





NORTH AND SOUTH LAGOONS

ADVANCED TREATMENT EVALUATION REPORT

FOR

LOUISBURG, KANSAS

CITY OF LOUISBURG
KANSAS • EST. 1868

PROJECT NO. 0315021.01
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Purpose Statement

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1. Introduction

1.1 Purpose

The purpose of this report is to evaluate the performance of the two existing wastewater treatment facilities owned and operated by the City of Louisburg, Kansas and recommend improvements to consistently meet current effluent limits for biochemical oxygen demand (BOD) and ammonia. This report will also address recommended improvements to meet the anticipated more stringent effluent limits in the future. The two facilities, the North Lagoons and South Lagoons, and are shown in **Figure 1-1** below.

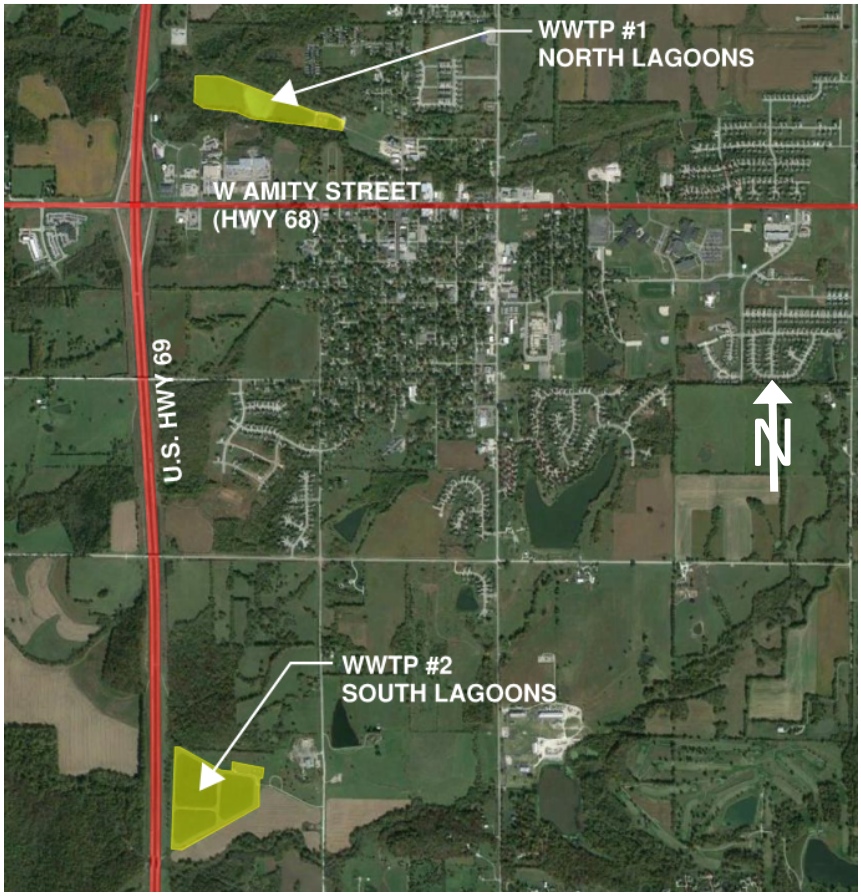


Figure 1-1. Vicinity Map

The City of Louisburg is a relatively large community to be served by non-mechanical treatment facilities. According to KDHE, out of the 800 municipal and commercial lagoons in Kansas, Louisburg is the 6th largest city with wastewater treatment

lagoons. There are 3 larger cities in Kansas with discharging lagoons that will be facing the same regulatory changes in the near future.

This evaluation report is required to be completed as part of the Schedule of Compliance Part C of each facility's National Pollutant Discharge Elimination System (NPDES) permit issued by the Kansas Department of Health and Environment (KDHE). The impetus for the evaluation is that both existing wastewater treatment facilities are not consistently meeting permit effluent limitations for ammonia and BOD and the City of Louisburg has been provided notice from KDHE regarding the Pending Revised Ammonia Numeric Criteria which is more stringent than the ammonia limits in the current permits. This report evaluates the following three alternatives:

- Alternative No. 1 – Do Nothing
- Alternative No. 2 – Existing Facilities Improvements
- Alternative No. 3 – Single 1.02 MGD Biological Nutrient Removal Facility

This evaluation summarizes existing conditions, analyzes the reason(s) why the facilities are not consistently meeting permit limitations, explains why Alternative No. 1 is not an option for the community, proposes recommendations for improvements to the existing facilities (Alternative No. 2), provides an opinion of probable project cost for the improvements including engineering, and proposes a schedule for improvements. Alternative No. 3 is presented at a feasibility level based on recent similar project costs to provide an affordability component in the evaluation.

The alternative of replacing each lagoon treatment facility (North and South) with its own mechanical wastewater treatment plant (WWTP) is not evaluated in this report. There is not much available land at the North Lagoons site and due to its close proximity to the community, the project team decided that the alternative of constructing a single mechanical WWTP at the South Lagoons site was a better alternative.

1.2 Cost Development

The conceptual study opinion of probable costs included in this report are preliminary in detail, and are intended for general fiscal planning only. These conceptual opinions of probable costs are based primarily on our experience and judgment as a professional consultant combined with information from past experience, vendors, and published sources. Since the engineer has no control over weather, cost and availability of labor, material and equipment, labor productivity, construction contractor's procedures and methods, unavoidable delays, construction contractor's methods of determining prices, economic conditions, government regulations and laws (including the interpretation thereof), competitive bidding or market conditions and other factors affecting such opinions or projections; consequently, the final project costs will vary from the opinions of costs presented in this study and funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

2. Existing Lagoons Evaluation

2.1 North Wastewater Treatment Lagoon Facility

The Louisburg Wastewater Treatment Plant No. 1 North Lagoon Facility, known as the North Lagoons, is located in the northwest part of the City of Louisburg to the west of the intersection of North 3rd Street and North Broadway Street. The plant is operated under Kansas Permit No. M-MC20-0001 and Federal Permit No. KS0024856 issued by KDHE. A copy of the NPDES permit issued June 1, 2015 is included in **Appendix A**.

The original plant constructed in 1962 consisted of a two-cell lagoon which is now Cells 3 and 4. In the 1970's, a third lagoon cell (now Cell 5) and a rock filter were added. In 2009, two aerated cells (Cells 1 and 2), were added. The plant now consists of five (5) lagoon cells, with two aerated cells followed by three facultative cells as shown in the aerial photo below (**Figure 2-1**).



Figure 2-1. Aerial North Lagoon Facility

Influent flows through 2 coarse basket screens into a wet well from 2 gravity sewers, a 24-inch sewer from the east and an 18-inch sewer from the north. From the wet well, influent is pumped to a splitter box at the head of Aerated Cells 1 and 2. The influent pump station, splitter box, and Aerated Cells 1 and 2 were completed in 2009 as part of the plant expansion to a design capacity of 0.42 million gallons per day. Aerated Cells 1 and 2 operate as sequencing batch reactors (SBR) where influent is directed into either

Cell 1 or 2 on an alternating basis and air is cycled on and off in each cell based on a pre-programmed timer which is coordinated with the influent flow. The existing SBR cycle times are as shown in **Figure 2-2**.

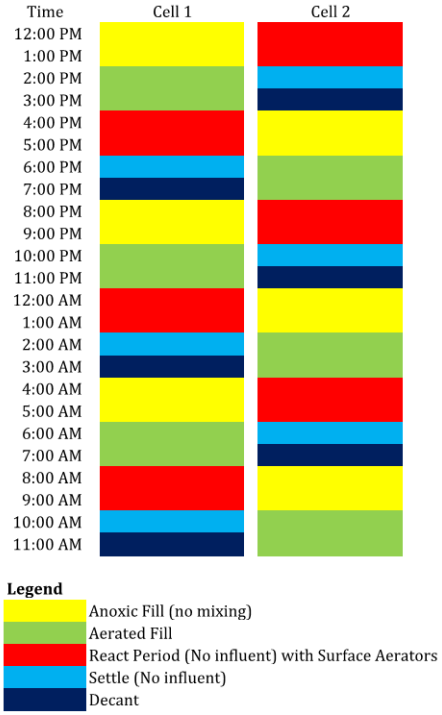


Figure 2-2: SBR Cycle Times

Flow is controlled by automated slide gates in the influent splitter box. Effluent from Cells 1 and 2 is directed to Cell 3 where it flows by gravity through facultative Cells 3, 4, and 5 consecutively before discharging to the South Wea Creek via an unnamed tributary. All cells have sloped sidewalls and clay lined floors. Cells 1 and 2 are made up of one earthen basin partitioned roughly in the middle with a cast-in-place concrete wall and rip rap on the upper portion of the sloped sidewalls where the water level is designed to fluctuate. **Table 2-1** shows a summary of the cell sizing.

Table 2-1: Summary of Existing Facilities - North Lagoon Cells

	Cell 1 (East)	Cell 2 (West)	Cell 3	Cell 4	Cell 5	**Total**
Type of Lagoon	Aerated w/ two 15 hp mechanical surface aerators	Aerated w/ two 15 hp mechanical surface aerators	Facultative	Facultative	Facultative	-
Surface Area, ac	0.52	0.51	3.43	3.31	7.06	**14.83**
Depth, ft	10.5	10.5	5	5	5	-
Volume, mg	1.79	1.73	5.13	4.99	10.88	**24.52**
Average Water Surface Elevation, ft AMSL	1023.0	1023.0	1015.7	1013.7	1006.1	-
Hydraulic Retention Time (HRT), days						
Design (0.42 mgd)	8.5	8.2	12.2	11.9	25.9	**58.2**
Current average (0.114 mgd)	31.4	30.4	45.0	43.8	95.4	**214.6**

Monthly reports were obtained from the City and used to determine average and peak plant flows and pollutant concentrations as well as to track historical lagoon effluent performance. Influent is not currently measured and pump run times are not available for use in estimating flow volumes. Flow shown in the monthly reports was taken from effluent readings. Effluent instantaneous peak is the instantaneous effluent peak flow on the effluent flow hydrograph. Since the influent flow is attenuated by the size of the lagoons, the actual instantaneous peak flow to the facility is unknown. Further, actual pollutant mass loadings to the plant could not be calculated because daily flow information was not available across the entire data set. Average daily effluent flow for each month was calculated based on the total volume of flow over that month divided by the number of days in the month, thus actual flowrates from the day that the samples were taken for analysis were not available. **Table 2-2** summarizes historical effluent flow and influent pollutant concentrations. Refer to **Appendix B** for a tabulation of the raw data obtained from the monthly reports.

Table 2-2: Historical Wastewater Characterization (Jan 2013 through April 2015)

Effluent Flow, mgd	
Average	0.114
Maximum Month	0.290
Instantaneous Peak from hydrograph	1.450
Peak to Average Flow Ratio	12.7*
Average Influent Concentrations	
Biochemical Oxygen Demand (BOD_5), mg/L	219
Total Suspended Solids (TSS), mg/L	194
Total Kjeldahl Nitrogen (TKN), mg/L	44
Total Phosphorus, mg/L	6.6
pH, SU	7.1
* A Peak:Average Flow Ratio of 12.7 is exceptionally high and could be indicative of extreme inflow and infiltration or inaccurate flow measurement. It is recommended that further flow monitoring be investigated to verify accuracy.	

Historically, the North aerated lagoons have met permitted effluent limits 82% of the time over the data set that we reviewed. Effluent ammonia and biochemical oxygen demand (BOD) concentrations have exceeded permitted limits 5 times over the data set

(4 for ammonia and 1 for BOD) due to surface aerator maintenance issues (clogging and power failures) and the loss of nitrifying bacteria as a result of low liquid temperatures in the colder months. Nitrification bacteria (nitrifiers) are more effected by temperature than bacteria that convert BOD. This results in nitrification slowing down considerably at liquid temperatures below 50 degrees F (10 degrees C) and ceasing altogether at 41 degrees F. Historically, the liquid temperature has dropped below 41 degrees F in the winter months. See **Appendix C** for a tabulation of historical liquid temperatures. The relatively long hydraulic retention time of the aerated cells for this SBR system and the mechanical aeration equipment which splashes the liquid into the cold, ambient air have a tendency to drive liquid temperatures down.

2.2 South Wastewater Treatment Lagoon Facility

The Louisburg Wastewater Treatment Plant No. 2 South Wastewater Lagoon Facility, known as the South Lagoons, is located south of the City of Louisburg, east of U.S. Highway 69, and southwest of the intersection of W 287th Street and Rogers Road. The plant is operated under Kansas Permit No. M-MC20-0002 and Federal Permit No. KS0087149 issued by KDHE. A copy of the NPDES permit issued June 1, 2015 is included in **Appendix A**.

The original plant constructed in 1990 consisted of three lagoons totaling approximately 21.07 acres of water surface. In 2006, the plant was upgraded and expanded and now consists of five (5) lagoon cells, with two aerated cells (Cells 1 and 2) followed by the three original facultative cells as shown in the aerial photo in **Figure 2-3**.



Figure 2-3 Aerial South Lagoon Facility

Influent flows through a coarse basket screen into a wet well from a 16-inch gravity sewer from the west. From the wet well, influent is pumped to a splitter box at the head of Aerated Cells 1 and 2. The influent pump station, splitter box, and Aerated Cells 1 and 2 were completed in 2006 as part of the plant expansion to a design capacity of 0.60 million gallons per day. Aerated Cells 1 and 2 operate as SBRs where influent is directed into either Cell 1 or 2 on an alternating basis and air is cycled on and off in each cell based on a pre-programmed timer which is coordinated with the influent flow. The SBR cycle is similar to the cycle shown for the North Lagoons shown in Figure 2-2. Flow is controlled by automated slide gates in the influent splitter box. Effluent from Cells 1 and 2 is directed to Cell 3 where it flows by gravity through facultative cells 3, 4, and 5 consecutively before discharging to the South Wea Creek via an unnamed tributary. All cells have sloped sidewalls and clay lined floors. Cells 1 and 2 have rip rap on the upper portion of the sloped sidewalls where the water level is designed to fluctuate. **Table 2-3** shows a summary of the cell sizing.

Table 2-3: Summary of Existing Facilities - South Lagoon Cells

	Cell 1 (East)	Cell 2 (West)	Cell 3	Cell 4	Cell 5	**Total**
Type of Lagoon	Aerated w/ two 10 hp mechanical surface aerators	Aerated w/ two 10 hp mechanical surface aerators	Facultative	Facultative	Facultative	-
Surface Area, ac	0.35	0.35	9.57	6.3	5.2	**21.77**
Depth, ft	10	10	5	5	8	-
Volume, mg	1.143	1.143	15.6	10.3	13.6	**41.79**
Average Water Surface Elevation, ft AMSL	970.5	970.5	962.0	962.0	962.0	-
Hydraulic Retention Time (HRT), days						
Design (0.60 mgd)	3.8	3.8	26	17.2	22.7	**69.7**
Current AA (0.263 mgd)	8.7	8.7	59.3	39.2	51.7	**158.9**

Monthly reports were obtained from the City and used to determine average and peak plant flows and pollutant concentrations as well as to track historical lagoon effluent performance. Influent is not currently measured and pump run times are not available for use in estimating flow volumes. Flow shown in the monthly reports was taken from effluent readings. Effluent instantaneous peak is the instantaneous effluent peak flow on the effluent flow hydrograph. Since the influent flow is attenuated by the size of the lagoons, the actual instantaneous peak flow to the facility is unknown. Further, actual pollutant mass loadings to the plant could not be calculated because daily flow information was not available across the entire data set. Average daily flow for each month was calculated based on the total volume of flow over that month divided by the number of days in the month, thus actual flowrates from the day that the samples were taken for analysis were not available. **Table 2-4** summarizes historical effluent flow and influent pollutant concentrations. Refer to **Appendix B** for a tabulation of the raw data obtained from the monthly reports.

Table 2-4: Historical Wastewater Characterization (Jan 2013 through April 2015)

Effluent Flow, mgd	
Average	0.263
Maximum Month	0.490
Instantaneous Peak on hydrograph	0.700
Peak to Average Flow Ratio	2.7
Average Influent Concentrations	
Biochemical Oxygen Demand (BOD_5), mg/L	156
Total Suspended Solids (TSS), mg/L	147
Total Kjeldahl Nitrogen (TKN), mg/L	34
Total Phosphorus, mg/L	5.2
pH, SU	7.1

Historically, the South aerated lagoons have met permitted effluent limits 57% of the time over the data set that we reviewed. Effluent ammonia and BOD concentrations have exceeded permitted limits 12 times over the data set (7 for ammonia and 5 for BOD) due to surface aerator maintenance issues (clogging and power failures) and the loss of nitrifying bacteria as a result of low liquid temperatures in the colder months. Nitrification bacteria (nitrifiers) are more effected by temperature than bacteria that convert BOD. This results in nitrification slowing down considerably at liquid temperatures below 50 degrees F (10 degrees C) and ceasing altogether at 41 degrees F. Historically, the liquid temperature has dropped below 41 degrees F in the winter months. See **Appendix C** for a tabulation of historical liquid temperatures. The relatively long hydraulic retention time of the aerated cells for this SBR system and the mechanical aeration equipment which splashes the liquid into the cold, ambient air have a tendency to drive liquid temperatures down.

2.3 Alternative No. 1 – Do Nothing

If surface aeration equipment is continued to be used in the future for both the North and the South Lagoons, BOD and ammonia effluent limits will continue to be violated in extreme cold weather months. Furthermore, KDHE has issued notice of pending revised ammonia limits based on receiving stream water quality standards for aquatic life (letters included in **Appendix D**). These new ammonia numbers are more stringent

than the current limits and the plants as currently designed will not be able to consistently meet the new limits.

3. Alternative No. 2 – Existing Facilities Improvements

As discussed in the previous section, the ability of the existing wastewater treatment systems to reliably meet current and future limits for BOD and ammonia depends on multiple factors – namely stability of the system microbiology and reliability of the mechanical equipment components. Through analysis of influent, effluent, and operating data as well as discussions with City staff, we have identified and developed recommendations to improve reliability of the City's two treatment plants to meet current and pending BOD and ammonia effluent limits as well as reduce required attention of City staff for maintenance issues. This section discusses the recommended upgrades to each plant.

3.1 Population Projection and Design Criteria

The 2010 census population of Louisburg is 4,315 persons. Louisburg has been increasing in population from 1940 to 2010 at an average annual growth rate of 2.88%. Over the 1990's, Louisburg annual growth rate was slightly below average at 2.49% and from 2000 to 2010, the growth rate increased significantly to 5.3%. Due to the economic downturn, population growth has been relatively flat over the last 5 years. With the economy improving, we believe Louisburg will continue to grow as it has over recent history. We believe there is a high growth potential, particularly on the north side of town toward the Kansas City metro area, so for the purposes of this report future population is being projected at 3.5%. The most recent population estimate is 4,299 persons and in 20 years the population is projected to be 9,165 persons, see **Table 3-1** below.

Table 3-1: Population Projection for Louisburg, Kansas

Year	Louisburg, KS Population	Average Annual Growth Rate
1940	590	-
1950	677	1.38%
1960	862	2.45%
1970	1,033	1.83%
1980	1,744	5.38%
1990	2,015	1.45%
2000	2,576	2.49%
2010	4,315	5.29%
2013	4,299	-0.12%
2025	6,495	3.50%*
2035	9,165	3.50%*

*Projected at a 3.5% annual growth rate.

Over a 20-year planning horizon with a typical design value of 100 gallons per capita per day, we are projecting that combined domestic sanitary flow to both treatment plants will be approximately 0.92 million gallons per day (mgd) in 2035. Currently, the combined design capacity of the WWTPs is 1.02 mgd. While the existing treatment systems have adequate capacity going beyond the 20 year planning horizon, we recommend maintaining the existing capacity for design of the next phase of improvements. We recommend this for two reasons. First, the existing facilities are already permitted for this flow through KDHE and keeping this capacity moving forward would be in the best interests of the City. Secondly, due to the economy of scale, there would be a financial advantage to designing the next phase improvements to the higher flow (1.02 mgd) because there is not much to save by designing and constructing a smaller 0.92 mgd facility.

The design criteria are shown in **Table 3-2** for the alternatives discussed in this chapter and chapters that follow. As stated previously, we are using 1.02 mgd as the design flow.

Table 3-2: Design Criteria

Parameter	South Lagoon	North Lagoon
Daily Flow, mgd Current Average Design	 0.27 0.60	 0.12 0.42
Peaking Factor*	4	4
Peak Hourly Flow, mgd	2.40	1.68
BOD_5, mg/L (lbs/day)	220 (1,100)	290 (1,020)
TSS, mg/L (lbs/day)	240 (1,200)	310 (1,090)
TKN, mg/L (lbs/day)	47 (235)	57 (200)
* The peaking factor indicated is typical for municipal systems and is being used as a design value. Historical effluent flow data indicates that the peaking factor for the North Lagoons is significantly higher although data for influent flow is not available.		

