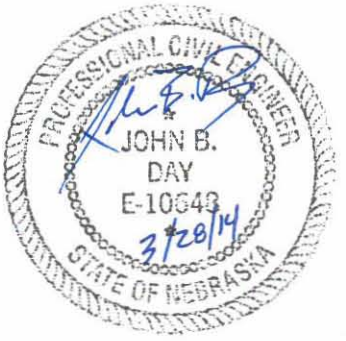
ENGINEERING REPORT
WASTEWATER TREATMENT FACILITY
CAPITAL IMPROVEMENT PLAN

PREPARED FOR

CITY OF BEATRICE

BEATRICE, NEBRASKA



MARCH 2014

OA PROJECT NO. 013-2627

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I. INTRODUCTION

A. Purpose

The purpose of this study is to provide the City of Beatrice with an evaluation of its Wastewater Treatment Facility (WWTF). This plan will review current and future standards and regulations and outline a plan for the City to follow to comply with current and future regulations and standards.

Foremost among the reasons for undertaking this study were: Concerns over potential future Federal and State permit limits for treatment, and the economics of other treatment alternatives available to the City.

On June 26, 2013, the Nebraska Department of Environmental Quality (NDEQ) issued the City an updated National Pollutant Discharge Elimination System (NPDES) Permit. The updated permit adds requirements for monitoring of total nitrogen and total phosphorous. Since the NDEQ is now requiring monitoring of these water quality parameters, it is believed that the NDEQ will set discharge limits for total nitrogen and total phosphorous when the next NDPES permit is issued, which may require year-round disinfection. The next NPDES permit is scheduled to be issued on June 30, 2018. A review of the existing plant and recommendations for improvements is necessary to assure it will meet current and proposed discharge standards.

Should the NDEQ set limits for total nitrogen, total phosphorous and year-round disinfection when the next NPDES permit is issued, the City will have to make improvements to the WWTF and the following schedule has been prepared to help the City determine when improvements may be required to be in-place.

Activity	Date	Time Frame	Cumulative Compliance Time Frame	Compliance Time Frame from Report Completion
Current NPDES Permit Issued	June 26, 2013	NA	NA	NA
Next NPDES Permit Scheduled to be Issued	June 30, 2018	5 Years	5 Years	4 Years
Design Improvements and Submit Plans & Specifications to the NDEQ	June 30, 2019	1st Year	6 Years	5 Years
Initiate Construction	June 30, 2020	2nd Year	7 Years	6 Years
Complete Construction	June 30, 2021	3rd Year	8 Years	7 Years

B. Scope

The scope of this Wastewater Treatment Facility Capital Improvement Plan is as follows:

- Provide a regulatory review of the current and future NPDES permit limits.
- Evaluate improvements required at the existing plant.
- Evaluate potential improvement alternatives to meet future regulatory requirements. Alternatives will be evaluated based on feasibility, economics, potential liability, operational requirements, flexibility, and long-term needs.
- Prepare anticipated budget costs for recommended improvements.
- Develop a Capital Improvement Plan (CIP) to provide a time frame for improvements over the next 10 years at 1-year intervals.
- Identify potential funding sources.
- Prepare a report so summarize the findings.

The CIP report will be used to prepare a cost of service analysis and sewer rate study.

II. INFLUENT FLOW AND WASTE LOADING PROJECTIONS

The size and location of the proposed WWTF must be compatible with future needs of the area to be served. Factors which reflect the future needs and which have a particular bearing on the facilities planning process are land use, demographic, and economic growth.

A. Land Use

Land use regulations within the corporate limits of Beatrice have been developed. The City Council has the final authority concerning growth policies of the City. The purpose of regulation is to provide for the orderly development and growth of the area in such a way as to protect the environment, public health, safety, and welfare. The City zoning ordinances aid in controlling future development.

The current land classifications for Beatrice are not anticipated to change within the current 20-year planning period. Land use for all land within a 2-mile radius of the existing City limits is residential or agricultural. The existing treatment plant falls within this areas so classified.

B. Economic Activity

Beatrice serves as a retail center for residents in the southeast area of Nebraska. Agriculture is a major form of employment and provides the base for the City's economy. There are several major industries in the area including ExMark, Store Kraft Manufacturing Company, Worldlawn/Encore, Neapco, Koch Nitrogen and Agrium. The City continues in the effort attract jobs and economic development including working to fill the now vacant Husqvarna Building. In addition, the biodiesel plant is scheduled to be placed into service. Added manufacturing and jobs will increase waste flows and loadings at the WWTF.

C. Population

The City of Beatrice had experienced a stable growth pattern between 1940 and 1980. The population declined between 1980 and 1990 and for the last 20 years, growth has been flat; refer to Table II-1 below. Based upon this information, City staff doesn't feel it's appropriate to project significant population growth. Therefore, it will be assumed that flat growth will continue, but waste flow and loadings will be increased based upon economic development, i.e., added industrial and manufacturing uses. For the purposes of this study, flow and loadings are assumed to increase by 15%.

