure, or had any pump stations. However, the annual reports show that most of the collection system is 4" PVC, which would make me believe it is a low pressure system. Further investigation is needed, but if it is determined the system is gravity, the system should also be smoke tested. Video inspection is anticipated on parts of the system as well.

Improvements Required: Map the system. Install a flow meter. Determine if system is gravity or low pressure and decide if smoke testing and video inspection of the collection system is warranted.

APPENDIX



Civil Engineering
 Surveying & Mapping
 Potable Water
 Wastewater Treatment



Civil Site Design
 Construction Support
 Transportation
 Wastewater Collection

This was the original estimate provided with the Engineering Memo
 Kingswood 124 Customers 24,800 gpd 20190402

CONSTRUCTION ITEM	QUANTITY	UNIT	UNIT PRICE	EXTENDED PRICE
Cleanup blower house and equipment	1	Lump Sum	\$15,000	\$15,000
Install Mission Alarm, wiring and mag meter	1	Lump Sum	\$11,000	\$11,000
Replace some diffusers in aeration tankage (assumed)	1	Lump Sum	\$10,000	\$10,000
Contractor O & P	1	Lump Sum	\$10,000	\$10,000
Replace blower (assumed)	1	Lump Sum	\$7,500	\$7,500
Smoke Test system (Might be pressure, to verify)	1	Lump Sum	\$20,000	\$20,000
SUBTOTAL				\$73,500
Surveying Fees				\$25,000
Engineering (To be determined)				\$15,000
Contingency(10%)				\$7,350
TOTAL				\$120,850

This estimate was prepared without a site visit by the Engineer and utilizing information gathered by CSWR. More information is needed prior to finalizing this estimate.

Lake Columbia-Kentucky (Wastewater)
Engineering Memorandum
Date: December 28, 2018

Wastewater Treatment Facility Understanding

The wastewater treatment facility is made up of a standard extended aeration activated sludge facility. The system has an active operating permit that is set to expire on November 30, 2019. The plant consists of an influent splitter/bar screen box, aeration tank, clarifier, and chlorine disinfection. Upon entering the site, it is very visible the plant is in disarray and is not being managed properly. Therefore, and through a combination of the actual structure and continual operational maintenance, the system has failed. This facility is a continual contamination and is surprising that any of the limits are being met. In review of the Echo website hosted by the EPA, the system has well exceeded the ammonia limits of the permit for a minimum of 12 consecutive testing periods. Additionally, the system violated CBOD, Chlorine residual, E. coli, Ammonia, and TSS. It shall also be noted that the system has been written up for violations consisting of Improper Operation and Maintenance, failure to notify, 25 counts of late and missing DMR measurements. (See Appendix 1 for overall picture)

This facility has seen its useful life and needs a complete overhaul and/or replacement.

There is no flow equalization at this facility. The incoming gravity flow enters directly into a bar screen box structure that has failed and the bar screen has been removed. (Appendix Picture 2.) This structure should be repaired.

The aeration tank sits above the surface. It has a number of large rust holes that show obvious signs of failure. These holes could be patched. However, I have concerns on the integrity of the remaining structure as it is not typical for the plant to rust completely through to this extent. (Appendix Picture 3.) Additionally, the facility liquid in no way has a resemblance of a mixed liquor. Items that should have been caught by the bar screen are piled on the surface of the water. The facility was not running upon arriving or leaving the site. I believe this portion of the treatment facility has completely failed. (Appendix Picture 4.)

The clarifier has received a number of patch repairs. The baffle for the effluent consists of treated lumber held in place by vise-grips on a rusted through baffle. (Appendix Picture 5.) The clarifier sludge returns were not running while we were on site. The operator did turn on the skimmer temporarily while we were there and it appeared working. However, the integrity of the structure and piping is in poor shape. The wiring of the control panel is exposed, not fastened, and is a safety issue for anyone working on this facility or on the plant. (Appendix Picture 6.)

The contact chamber does not have typical baffling and may experience short circuiting. This facility has seen violations of both residual chlorine and E. Coli. This facility is obviously struggling to meet limits with its current setup. Upgrades should consist of converting to ultraviolet. (Appendix Picture 7)

The effluent quality is very poor. There were remnants of toilet paper on the banks of the receiving stream. (Appendix Picture 8)

Improvements: This plant will need major reconstruction. Various processes will need to be evaluated. I anticipate an entire new treatment facility with possible reuse of the existing facility as flow equalization. Additionally, the system should include a new bar screen with flow meter. The chlorine contact chamber should be abandoned and ultraviolet disinfection would be recommended.