3.2 North Wastewater Treatment Lagoon Facility

For the North Lagoons, we recommend the following to improve reliability of plant operations and treatment for BOD and ammonia removal. We are designing for total nitrogen removal even though we only expect an ammonia limit.

Influent Flow Metering and Sampling – We recommend that the City install flow metering and an automatic composite sampler for plant influent. This will improve collection of influent data (flow and pollutant concentrations) to help the City understand current conditions and be better prepared for addressing future regulations. The data we used for this evaluation were compiled from infrequent grab samples that were not correlated to instantaneous flow readings. Therefore, pollutant loadings, peak hourly flow, and diurnal patterns could not be determined. Further, the maximum and average historical influent concentrations for the North Lagoons are higher than typical domestic wastewater concentrations. It is important to try to ascertain the reasons for the above average concentrations, and better sampling would help in this determination. Before any plans for plant improvements are assembled, we recommend that data collection be improved. We can assist with selection of an automatic sampler if desired by the City. Note, the automatic sampler just takes the samples, either composite or discrete. These samples would need to be sent to a third

party for testing similar to the current mode of operation for monthly compliance samples.

A preliminary recommendation for a flow meter would be to install a Parshall flume upstream of the influent well in a vault below grade. A Parshall flume is reasonably accurate and relies on an ultrasonic flow meter to measure depth and calculate flow. Another common meter used for measuring influent, a magnetic flow meter on the discharge of the pump, is also a possibility worth investigating in detailed design.

Influent Screening – Currently, the North Lagoons rely on manually cleaned basket screens with 2-inch openings to remove potentially damaging and nuisance debris from the stream as influent enters the wet well. There are two influent sewers that enter the wet well, a 24-inch sewer from the east and an 18-inch sewer from the north, and each of these sewers have their own basket screen. See Photo 1 in **Appendix F** for a picture of the current wet well configuration. The basket screens collect objects larger than 2-inches and allow smaller particles to enter the wet well. Some of the items that make it through the screens are rags, sanitary wipes, and stringy materials that can clog influent pump impellers and the floating surface aerators.

Clogging is a not only a nuisance to City staff, it can be detrimental to the process if the clog causes equipment to shut down for any significant length of time. In the past, equipment failure has resulted in permit violations. We recommend replacing the basket screens with an automatically cleaned mechanical screen. Various products exist for automatic screening, but the two most appropriate technologies for this application are vertical auger screens and vertical bar screens. An example of each is shown in **Figure 3-1**.

Rather than installing a new mechanical screen over each influent pipe, we recommend reconfiguring the influent pipes so that all flow enters the wet well through a single pipe and single screen. It will be evaluated in detailed design whether the screen(s) will

be able to fit in the wet well without disrupting the ability to remove pumps. Another well (screening manhole) may have to be constructed off to the side in order to accommodate the addition of the screen. A conceptual layout showing a potential location of a new flow metering structure and screen well is provided in **Figure 3-2**.

A final direction would ultimately have to be determined during detailed design of the improvements. The advantages of a mechanical screen are threefold. First, a mechanical screen like the one shown will have finer openings (3/8-inch or smaller), so the screening removal efficiency will increase and fewer objects will make it to the downstream processes. Clogging of influent pumps will be drastically reduced if not eliminated altogether, thereby making the treatment plant more reliable. Secondly, automated screens do not require an operator to hook a basket to a jib crane to lift and manually clean. This eliminates an unpleasant and potentially unsafe job. Lastly, a mechanical screen like the ones shown will automatically discharge the screenings into a disposal container. It is recommended that the screenings be deposited directly into a dumpster that has enough capacity to hold at least a weeks' worth of material so that more frequent attention by plant staff is not required. The auger type has the added feature of integral compacting of the screenings collected and therefore, the volume of material will be manageable even with the increased capture rate. A bagger can be added to the discharge chute if desired by the City which can further contain odors.

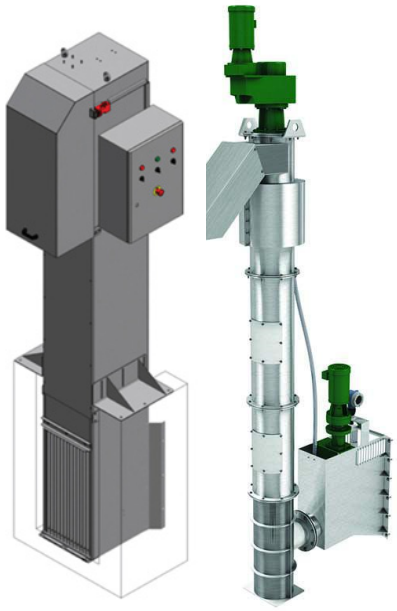
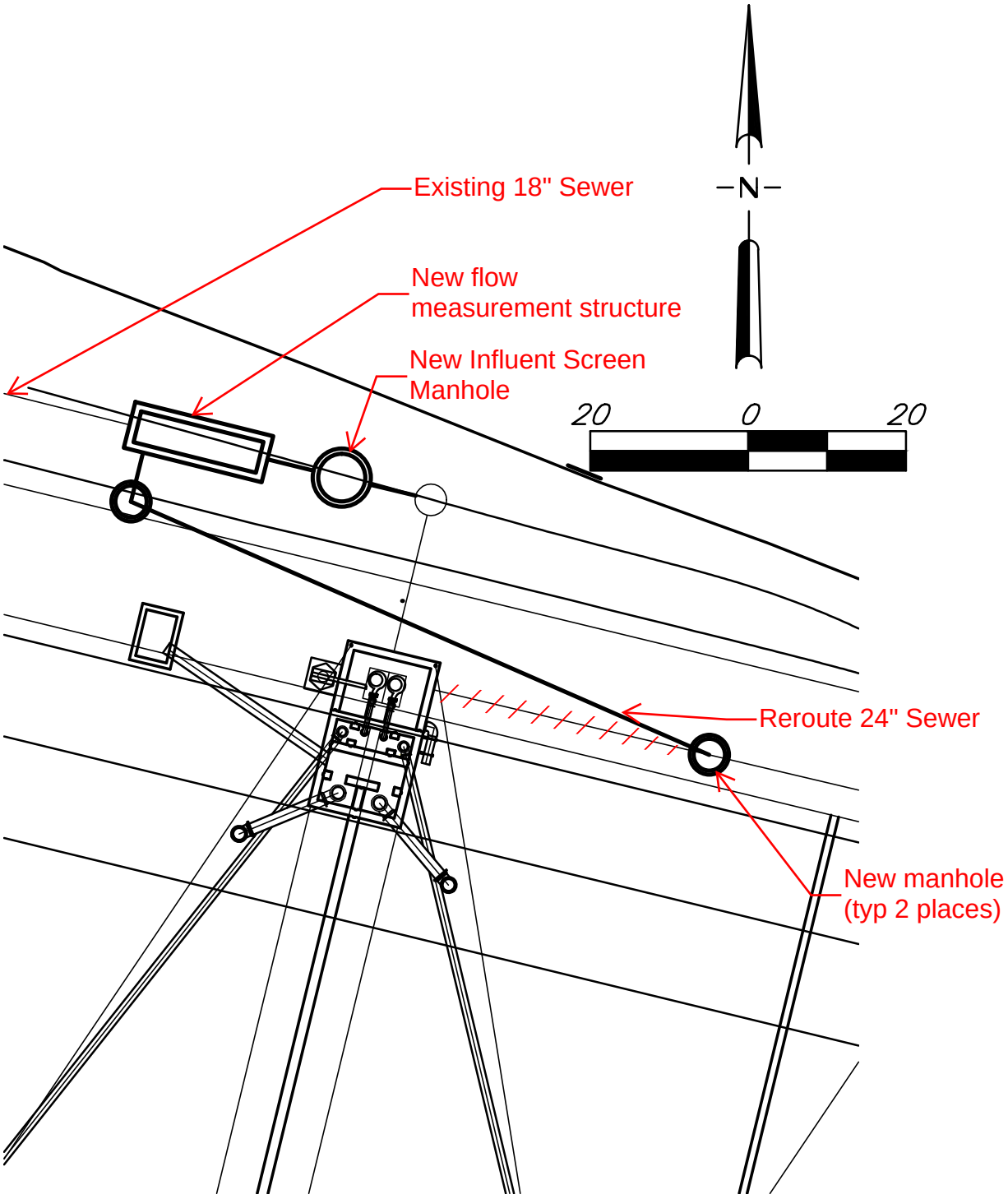


Figure 3-1: Screen Technologies. Screentec Vertical Bar Screen, Aqualitec (Left); Vertical Auger Monster, JWC Environmental (Right)

Aerated Cells Configuration and Aeration Equipment – As discussed previously, nitrification, biological oxidation of ammonia to nitrate, relies on microorganisms that go dormant in cold liquid temperatures. The relatively long hydraulic retention time of



NORTH LAGOONS INFLUENT FLOW MEASUREMENT AND SCREENING CONCEPT

FIGURE 3 - 2

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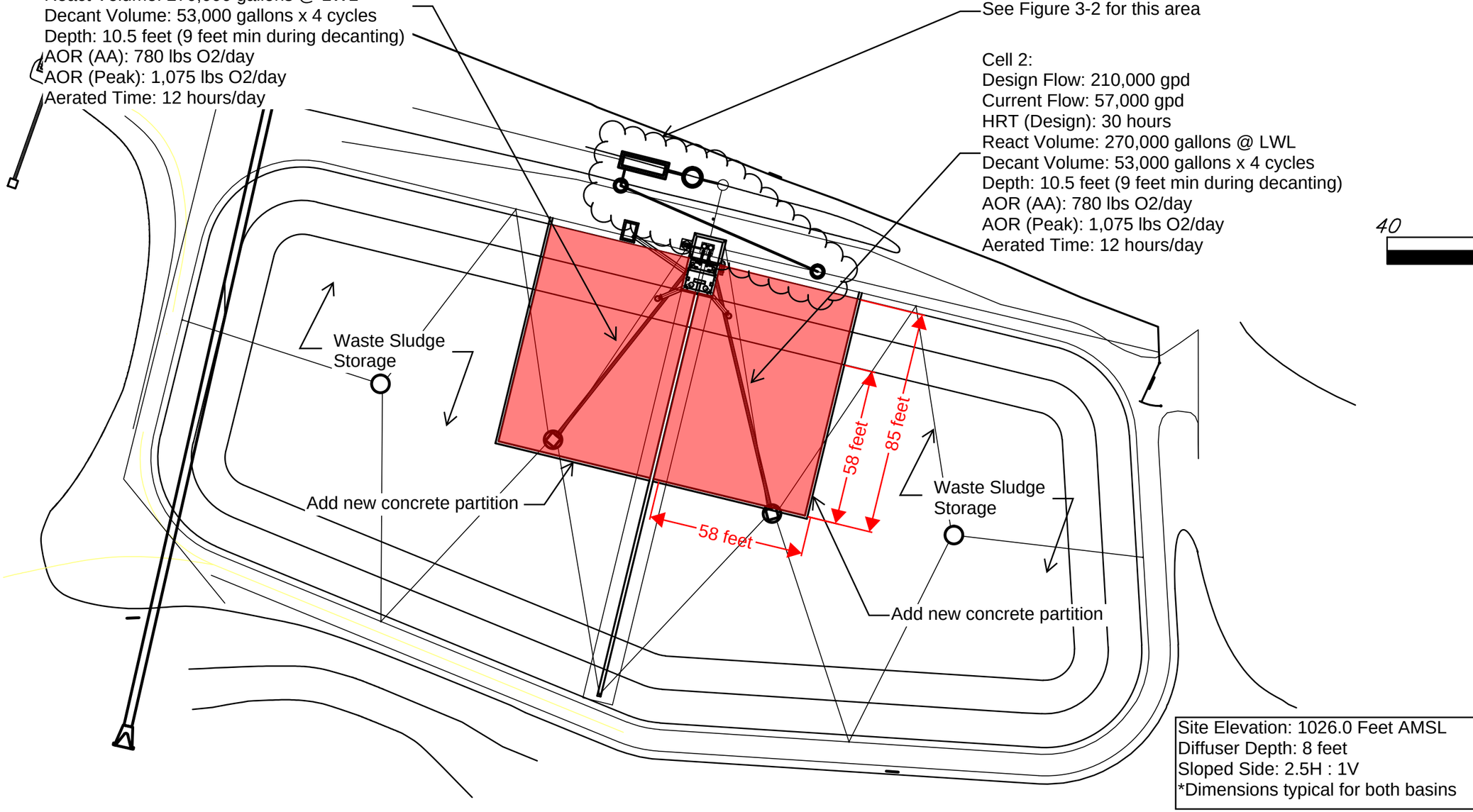
the aerated cells and the mechanical aeration equipment which splashes the liquid into the cold, ambient air drive liquid temperatures down. We recommend that the basin size be reduced by constructing concrete baffle walls within the basin as shown in **Figure 3-3**. The smaller basin will have a shorter HRT and therefore the wastewater would not have as much time to lose heat to the atmosphere during the time it is in the basin. The smaller basin allows for the solids inventory including the concentration of nitrifying bacteria to increase making the treatment process more efficient.

Instead of using mechanical surface aerators, we recommend that aeration be accomplished through diffused air, and mixing for anoxic cycles be accomplished by submersible mixers. Air would be supplied by blowers that compress ambient air thereby increasing the air temperature before introducing it to the water. Further, diffused air does not splash liquid into the cold, ambient air to entrain oxygen, and therefore heat is better retained. Preliminary process calculations were completed and the following **Table 3-3** summarizes the conceptual sizing of the recommended system components for a diffused air process system. Calculations have been included in **Appendix E**.

Table 3-3: Conceptual Sizing of Aeration Cells and Equipment

Cell Volume, each React Decant	323,000 gallons @ max water level 270,000 gallons @ low water level 53,000 gallons
Hydraulic Retention Time at Design Flow	30 hours
Depth Range	10.5 feet (9 feet min)
Actual Oxygen Required per cell, AA (Peak)	780 lbs O_2/day (1,075 lbs O_2/day)
Aerated Time per day	12 hours/day
Airflow per cell, AA (peak)	1,530 scfm (2,100 scfm)
Blowers Type Number Capacity, each Motor Size Drive	 Positive Displacement 3 (1 duty per basin, 1 shared standby) 2,100 scfm 100 hp Variable Frequency
Diffuser Type	Fine bubble, fixed
Supplemental Mixer Type	Submersible Propeller

Cell 1:
Design Flow: 210,000 gpd
Current Flow: 57,000 gpd
HRT (Design): 30 hours
React Volume: 270,000 gallons @ LWL
Decant Volume: 53,000 gallons x 4 cycles
Depth: 10.5 feet (9 feet min during decanting)
AOR (AA): 780 lbs O2/day
AOR (Peak): 1,075 lbs O2/day
Aerated Time: 12 hours/day



Site Elevation: 1026.0 Feet AMSL
Diffuser Depth: 8 feet
Sloped Side: 2.5H : 1V
*Dimensions typical for both basins

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CITY OF LOUISBURG, KANSAS
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FIGURE 3-3: NORTH LAGOON – PROPOSED MODIFICATIONS

Alternatively, another technology could be utilized to transfer oxygen to the basin. AquaTec makes a proprietary product known as the Submersible-Aerator-Mixer (SAM) unit that relies on compressed air supplied by blowers and a submersible, slow-speed mixer. During aerated cycles, the mixer will mix the contents of the basin while distributing the air supplied by the blowers. During anoxic periods, the unit will continue to mix without air from the blowers, and during decant cycles, both the air and the submersible mixer will be off. Since this system is proprietary and the project is most likely going to be funded through the State Revolving Fund (SRF) program, it cannot be solely selected as the process to design the improvements around. It can however, be competitively bid against the diffused air alternative mentioned above. For the purposes of this report, assume that Alternative No. 2 will consist of one of these systems, but the specific technology will be chosen during the preliminary design phase.

The proposed process improvements to the aerated cells would not change the mode of operation. The current batch sequence of operation shown in Figure 2-2 would still be utilized with the new configuration and equipment, only instead of three 8-hour cycles per day, we recommend four 6-hour cycles. With one more cycle, adequate decant volume can be provided for the design flow with a smaller basin footprint.

More sophisticated instrumentation and controls are also recommended, such as a dissolved oxygen (DO) probe and an oxidation reduction potential (ORP) analyzer, to control aeration cycle length and "prove" anoxic conditions. The instrumentation can help with automatic control, process verification, and giving valuable real-time feedback to operators to make sure they have the right information to make adjustments when needed. The cycles would still have the back-up of using a pre-programmed, adjustable timer for each mode.

In addition to the other improvements mentioned, the influent pipe will need to be modified to direct influent into the reconfigured cells. Further, during design it is recommended that a floating decanter be evaluated for incorporation with the basin

effluent pipe to ensure that large amounts of solids are not sent to Cell No. 3 on a regular basis during decanting.

Sludge Management – To maintain a proper solids inventory in the aerated cells, sludge will need to be periodically wasted. Wasting can occur during decant periods by leaving the mixer on and allowing solids to be sent downstream to the facultative cells, or waste sludge can directly be pumped into a separate storage cell that would need to be periodically cleaned out. For solids storage, we recommend using the remaining area of the original aerated cells that will be physically separated from the SBR cells with the new concrete partition wall. A submersible pump in the aerated cell could simply pump mixed liquor over the wall periodically. This could be simply controlled using a timer, manually based on operator testing of the mixed liquor solids concentration, or more sophisticated analyzers could be installed that would provide real time monitoring of the solids concentration thereby allowing automated wasting with the appropriate logic in place.

Redundant Power – As previously discussed, the facility has had multiple permit violations. In discussions with KDHE, not having a back-up power source has impacted the facilities ability to consistently meet permit limitations. It is recommended that a redundant power source be added for the event of power failure as currently only a primary power feed exists with no redundancy. KDHE Minimum Standards of Design require that standby power capability should be provided for all modifications or additions to facilities. Standby power can be accomplished by running a second, dedicated power feed to the plant from the utility, a permanently mounted on-site diesel (or natural gas) generator, or adding provisions to allow for the connection of a portable generator. Based on the connected and running loads from the existing and recommended equipment for these improvements, we have preliminarily determined that a 350 kilowatt (kW) generator would be required for the North Lagoons. A conceptual level cost comparison for each redundant power option is provided in **Table 3-4**.

Table 3-4: Redundant Power Options

Redundant Power Source	Opinion of Probable Installed Cost
Second Dedicated Feed from KCP&L with transfer switch	* Estimated at $250,000 per mile plus $13,000 for the transfer switch.
Permanently mounted, on-site Diesel Generator (350 kW) with transfer switch	$160,000
Portable trailer-mounted Diesel Generator (350 kW) with transfer switch	** $125,000
* Appears to be cost prohibitive. Will be confirmed in detailed design. ** Total cost of this option is $250,000, but the gen set will be shared with South Lagoons.	

The most economical approach is to use a trailer-mounted generator and share it between the two wastewater treatment facilities. However, this approach does not truly provide 100-percent redundancy for both plants at the same time. There is still a risk of not having backup power at one of the facilities should they both lose power simultaneously. Therefore, at this time, a permanently mounted on-site diesel generator is recommended for the North Lagoons, and this option has been included in the cost opinion for Alternative No. 2.

Sludge Cleanout in Facultative Cells – In the initial meeting with the City, it was discussed that the existing facultative cells (Cells 3, 4, and 5) need to have the sludge cleaned out. It is recommended that sludge cleanout is completed as part of the improvements project and therefore, a cost for cleanout of Cells 3, 4, and 5 has been included in the opinion of probable project costs.

3.3 South Wastewater Treatment Lagoon Facility

For the South Lagoons, we recommend the following to improve reliability of plant operations and treatment for BOD and ammonia removal. We are designing for total nitrogen removal even though we only expect an ammonia limit. Most of these recommendations mirror the discussions provided under the North Lagoons with a few exceptions. Some of the detailed discussion of advantages and benefits of these recommendations have not been included in this section. Refer to the North Lagoons section for those discussions.

Influent Flow Metering and Sampling – Similar to the North Lagoons, we recommend that the City install flow metering and an automatic composite sampler for plant influent. Before any plans for plant improvements are assembled, we recommend that data collection be improved. We can assist with selection of an automatic sampler if desired by the City. Note, the automatic sampler just takes the samples, either composite or discrete. These samples would need to be sent to a third party for testing similar to the current mode of operation for monthly compliance samples.

A preliminary recommendation for a flow meter would be to install a Parshall flume upstream of the influent well in a vault below grade. A Parshall flume is reasonably accurate and relies on an ultrasonic flow meter to measure depth and calculate flow. Another common meter used for measuring influent, a magnetic flow meter on the discharge of the pump, is also a possibility worth investigating in detailed design.

Influent Screening – Currently, the South Lagoons rely on a manually cleaned basket screen with 2-inch openings to remove potentially damaging and nuisance debris from the stream as influent enters the wet well. Influent flows through the coarse basket screen into a wet well from a 16-inch gravity sewer from the west. See Photos 20, 21, and 22 in **Appendix F** for pictures of the current wet well and screen configuration. The basket screen collects objects larger than 2-inches and allows smaller particles to enter the wet well. Some of the items that make it through the screens are rags, sanitary wipes, and stringy materials that can clog influent pump impellers and the floating surface aerators. According to the City, the South Lagoons have experienced more problems with clogging and ragging in the equipment than the North Lagoons.

We recommend replacing the basket screen with an automatically cleaned mechanical screen, such as one of the units shown in Figure 3-1, or a similar screen by another manufacturer. It appears that the South Lagoon influent wet well is not adequately sized to accommodate the installation of a mechanical screen and another well will have to be constructed off to the side in order to accommodate the addition of the screen.

Influent Pumps – In the initial discussions with City staff, it was indicated that the pumps in the South Lagoons pump station clogged frequently. It is recommended that the existing pumps be replaced concurrently with the other plant upgrades recommended in this report. As part of preliminary design it is recommended that the alternative of constructing a new wet well to accommodate both new pumps and an influent mechanical screen be investigated.

Aerated Cells Configuration and Aeration Equipment – Similar to the North Lagoons, we recommend that the basin size be reduced by constructing concrete baffle walls within the basins as shown in **Figure 3-4**. The smaller basins will have a shorter HRT and therefore the wastewater would not have as much time to lose heat to the atmosphere during the time it is in the basin. The smaller basin allows for the solids inventory including the population of nitrifying bacteria to increase making the treatment process more efficient. There is also a possibility that the 2 aerated cells could be created within one of the existing basins and the other basin dedicated for sludge storage. This option will be evaluated in detailed design.

Instead of using mechanical surface aerators, we recommend that aeration be accomplished through diffused air, and mixing for anoxic cycles be accomplished by submersible mixers. Air would be supplied by blowers that compress ambient air thereby increasing the air temperature before introducing it to the water. Further, diffused air does not splash liquid into the cold, ambient air to entrain oxygen, and therefore heat is better retained. Preliminary process calculations were completed and the following **Table 3-5** summarizes the conceptual sizing of the recommended system components. Calculations have been included in **Appendix E**.

Cell 1:
Design Flow: 300,000 gpd
Current Flow: 132,000 gpd
HRT (Design): 40 hours
Volume: 500,000 gallons @ LWL
Decant Volume: 75,000 gallons x 4 cycles
Depth: 10 feet (9 feet min during decanting)
AOR (AA): 1,035 lbs O2/day
AOR (Peak): 1,175 lbs O2/day
Aerated Time: 12 hours/day

Cell 2:
Design Flow: 300,000 gpd
Current Flow: 132,000 gpd
HRT (Design): 40 hours
Volume: 500,000 gallons @ LWL
Decant Volume: 75,000 gallons x 4 cycles
Depth: 10 feet (9 feet min during decanting)
AOR (AA): 1,035 lbs O2/day
AOR (Peak): 1,175 lbs O2/day
Aerated Time: 12 hours/day

N

30 0 30

975

Waste Sludge Storage

Add new concrete partition

Add new concrete partition

974

60 feet

105 feet

80 feet

105 feet

Waste Sludge Storage

Site Elevation: 971.0 Feet AMSL
Diffuser Depth: 8 feet
Sloped Sides: 2.5H : 1V
*Dimensions typical for both basins

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CITY OF LOUISBURG, KANSAS
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FIGURE 3-4: SOUTH LAGOON - PROPOSED MODIFICATIONS

Table 3-5: Conceptual Sizing of Aeration Cells and Equipment

Cell Volume, each React Decant	575,000 gallons @ max water level 500,000 gallons @ low water level 75,000 gallons
Hydraulic Retention Time at Design Flow	40 hours
Depth Range	10 feet (9 feet min)
Actual Oxygen Required per cell, AA (Peak)	1,035 lbs O_2/day (1,175 lbs O_2/day)
Aerated Time per day	12 hours/day
Airflow per cell, AA (peak)	1,850 scfm (2,300 scfm)
Blowers Type Number Capacity, each Motor Size Drive Type	 Positive Displacement 3 (1 duty per basin, 1 shared standby) 2,300 scfm 125 hp Variable Frequency
Diffuser Type	Fine bubble, fixed
Supplemental Mixer Type	Submersible Propeller

As discussed for the North Lagoons, an alternative technology made by AquaTec could be utilized to transfer oxygen to the basin. The proprietary product known as the SAM unit relies on compressed air supplied by blowers and a submersible, slow-speed mixer. For the purposes of this report, assume that Alternative No. 2 will consist of one of these systems, but the specific technology will be chosen during the preliminary design phase.

The proposed process improvements to the aerated cells would not change the mode of operation. The current batch sequence of operation shown in Figure 2-2 would still be utilized with the new configuration and equipment, only instead of three 8-hour cycles per day, we recommend four 6-hour cycles. With one more cycle, adequate decant volume can be provided for the design flow with a smaller basin footprint.

More sophisticated instrumentation and controls are recommended, such as a DO probe and an ORP analyzer, to control aeration cycle length and "prove" anoxic conditions. The instrumentation can help with automatic control, process verification, and giving valuable real-time feedback to operators to make sure they have the right information to make adjustments when needed. The cycles would still have the back-up of using a pre-programmed, adjustable timer for each mode.

During design it is recommended that a floating decanter be evaluated for incorporation with the basin effluent pipe to ensure that large amounts of solids are not sent to Cell No. 3 on a regular basis during decanting.

Sludge Management – To maintain a proper solids inventory in the aerated cells, sludge will need to be periodically wasted. Wasting can occur during decant periods by leaving the mixer on and allowing solids to be sent downstream to the facultative cells, or waste sludge can directly be pumped into a separate storage cell that would need to be periodically cleaned out. For solids storage, we recommend using the remaining area of the original aerated cells that will be physically separated from the SBR cells with the concrete partition wall. A submersible pump in the aerated cell could simply pump mixed liquor over the wall periodically. This could be simply controlled using a timer or more sophisticated analyzers could be installed that would provide real time monitoring of the solids concentration thereby allowing automated wasting with the appropriate logic in place.

Improved Primary Feed from Utility and Addition of Redundant Power – Currently, the South Lagoons receive single phase power from KCP&L with conversion to 3-phase on site with a static phase converter **(See Photos 17 and 18 in Appendix F)**. The primary power feed to the site has not been reliable and it is recommended that 3-phase power from KCP&L be extended to the site. In conversation with KCP&L staff, the nearest 3-phase power to the treatment plant site is near the intersection of 14th Street and Rogers Road – about 1 mile north of the South Lagoons. The KCP&L representative stated that installing a new service line costs approximately $250,000 per mile. In discussions with KDHE, they indicated that many of the effluent violations can be attributable to only having single phase power to the site.

In addition, it is recommended that a redundant power source be added for the event of power failure. Currently, only a primary power feed exists with no redundancy. KDHE Minimum Standards of Design require that standby power capability should be

provided for all modifications or additions to facilities. Standby power can be accomplished by running a second, dedicated power feed to the plant from the utility, a permanently mounted on-site diesel (or natural gas) generator, or adding provisions to allow for the connection of a portable generator. In discussions with KCP&L, running a secondary feed would require approximately 1.3 miles of service line at an estimated cost of $325,000.

Based on the connected and running loads from the existing and recommended equipment for these improvements, we have preliminarily determined that a 350 kilowatt (kW) generator would be required for the South Lagoons. A conceptual level cost comparison for each redundant power option is provided in **Table 3-6**.

Table 3-6: Redundant Power Options

Redundant Power Source	Opinion of Probable Installed Cost
Second Dedicated Feed from KCP&L with transfer switch	$338,000
Permanently mounted, on-site Diesel Generator (350 kW) with transfer switch	$160,000
Portable trailer-mounted Diesel Generator (350 kW) with transfer switch	** $125,000
* Appears to be cost prohibitive. Will be confirmed in detailed design. ** Total cost of this option is $250,000, but the gen set will be shared with South Lagoons.	

The most economical approach is to use a trailer-mounted generator and share it between the two wastewater treatment facilities. However, this approach does not truly provide 100-percent redundancy for both plants at the same time. There is still a risk of not having backup power at one of the facilities should they both lose power simultaneously. Therefore, at this time, a permanently mounted on-site diesel generator is recommended for the South Lagoons, and this option has been included in the cost opinion for Alternative No. 2.

3.4 Breakpoint Chlorination as a Backup

If Alternative No. 2, modifying the existing lagoons, is chosen then it will be important to consider adding provisions in the design of each plant for a future breakpoint

chlorination (chemical polishing system) to remove ammonia during process upsets or cold conditions when nitrifying bacteria may be lost. This polishing system would not need to be constructed during the first phase of improvements. After the improvements are in operation and effluent data are available, then a determination can be made as to whether or not a breakpoint chlorination system is necessary. We have successfully designed and implemented breakpoint chlorination systems for removal of ammonia in several Missouri and Oklahoma communities. Basic system sizing and requirements can be examined during later phases of design.

3.5 Engineers Opinion of Probable Costs

The opinions of probable costs are for the design and construction of the listed improvements and include building, equipment, installation, civil site work, piping, electrical, instrumentation, engineering, contractor's mark-ups, and contingency. Contractor mark-ups were assumed to be 12-percent of the total construction cost and include field overhead, office administration, subcontractor profit, prime contractor overhead and profit, and insurance. However, these costs do not include wastewater characterization, treatability testing, pilot testing, special excavation requirements, special permitting requirements, removal and disposal of hazardous materials, sales tax, financing expenses, or other non-construction costs. These opinions assume that the equipment can be powered by existing electrical supply and that a new substation is not required.

A 25-percent contingency allowance is included to cover all types of unaccounted-for project costs resulting from conditions, details or components which are not normally known or determined until final detailed design. The conceptual opinions of probable costs are included in **Table 3-7** below. For a detailed breakdown of the cost opinions, refer to **Appendix G**.

Table 3-7: Summary of Costs for Alternative No. 2

North Lagoon Improvements	$2,140,000
Lagoon Cleanout*	$240,000
South Lagoon Improvements	$2,500,000
Three-Phase Power to South Lagoons**	$250,000
Construction Total	$5,130,000
Engineering and Construction Administration (20%)	$930,000
Total Project Cost	**$6,060,000**

* Lagoon cleanout for the North Lagoons assumes an average depth of 18-inches of 5% sludge across the floor of Cells 3, 4 and 5. Pricing was taken from a recent project where a contractor removed sludge at a cost of $170 / dry ton.
** Cost provided by Kansas City Power and Light, July 14, 2015.

4. Alternative No. 3 - Biological Nutrient Removal (BNR) Facility

4.1 General

A feasibility level evaluation of a single 1.02 MGD BNR treatment plant is being provided for comparison purposes to improving the existing lagoon facilities. The South Lagoon site is recommended as a combined treatment site because it is located outside of the community, is large enough for a mechanical treatment facility, and is generally downstream from the North Facility. The North Lagoon Facility is located too close to the City of Louisburg and does not have available space for an expansion.

Larkin Lamp Rynearson designed and bid a very similar project for the City of Odessa, Missouri. The project includes a 1 MGD BNR plant constructed on an existing lagoon site. The Odessa treatment plant, when completed, will also treat flow conveyed from a lagoon located almost 3-miles south, and in general, is very similar to a facility that would be recommended for the City of Louisburg. It too was funded through the State Revolving Fund (SRF) loan program. The 1 MGD BNR treatment facility bid in December 2014 for $9.5 million dollars. The related collection system project bid in August 2015 for $2 million dollars. These actual bid prices will be used to develop a feasibility level cost opinion and adjusted to the specifics of a recommended facility for the City of Louisburg.

4.2 Design Parameters

The design parameters for a single BNR facility are summarized in **Table 4-1**. The influent parameters are based on the existing data for each facility and calculated by adding the pounds per day loading for each site presented in Table 3-2.

Table 4-1: Design Parameters for a Single BNR Facility

Average Daily Flow, mgd	1.02
Peaking Factor	4
Peak Design Flow, mgd (gpm)	4.08 (3,300)
Influent Characteristics	
BOD_5, mg/L (lbs/day)	250 (2,120)
TSS, mg/L (lbs/day)	270 (2,290)
Total Nitrogen, mg/L (lbs/day)	50 (435)
Design Effluent Quality	
BOD, mg/L,	10
TSS, mg/L,	10
Ammonia, mg/L	Winter < 3.57 mg/L; Summer <1.02 mg/L
E. coli, colonies/100 ml	As permitted by KDHE

4.3 BNR Treatment Plant

A new 1 MGD WWTP would include the following unit processes as shown schematically on **Figure 4-1**.

- Influent pump station (cost specific to Louisburg, not included in Odessa)
- Headworks including:
  - Grit chamber (sized for 4 mgd peak flow)
  - Fine bar screen (sized for 4 mgd peak flow)
  - Building
- Advanced treatment (BNR) aeration basins, 2 operated in parallel with supplemental mixing, fine bubble aeration, and dissolved oxygen control.
- Secondary clarifiers, 2 operated in parallel (including building and electrical)
- Waste activated sludge (WAS) and return activated sludge (RAS) pump station
- Ultraviolet (UV) Disinfection
- Non-potable plant water system
- Office, laboratory, and control building
- Backup generator
- Miscellaneous flow splitting structures and cascade step effluent re-aeration
- Site work
- Yard piping
- Electrical
- Instrumentation and controls
- No sludge digestion, dewatering, or storage building.
- Electric power upgrade to 3 phase (cost specific to Louisburg)

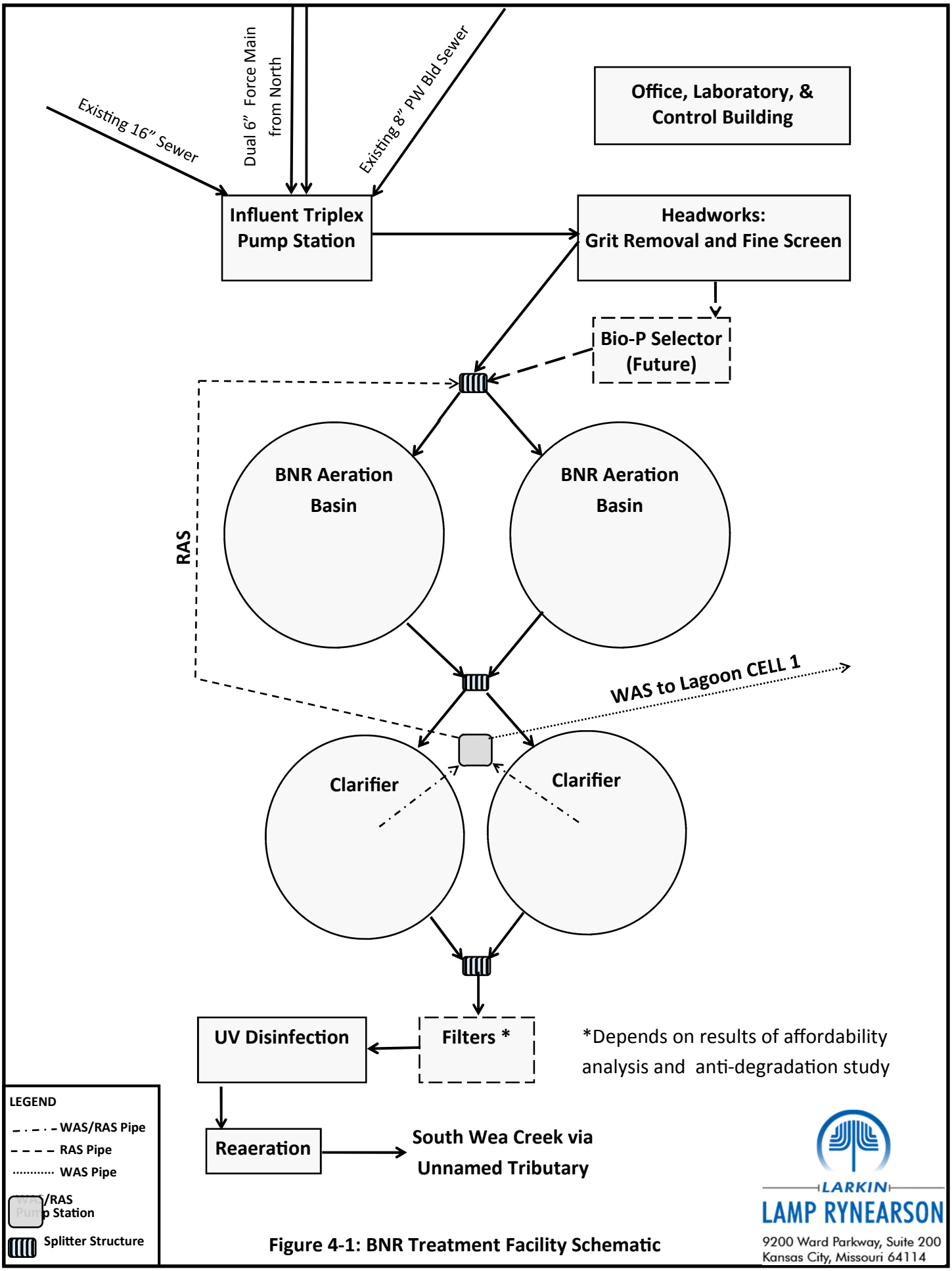


Figure 4-1: BNR Treatment Facility Schematic

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Budget costs are summarized in **Section 4.5**.

4.4 Wastewater Collection North to South Treatment Site

Sewage from the North Lagoon site would be conveyed to the single BNR facility at the South Lagoon site. The peak flow to the North Lagoon as discussed previously is unknown since the facility does not measure influent flow. To not over-build the pump station and ensure no sanitary sewer overflows occur at the North Pump Station site, Cell 1 would be reduced in size for a peak flow equalization basin. Initial estimate of size is 1.5 to 2 million gallons. If flows exceed the capacity of the pump station or a power outage occurred, flow would divert by gravity into Cell 1 equalization basin and flow back into the wet-well by gravity after the emergency event is over. The remainder of the lagoons would be closed, per KDHE and EPA requirements in the facilities NPDES permit. For the feasibility level probable cost opinion, a 300 gpm (the North Lagoons permitted design flow) triplex pump station is proposed. Dual 6-inch force mains conveying raw sewage from the North Lagoons site to the new BNR facility is recommended. In discussions with the City, it may be possible to pump to a manhole near the intersection of 8th and Rogers Road where the wastewater could flow by gravity to the new plant at the South Lagoons site. Feasibility of this option will be investigated during detailed design.

At the design flow only one 6-inch force main would be utilized, and the velocity in the force main will be 3.3 fps. The second 6-inch force main would be installed in the same trench for future expansion capability. Additional pipe material in the same pipe trench is an economic way to handle future expandability.

Table 4-2: North Pump Station Design Parameters

Effluent Flow, MGD (gpm) (from Table 2-2). Average Maximum Month Instantaneous Peak from hydrograph	 0.114 (80) 0.290 (200) 1.450 (1,000)
Pump Station Capacity, MGD (gpm)	0.42 (300)
Flow Equalization, MG	1.5 to 2
Force main diameter, in.	6

4.5 Engineers Opinion of Probable Costs

The budget cost for the BNR facility in **Table 4-3** is based on the contractor's schedule of values (SOV) from the similar Odessa, Missouri 1 MGD BNR treatment facility recently designed by Larkin Lamp Rynearson. The $9.5 million dollar project was modified by removing the sludge processing unit costs and adding an influent pump station and three phase power service. The budget cost for the North Pump Station and North force mains are calculated based on average unit cost from the similar project that bid on August 4, 2015. Both construction costs include: construction contingency (15-percent for the BNR Treatment Facility and 25-percent for the North Pump Station and force mains); 12-percent for contractor bonds, insurance, mobilization and profit; and are inflated at 2-percent for 3 years for the plant and 2 years for the conveyance. Total project costs include topographical survey, design engineering, construction phase engineering and observation, and funding procurement and coordination support. The two projects together are Alterative No. 3.

All projects submitted for funding since October 2014 through the Kansas Water Pollution Control Revolving Fund program (KWPCRF) are required to develop a Fiscal Sustainability Plan (FSP). The FSP is to include:

- An inventory of critical treatment works assets
- A written plan to evaluate and coordinate the condition and performance of all treatment, pumping, and collection system assets.
- A certification from the borrower that water and energy conservation efforts will be implemented as part of the plan.
- A plan for maintaining, repairing, rehabilitating, and, as necessary, replacing the treatment works and a plan for funding such activities.

Development of the FSP is eligible for payment by the KWPCRF loan. This additional effort along with environmental clearances including a Facility Plan with anti-degradation study, funding support to the City, coordination with KWPCRF, and utility rate evaluation are estimated at 1.5-percent in the Alternative No. 3 Total Project Cost.