Wastewater Collection System Understanding

Per records provided by the owner, the system has approximately 33 customers. These customers are served by a gravity sewer system that was once a mobile home park. From my experience, collection systems from mobile home parks are typically poorly maintained and constructed. Inflow and infiltration will be a problem. This was confirmed by the operator in our discussions. No maps of the system were provided. The system will need to be mapped for future operation as it appeared nothing has been compiled for our review or operational maintenance purposes. The system should also be smoke tested. Video inspection is anticipated on parts of the system as well.

Improvements Required: Map the system. Install a flow meter. Smoke test and video inspect the collection system.

CONSTRUCTION ITEM	QUANTITY	UNIT	UNIT PRICE	EXTENDED PRICE
Repair bar screen system	1	Lump Sum	\$5,000	\$5,000
Flow equalization and pumping system	1	Lump Sum	\$40,000	\$40,000
Sludge Holding tank & blower	1	Lump Sum	\$30,000	\$30,000
Install aeration in Flow Eq and Sludge holding	1	Lump Sum	\$15,000	\$15,000
Install Mission Alarm and wiring with meter	1	Lump Sum	\$10,000	\$10,000
Return piping from new clarifier	1	Lump Sum	\$5,000	\$5,000
Contractor O & P	1	Lump Sum	\$25,000	\$25,000
Replace motor on blower	2	Lump Sum	\$6,500	\$13,000
Sand blast, paint, and repair tankage	1	Lump Sum	\$20,000	\$20,000
New fencing	1	Lump Sum	\$15,000	\$15,000
Cleanup sludge from creek	1	Lump Sum	\$10,000	\$10,000
Smoke test system	1	Lump Sum	\$15,000	\$15,000
Collection system repair for I and I	1	Lump Sum	\$30,000	\$30,000
SUBTOTAL				\$233,000
Surveying Fees				\$20,000
Engineering (To be determined)				\$32,500
Contingency(10%)				\$23,300
TOTAL				\$308,800
Design will incorporate new concept that needs to be evaluated for optimal performance.				
Cleanup creek is not in				

APPENDIX





Q

LH Treatment-Kentucky (Wastewater, KY0081591)

Engineering Memorandum

Date: February 17, 2019

Wastewater Treatment Facility Understanding

The wastewater treatment facility is made up of a standard extended aeration activated sludge facility. It doesn't appear this system has an active permit to operate. The permit appears to have expired on December 31, 2018. The plant consists of an aeration tank, clarifier, and chlorine disinfection with dechlorination. (Appendix Picture 1) The facility appears to have a good quality structure, air piping, sludge returns, and capacity to continue to be efficient towards treatment. I performed a quick estimate of capacity and it appears the structures are adequate for the 276 customers currently attached.

A review was performed of EPA's Echo compliance website which lists violations. Prior to July 1, 2017, the system appeared to be a regular offender of violations in regards to effluent limits. It is my understanding they recently completed upgrades to the facility and total performance has improved. However, the system still appears to be exceeding limits but violations are more sporadic. In 2018, the facility violated CBOD, TRC, E. coli, Ammonia, DO and TSS at least once. Understanding that the tankage and piping appears to be efficiently laid out and seems in good quality with adequate capacity, I would tend to believe that the system violations may be more from operational issues rather than capacity of facility.

While the plant appears adequate, there are a few items of concern for the facility. The facility looks relatively new and in reasonable shape. However, the system continues to violate at least one limit each testing period.

The aeration process of the treatment facility appeared to have a reasonable mixed liquor. However, standard operational testing has not been provided to us for evaluation on the operational control of the facility. Daily testing should be completed until an understanding of the facility is clear. Additionally, I'm not aware of the current operator's maintenance practice. The diffusers should be pulled from the tank and inspected in case they have fouled due to not performing preventative maintenance. While the aeration tank mixed liquor looked reasonable, it is obvious consistent operation control is not occurring. (Appendix Picture 2)

The clarifier appears to be working properly. However, the supernatant water of the clarifier appeared to have a large amount of floc releasing and/or coming to the surface. While this might also be an operational issue in regards to control of the mixed liquor and sludge returns, the clarifier is not operating at an optimal level. Allowing floc to discharge the facility can lead to surpassing the limits imposed on the facility. As discussed above, various limits were exceeded in 2018. Avoiding excessive

Civil Engineering
Surveying & Mapping
Potable Water
Wastewater Treatment



Civil Site Design
Construction Support
Transportation
Wastewater Collection

floc in the clarifier is vital in maintaining a healthy facility. Additionally, the effluent trough appears to have some green algae attached to the bottom, which if not cleaned, may build up and cause issues with effluent samples periodically. The clarifier should be cleaned as well as evaluated for size after actual dimensions and/or as-built drawings are provided. (Appendix Picture 3)

Minimal pictures were provided of the chlorination system that would aid in 21DG providing an opinion of its state. However, the system has violated E. coli and TRC in the past year and they should be evaluated. Again, these violations could be due to poor operational and maintenance practices.