Table 4-3: Alternative No. 3 Opinion of Probable Cost

1.02 MGD BNR Facility Unit Process			**Budget Cost w/ Filters [1]**	**Budget Cost w/o Filters [1]**
Influent pump station (1.02 MGD avg, 4 MGD peak)			$500,000	$500,000
Headworks			$700,000	$700,000
BNR aeration basins			$2,000,000	$2,000,000
Clarifiers and RAS/WAS pump station			$1,300,000	$1,300,000
UV and non-potable plant water system			$700,000	$700,000
Effluent Filters			$500,000	
Office, laboratory, and electrical building			$400,000	$400,000
Backup generator			$200,000	$200,000
Misc. structures			$350,000	$350,000
BNR Construction Subtotal			*$6,650,000*	*$6,150,000*
Site work (10% of construction subtotal)			$665,000	$615,000
Yard piping and process mechanical piping and valves (12%)			$800,000	$740,000
Electrical (6%)			$400,000	$370,000
Instrumentation and controls (5%)			$330,000	$310,000
Electrical 3-phase power service (KCP&L)			$250,000	$250,000
Contractor bonds, insurance, mobilization, and profit (12%)			$800,000	$740,000
Construction Contingency (15%)			$1,485,000	$1,380,000
BNR Construction Total			$11,380,000	$10,555,000
Inflation factor, 2% for 3 years			1.0642	1.0642
BNR Construction total with inflation			***$12,110,000***	***$11,230,000***
North Pump Station and North Force Main				
	Unit	Unit Price	Total	Total
Pump station including VFDs, site work, yard piping, and ancillary equipment	1 Each	$300,000/Each	$300,000	$300,000
Two, 6-inch Class 200 PVC force mains	11,000 LF	$80/LF	$880,000	$880,000
Tracer Wire	22,000 LF	$2/LF	$44,000	$44,000
Air Release Valve and Vault	8 Each	$10,000/Each	$80,000	$80,000
Road Crossings, Directional Drill	800 LF	$400/LF	$320,000	$320,000
Driveway Crossings	10 Each	$5,000/Each	$50,000	$50,000
North PS and FM Construction subtotal			*$1,674,000*	*$1,674,000*
Electrical and Instrumentation (6%)			$100,000	$100,000
Construction Contingency (25%)			$444,000	$444,000
Contractor bonds, insurance, mobilization, and profit (12%)			$200,000	$200,000
North PS and FM Construction Total			*$2,418,000*	*$2,418,000*
Inflation factor, 2% for 2 years			1.0404	1.0404
North PS and FM Construction Total with Inflation			***$2,515,000***	***$2,515,000***
Total Project Construction Total Cost (BNR and PS/FM)			***$14,625,000***	***$13,745,000***
Topographical survey and design engineering (12%)			$1,755,000	$1,650,000
SRF financing support including Fiscal Sustainability Plan, utility rate evaluation, Affordability Analysis and Anti-degradation Study (1.5%)			$220,000	$205,000
Construction phase engineering and observation (6%)			$880,000	$825,000
Alternative No. 3 Total Project Cost			***$17,480,000***	***$16,425,000***

Note:
1. Whether or not filters are included in the new mechanical WWTP is dependent on the results of the Affordability Analysis and Anti-degradation study that need to be completed.

The conservative total project cost for Alternative No. 3 is estimated at $17.5 million dollars which includes the cost of effluent filters. Cost of financing for a 20 year SRF loan at 2% interest rate (factor 0.0612) would be approximately $1,070,000 dollars per year. If the Affordability Analysis demonstrates that including filters makes the project unaffordable for the community or if the Anti-degradation study shows that the effluent limitations for total phosphorus don't require effluent filters, then the cost of the project can be reduced to approximately $16.4 million.

In addition to the construction capital cost, a mechanical plant will have operation and maintenance (O&M) annual cost significantly higher than Alternate No. 2 annual costs. Based on previous experience, it is anticipated that 1.5 full time equivalent staff persons will be required for a mechanical plant. However, it is not anticipated that this will be a facility that is manned 24 hours/day as the instrumentation and controls will allow the plant to run in auto overnight and over the weekend. Further, the plant operator certification will likely need to change to a higher level of certification due to the complexity of the plant when compared to operating a lagoon system. Initial investigations indicate that an advanced facility incorporating nutrient removal will most likely require a Class IV certification. Depending on the permitted effluent limits, it may be possible that only a Class III certification would be required. This will need to be determined as the project progresses into design.

O&M budget cost for the Odessa 1 MGD BNR facility, excluding sludge processing, is estimated at $420,000 per year. This would be in the same order of magnitude for the City of Louisburg. Specific O&M cost were not calculated for this feasibility level evaluation.

The total increase in annual costs for capital improvements debt service and O&M would be approximately $1,490,000. With 1,667 connections, this would equate to an increase of approximately $75 per rate payer, per month. This represents a relatively large increase over the current average rate of $20 per rate payer per month. A more

detailed economic impact assessment is required in order to determine if the rate increase will exceed the EPA established affordability threshold of 2% of median household income (MHI). According to the US Census Bureau, the annual MHI for Louisburg is approximately $53,600. The threshold for affordability would be 2% of this number, or about $90 per household per month. The economic impact assessment will be done as part of the required Facility Plan which includes an anti-degradation study.

5. Summary and Recommendations

5.1 Summary of Findings

Historically, both the North and South aerated lagoons have not met permitted effluent limits on a number of occasions over the data set that we reviewed. For the North Lagoons, effluent ammonia and biochemical oxygen demand (BOD) concentrations have exceeded permitted limits 5 times over the data set (4 for ammonia and 1 for BOD), while the South Lagoons have exceeded permitted limits 12 times over the data set (7 for ammonia and 5 for BOD). These permit violations are due to surface aerator maintenance issues (clogging and power failures) and the loss of nitrifying bacteria as a result of low liquid temperatures in the colder months. According to KDHE, not having a 3-phase power source has impacted the facilities ability to consistently meet permit limitations.

If surface aeration equipment is continued to be used in the future for both the North and the South Lagoons, BOD and ammonia effluent limits will continue to be violated in extreme cold weather months. Furthermore, KDHE has issued notice of pending revised ammonia limits based on receiving stream water quality standards for aquatic life. These new ammonia numbers are more stringent than the current limits and the plants as currently designed will not be able to consistently meet the new limits.

To improve reliability of plant operations and treatment for BOD and ammonia removal, this report evaluated the following 3 alternatives. Note, the "Do Nothing Case" of Alternative No. 1 is not a viable alternative and was only included as a base case for comparison to Alternatives 2 and 3.

- Alternative No. 1 – Do Nothing
- Alternative No. 2 – Existing Facilities Improvements
- Alternative No. 3 – Single 1.02 MGD Biological Nutrient Removal Facility

Table 5-1 provides a summary of the findings from the evaluation of the alternatives in this report.

Table 5-1: Summary of Findings

Alternative	Capital Cost	Benefits	Challenges / Risks
Alternative No. 1 – Do Nothing	--	--	• Continue to violate permit • Risk EPA Consent Order and fines • Risk EPA compliance schedule requiring improvements • **Not a viable option**
Alternative No. 2 – Existing Facilities Improvements	$6,060,000	• Lowest immediate capital cost • On site construction • Permit limits for lagoons are historically less stringent • Lower O&M costs	• Solution is short term • Open to risk of regulatory changes, lagoon systems are not easily adaptable • Abbreviated project schedule • Long run total capital costs will be higher due to "throw away" facilities
Alternative No. 3 – Single 1.02 MGD BNR Facility	$17,480,000 (w/ filters) $16,425,000 (w/o filters)	• Capital investment is long term - facilities are not "throw-away" • Longest compliance schedule • Mitigates risk of regulatory uncertainty – mechanical plant can be modified to adapt • Consolidation of facilities	• Highest immediate capital cost • Higher annual O&M costs • Force main construction more disruptive to community • Permits for mechanical plants are more stringent • Higher level operator certification required

5.2 Recommended Alternative

Based on the above economic and qualitative analysis of the alternatives as well as discussions with KDHE regarding the future viability of lagoon systems (particularly for large communities such as the City of Louisburg) it is recommended that the City of Louisburg proceed with initiating Alternative No. 3 – constructing a Single 1.02 MGD BNR Facility at the South Lagoons site. While the initial capital costs are higher than that of Alternative No. 2 – investing in improvements to the existing lagoon systems – it will be more cost-effective over the long run for the City of Louisburg to be proactive

and invest in the future. While it is not possible to predict the timeline of regulatory changes, it is virtually certain that future limits will be stringent enough that the lagoon systems (even as modified by Alternative No. 2) will need to be closed and replaced by a mechanical facility in the near future. Other communities in Kansas are having to face this same decision. By being proactive and starting the initial process of planning for a mechanical plant now, capital expenditures spent on infrastructure that may be obsolete in a few years can be avoided. Thus, money can be saved in the long term. A preliminary implementation schedule is included in the next section.

6. Project Schedule

The preliminary project implementation schedule for the improvements to the North and South Lagoons (Alternative No. 2) is presented in **Table 6-1** and a preliminary project schedule for the design and construction of a BNR WWTP Facility (Alternative No. 3) is presented in **Table 6-2**. The implementation schedules indicate the recommended timing of the engineering and construction activities associated with the improvements. Please note that the schedule will be dependent on a number of factors that are beyond the control of the City and Engineer such as obtaining financing and review/approval from regulatory agencies.

Table 6-1: Preliminary Project Implementation Schedule – Alternative No. 2

Project Milestone	Anticipated Date	Duration (months)
Submit Final Report to KDHE	November 2015	--
KDHE Review	December 2015 to January 2016	2
Internal Funding Investigation	January 2016 to June 2016	6
SRF Application Coordination and funding requirements (i.e. FSP, etc.)	July 2016 to April 2017 (concurrently with design activities)	10
Start Preliminary / Detailed Design Complete Preliminary Design Submit 60% Documents Submit 90% Documents	July 2016 (or upon approval from KDHE) September 2016 December 2016 February 2017	-- 3 3 2
City / KDHE Review of Final Documents	March 2017 to May 2017	3
Advertise for Bids	June 2017	2
Receive & Evaluate Bids	August 2017	2
Award Project	October 2017	2
Complete Construction	October 2018	12
	Total	**37**

Table 6-2: Preliminary Project Implementation Schedule – Alternative No. 3

Project Milestone	Anticipated Date	Duration (months)
Submit Final Report to KDHE	November 2015	--
KDHE Review	December 2015 to January 2016	2
Internal Funding Investigation	January 2016 to June 2016	6
SRF Application Coordination and Fiscal Sustainability Plan development	July 2016 to October 2017 (concurrently with design activities)	16
Facility Plan – Process Selection, Affordability Analysis / Anti-degradation Study	July 2016 (or upon approval from KDHE)	6
KDHE Review	January 2017	2
Preliminary Design Prepare Design Memo KDHE Review	 January 2017 April 2017	 3 1
Detailed Design Submit 30% Documents Submit 60% Documents Submit 90% Documents	May 2017 (or upon approval from KDHE) August 2017 December 2017 March 2018	-- 4 4 3
City / KDHE Review of Final Documents	April 2018 to June 2018	3
Easement Acquisition	February 2018 to July 2018	6
Advertise for Bids	July 2018	2
Receive & Evaluate Bids	September 2018	2
Award Project	November 2018	2
Complete Construction	April 2020	18
	Total	**54**

APPENDIX

APPENDIX A

Current NPDES Permits

Technical Services Section
Bureau of Water
1000 SW Jackson St., Suite 420
Topeka, KS 66612-1367

Kansas

Phone: 785-296-2856
Fax: 785-296-0086
SShoresM@kdheks.gov
www.kdheks.gov

Susan Mosier, MD, Secretary | Department of Health & Environment | Sam Brownback, Governor

May 21, 2015

City Clerk
Attn: Rita Cassida
5 South Peoria Street
Louisburg, KS 66053

RE: Kansas Water Pollution Control
Permit No. M-MC20-OO01
Louisburg, City of - WTP #1

Dear Permittee:

You have fulfilled all the filing requirements for a Kansas Water Pollution Control Permit and Authorization to Discharge under the National Pollutant Discharge Elimination System (NPDES). We are pleased to forward your new permit. While it is permissible to make as many copies as needed for monitoring and reporting purposes, you need to retain the original permit for your files.

We suggest you carefully read the terms and conditions of your permit and understand these terms and conditions are enforceable under both State and Federal law.

Please notice the reporting paragraph on page 2 of your permit, where all reports are due by the 28th day of the schedule noted. Please submit reports to the Kansas Department of Health and Environment, Bureau of Water-TSS, 1000 SW Jackson St., Suite 420, Topeka, Kansas 66612-1367.

Also, please note that if the permit requires routine monitoring and reporting, the table under section A will contain a new term called "EDMR code". This term stands for Electronic Discharge Monitoring Report and is an addition to the permits to allow all permittees, in the future, to report the discharge monitoring report data electronically instead of on paper.

If you have any questions concerning this permit, contact Shelly Shores-Miller at (785)296-2856.

Sincerely,

Michael B. Tate, P.E.
Director, Bureau of Water

pc: NE - District
RG- Permit File

Kansas Permit No.: M-MC20-0001

Federal Permit No.: KS0024856

KANSAS WATER POLLUTION CONTROL PERMIT AND
AUTHORIZATION TO DISCHARGE UNDER
THE NATIONAL POLLUTANT DISCHARGE
ELIMINATION SYSTEM

Pursuant to the Provisions of Kansas Statutes Annotated 65-164 and 65-165, the Federal Water Pollution Control Act as amended, (33 U.S.C. 1251 et seq; the "Act"),

Owner:	Louisburg, City of
Owner's Address:	5 South Peoria Street Louisburg, Kansas 66053
Facility:	Louisburg Wastewater Treatment Plant #1 North Lagoon Facility North 3rd & Broadway Louisburg, KS
Facility Location:	SW¼ Section 30, Township 16S, Range 25E Miami County, Kansas Lat: 38.624525 Long: -94.686206
Outfall:	Lat: 38.62574 Long -94.69330
Receiving Stream:	South Wea Creek via Unnamed Tributary
Basin:	Marais des Cygnes River Basin

is authorized to discharge from the wastewater treatment facility described herein, in accordance with effluent limits and monitoring requirements as set forth herein.

This permit is effective June 1, 2015 supercedes the previously issued Kansas water pollution control permit M-MC20-0001, and expires June 30, 2019.

EXISTING FACILITY DESCRIPTION:

1. Five Cell Aerated Lagoon Wastewater Treatment System
2. Cell 1 and Cell 2 - 3.9 day detention each, 10.5 feet deep with 2-15 hp Surface Aerators each cell
3. Cells 3, 4, 5 - 13.8 acres at 5 feet deep
4. Design Flow = 0.42 MGD, 59 days detention time
5. Design P.E. = 4200

Secretary, Kansas Department of Health and Environment

May 20, 2015
Date

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

The permittee is authorized to discharge from outfall(s) with serial number(s) as specified in this permit. The effluent limits shall become effective on the dates specified herein. Such discharges shall be controlled, limited, and monitored by the permittee as specified. There shall be no discharge of floating solids or visible foam in other than trace amounts.

Monitoring reports shall be submitted on or before the 28th day of the month. In the event no discharge occurs, written notification is still required.

Parameters	Final Limits	Measurement Frequency	Sample Type
Monitoring Location 001AG (EDMR code: INF001AG)- Influent to Treatment Plant			
Biochemical Oxygen Demand (5-Day)- mg/l	Monitor	Once Monthly	Grab
Total Suspended Solids - mg/l	Monitor	Once Monthly	Grab
Total Phosphorus (as P)-mg/l	Monitor	Once Monthly	Grab
Total Kjeldahl Nitrogen (as N)-mg/l	Monitor	Once Monthly	Grab
Outfall 001A1 (EDMR code: EFF001A1) - Effluent at discharge structure			
Biochemical Oxygen Demand (5-Day)*		Once Monthly	Grab
Jan, Feb, Mar, Apr, Oct, Nov, and Dec			
Weekly Average-mg/l	45		
Monthly Average-mg/l	30		
May, June and September			
Weekly Average-mg/l	40		
Monthly Average-mg/l	25		
July and August			
Weekly Average-mg/l	35		
Monthly Average-mg/l	20		
Total Suspended Solids		Once Monthly	Grab
Weekly Average-mg/l	120		
Monthly Average-mg/l	80		
pH - Standard Units	See Supplemental Condition 2	Once Monthly	Grab
Ammonia (as N)-mg/l		Once Monthly	Grab
January, February & December			
Daily Maximum	9.7		
Monthly Average	9.7		
March and April			
Daily Maximum	9.7		
Monthly Average	6.0		
May			
Daily Maximum	9.7		
Monthly Average	4.7		
June			
Daily Maximum	9.7		
Monthly Average	3.6		

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS (continued)

July and August			
Daily Maximum	9.7		
Monthly Average	3.0		
September			
Daily Maximum	9.7		
Monthly Average	3.4		
October			
Daily Maximum	9.7		
Monthly Average	5.4		
November			
Daily Maximum	9.7		
Monthly Average	8.5		
E.coli - Colonies/100 ml		Once Monthly	Grab
April through October			
Monthly Geometric average	427		
November through March			
Monthly Geometric Average	3843		
Nitrate (NO_3)+ Nitrite (NO_2)as N-mg/l**	Monitor	Once Monthly	Grab
Total Kjeldahl Nitrogen (as N) - mg/l**	Monitor	Once Monthly	Grab
Total Nitrogen (as N) - mg/l** (TKN + NO_3 + NO_2)	Calculate	Once Monthly	Calculate
Total Phosphorus (as P)- mg/l	Monitor	Once Monthly	Grab
Temperature, ^oF	Monitor	Twice Monthly	Field
Flow - MGD	Monitor	Weekdays	Meter

Monitoring Location 001B1 - (EDMR Code: CELL1001B1) - Wastewater from or near discharge point from Cell 1

Temperature, ^oF	Monitor	Twice Monthly	Field

Monitoring Location 002B2 - (EDMR Code: CELL2002B2) - Wastewater from or near discharge point from Cell 2

Temperature, ^oF	Monitor	Twice Monthly	Field

* Minimum removal of 85% required for Biochemical Oxygen Demand (5-Day).

** Permittee shall sample for these tests on the same day and calculate the total nitrogen only when both test values are available. The Minimum Reportable Limit (MRL) for TKN is 1 mg/l and for nitrate + nitrite is 0.1 mg/l. Values less than the MRL shall be reported using the less than sign (<) with the MRL value but for purposes of calculating and reporting the total nitrogen result, less than values shall be defaulted to zero.

B. STANDARD CONDITIONS

In addition to the specified conditions stated herein, the permittee shall comply with the attached Standard Conditions dated August 1, 2010.

C. SCHEDULE OF COMPLIANCE

1. By June 30, 2015 the permittee shall hire a Kansas-licensed engineer consultant to provide an operations and wastewater treatment lagoon evaluation engineering report.

2. By November 30, 2015, the permittee shall provide KDHE an engineering report of the operation and wastewater treatment lagoon evaluation, including a proposed schedule for improvements, if necessary, to bring this facility into consistent compliance with the requirements of this permit and K.A.R. 28-16-160 et seq. The engineering report and proposed schedule are subject to approval by KDHE and are enforceable under this permit.

D. SUPPLEMENTAL CONDITIONS

1. This facility is subject to the EPA 40 CFR Part 503 regulations in effect when sludge is removed from the facility.

2. Permittee shall obtain a sample of the treated wastewater from outfall 001A1 at the same time as other effluent sampling is conducted to determine general operational status of the facility. The pH test must be done by a KDHE-certified laboratory but need not meet the 40 CFR Part 136 requirements for the sampling-to-test time limit of 15 minutes. Test results shall be submitted on the standard quarterly discharge monitoring report.

STANDARD CONDITIONS FOR
KANSAS WATER POLLUTION CONTROL AND
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM PERMITS

1. Representative Sampling and Discharge Monitoring Report Submittals:
   A. Samples and measurements taken as required herein shall be representative of the quality and quantity of the monitored discharge. Test results shall be recorded for the day the samples were taken. If sampling for a parameter was conducted across more than one calendar day, the test results may be recorded for the day sampling was started or ended. All samples shall be taken at the locations designated in this permit, and unless specified, at the outfall/monitoring location(s) before the wastewater joins or is diluted by any other water or substance.

   B. Monitoring results shall be recorded and reported on forms acceptable to the Division and postmarked no later than the 28th day of the month following the completed reporting period. Signed and certified copies of these, prepared in accordance with KAR 28-16-59, and all other reports required herein, may be FAXed to 785.296.0086, e-mailed as scanned attachments to dmr4kdhe@kdheks.gov , or sent by U.S. mail to:

      Kansas Department of Health & Environment
      Bureau of Water-Technical Services Section
      1000 SW Jackson Street, Suite 420
      Topeka, KS 66612-1367

2. Definitions:
   A. Unless otherwise specifically defined in this permit, the following definitions apply:

      1. The "Daily Maximum" is the total discharge by weight or average concentration, measurement taken, or value calculated during a 24-hour period. The parameter, pH, is limited as a range between and including the values shown.

      2. The "Weekly Average" is the arithmetic mean of the value of test results from samples collected, measurements taken or values calculated during four monitoring periods in each month consisting of calendar days 1-7, 8-14, 15-21 and 22 through the end of the month.

      3. The "Monthly Average", other than for E. coli bacteria, is the arithmetic mean of the value of test results from samples collected, measurements taken or values calculated during a calendar month. The monthly average is determined by the summation of all calculated values or measured test results divided by the number of calculated values or test results reported for that parameter during the calendar month. The monthly average for E. coli bacteria is the geometric average of the value of the test results from samples collected in a calendar month. The geometric average can be calculated by using a scientific calculator to multiply all the E. coli test results together and then taking the nth root of the product where n is the number of test results. Non-detect values shall be reported using the less than symbol (<) and the minimum detection or reportable value. To calculate average values, non-detects shall be defaulted to zero (or one for geometric averages). Greater than values shall be reported using the greater than symbol (>) and the reported value. To calculate average values, the greater than reported value shall be used in the averaging calculation.

   B. A "grab sample" is an individual sample collected in less than 15 minutes. A "composite sample" is a combination of individual samples in which the volume of each individual sample is proportional to the flow, or the sample frequency is proportioned to the flow rate over the sample period, or the sample frequency is proportional to time.

   C. The terms "Director", "Division", and "Department" refer to the Director, Division of Environment, Kansas Department of Health and Environment, respectively.

   D. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of an in-plant diversion. Severe property damage does not mean economic loss caused by delays in production.

   E. "Bypass" means the intentional diversion of waste streams from any portion of the treatment facility.

17. Permit Modifications and Terminations: As provided by KAR 28-16-62, after notice and opportunity for a hearing, this permit may be modified, suspended or revoked or terminated in whole or in part during its term for cause as provided, but not limited to those set forth in KAR 28-16-62 and KAR 28-16-28b through g. The permittee shall furnish to the Director, within a reasonable amount of time, any information which the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The permittee shall also furnish upon request, copies of all records required to be kept by this permit. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

18. Toxic Pollutants: Notwithstanding paragraph 17 above, if a toxic effluent standard or prohibition (including any schedule of compliance specified at such effluent standards) is established under 33 USC Section 1317(a) for a toxic pollutant which is present in the discharge and such standard or prohibition is more stringent than any limitation for such pollutant in this permit, this permit shall be revised or modified in accordance with the toxic effluent standard or prohibition. Nothing in this permit relieves the permittee from complying with federal toxic effluent standards as promulgated pursuant to 33 USC Section 1317.

19. Administrative, Civil and Criminal Liability: The permittee shall comply with all requirements of this permit. Except as authorized in paragraph 9 above, nothing in this permit shall be construed to relieve the permittee from administrative, civil or criminal penalties for noncompliance as provided for in KSA 65-161 et seq., and 33 USC Section 1319.

20. Oil and Hazardous Substance Liability: Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities or penalties to which the permittee is or may be subject to under 33 USC Section 1321 or KSA 65-164 et seq. A municipal permittee shall promptly notify the Division by telephone upon discovering crude oil or any petroleum derivative in its sewer system or wastewater treatment facilities.

21. Industrial Users: A municipal permittee shall require any industrial user of the treatment works to comply with 33 USC Section 1317, 1318 and any industrial user of storm sewers to comply with 33 USC Section 1308.

22. Property Rights: The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights nor any infringements of or violation of federal, state or local laws or regulations.

23. Operator Certification: The permittee shall, if required, ensure the wastewater facilities are under the supervision of an operator certified by the Department. If the permittee does not have a certified operator or loses its certified operator, appropriate steps shall be taken to obtain a certified operator as required by KAR 28-16-30 et seq.

24. Severability: The provisions of this permit are severable. If any provision of this permit or any circumstance is held invalid, the application of such provision to other circumstances and the remainder of the permit shall not be affected thereby.

25. Removal from Service: The permittee shall inform the Division at least three months before a pumping station, treatment unit, or any other part of the treatment facility permitted by this permit is to be removed from service and shall make arrangements acceptable to the Division to decommission the facility or part of the facility being removed from service such that the public health and waters of the state are protected.

26. Duty to Reapply: A permit holder wishing to continue any activity regulated by this permit after the expiration date, must apply for a new permit at least 180 days prior to expiration of the permit.

FACILITY INFORMATION:
CITY OF LOUISBURG
5 SOUTH PEORIA ST.
LOUISBURG, KS 66053

MONITORING REPORT
KDHE-DIVISION OF ENVIRONMENT
Bureau of Water - Tech Services Section
1000 SW Jackson St., Suite 420
Topeka, KS 66612-1367

KANSAS PERMIT NO.
M-MC20-OO01
NORTH FACILITY

Certified Laboratory & Number

SAMPLING IS REQUIRED IF THERE IS A DISCHARGE AT ANY TIME DURING THE MONTH - REPORTING IS REQUIRED EVEN IF THERE IS NO DISCHARGE

MONTH & YEAR OF SAMPLE or
Period of No Discharge

Date of Sample	MONITORING LOCATION 001AG - INFLUENT				OUTFALL 001A1 - EFFLUENT	
	BOD mg/l Monthly	**TSS** mg/l Monthly	**Total Phosphorus** mg/l Monthly	**TKN** mg/l Monthly	**Flow** MGD Weekdays	**Temp** °F 2X Monthly
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
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19						
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21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
Average						

Were any of the permit limits exceeded? **NO:** **YES:**

If yes, K.A.R. 28-16-63 requires an explanation of any permit exceedance.

Explanation of permit exceedance:

PAGE ONE OF THREE

SIGNATURE OF AUTHORIZED PERSONNEL

TELEPHONE NUMBER

FACILITY INFORMATION:
CITY OF LOUISBURG
5 SOUTH PEORIA ST.
LOUISBURG. KS 66053

MONITORING REPORT
KDHE-DIVISION OF ENVIRONMENT
Bureau of Water - Tech Services Section
1000 SW Jackson St., Suite 420
Topeka, KS 66612-1367

KANSAS PERMIT NO.
M-MC20-OO01
NORTH FACILITY

MONTH & YEAR OF SAMPLE or
Period of No Discharge

Date of Sample	OUTFALL 001A1 - EFFLUENT (Continued)					
	BOD mg/l Monthly	**TSS** mg/l Monthly	**pH** S.U. Monthly	**Ammonia** mg/l Monthly	**E. coli** col/100ml Monthly	**T. Phosphorus** mg/l Monthly
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
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27						
28						
29						
30						
31						
Average						

FACILITY INFORMATION:
CITY OF LOUISBURG
5 SOUTH PEORIA ST.
LOUISBURG. KS 66053

MONITORING REPORT
KDHE-DIVISION OF ENVIRONMENT
Bureau of Water - Tech Services Section
1000 SW Jackson St., Suite 420
Topeka, KS 66612-1367

KANSAS PERMIT NO.
M-MC20-OO01
NORTH FACILITY

MONTH & YEAR OF SAMPLE or
Period of No Discharge

	OUTFALL 001A1 - EFFLUENT (Continued)				Discharge Point CELL 1	Discharge Point CELL 2
Date of Sample	**Nitrate + Nitrite** mg/l	**TKN** mg/l	**Total Nitrogen** m/gl		Temp °F	Temp °F
	Monthly	Monthly	Monthly		2X Monthly	2X Monthly
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
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30						
31						
Average						

Technical Services Section
Bureau of Water
1000 SW Jackson St., Suite 420
Topeka, KS 66612-1367

Phone: 785-296-2856
Fax: 785-296-0086
SShoresM@kdheks.gov
www.kdheks.gov

Kansas

Susan Mosier, MD, Secretary

Department of Health & Environment

Sam Brownback, Governor

May 21, 2015

City Clerk
Attn: Rita Cassida
5 South Peoria Street
Louisburg, KS 66053

RE: Kansas Water Pollution Control
Permit No. M-MC20-OO02
Louisburg, City of - WTP #2

Dear Permittee:

You have fulfilled all the filing requirements for a Kansas Water Pollution Control Permit and Authorization to Discharge under the National Pollutant Discharge Elimination System (NPDES). We are pleased to forward your new permit. While it is permissible to make as many copies as needed for monitoring and reporting purposes, you need to retain the original permit for your files.

We suggest you carefully read the terms and conditions of your permit and understand these terms and conditions are enforceable under both State and Federal law.

Please notice the reporting paragraph on page 2 of your permit, where all reports are due by the 28th day of the schedule noted. Please submit reports to the Kansas Department of Health and Environment, Bureau of Water-TSS, 1000 SW Jackson St., Suite 420, Topeka, Kansas 66612-1367.

Also, please note that if the permit requires routine monitoring and reporting, the table under section A will contain a new term called "EDMR code". This term stands for Electronic Discharge Monitoring Report and is an addition to the permits to allow all permittees, in the future, to report the discharge monitoring report data electronically instead of on paper.

If you have any questions concerning this permit, contact Shelly Shores-Miller at (785)296-2856.

Sincerely,

Michael B. Tate, P.E.
Director, Bureau of Water

pc: NE - District
RG- Permit File

Kansas Permit No.: M-MC20-0002

Federal Permit No.: KS0087149

KANSAS WATER POLLUTION CONTROL PERMIT AND AUTHORIZATION TO DISCHARGE UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

Pursuant to the Provisions of Kansas Statutes Annotated 65-164 and 65-165, the Federal Water Pollution Control Act as amended, (33 U.S.C. 1251 et seq; the "Act"),

Owner:	Louisburg, City of
Owner's Address:	5 South Peoria Street Louisburg, Kansas 66053
Facility:	Louisburg Wastewater Treatment Plant #2 South Lagoon Facility 29148 Rogers Road Louisburg, KS
Facility Location:	SW¼, Section 6, Township 17S, Range 25E Miami County, Kansas Lat: 38.596684 Long: -94.689964
Outfall:	Lat: 38.59698 Long: -94.69330
Receiving Stream:	South Wea Creek via Unnamed Tributary
Basin:	Marais des Cygnes River Basin

is authorized to discharge from the wastewater treatment facility described herein, in accordance with effluent limits and monitoring requirements as set forth herein.

This permit is effective June 1, 2015, supercedes the previously issued water pollution control permit M-MC20-0002 and expires June 30, 2019.

EXISTING FACILITY DESCRIPTION:

1. Five Cell Aerated Lagoon Wastewater Treatment System.
2. Cell 1 and Cell 2 - 1.9 day detention each, 10 feet deep with 4-10 hp Surface Aerators each cell.
3. Cells 3, 4, 5 - 21.07 acres at 5 feet deep.
4. Design Flow = 0.6 MGD, 65.8 days detention time.
5. Design P.E. = 6000.

Secretary, Kansas Department of Health and Environment

May 20, 2015
Date

A. EFFLUENT LIMITS AND MONITORING REQUIREMENTS

The permittee is authorized to discharge from outfall(s) with serial number(s) as specified in this permit. The effluent limits shall become effective on the dates specified herein. Such discharges shall be controlled, limited, and monitored by the permittee as specified. There shall be no discharge of floating solids or visible foam in other than trace amounts.

Monitoring reports shall be submitted on or before the 28th day of the month. In the event no discharge occurs, written notification is still required.

Parameters	Final Limits	Measurement Frequency	Sample Type
Monitoring Location 001XG- (EDMR code: INF001XG) - Influent to Treatment Plant			
Biochemical Oxygen Demand (5-Day)- mg/l	Monitor	Once Monthly	Grab
Total Suspended Solids - mg/l	Monitor	Once Monthly	Grab
Total Phosphorus (as P)-mg/l	Monitor	Once Monthly	Grab
Total Kjeldahl Nitrogen (as N)-mg/l	Monitor	Once Monthly	Grab
Outfall 001X1 - Effluent at discharge structure			
Biochemical Oxygen Demand (5-Day)*		Once Monthly	Grab
Jan, Feb, Mar, Apr, Oct, Nov, and Dec			
Weekly Average-mg/l	45		
Monthly Average-mg/l	30		
May, June and September			
Weekly Average-mg/l	40		
Monthly Average-mg/l	25		
July and August			
Weekly Average-mg/l	35		
Monthly Average-mg/l	20		
Total Suspended Solids		Once Monthly	Grab
Weekly Average-mg/l	120		
Monthly Average-mg/l	80		
pH - Standard Units	See Supplemental Condition 2	Once Monthly	Grab
Ammonia (as N)-mg/l		Once Monthly	Grab
January, February, and December			
Daily Maximum	9.3		
Monthly Average	8.1		
March and April			
Daily Maximum	9.3		
Monthly Average	4.9		
May			
Daily Maximum	9.3		
Monthly Average	3.9		
June			
Daily Maximum	9.3		
Monthly Average	3.1		

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS (continued)

July and August			
Daily Maximum	9.3		
Monthly Average	2.4		
September			
Daily Maximum	9.3		
Monthly Average	2.8		
October			
Daily Maximum	9.3		
Monthly Average	4.5		
November			
Daily Maximum	9.3		
Monthly Average	7.0		
E.coli - Colonies/100 ml		Once Monthly	Grab
April through October			
Monthly Geometric Average	427		
November through March			
Monthly Geometric Average	3843		
Nitrate (NO_3) + Nitrite (NO_2) as N-mg/l**	Monitor	Once Monthly	Grab
Total Kjeldahl Nitrogen (as N) - mg/l**	Monitor	Once Monthly	Grab
Total Nitrogen (as N) - mg/l** ($TKN + NO_3 + NO_2$)	Calculate	Once Monthly	Calculate
Total Phosphorus (as P) - mg/l	Monitor	Once Monthly	Grab
Temperature, °F	Monitor	Twice Monthly	Field
Flow - MGD	Monitor	Weekdays	Meter

Monitoring Location 001A1 (EDMR code: CELL1001A1) - Wastewater from or near discharge point from Cell 1

Temperature, °F	Monitor	Twice Monthly	Field

Monitoring Location 001B1 - (EDMR code: CELL2001B1) Wastewater from or near discharge point from Cell 2

Temperature, °F	Monitor	Twice Monthly	Field

* Minimum removal of 85% required for Biochemical Oxygen Demand (5-Day).

** Permittee shall sample for these tests on the same day and calculate the total nitrogen only when both test values are available. The Minimum Reportable Limit (MRL) for TKN is 1 mg/l and for nitrate + nitrite is 0.1 mg/l. Values less than the MRL shall be reported using the less than sign (<) with the MRL value but for purposes of calculating and reporting the total nitrogen result, less than values shall be defaulted to zero.

STANDARD CONDITIONS FOR
KANSAS WATER POLLUTION CONTROL AND
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM PERMITS

1. Representative Sampling and Discharge Monitoring Report Submittals:
   A. Samples and measurements taken as required herein shall be representative of the quality and quantity of the monitored discharge. Test results shall be recorded for the day the samples were taken. If sampling for a parameter was conducted across more than one calendar day, the test results may be recorded for the day sampling was started or ended. All samples shall be taken at the locations designated in this permit, and unless specified, at the outfall/monitoring location(s) before the wastewater joins or is diluted by any other water or substance.

   B. Monitoring results shall be recorded and reported on forms acceptable to the Division and postmarked no later than the 28th day of the month following the completed reporting period. Signed and certified copies of these, prepared in accordance with KAR 28-16-59, and all other reports required herein, may be FAXed to 785.296.0086, e-mailed as scanned attachments to dmr4kdhe@kdheks.gov , or sent by U.S. mail to:

      Kansas Department of Health & Environment
      Bureau of Water-Technical Services Section
      1000 SW Jackson Street, Suite 420
      Topeka, KS 66612-1367

2. Definitions:
   A. Unless otherwise specifically defined in this permit, the following definitions apply:

      1. The "Daily Maximum" is the total discharge by weight or average concentration, measurement taken, or value calculated during a 24-hour period. The parameter, pH, is limited as a range between and including the values shown.

      2. The "Weekly Average" is the arithmetic mean of the value of test results from samples collected, measurements taken or values calculated during four monitoring periods in each month consisting of calendar days 1-7, 8-14, 15-21 and 22 through the end of the month.

      3. The "Monthly Average", other than for E. coli bacteria, is the arithmetic mean of the value of test results from samples collected, measurements taken or values calculated during a calendar month. The monthly average is determined by the summation of all calculated values or measured test results divided by the number of calculated values or test results reported for that parameter during the calendar month. The monthly average for E. coli bacteria is the geometric average of the value of the test results from samples collected in a calendar month. The geometric average can be calculated by using a scientific calculator to multiply all the E. coli test results together and then taking the nth root of the product where n is the number of test results. Non-detect values shall be reported using the less than symbol (<) and the minimum detection or reportable value. To calculate average values, non-detects shall be defaulted to zero (or one for geometric averages). Greater than values shall be reported using the greater than symbol (>) and the reported value. To calculate average values, the greater than reported value shall be used in the averaging calculation.

   B. A "grab sample" is an individual sample collected in less than 15 minutes. A "composite sample" is a combination of individual samples in which the volume of each individual sample is proportional to the flow, or the sample frequency is proportioned to the flow rate over the sample period, or the sample frequency is proportional to time.

   C. The terms "Director", "Division", and "Department" refer to the Director, Division of Environment, Kansas Department of Health and Environment, respectively.

   D. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of an in-plant diversion. Severe property damage does not mean economic loss caused by delays in production.

   E. "Bypass" means the intentional diversion of waste streams from any portion of the treatment facility.

3. Schedule of Compliance: No later than 14 calendar days following each date identified in the "Schedule of Compliance," the permittee shall submit via mail, e-mail or fax per paragraph 1.B above, either a report of progress or, in the case of specific action being required by identified dates, a written notice of compliance or noncompliance. In the latter case, the notice shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirements, or, if there are no more scheduled requirements, when such noncompliance will be corrected.

4. Test Procedures: All analyses required by this permit shall conform to the requirements of 40 CFR Part 136, unless otherwise specified, and shall be conducted in a laboratory accredited by the Department. For each measurement or sample, the permittee shall record the exact place, date, and time of measuring/sampling; the date and time of the analyses, the analytical techniques or methods used, minimum detection or reportable level, and the individual(s) who performed the measuring/sampling and analysis and, the results. If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved procedures, the results shall be included in the Discharge Monitoring Report form required in 1.B. above. Such increased frequencies shall also be indicated.

5. Change in Discharge: All discharges authorized herein shall be consistent with the permit requirements. The discharge of any pollutant not authorized by this permit or of any pollutant identified in this permit more frequently than or at a level in excess of that authorized shall constitute a violation of this permit. Any anticipated facility expansions, production or flow increases, or production or wastewater treatment system modifications which result in a new, different, or increased discharge of pollutants shall be reported to the Division at least one hundred eighty (180) days before such change.

6. Facilities Operation: The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the requirements of this permit and Kansas and Federal law. Proper operation and maintenance also include adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems which are installed by a permittee only when the operation is necessary to achieve compliance with the requirements of this permit. The permittee shall take all necessary steps to minimize or prevent any adverse impact to human health or the environment resulting from noncompliance with any effluent limits specified in this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge. When necessary to maintain compliance with the permit requirements, the permittee shall halt or reduce those activities under its control which generate wastewater routed to this facility.

7. Incidents:

   "Collection System Diversion" means the diversion of wastewater from any portion of the collection system.

   "In-Plant Diversion" means routing the wastewater around any treatment unit in the treatment facility through which it would normally flow.

   "In-Plant Flow Through" means an incident in which the wastewater continues to be routed through the equipment even though full treatment is not being accomplished because of equipment failure for any reason.

   "Spill" means any discharge of wastewater, sludge or other materials from the treatment facility other than effluent or as more specifically described by other "Incidents" terms.

   "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance or anticipated noncompliance with permit effluent limits because of factors beyond the reasonable control of the permittee, as described by 40 C.F.R. 122.41(n).

8. Diversions not Exceeding Limits: The permittee may allow any diversion to occur which does not cause effluent limits to be exceeded, but only if it also is for essential maintenance to assure efficient operation. Such diversions are not subject to the Incident Reporting requirements shown below.

9. Prohibition of an In-Plant Diversion: Any in-plant diversion from facilities necessary to maintain compliance with this permit is prohibited, except: (a) where the in-plant diversion was unavoidable to prevent loss of life, personal injury, or severe property damage; (b) where there were no feasible alternatives to the in-plant diversion, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime and (c) the permittee submitted a notice as required in the Incident Reporting paragraph below. The Director may approve an anticipated in-plant diversion, after considering its adverse effects, if the Director determines that it will meet the three conditions listed above.