The effluent quality looks clean as it was discharging to the stream. There were no signs of sludge or buildup in the stream. (Appendix Picture 4)

It did not appear any monitoring was in place for this facility. I recommend Mission monitoring be installed for improvement control and access.

It also appeared that the shed needed to be cleaned up. Various supports are not conventional and consist of buckets and wood holding up some piping. Sunlight is also coming through the walls that will tend to let rain into the building. This will allow the building to deteriorate faster than desired. Insulation appears to be failing and should be repaired. The shed should be cleaned up to allow better access and conventional supportive items.

Improvements: Pull and inspect diffusers and possible replacement. Install Mission monitoring. Clean up shed for adequate installation and cleaner environment. Perform operational improvements that will likely allow the facility to return to meeting effluent limits.

Wastewater Collection System Understanding

No information in regards to the collection system was provided to the Engineer for review to drafting this memo. It is recommended to obtain DMRS and/or flow data for the facility from the current owner to evaluate if I and I is a problem. If the owner is knowledgeable on wastewater systems, they may also be able to shed some light on if I and I is a problem. This would be adequate to start our evaluation period until actual flow monitoring and smoke testing of the system is completed. The system does have a flow meter installed at the effluent and it is recommended to get access to the data that is being compiled.

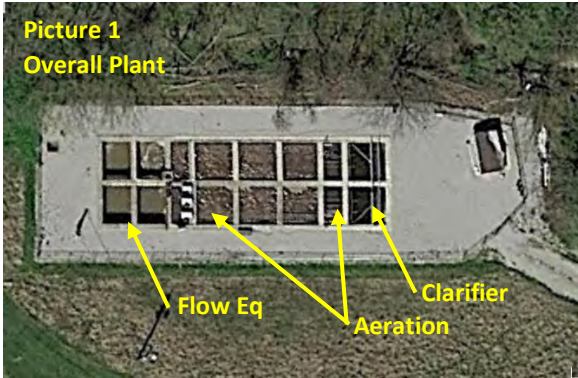
No maps of the system were provided. The system will need to be mapped for future operation as it appeared nothing has been compiled for our review or operational maintenance purposes. The Engineer was not informed if this system was all gravity, pressure, or had any pump stations. The system should also be smoke tested. Video inspection is anticipated on parts of the system as well.

Improvements Required: Map the system. Install a flow meter. Smoke test and video inspect the collection system.

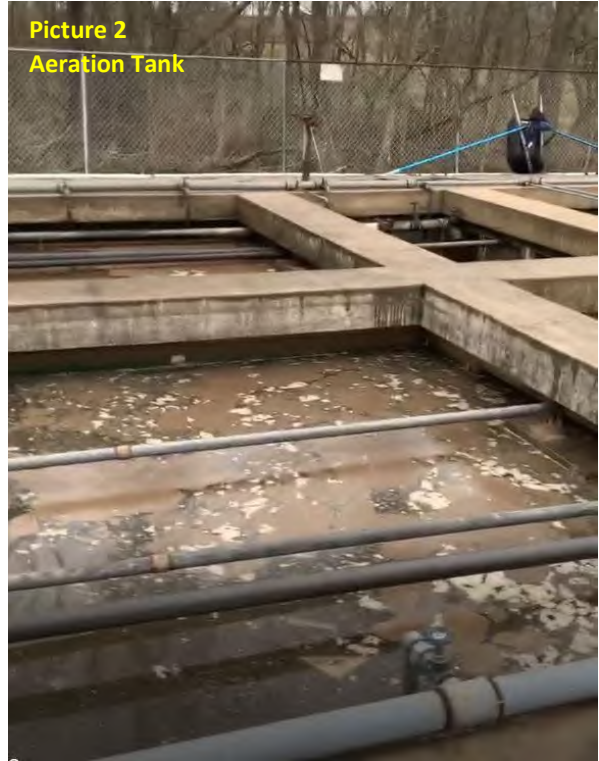
CONSTRUCTION ITEM	QUANTITY	UNIT	UNIT PRICE	EXTENDED PRICE
Cleanup blower house and equipment	1	LS	\$15,000	\$15,000
Install Mission Alarm and wiring	1	LS	\$7,500	\$7,500
Replace diffusers in aeration tankage	1	LS	\$10,000	\$10,000
Contractor O & P	1	LS	\$5,000	\$5,000
Replace blower	1	LS	\$7,500	\$7,500
Sanitary sewer video inspection	1	LS	\$6,500	\$6,500
Sanitary sewer lining	1	LS	\$25,000	\$25,000
Smoke Test system	1	LS	\$20,000	\$20,000
SUBTOTAL				\$96,500
Surveying Fees				\$25,000
Engineering (To be determined)				\$15,000
Contingency(10%)				\$9,650
TOTAL				\$146,150
This estimate was prepared without a site visit by the Engineer and utilizing information gathered by CSWR				