10. Incident Reporting: The permittee shall report any unanticipated collection system diversion, in-plant diversion, in-plant flow through occurrence, spill, upset or any violation of a permitted daily maximum limit within 24 hours from the time the permittee became aware of the incident. A written submission shall be provided within 5 days of the time the permittee became aware of the incident. The written submission shall contain a description of the noncompliance and its cause, the period of noncompliance, including exact dates and times; and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance. An Incident Report form is available at www.kdheks.gov/water/tech.html.

    For an anticipated incident or any planned changes or activities in the permitted facility that may result in noncompliance with the permit requirements, the permittee shall submit written notice, if possible, at least ten days before the date of the event.

    For other noncompliance, the above information shall be provided with the next Discharge Monitoring Report.

11. Removed Substances: Solids, sludges, filter backwash, or other pollutants removed in the course of treatment of water shall be utilized or disposed of in a manner acceptable to the Division.

12. Power Failures: The permittee shall provide an alternative power source sufficient to operate the wastewater control facilities or otherwise control pollution and all discharges upon the loss of the primary source of power to the wastewater control facilities.

13. Right of Entry: The permittee shall allow authorized representatives of the Division of Environment or the Environmental Protection Agency upon the presentation of credentials, to enter upon the permittee's premises where an effluent source is located, or in which are located any records required by this permit, and at reasonable times, to have access to and copy any records required by this permit, to inspect any facilities, monitoring equipment or monitoring method required in this permit, and to sample any influents to, discharges from or materials in the wastewater facilities.

14. Transfer of Ownership: The permittee shall notify the succeeding owner or controlling person of the existence of this permit by certified letter, a copy of which shall be forwarded to the Division. The succeeding owner shall secure a new permit. This permit is not transferable to any person except after notice and approval by the Director. The Director may require modification or revocation and reissuance of the permit to change the name of the permittee and incorporate such other requirements as may be necessary.

15. Records Retention: Unless otherwise specified, all records and information resulting from the monitoring activities required by this permit, including all records of analyses and calibration and maintenance of instruments and recordings from continuous monitoring instruments, shall be retained for a minimum of 3 years, or longer if requested by the Division. Biosolids/sludge records and information are required to be kept for a minimum of 5 years or longer if requested by the Division. Groundwater monitoring data, including background samples results, shall be kept for the life of the facility regardless of ownership.

16. Availability of Records: Except for data determined to be confidential under 33 USC Section 1318, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Department. Effluent data shall not be considered confidential. Knowingly making any false statement on any such report or tampering with equipment to falsify data may result in the imposition of criminal penalties as provided for in 33 USC Section 1319 and KSA 65-170c.

17. Permit Modifications and Terminations: As provided by KAR 28-16-62, after notice and opportunity for a hearing, this permit may be modified, suspended or revoked or terminated in whole or in part during its term for cause as provided, but not limited to those set forth in KAR 28-16-62 and KAR 28-16-28b through g. The permittee shall furnish to the Director, within a reasonable amount of time, any information which the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The permittee shall also furnish upon request, copies of all records required to be kept by this permit. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

18. Toxic Pollutants: Notwithstanding paragraph 17 above, if a toxic effluent standard or prohibition (including any schedule of compliance specified at such effluent standards) is established under 33 USC Section 1317(a) for a toxic pollutant which is present in the discharge and such standard or prohibition is more stringent than any limitation for such pollutant in this permit, this permit shall be revised or modified in accordance with the toxic effluent standard or prohibition. Nothing in this permit relieves the permittee from complying with federal toxic effluent standards as promulgated pursuant to 33 USC Section 1317.

19. Administrative, Civil and Criminal Liability: The permittee shall comply with all requirements of this permit. Except as authorized in paragraph 9 above, nothing in this permit shall be construed to relieve the permittee from administrative, civil or criminal penalties for noncompliance as provided for in KSA 65-161 et seq., and 33 USC Section 1319.

20. Oil and Hazardous Substance Liability: Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities or penalties to which the permittee is or may be subject to under 33 USC Section 1321 or KSA 65-164 et seq. A municipal permittee shall promptly notify the Division by telephone upon discovering crude oil or any petroleum derivative in its sewer system or wastewater treatment facilities.

21. Industrial Users: A municipal permittee shall require any industrial user of the treatment works to comply with 33 USC Section 1317, 1318 and any industrial user of storm sewers to comply with 33 USC Section 1308.

22. Property Rights: The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights nor any infringements of or violation of federal, state or local laws or regulations.

23. Operator Certification: The permittee shall, if required, ensure the wastewater facilities are under the supervision of an operator certified by the Department. If the permittee does not have a certified operator or loses its certified operator, appropriate steps shall be taken to obtain a certified operator as required by KAR 28-16-30 et seq.

24. Severability: The provisions of this permit are severable. If any provision of this permit or any circumstance is held invalid, the application of such provision to other circumstances and the remainder of the permit shall not be affected thereby.

25. Removal from Service: The permittee shall inform the Division at least three months before a pumping station, treatment unit, or any other part of the treatment facility permitted by this permit is to be removed from service and shall make arrangements acceptable to the Division to decommission the facility or part of the facility being removed from service such that the public health and waters of the state are protected.

26. Duty to Reapply: A permit holder wishing to continue any activity regulated by this permit after the expiration date, must apply for a new permit at least 180 days prior to expiration of the permit.

FACILITY INFORMATION:
CITY OF LOUISBURG
5 SOUTH PEORIA ST.
LOUISBURG, KS 66053

MONITORING REPORT
KDHE-DIVISION OF ENVIRONMENT
Bureau of Water - Tech Services Section
1000 SW Jackson St., Suite 420
Topeka, KS 66612-1367

KANSAS PERMIT NO.
M-MC20-OO02
SOUTH FACILITY

Certified Laboratory & Number

SAMPLING IS REQUIRED IF THERE IS A DISCHARGE AT ANY TIME DURING THE MONTH - REPORTING IS REQUIRED EVEN IF THERE IS NO DISCHARGE

MONTH & YEAR OF SAMPLE or
Period of No Discharge

Date of Sample	MONITORING LOCATION 001XG - INFLUENT				OUTFALL 001X1 - EFFLUENT	
	BOD mg/l Monthly	**TSS** mg/l Monthly	**Total Phosphorus** mg/l Monthly	**TKN** mg/l Monthly	**Flow** MGD Weekdays	**Temp** ^{o}F 2X Monthly
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
Average						

Were any of the permit limits exceeded? **NO:** **YES:**

If yes, K.A.R. 28-16-63 requires an explanation of any permit exceedance.

Explanation of permit exceedance:

PAGE ONE OF THREE

SIGNATURE OF AUTHORIZED PERSONNEL

TELEPHONE NUMBER

FACILITY INFORMATION:
CITY OF LOUISBURG
5 SOUTH PEORIA ST.
LOUISBURG. KS 66053

MONITORING REPORT
KDHE-DIVISION OF ENVIRONMENT
Bureau of Water - Tech Services Section
1000 SW Jackson St., Suite 420
Topeka, KS 66612-1367

KANSAS PERMIT NO.
M-MC20-OO02
SOUTH FACILITY

MONTH & YEAR OF SAMPLE or
Period of No Discharge

Date of Sample	OUTFALL 001X1 - EFFLUENT (Continued)					
	BOD mg/l Monthly	**TSS** mg/l Monthly	**pH** S.U. Monthly	**Ammonia** mg/l Monthly	**E. coli** col/100ml Monthly	**T. Phosphorus** mg/l Monthly
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
Average						

FACILITY INFORMATION:
CITY OF LOUISBURG
5 SOUTH PEORIA ST.
LOUISBURG. KS 66053

MONITORING REPORT
KDHE-DIVISION OF ENVIRONMENT
Bureau of Water - Tech Services Section
1000 SW Jackson St., Suite 420
Topeka, KS 66612-1367

KANSAS PERMIT NO.
M-MC20-OO02
SOUTH FACILITY

MONTH & YEAR OF SAMPLE or
Period of No Discharge

	OUTFALL 001X1 - EFFLUENT (Continued)				Discharge Point CELL 1	Discharge Point CELL 2
Date of Sample	Nitrate + Nitrite mg/l	TKN mg/l	Total Nitrogen m/gl		Temp °F	Temp °F
	Monthly	Monthly	Monthly		2X Monthly	2X Monthly
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
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22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
Average						

APPENDIX B

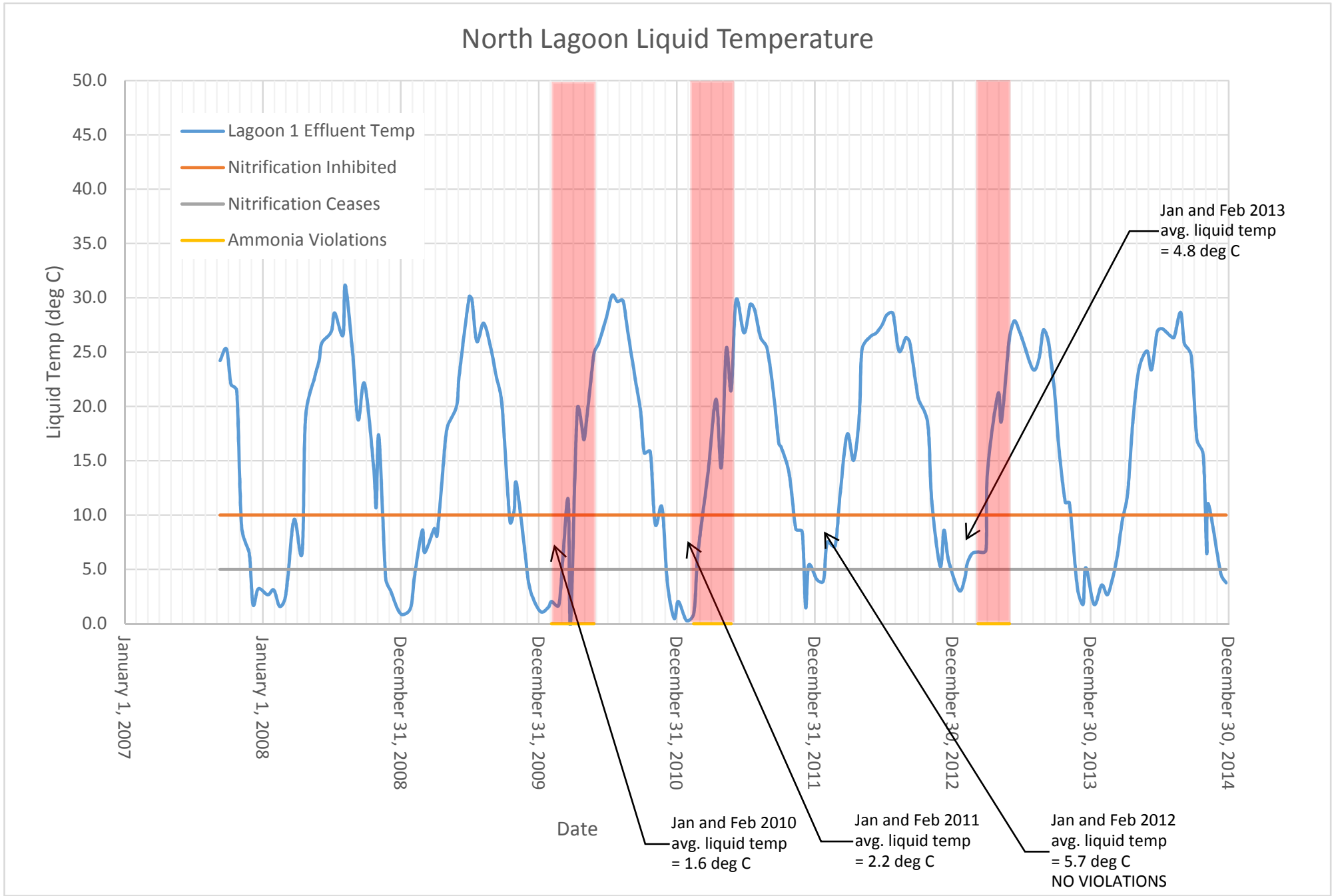
Tabulation of Raw Data from Monthly Reports

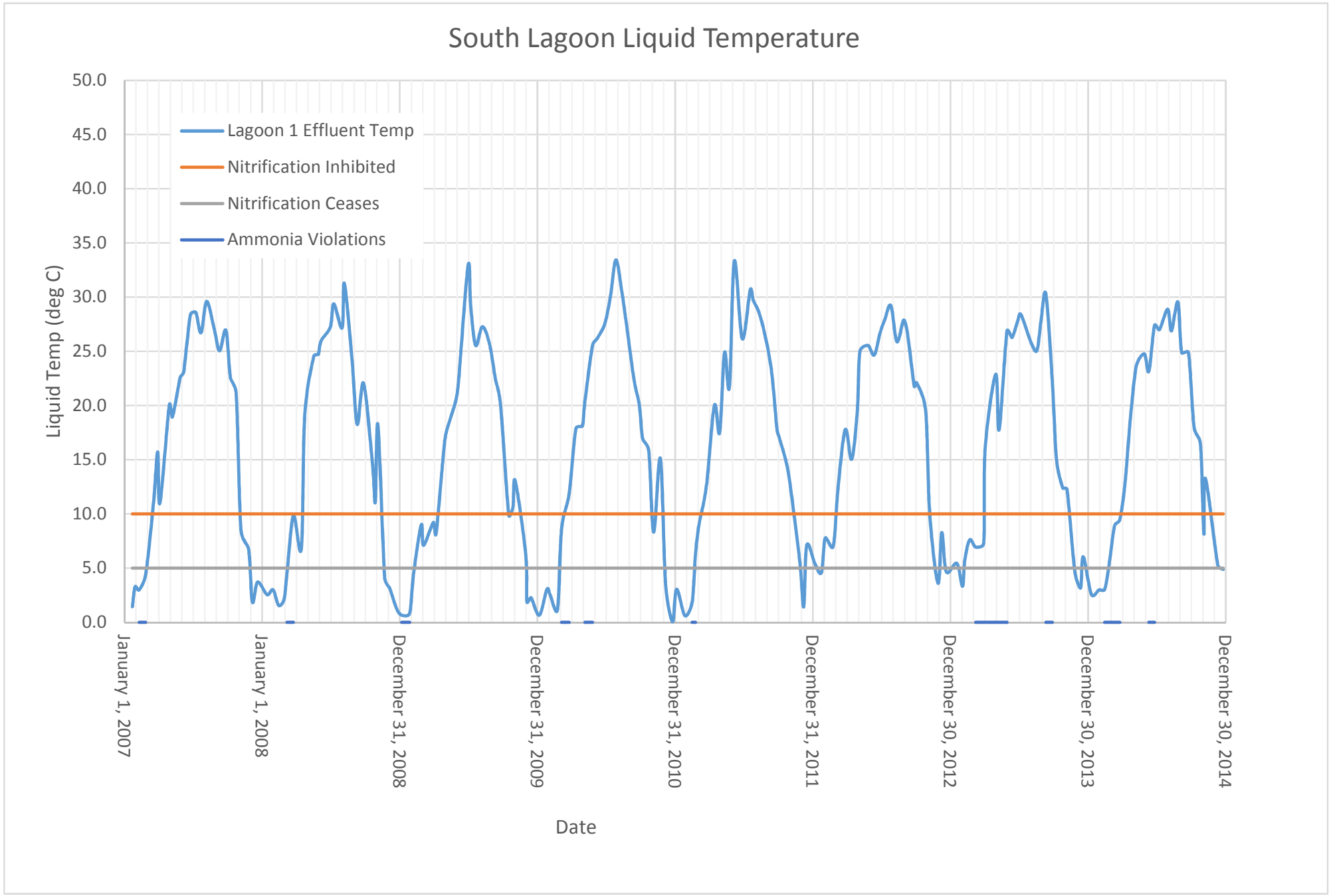
		Influent Parameters										Effluent Parameters									
Year	Month	Flow (mgd)	BOD5 (mg/L)	TSS (mg/L)	pH (SU)	TKN (mg/L)	TP (mg/L)		BOD5 (ppd)	TSS (ppd)	TKN (ppd)	TP (ppd)	BOD5 (mg/L)	TSS (mg/L)	pH (SU)	Ammonia-N (mg/L)	E. Coli (cfu/100 mL)	TKN (mg/L)	Nitrate + Nitrite (mg/L)	TP (mg/L)	TN (mg/L)	Temp (F)
2013	Jan	0.116	180	165	7.48	43.8	4.36		174	159	42	4	21.8	17.1	8.4	4.9	ND	12.2	0.42	4.11	12.6	41
2013	Feb	0.167	244	207	7.22	52.9	6.83		339	287	73	9	21.2	12.9	8.6	7.7	ND	10.9	0.42	4.52	11.3	42
2013	Mar	0.229	174	155	6.86	26.1	7.26		331	295	50	14	17.8	17.0	7.9	9.3	20	13.2	0.30	4.21	13.5	45
2013	Apr	0.244	130	78.8	7.12	39.8	5.43		264	160	81	11	22.4	19.3	7.8	7.6	110	11.1	1.52	3.84	12.6	52
2013	May		284	200	7.06	79.8	6.83						12.8	4.8	8.1	6.0	10	11.3	0.60	3.44	11.9	73
2013	Jun	0.215	156	113	6.86	31.2	6.22		279	202	56	11	10.5	5.2	8.4	1.8	ND	6.6	0.72	3.38	7.3	83
2013	Jul	0.120	127	92.9	6.89	31.7	5.30		127	93	32	5	15.2	28.6	9.4	0.1	ND	5.7	0.37	3.20	6.1	84
2013	Aug	0.078	332	305	6.64	42.4	9.51		215	198	28	6	20.0	15.6	8.7	0.7	10	5.4	0.30	3.11	5.7	79
2013	Sep	0.057	262	218	7.12	29.8	5.27		124	103	14	2	9.8	5.2	8.6	0.6	ND	5.3	0.24	2.41	5.5	68
2013	Oct	0.092	210	172	7.11	43.6	3.26		161	132	33	2	11.6	5.0	9.2	0.9	30	4.8	0.21	2.22	5.0	65
2013	Nov	0.110	358	396	7.08	50.1	8.78		327	362	46	8	11.6	6.0	7.9	0.9	ND	5.2	0.59	2.72	5.8	46
2013	Dec	0.065	166	128	7.10	37.3	7.29		90	69	20	4	20.6	25.2	8.2	1.0	15	6.2	0.93	2.50	7.1	44
2014	Jan	0.068	128	84	7.11	45.2	7.38		72	48	26	4	15.4	7.6	7.9	3.4	ND	8.1	1.53	3.11	9.6	41
2014	Feb	0.084	164	137	7.03	32.2	6.46		115	96	22	5	18.0	7.8	7.8	7.9	15	10.6	0.87	1.98	11.5	42
2014	Mar	0.049	273	304	7.06	79.9	7.53		111	124	33	3	21.4	53.2	8.1	5.4	ND	11.6	0.96	3.21	12.6	50
2014	Apr	0.084	163	126	7.03	45.9	7.16		114	88	32	5	10.0	3.3	7.9	0.4	ND	8.4	1.21	3.10	9.6	62
2014	May	0.070	162	126	6.94	39.8	6.71		94	73	23	4	13.1	3.0	7.9	1.7	ND	6.9	1.44	2.89	8.3	68
2014	Jun	0.290	211	150	6.94	36.5	8.32		509	362	88	20	16.8	3.6	8.3	0.1	ND	8.1	0.62	3.18	8.7	83
2014	Jul	0.040	209	210	8.34	60.0	8.34		70	70	20	3	10.0	13.0	9.0	0.2	10	3.5	0.30	1.60	3.8	80
2014	Aug	0.056				63.8	12.30				30	6	8.0	10.0	9.0	0.4	20	3.7	0.30	1.02	4.0	82
2014	Sep	0.116	286	304		32.8	4.14		276	293	32	4	8.0	11.0	9.8	0.2	512	3.2	0.30	0.98	3.5	77
2014	Oct	0.230	160	121		45.3	5.21		306	231	87	10	14.0	20.0	8.6	0.1	36	3.5	0.40	2.16	3.9	61
2014	Nov	0.047	219	188		55.9	6.27		86	73	22	2	11.0	14.0	8.9	0.2	10	3.2	0.30	1.86	3.5	48
2014	Dec	0.097	313	228		35.8	4.42		252	184	29	4	14.0	30.0	7.8	0.7	20	3.7	0.70	1.81	4.4	40
2015	Jan	0.065	290	328		57.1	7.20	0.076	183	207	36	5	18.0	28.0	8.7	0.3	10	5.6	1.20	1.75	6.8	44
2015	Feb	0.097	179	154		38.2	4.80	0.070	104	90	22	3	32.0	53.0	9.2	0.4	10	7.3	1.10	2.24	8.4	42
2015	Mar	0.070	297	368		38.3	7.66	0.072	178	220	23	5	34.0	48.0	8.8	0.5	10	6.3	0.70	1.31	7.0	51
2015	Apr	0.109	240	192		29.8	4.88	0.138	275	220	34	6	6.0	10.0	7.2	6.2	87	9.9	0.30	4.69	10.2	60
Average		0.114	219	194	7.10	44	6.6		199	171	38	6	16	17	8.4	2.5	55	7.2	0.67	2.73	7.86	59
Minimum		0.040	127	79	6.64	26	3.3		70	48	14	2	6	3	7.2	0.1	10	3.2	0.21	0.98	3.50	40
Maximum		0.290	358	396	8.34	80	12.3		509	362	88	20	34	53	9.8	9.3	512	13.2	1.53	4.69	13.50	84

		Influent Parameters									Effluent Parameters									
Year	Month	Flow (mgd)	BOD5 (mg/L)	TSS (mg/L)	pH (SU)	TKN (mg/L)	TP (mg/L)	BOD5 (ppd)	TSS (ppd)	TKN (ppd)	TP (ppd)	BOD5 (mg/L)	TSS (mg/L)	pH (SU)	Ammonia-N (mg/L)	E. Coli (cfu/100 mL)	TKN (mg/L)	Nitrate + Nitrite (mg/L)	TP (mg/L)	TN (mg/L)	Temp (F)
2013	Jan	0.198	214	192	7.11	46.7	5.98	352	316	77	10	18.8	24	7.83	1.8	ND	8.95	0.483	0.963	9.433	41
2013	Feb	0.336	141	118	7.34	35.8	8.14	394	330	100	23	20.4	35	8.11	6.57	ND	9.32	0.849	1.34	10.169	42
2013	Mar		130	83	6.96	22	5.67					16.2	28	7.96	7.13	ND	11.7	0.625	1.61	12.325	45
2013	Apr	0.412	64.8	40.6	7.04	25.2	2.38	222	139	86	8	21.3	34	7.89	5.68	260	8.97	1.26	1.79	10.23	52
2013	May	0.399	114		7.03			378				16.5	20.5	8.12	6.31	ND			3.21		72
2013	Jun	0.354	97.8	56.4	7.10	23	4.68	288	166	68	14	17.6	20.4	8.88	0.21	ND	4.72	0.818	3.09	5.538	82
2013	Jul	0.094	203	174	7.18	37.5	7.38	159	136	29	6	16.5	28	8.01	0.9	ND	6.56	0.25	2.91	6.81	83
2013	Aug	0.262	170	130	6.87	32.2	8.11	370	283	70	18	17.5	15.6	7.9	0.85	20	5.73	0.17	2.8	5.9	79
2013	Sep		298	247	7.19	35.8	5.61					10.8	22.7	7.96	3.27	ND	8.39	0.11	3.77	8.5	68
2013	Oct	0.171	134	91	7.20	25.5	3.9	191	129	36	6	21.6	49	9.04	0.77	2400	8.14	0.483	3.13	8.623	66
2013	Nov	0.282	180	139	7.10	37.1	4.88	422	326	87	11	19.8	34	8.12	2.74	60	8.35	1.01	2.82	9.36	46
2013	Dec	0.180	172	132	6.94	42.2	6.55	257	198	63	10	22.0	21.7	7.97	2.35	110	8.27	0.937	1.8	9.207	44
2014	Jan	0.178	161	112	7.04	28.2	5.98	238	166	42	9	21.0	9.2	7.77	6.94	10	8.9	1.07	1.47	9.97	41
2014	Feb	0.220	147	115	6.94	25.4	3.2	269	210	46	6	20.8	36.2	7.71	9.9	40	12.8	0.79	1.13	13.59	42
2014	Mar	0.185	157	128	7.13	29.7	4.84	242	197	46	7	24.4	26	7.89	11.6	ND	13.1	0.538	2.78	13.638	50
2014	Apr	0.264	154	96.2	7.13	34.1	6.16	338	211	75	14	17.4	14.8	8.04	0.14	ND	6.28	0.743	2.62	7.023	62
2014	May	0.210	103	51.5	7.08	34.9	3.84	180	90	61	7	16.7	21.7	8.24	0.71	ND	6.49	0.58	2.76	7.07	68
2014	Jun	0.490	122	61	7.03	25.8	4.76	497	249	105	19	17.4	10.4	8.06	3.29	ND	7.66	0.373	2.98	8.033	83
2014	Jul	0.165	157	238		47.4	5.6	215	327	65	8	44.0	37	8.1	1	10	13.7	0.3	3.94	14	82
2014	Aug	0.218	141	178		37.9	4.9	256	323	69	9	22.0	56	8.7	0.7	10	8.8	0.3	3.59	9.1	83
2014	Sep	0.305	88	98		21	2.02	223	249	53	5	26.0	59	9	0.4	20	9.2	0.3	2.96	9.5	77
2014	Oct	0.410	104	116		7.6	3.53	355	396	26	12	25.0	39	7.9	1.3	74	8.1	0.3	3.34	8.4	63
2014	Nov	0.177	186	238		71.3	6.05	274	350	105	9	17.0	37	8	0.6	20	6.1	0.4	1.03	6.5	51
2014	Dec	0.308	127	146		32.1	3	325	374	82	8	12.0	18	7.5	1.8	216	5.4	0.6	0.57	6	41
2015	Jan	0.240	179	216		52.8	6.24	345	417	102	12	22.0	27	7.9	4.3	10	9.6	0.9	0.64	10.5	44
2015	Feb	0.304	240	266		50	5.42	485	538	101	11	36.0	42	8.8	1.2	10	7.3	0.8	0.84	8.1	44
2015	Mar	0.179	279	340		41.1	6.72	420	512	62	10	34.0	48	8.8	0.5	10	6.3	0.7	1.31	7	54
2015	Apr	0.290	91	174		28.6	4.56	263	504	83	13	46.0	66	8.3	1.4	10	9.7	0.3	2.55	10	58
Average		0.263	156	147	7.08	34	5.2	306	285	70	11	22	31	8.2	3.0	194	8.5	0.59	2.28	9.06	59
Minimum		0.094	65	41	6.87	8	2.0	159	90	26	5	11	9	7.5	0.1	10	4.7	0.11	0.57	5.54	41
Maximum		0.490	298	340	7.34	71	8.1	497	538	105	23	46	66	9.0	11.6	2400	13.7	1.26	3.94	14.00	83

APPENDIX C

Historical Liquid Temperature of the Aerated Lagoon Effluent


North Lagoon Liquid Temperature
Liquid Temp (deg C)
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
Lagoon 1 Effluent Temp
Nitrification Inhibited
Nitrification Ceases
Ammonia Violations
January 1, 2007
January 1, 2008
December 31, 2008
December 31, 2009
December 31, 2010
December 31, 2011
December 30, 2012
December 30, 2013
December 30, 2014
Date
Jan and Feb 2013
avg. liquid temp
= 4.8 deg C
Jan and Feb 2010
avg. liquid temp
= 1.6 deg C
Jan and Feb 2011
avg. liquid temp
= 2.2 deg C
Jan and Feb 2012
avg. liquid temp
= 5.7 deg C
NO VIOLATIONS


South Lagoon Liquid Temperature
Lagoon 1 Effluent Temp
Nitrification Inhibited
Nitrification Ceases
Ammonia Violations
Liquid Temp (deg C)
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
January 1, 2007
January 1, 2008
December 31, 2008
December 31, 2009
December 31, 2010
December 31, 2011
December 30, 2012
December 30, 2013
December 30, 2014
Date

APPENDIX D

Letters from KDHE: Notice of Pending Revised Ammonia Numeric Criteria

Division of Environment
Curtis State Office Building
1000 SW Jackson St., Suite 400
Topeka, KS 66612-1367

Kansas
Department of Health & Environment

Phone: 785-296-1535
Fax: 785-296-8464
www.kdheks.gov

Susan Mosier, MD, Acting Secretary

Sam Brownback, Governor

March 3, 2015

City of Louisburg
Rita Cassida
5 S Peoria Suite 105
Louisburg, KS 66053

RE: Notice of Pending Revised Ammonia Numeric Criteria
KWPC Permit No. M-MC20-OO01 – Plant 1

Dear Ms. Cassida,

The purpose of this letter is to inform certain municipal and industrial mechanical facilities about a pending change to the Kansas Surface Water Quality Numeric Criteria for ammonia. In 2013, the United States Environmental Protection Agency (EPA) released the "Aquatic Life Ambient Water Quality Criteria for Ammonia – Freshwater 2013" guide, which includes new criteria recommendations. As part of the next Water Quality Standards review process, over the next two years, the Kansas Department of Health and Environment (KDHE) will propose to adopt the recommended criteria defined in this document. These new criteria are based on the acute and chronic toxicity levels of ammonia in the presence of mussels and other shellfish as well as traditional aquatic species present in Kansas waters.

KDHE has assessed current monitoring data from municipal and industrial mechanical facilities to identify how this will affect current permit limits. Based on this data assessment, KDHE has determined that the new revised ammonia criteria may lower acute and chronic permit levels by as much as 75% during summer months.

Based on the assessment of current data, it is likely your facility or operation would not support the recommended criteria which KDHE proposes to adopt. We are providing this notification to initiate communication with KDHE in regard to lowering the wastewater ammonia concentrations well in advance of adoption of the criteria and to maintain compliance with future permit limits. A printout of the projected month by month new ammonia limits for the referenced wastewater treatment facility is attached. Please note, these limits are based on this initial review, and may change slightly when the formal permit reissuance review is completed.

Additionally, the NPDES permit for this facility is currently in review for reissuance. This facility has not been in full compliance with the effluent limits for ammonia based on the current Kansas water

quality standards regulations for ammonia. Therefore, when this permit is reissued, it is expected to include a schedule of compliance to upgrade this facility to improve ammonia reduction. The city should engage your facility's engineering professionals to conduct their own analysis of potential impacts based on the new ammonia criteria, and necessary upgrades to meet the new criteria limits.

If you have specific questions on the pending ammonia criteria please feel free to contact, Julia Young, at (785) 296-5508 or via email at jyoung@kdheks.gov. Municipal dischargers needing to upgrade facilities or operations should contact Rod Geisler (785-296-5527; rgeisler@kdheks.gov). Industrial dischargers needing to upgrade facilities or operations should contact Don Carlson (785-286-5547; dcarlson@kdheks.gov).

Sincerely,

R. Trevor Flynn
Planning and Standards Unit
Bureau of Water, Kansas Department of Health and Environment

Att: Estimate of Proposed Future Ammonia Limits

Notice of Pending Revised Ammonia Numeric Criteria
WPC Permit No.: M-MC20-OO01
Estimate of Proposed Future Ammonia Limits

Facility	NPDES_Num	Month	Estimate of Proposed Acute Criteria (mg/L)	Estimate of Proposed Chronic Criteria (mg/L)
Louisburg #1	M-MC20-OO01	Jan	**10.10**	**4.33**
Louisburg #1	M-MC20-OO01	Feb	**10.10**	**4.33**
Louisburg #1	M-MC20-OO01	Mar	**10.10**	**4.33**
Louisburg #1	M-MC20-OO01	April	**8.03**	**2.87**
Louisburg #1	M-MC20-OO01	May	**5.57**	**2.10**
Louisburg #1	M-MC20-OO01	June	**3.96**	**1.56**
Louisburg #1	M-MC20-OO01	July	**3.13**	**1.26**
Louisburg #1	M-MC20-OO01	Aug	**3.00**	**1.22**
Louisburg #1	M-MC20-OO01	Sep	**3.61**	**1.44**
Louisburg #1	M-MC20-OO01	Oct	**6.41**	**2.37**
Louisburg #1	M-MC20-OO01	Nov	**10.10**	**3.83**
Louisburg #1	M-MC20-OO01	Dec	**10.10**	**4.33**

Division of Environment
Curtis State Office Building
1000 SW Jackson St., Suite 400
Topeka, KS 66612-1367

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www.kdheks.gov

Susan Mosier, MD, Acting Secretary

Sam Brownback, Governor

March 3, 2015

City of Louisburg
Rita Cassida
5 S Peoria Suite 105
Louisburg, KS 66053

RE: Notice of Pending Revised Ammonia Numeric Criteria
KWPC Permit No. M-MC20-OO02 – Plant 2

Dear Ms. Cassida,

The purpose of this letter is to inform certain municipal and industrial mechanical facilities about a pending change to the Kansas Surface Water Quality Numeric Criteria for ammonia. In 2013, the United States Environmental Protection Agency (EPA) released the "Aquatic Life Ambient Water Quality Criteria for Ammonia – Freshwater 2013" guide, which includes new criteria recommendations. As part of the next Water Quality Standards review process, over the next two years, the Kansas Department of Health and Environment (KDHE) will propose to adopt the recommended criteria defined in this document. These new criteria are based on the acute and chronic toxicity levels of ammonia in the presence of mussels and other shellfish as well as traditional aquatic species present in Kansas waters.

KDHE has assessed current monitoring data from municipal and industrial mechanical facilities to identify how this will affect current permit limits. Based on this data assessment, KDHE has determined that the new revised ammonia criteria may lower acute and chronic permit levels by as much as 75% during summer months.

Based on the assessment of current data, it is likely your facility or operation would not support the recommended criteria which KDHE proposes to adopt. We are providing this notification to initiate communication with KDHE in regard to lowering the wastewater ammonia concentrations well in advance of adoption of the criteria and to maintain compliance with future permit limits. A printout of the projected month by month new ammonia limits for the referenced wastewater treatment facility is attached. Please note, these limits are based on this initial review, and may change slightly when the formal permit reissuance review is completed.

Please also note, the NPDES permit for this facility is currently in review for reissuance. This facility has not been in full compliance with the effluent limits for ammonia based on the current Kansas

water quality standards regulations for ammonia. Therefore, when this permit is reissued, it is expected to include a schedule of compliance to upgrade this facility to improve ammonia reduction. The city should engage your facility's engineering professionals to conduct their own analysis of potential impacts based on the new ammonia criteria, and necessary upgrades to meet the new criteria limits.

If you have specific questions on the pending ammonia criteria please feel free to contact, Julia Young, at (785) 296-5508 or via email at jyoung@kdheks.gov. Municipal dischargers needing to upgrade facilities or operations should contact Rod Geisler (785-296-5527; rgeisler@kdheks.gov). Industrial dischargers needing to upgrade facilities or operations should contact Don Carlson (785-286-5547; dcarlson@kdheks.gov).

Sincerely,

R. Trevor Flynn
Planning and Standards Unit
Bureau of Water, Kansas Department of Health and Environment

Att: Estimate of Proposed Future Ammonia Limits

Notice of Pending Revised Ammonia Numeric Criteria
WPC Permit No.: M-MC20-OO02
Estimate of Proposed Future Ammonia Limits

Facility	NPDES_Num	Month	Estimate of Proposed Acute Criteria (mg/L)	Estimate of Proposed Chronic Criteria (mg/L)
Louisburg #2	M-MC20-OO02	Jan	**9.70**	**3.57**
Louisburg #2	M-MC20-OO02	Feb	**9.70**	**3.57**
Louisburg #2	M-MC20-OO02	Mar	**9.70**	**3.57**
Louisburg #2	M-MC20-OO02	April	**7.71**	**2.37**
Louisburg #2	M-MC20-OO02	May	**5.35**	**1.75**
Louisburg #2	M-MC20-OO02	June	**3.80**	**1.30**
Louisburg #2	M-MC20-OO02	July	**3.01**	**1.06**
Louisburg #2	M-MC20-OO02	Aug	**2.89**	**1.02**
Louisburg #2	M-MC20-OO02	Sep	**3.47**	**1.20**
Louisburg #2	M-MC20-OO02	Oct	**6.16**	**1.97**
Louisburg #2	M-MC20-OO02	Nov	**9.70**	**3.16**
Louisburg #2	M-MC20-OO02	Dec	**9.70**	**3.57**

APPENDIX E

Design Calculations

South Lagoon

	Loading	Liquid Temp (deg C)	AOR (ppd)	SOR (ppd)	Airflow (scfm)	AOR/SOR	Airflow Per Cell
Vance	Average	10	2,069	5,390	3,862	0.38	1,931
ITC	Average	10	2,069	5,033	3,707	0.41	1,854
Vance	Average	20	2,069	5,558	3,983	0.37	1,992
ITC	Average	20	2,069	5,192	4,052	0.40	2,026
Vance	Peak	10	2,352	6,128	4,391	0.38	2,196
ITC	Peak	10	2,352	5,722	4,215	0.41	2,107
Vance	Peak	20	2,352	6,319	4,529	0.37	2,264
ITC	Peak	20	2,352	5,903	4,606	0.40	2,303

North Lagoon

	Loading	Liquid Temp (deg C)	AOR (ppd)	SOR (ppd)	Airflow (scfm)	AOR/SOR	Airflow Per Cell
Vance	Average	10	1,557	4,066	2,913	0.38	1,457
ITC	Average	10	1,557	3,795	2,801	0.41	1,401
Vance	Average	20	1,557	4,194	3,005	0.37	1,503
ITC	Average	20	1,557	3,916	3,062	0.40	1,531
Vance	Peak	10	2,147	5,608	4,019	0.38	2,009
ITC	Peak	10	2,147	5,235	3,864	0.41	1,932
Vance	Peak	20	2,147	5,785	4,145	0.37	2,073
ITC	Peak	20	2,147	5,401	4,223	0.40	2,112

Design Flow	0.42	mgd
Influent TKN	44	mg/L
Influent BOD	220	mg/L
Air Temp	68	°F
Liquid Temp	10	°C
Elevation	1026	ft
O_t	19	%
C_L	2	mg/L
Diffuser Depth	8	ft
α	0.5	
β	0.98	
F	1	
C_T	11.28	mg/L
Aerated Time	12	hrs
Transfer Efficiency	1.40%	
Denite O2 Credit	1.5	mg/l

Minimum depth based on floating diffusers (this is conservative)

Max is 2.86 mg/l

		Design Flow	0.42	mgd	Air Temp	68	°F			
	Influent	TKN	44	mg/L	Liquid Temp	10	°C			
	Effluent	TKN	0	mg/L	Elevation	1026	ft			
	Removed	TKN	44	mg/L		313	m			
			154	ppd	g	9.81	m/s2			
					M	28.97	kg/kg-mole			
	Influent	BOD	220	mg/L	R	8314	N-m/kg-mole-K			
	Effluent	BOD	0	mg/L	T	283.15	K			
	Removed	BOD	220	mg/L	P	101,325	N/m2			
			771	ppd	P_a/P_b	0.96				
					C_{10}	11.28	mg/L	O_t	19	%
AOR/SOR	0.41	AOR	**1,557**	ppd	$C_{s,t,h}$	10.86	mg/L	$C_{s,20}$	9.08	mg/L
		SOR	**3,795**	ppd	γ_a	9.802	kN/m3	Operating DO	2	mg/L
		Aerated Time	12	h/day	$P_{atm,h}$	9.95	m of water			
			316	pph	P_d	2.44	m of water	*Diffusers 1 foot off the floor, basin is 9 feet deep min. Diffuser depth is 8 feet*	8	ft
		Total Airflow Rate	**2,801**	scfm	$C_{\acute{S},T,H}$	11.68	mg/L			
		Airflow Rate per cell	**1,401**	scfm	α	0.5				
					β	0.98				
					F	1				
					ρ_a	0.075265	lb/ft^3			
					$\rho_{a,h}$	0.072475	lb/ft^3			
						0.016800	lb O_2/ft^3 air			
					OTE	11.2%		*1.4% per ft of diffuser depth*	1.40%	

Design Flow	0.42	mgd
Influent TKN	44	mg/L
Influent BOD	220	mg/L
Air Temp	100	°F
Liquid Temp	20	°C
Elevation	1026	ft
O_t	19	%
C_L	2	mg/L
Diffuser Depth	8	ft
α	0.5	
β	0.98	
F	1	
C_T	9.08	mg/L
Aerated Time	12	hrs
Transfer Efficiency	1.40%	
Denite O2 Credit	1.5	mg/l

Minimum depth based on floating diffusers (this is conservative)

Max is 2.86 mg/l

		Design Flow	0.42	mgd	Air Temp	100	°F			
	Influent	TKN	44	mg/L	Liquid Temp	20	°C			
	Effluent	TKN	0	mg/L	Elevation	1026	ft			
	Removed	TKN	44	mg/L		313	m			
			154	ppd	g	9.81	m/s2			
					M	28.97	kg/kg-mole			
	Influent	BOD	220	mg/L	R	8314	N-m/kg-mole-K			
	Effluent	BOD	0	mg/L	T	293.15	K			
	Removed	BOD	220	mg/L	P	101,325	N/m2			
			771	ppd	P_a/P_b	0.96				
					C_{20}	9.08	mg/L	O_t	19	%
AOR/SOR	0.40	AOR	**1,557**	ppd	$C_{s,t,h}$	8.75	mg/L	$C_{s,20}$	9.08	mg/L
		SOR	**3,916**	ppd	γ_a	9.789	kN/m3	Operating DO	2	mg/L
		Aerated Time	12	h/day	$P_{atm,h}$	9.98	m of water			
			326	pph	P_d	2.44	m of water	*Diffusers 1 foot off the floor, basin is 9 feet deep min. Diffuser depth is 8 feet*	8	ft
		Total Airflow Rate	**3,062**	scfm	$C_{\acute{S},T,H}$	9.41	mg/L			
		Airflow Rate per cell	**1,531**	scfm	α	0.5				
					β	0.98				
					F	1				
					ρ_a	0.070961	lb/ft^3			
					$\rho_{a,h}$	0.068419	lb/ft^3			
						0.01586	lb O_2/ft^3 air			
					OTE	11.2%		*1.4% per ft of diffuser depth*	1.40%	