APPENDIX

Picture 1
Overall Plant



Picture 2
Aeration Tank



Picture 3
Clarifier



Picture 4
Effluent

Marshall Ridge (Wastewater) – No discharge/No permit Engineering Memorandum

Date: October 5, 2019

Wastewater Treatment Facility Understanding

The Marshall Ridge wastewater treatment facility is located in West Paducah, KY. The plant services about 40 customers which is approximately 120 people. The facility consists of a no-discharge lagoon.

The facility does not have a discharge permit and has minimal oversight from permitting entities. The Kentucky Department of Environmental Protection governs wastewater permits with discharges but does not have any oversight on non-discharging systems such as this facility. The KDEP leaves management and oversight up to the local Health Departments. In speaking with head of the Health Department in this county, they will perform field inspections only when a complaint is filed. Therefore, we recommend investigation with the Health Department for quantity and relevance of complaints in the near future. Conversations with the head of the Health department made me believe they have construction plans for this system in their files. However, he didn't have time to research the files at the prior to drafting this memo.

During our visit to the lagoon, various site components were showing signs of failure and minimal maintenance. The two cell Lagoon has limited access. The perimeter fencing needs repairs at multiple locations. The berms have multiple varmint holes that are compromising the integrity of the lagoon berm. The lagoon itself has erosion around the inner edge and has overgrown brush on the inner berms that needs removed. While we did not have construction plans with us during our site, visit, I recommend bringing plans and comparing them to the onsite features. It appears the lagoon system is followed by a lateral field for sub-surface discharge. Remnants of construction debris and/or repair materials were in the woods in the vicinity I would anticipate the drainage field.

This facility does not have an operating permit. It also does not have any monitoring or testing limits imposed on the facility that need to be reported. Therefore, this system does not show up in the EPA's Echo website for evaluation.

Improvements: The perimeter fence needs repair. Inspection of the lateral field should be completed and compared to any design plans that the Health Department may have. Remove overgrowth from the inside of the lagoon berms. Repair inside berms where erosion is occurring.

Wastewater Collection System Understanding

The collection system flow gravity feeds to the lagoon from the Marshall Ridge neighborhood. No other information regarding the collection system was provided to the Engineer for review to drafting this memo. We recommend researching the Health Department's files to see if they have construction plans for the collection system.

Improvements Required: Perform smoke testing, evaluate system and create GIS mapping for future maintenance needs. Research Health Department files.





Civil Engineering
 Land Surveying
 Potable Water
 Wastewater Treatment



Civil Site Design
 Construction Support
 GIS Mapping
 Wastewater Collection

Estimate of Construction
 Marshall Ridge WWTF
 No Permit for Non-Discharging Lagoon
 McCracken County, KY

Project: Construction Cost Estimate for WWTF Improvements

Description	Unit	Unit Price	Quantity	Total Cost
Chainlink fence repair	Lump Sum	\$7,500	1	\$7,500
Repair leaking berm/drain field	Lump Sum	\$25,000	1	\$25,000
Repair varment damage	Lump Sum	\$5,000	1	\$5,000
New access road	Lump Sum	\$7,500	1	\$7,500
Clear brush from lagoon berms	Lump Sum	\$5,000	1	\$5,000
Collection System repair for I and I	Lump Sum	\$15,000	1	\$15,000
Construction Cost Total				\$65,000
Smoke Testing	Lump Sum	\$3,500	1	\$3,500
Surveying	Lump Sum	\$7,500	1	\$7,500
GIS	Lump Sum	\$2,500	1	\$2,500
Engineering	Lump Sum	\$17,500	1	\$17,500
Construction Cost Total				\$111,000

Consider budgeting for Lagoon Sludge (Estimated)	\$50,000
--	----------