Design Flow	0.42	mgd	
Influent TKN	60	mg/L	90 percentile value from the data set
Influent BOD	305	mg/L	90 percentile value from the data set
Air Temp	68	°F	
Liquid Temp	10	°C	
Elevation	1026	ft	
O_t	19	%	
C_L	2	mg/L	
Diffuser Depth	8	ft	Minimum depth based on floating diffusers (this is conservative)
α	0.5		
β	0.98		
F	1		
C_T	11.28	mg/L	
Aerated Time	12	hrs	
Transfer Efficiency	1.40%		
Denite O2 Credit	1.5	mg/l	Max is 2.86 mg/l

		Design Flow	0.42	mgd	Air Temp	68	°F		
	Influent	TKN	60	mg/L	Liquid Temp	10	°C		
	Effluent	TKN	0	mg/L	Elevation	1026	ft		
	Removed	TKN	60	mg/L		313	m		
			210	ppd	g	9.81	m/s2		
					M	28.97	kg/kg-mole		
	Influent	BOD	305	mg/L	R	8314	N-m/kg-mole-K		
	Effluent	BOD	0	mg/L	T	283.15	K		
	Removed	BOD	305	mg/L	P	101,325	N/m2		
			1068	ppd	P_a/P_b	0.96			
					C_{10}	11.28	mg/L	O_t	19 %
AOR/SOR	0.41	AOR	**2,147**	ppd	$C_{s,t,h}$	10.86	mg/L	$C_{s,20}$	9.08 mg/L
		SOR	**5,235**	ppd	γ_a	9.802	kN/m3	Operating DO	2 mg/L
		Aerated Time	12	h/day	$P_{atm,h}$	9.95	m of water		
			436	pph	P_d	2.44	m of water	*Diffusers 1 foot off the floor, basin is 9 feet deep min. Diffuser depth is 8 feet*	8 ft
		Total Airflow Rate	**3,864**	scfm	$C_{\acute{S},T,H}$	11.68	mg/L		
		Airflow Rate per cell	**1,932**	scfm	α	0.5			
					β	0.98			
					F	1			
					ρ_a	0.075265	lb/ft^3		
					$\rho_{a,h}$	0.072475	lb/ft^3		
						0.016800	lb O_2/ft^3 air		
					OTE	11.2%		*1.4% per ft of diffuser depth*	1.40%

Design Flow	0.42	mgd	
Influent TKN	60	mg/L	90 percentile value from the data set
Influent BOD	305	mg/L	90 percentile value from the data set
Air Temp	100	°F	
Liquid Temp	20	°C	
Elevation	1026	ft	
O_t	19	%	
C_L	2	mg/L	
Diffuser Depth	8	ft	Minimum depth based on floating diffusers (this is conservative)
α	0.5		
β	0.98		
F	1		
C_T	9.08	mg/L	
Aerated Time	12	hrs	
Transfer Efficiency	1.40%		
Denite O2 Credit	1.5	mg/l	Max is 2.86 mg/l

	Design Flow		0.42	mgd	Air Temp	100	°F		
	Influent	TKN	60	mg/L	Liquid Temp	20	°C		
	Effluent	TKN	0	mg/L	Elevation	1026	ft		
	Removed	TKN	60	mg/L		313	m		
			210	ppd	g	9.81	m/s2		
					M	28.97	kg/kg-mole		
	Influent	BOD	305	mg/L	R	8314	N-m/kg-mole-K		
	Effluent	BOD	0	mg/L	T	293.15	K		
	Removed	BOD	305	mg/L	P	101,325	N/m2		
			1068	ppd	P_a/P_b	0.96			
					C_{20}	9.08	mg/L	O_t	19 %
AOR/SOR	0.40	AOR	**2,147**	ppd	$C_{s,t,h}$	8.75	mg/L	$C_{s,20}$	9.08 mg/L
		SOR	**5,401**	ppd	γ_a	9.789	kN/m3	Operating DO	2 mg/L
		Aerated Time	12	h/day	$P_{atm,h}$	9.98	m of water		
			450	pph	P_d	2.44	m of water	*Diffusers 1 foot off the floor, basin is 9 feet deep min. Diffuser depth is 8 feet*	8 ft
		Total Airflow Rate	**4,223**	scfm	$C_{\acute{S},T,H}$	9.41	mg/L		
		Airflow Rate per cell	**2,112**	scfm	α	0.5			
					β	0.98			
					F	1			
					ρ_a	0.070961	lb/ft^3		
					$\rho_{a,h}$	0.068419	lb/ft^3		
						0.01586	lb O_2/ft^3 air		
					OTE	11.2%		*1.4% per ft of diffuser depth*	1.40%

Design Flow	0.60	mgd	
Influent TKN	34	mg/L	
Influent BOD	220	mg/L	
Air Temp	68	°F	
Liquid Temp	10	°C	
Elevation	971	ft	
O_t	19	%	
C_L	2	mg/L	
Diffuser Depth	8	ft	Minimum depth based on floating diffusers (this is conservative)
α	0.5		
β	0.98		
F	1		
C_T	11.28	mg/L	
Aerated Time	12	hrs	
Transfer Efficiency	1.40%		
Denite O2 Credit	1.5	mg/l	Max is 2.86 mg/l

	Design Flow	0.60	mgd	Air Temp	68	°F			
Influent	TKN	34	mg/L	Liquid Temp	10	°C			
Effluent	TKN	0	mg/L	Elevation	971	ft			
Removed	TKN	34	mg/L		296	m			
		170	ppd	g	9.81	m/s2			
				M	28.97	kg/kg-mole			
Influent	BOD	220	mg/L	R	8314	N-m/kg-mole-K			
Effluent	BOD	0	mg/L	T	283.15	K			
Removed	BOD	220	mg/L	P	101,325	N/m2			
		1101	ppd	P_a/P_b	0.96				
				C_{10}	11.28	mg/L	O_t	19	%
	AOR	**2,069**	ppd	$C_{s,t,h}$	10.88	mg/L	$C_{s,20}$	9.08	mg/L
	SOR	**5,033**	ppd	γ_a	9.802	kN/m3	Operating DO	2	mg/L
	Aerated Time	12	h/day	$P_{atm,h}$	9.97	m of water			
		419	pph	P_d	2.44	m of water	*Diffusers 1 foot off the floor, basin is 9 feet deep min. Diffuser depth is 8 feet*	8	ft
	Total Airflow Rate	**3,707**	scfm	$C_{\acute{S},T,H}$	11.70	mg/L			
	Airflow Rate per cell	**1,854**	scfm	α	0.5				
				β	0.98				
				F	1				
				ρ_a	0.075265	lb/ft^3			
				$\rho_{a,h}$	0.072622	lb/ft^3			
					0.016834	lb O_2/ft^3 air			
				OTE	11.2%		*1.4% per ft of diffuser depth*	1.40%	

Design Flow	0.6	mgd	
Influent TKN	34	mg/L	
Influent BOD	220	mg/L	
Air Temp	100	°F	
Liquid Temp	20	°C	
Elevation	971	ft	
O_t	19	%	
C_L	2	mg/L	
Diffuser Depth	8	ft	Minimum depth based on floating diffusers (this is conservative)
α	0.5		
β	0.98		
F	1		
C_T	9.08	mg/L	
Aerated Time	12	hrs	
Transfer Efficiency	1.40%		
Denite O2 Credit	1.5	mg/l	Max is 2.86 mg/l

	Design Flow	0.6	mgd	Air Temp	100	°F			
Influent	TKN	34	mg/L	Liquid Temp	20	°C			
Effluent	TKN	0	mg/L	Elevation	971	ft			
Removed	TKN	34	mg/L		296	m			
		170	ppd	g	9.81	m/s2			
				M	28.97	kg/kg-mole			
Influent	BOD	220	mg/L	R	8314	N-m/kg-mole-K			
Effluent	BOD	0	mg/L	T	293.15	K			
Removed	BOD	220	mg/L	P	101,325	N/m2			
		1101	ppd	P_a/P_b	0.97				
				C_{20}	9.08	mg/L	O_t	19	%
	AOR	**2,069**	ppd	$C_{s,t,h}$	8.77	mg/L	$C_{s,20}$	9.08	mg/L
	SOR	**5,192**	ppd	γ_a	9.789	kN/m3	Operating DO	2	mg/L
	Aerated Time	12	h/day	$P_{atm,h}$	10.00	m of water			
		433	pph	P_d	2.44	m of water	*Diffusers 1 foot off the floor, basin is 9 feet deep min. Diffuser depth is 8 feet*	8	ft
	Total Airflow Rate	**4,052**	scfm	$C_{\acute{S},T,H}$	9.42	mg/L			
	Airflow Rate per cell	**2,026**	scfm	α	0.5				
				β	0.98				
				F	1				
				ρ_a	0.070961	lb/ft^3			
				$\rho_{a,h}$	0.068553	lb/ft^3			
					0.015891	lb O_2/ft^3 air			
				OTE	11.2%		*1.4% per ft of diffuser depth*	1.40%	

Design Flow	0.60	mgd	
Influent TKN	50	mg/L	90 percentile value from the data set
Influent BOD	225	mg/L	90 percentile value from the data set
Air Temp	68	°F	
Liquid Temp	10	°C	
Elevation	971	ft	
O_t	19	%	
C_L	2	mg/L	
Diffuser Depth	8	ft	Minimum depth based on floating diffusers (this is conservative)
α	0.5		
β	0.98		
F	1		
C_T	11.28	mg/L	
Aerated Time	12	hrs	
Transfer Efficiency	1.40%		
Denite O2 Credit	1.5	mg/l	Max is 2.86 mg/l

	Design Flow	0.60	mgd	Air Temp	68	°F			
Influent	TKN	50	mg/L	Liquid Temp	10	°C			
Effluent	TKN	0	mg/L	Elevation	971	ft			
Removed	TKN	50	mg/L		296	m			
		250	ppd	g	9.81	m/s2			
				M	28.97	kg/kg-mole			
Influent	BOD	225	mg/L	R	8314	N-m/kg-mole-K			
Effluent	BOD	0	mg/L	T	283.15	K			
Removed	BOD	225	mg/L	P	101,325	N/m2			
		1126	ppd	P_a/P_b	0.96				
				C_{10}	11.28	mg/L	O_t	19	%
	AOR	**2,352**	ppd	$C_{s,t,h}$	10.88	mg/L	$C_{s,20}$	9.08	mg/L
	SOR	**5,722**	ppd	γ_a	9.802	kN/m3	Operating DO	2	mg/L
	Aerated Time	12	h/day	$P_{atm,h}$	9.97	m of water			
		477	pph	P_d	2.44	m of water	*Diffusers 1 foot off the floor, basin is 9 feet deep min. Diffuser depth is 8 feet*	8	ft
	Total Airflow Rate	**4,215**	scfm	$C_{Ś,T,H}$	11.70	mg/L			
	Airflow Rate per cell	**2,107**	scfm	α	0.5				
				β	0.98				
				F	1				
				ρ_a	0.075265	lb/ft^3			
				$\rho_{a,h}$	0.072622	lb/ft^3			
					0.016834	lb O_2/ft^3 air			
				OTE	11.2%		*1.4% per ft of diffuser depth*	1.40%	

Design Flow	0.6	mgd	
Influent TKN	50	mg/L	90 percentile value from the data set
Influent BOD	225	mg/L	90 percentile value from the data set
Air Temp	100	°F	
Liquid Temp	20	°C	
Elevation	971	ft	
O_t	19	%	
C_L	2	mg/L	
Diffuser Depth	8	ft	Minimum depth based on floating diffusers (this is conservative)
α	0.5		
β	0.98		
F	1		
C_T	8.24	mg/L	
Aerated Time	12	hrs	
Transfer Efficiency	1.40%		
Denite O2 Credit	1.5	mg/l	Max is 2.86 mg/l

	Design Flow	0.6	mgd	
Influent	TKN	50	mg/L	
Effluent	TKN	0	mg/L	
Removed	TKN	50	mg/L	
		250	ppd	
Influent	BOD	225	mg/L	
Effluent	BOD	0	mg/L	
Removed	BOD	225	mg/L	
		1126	ppd	
	AOR	**2,352**	ppd	
	SOR	**5,903**	ppd	
	Aerated Time	12	h/day	
		492	pph	
	Total Airflow Rate	**4,606**	scfm	
	Airflow Rate per cell	**2,303**	scfm	

Air Temp	100	°F	
Liquid Temp	20	°C	
Elevation	971	ft	
	296	m	
g	9.81	m/s2	
M	28.97	kg/kg-mole	
R	8314	N-m/kg-mole-K	
T	293.15	K	
P	101,325	N/m2	
P_a/P_b	0.97		
C_{20}	9.08	mg/L	
$C_{s,t,h}$	8.77	mg/L	
γ_a	9.789	kN/m3	
$P_{atm,h}$	10.00	m of water	
P_d	2.44	m of water	
$C_{ś,T,H}$	9.42	mg/L	
α	0.5		
β	0.98		
F	1		
ρ_a	0.070961	lb/ft^3	
$\rho_{a,h}$	0.068553	lb/ft^3	
	0.015891	lb O_2/ft^3 air	
OTE	11.2%		

O_t	19	%
$C_{s,20}$	9.08	mg/L
Operating DO	2	mg/L

Diffusers 1 foot off the floor, basin is 9 feet deep min. Diffuser depth is 8 feet 8 ft

1.4% per ft of diffuser depth 1.40%

APPENDIX F

Photos


Photo 1


Photo 2


Photo 3


Photo 4



Photo 5



Photo 6



Photo 7



Photo 8



Photo 9



Photo 10



Photo 11



Photo 12



Photo 13



Photo 14



Photo 15



Photo 16



Photo 17



Photo 18



Photo 19



Photo 20



Photo 21



Photo 22



Photo 23



Photo 24



Photo 25



Photo 26

APPENDIX G

Detailed Cost Back-up

Summary

		EDI	AquaTec	Average
North Lagoon Improvements		2,183,000	2,105,000	$2,140,000
Lagoon Cleanout				$240,000
South Lagoon Improvements		2,628,000	2,373,000	$2,501,000
Three-Phase Power to South Lagoons		250,000	250,000	$250,000
Construction Total		5,061,000	4,728,000	$5,131,000
Engineering and Construction Administration	20%	962,000	896,000	$928,000
Total Project Cost		**6,023,000**	**5,624,000**	**$6,059,000**

North Lagoon Improvements (EDI/Kaesar/Lakeside Package)

	Qty	Unit	Unit Cost	Total
General Requirements (bonds, insur, mob, and profit)	12	%		179,800
Sitework	5	%		71,300
Concrete				
Slab on Grade				
Parshall Flume Structure	7	cu yd	600.00	3,940
Blower Pad	26	cu yd	600.00	15,400
Generator Pad	25	cu yd	600.00	15,000
Aerated Cell Partition Wall Footing	147	cu yd	600.00	88,300
Walls				
Aerated Cell Partition Walls	156	cu yd	1,000.00	155,560
Parshall Flume Structure	16	cu yd	1,000.00	16,300
Precast MH (w/ H2S Inhibitor)				
4'-0" Diameter	2	ea	6,000.00	12,000
6'-0" Diameter (Screen Well)	12	vlf	830.00	10,000
Mechanical				
PVC Pipe, 24" (Reroute East Interceptor)	80	lin ft	240.00	19,200
Equipment				
Blowers	3	ea	76,000.00	228,000
Screens	1	ea	74,000.00	74,000
Fine Bubble Diffusers		lump sum		260,000
Mixers		lump sum		53,250
Installation	30	%		184,575
350 kW Diesel Generator (installed)	1	ea	145,000.00	145,000
Composite Sampler	1	ea	5,000.00	5,000
Electrical and Controls	11	%		141,400
Subtotal Construction				**1,678,000**
Contingency	25	%		420,000
Inflation to Mid-Point of Construction	2	%		85,000
Total Construction				**2,183,000**

South Lagoon Improvements (EDI/Kaesar/Lakeside Package)

	Qty	Unit	Unit Cost	Total
General Requirements (bonds, insur, mob, and profit)	12	%		216,500
Sitework	5	%		85,900
Concrete				
Slab on Grade				
Parshall Flume Structure	7	cu yd	600.00	3,940
Blower Pad	26	cu yd	600.00	15,400
Generator Pad	25	cu yd	600.00	15,000
Aerated Cell Partition Wall Footing	200	cu yd	600.00	120,250
Walls				
Aerated Cell Partition Walls	219	cu yd	1,000.00	218,910
Parshall Flume Structure	18	cu yd	1,000.00	17,930
Precast MH (w/ H2S Inhibitor)				
4'-0" Diameter	1	ea	6,000.00	6,000
6'-0" Diameter (Screen Well)	18	vlf	830.00	15,000
Mechanical				
PVC Pipe, 8" (Reroute Sewer from PW Building)	120	lin ft	80.00	9,600
Equipment				
Pumps (Replace existing)	2	ea	20,000.00	40,000
Blowers	3	ea	79,000.00	237,000
Screens	1	ea	91,159.42	91,160
Fine Bubble Diffusers		lump sum		320,000
Mixers		lump sum		62,500
Installation	30	%		225,198
350 kW Diesel Generator (installed)	1	ea	145,000.00	145,000
Composite Sampler	1	ea	5,000.00	5,000
Electrical and Controls	11	%		170,300
Subtotal Construction				**2,021,000**
Contingency	25	%		505,000
Inflation to Mid-Point of Construction	2	%		102,000
Total Construction				**2,628,000**

North Lagoon Improvements (AquaTec, Aqualitec)

	Qty	Unit	Unit Cost	Total
General Requirements (bonds, insur, mob, and profit)	12	%		173,400
Sitework	5	%		68,800
Concrete				
Slab on Grade				
Parshall Flume Structure	7	cu yd	600.00	3,940
Blower Pad	26	cu yd	600.00	15,400
Generator Pad	25	cu yd	600.00	15,000
Aerated Cell Partition Wall Footing	147	cu yd	600.00	88,300
Walls				
Aerated Cell Partition Walls	156	cu yd	1,000.00	155,560
Parshall Flume Structure	16	cu yd	1,000.00	16,300
Precast MH (w/ H2S Inhibitor)				
4'-0" Diameter	2	ea	6,000.00	12,000
6'-0" Diameter (Screen Well)	12	vlf	830.00	10,000
Mechanical				
PVC Pipe, 24" (Reroute East Interceptor)	80	lin ft	240.00	19,200
Equipment				
Screens	1	ea	70,000.00	70,000
SAM Units		lump sum		510,000
Installation	30	%		174,000
350 kW Diesel Generator (installed)	1	ea	145,000.00	145,000
Composite Sampler	1	ea	5,000.00	5,000
Electrical and Controls	11	%		136,400
Subtotal Construction				**1,618,000**
Contingency	25	%		405,000
Inflation to Mid-Point of Construction	2	%		82,000
Total Construction				**2,105,000**

South Lagoon Improvements (AquaTec, Aqualitec)

	Qty	Unit	Unit Cost	Total
General Requirements (bonds, insur, mob, and profit)	12	%		195,500
Sitework	5	%		77,600
Concrete				
Slab on Grade				
Parshall Flume Structure	7	cu yd	600.00	3,940
Blower Pad	26	cu yd	600.00	15,400
Generator Pad	25	cu yd	600.00	15,000
Aerated Cell Partition Wall Footing	200	cu yd	600.00	120,250
Walls				
Aerated Cell Partition Walls	219	cu yd	1,000.00	218,910
Parshall Flume Structure	18	cu yd	1,000.00	17,930
Precast MH (w/ H2S Inhibitor)				
4'-0" Diameter	1	ea	6,000.00	6,000
6'-0" Diameter (Screen Well)	18	vlf	830.00	15,000
Mechanical				
PVC Pipe, 8" (Reroute Sewer from PW Building)	120	lin ft	80.00	9,600
Equipment				
Pumps (Replace existing)	2	ea	20,000.00	40,000
Screens	1	ea	85,381.00	85,380
SAM Units		lump sum		510,000
Installation	30	%		190,614
350 kW Diesel Generator (installed)	1	ea	145,000.00	145,000
Composite Sampler	1	ea	5,000.00	5,000
Electrical and Controls	11	%		153,800
Subtotal Construction				**1,825,000**
Contingency	25	%		456,000
Interest to Mid-Point of Construction	2	%		92,000
Total Construction				**2,373,000**