Table II-1: Historical Population Data

YEAR	POPULATION
1940	10,083
1950	11,813
1960	12,132
1970	12,389
1980	12,891
1990	12,354
2000	12,496
2010	12,459

D. Treatment Plant Flow and Waste Loading Projections

Municipal WWTFs are designed on the basis of quantity of flow and organic content of the raw wastewater. The wastewater quantity for sizing the components of the plant varies, but a primary design parameter is the average daily flow during the year.

In 1995 when the most recent facility plan was prepared, the average residential, commercial, and industrial flow was found to be 181 gallons per capita per day. This per capita flow rate is higher than average for a community of this type. It was determined that excess infiltration may exist within the wastewater collection system and that inflow will have an effect on future design of the system. Since that time, the utility has worked to line sewer mains in order to reduce infiltration and inflow. In addition, the City has lost some industries which were large water users. Based upon the influent flow data from 2008 through 2013, average residential, commercial, and industrial flow is 91 gallons per capita per day.

As previously discussed, population growth over the last 30 years has been flat. Future population will be assumed to be 12,500. Flow and loading projections will be increased by 15% to account for future economic and industrial growth.

Based upon the projected population equivalent of 12,500 and industrial capacity, the future average daily design flow for the WWTF will be 1,500,000 gallons per day. The extreme annual peak hour flow was calculated using a calculation from Ten States Standards (see Figure 1 of the 2004 edition). The calculation is listed below:

$$Peak\ Hourly\ to\ Average\ Flow\ Peaking\ Factor = \frac{18 + \sqrt{P}}{4 + \sqrt{P}}$$

P is the population in thousands. The peaking factor using this equation is 2.86. The resulting current peak hour flow is 3.74 MGD. From a review of City influent and effluent flow records, some inconsistencies in the data were observed between the flow measurements.

It was determined that the effluent flow rates would be used for the purposes of this evaluation. See Table II-2 for hydraulic flows and loading rates.

Organic content of municipal wastewater is defined by concentrations of Biochemical Oxygen Demand (BOD_5), Total Suspended Solids (TSS), and ammonia. Ammonia and Total Kjeldahl Nitrogen (TKN) were calculated using an assumed concentration of 25 mg/L and 45 mg/L, respectively. Future land use does not indicate a change in the land use pattern which has been maintained throughout the past. The present domestic waste load was used for design of future wastewater treatment improvements. The domestic waste load was determined from existing City of Beatrice WWTF records. It is recommended that additional testing be performed to develop an organic loading baseline for nutrients listed below with assumed loading parameters.

Table II-2: Design Loadings

HYDRAULIC FLOW		
Hydraulic Flow	**Present**	**Design Year 2034**
Average Daily Dry Weather (2008-2013)	1.31 MGD	1.50 MGD
Average Annual Max Month	1.63 MGD	1.87 MGD
Peak Day (Effluent) Flow Rate (Jan. 23, 2010)	2.39 MGD	2.75 MGD
Extreme Annual Peak Hour Flow (Ten States)	3.74 MGD	4.31 MGD
Extreme Annual Day (June 6, 2008)	5.83 MGD	-
ORGANIC LOADINGS		
BOD (lb/day)	**Present**	**Design Year 2034**
Average Annual Loading	1,504	1,730
Average Annual Max Month	1,872	2,811
SS (lb/day)	**Present**	**Design Year 2034**
Average Annual Loading	2,249	2,586
Average Annual Max Month	2,798	5,113
Ammonia (lb/day)	**Present**	**Design Year 2034**
Average Annual Loading – Assumed (25 mg/L)	492	565
Total Kjeldahl Nitrogen (lb/day)	**Present**	**Design Year 2034**
Average Annual Loading – Assumed (45 mg/L)	612	704

E. Process Sampling

Composite samples were collected from the existing process to determine operational efficiencies. This included collecting 24-hour composite samples at 4 locations: 1) from the plant influent, 2) from the primary clarifier effluent trough, 3) from the trickling filter effluent in Control Structure No. 2, between the trickling filter and Rotating Biological Contactors (RBCs), and 4) from the plant effluent control structure. Samples were obtained within the timeframe from December 12 to 18, 2013. The samples were analyzed for several parameters with results as summarized in Tables II-3. Copies of the lab analysis are included in Appendix "A."

Table II-3: Average Composite Sampling Results

Parameter, mg/L	WWTP Influent	Primary Clarifier Effluent	Trickling Filter Effluent	WWTP Effluent
Ammoniacal Nitrogen	19.3	20.7	9.88	1.54
BOD	168.33	105.33	72.33	16.33
Soluble BOD	42.33	34.33	17.67	5.33
TSS	196.33	77.67	69.00	15
pH, S.U.	7.62	7.68	7.79	7.92
Parameter, in lbs/day (1.14 MGD flow rate)				
Ammoniacal Nitrogen	183.50	196.81	93.97	14.64
BOD	1,600.45	1,001.47	687.72	155.29
Soluble BOD	402.49	326.43	167.97	50.70
TSS	1,866.66	738.42	656.02	142.61
pH, S.U.	-	-	-	-

III. WATER QUALITY STANDARDS

Water quality planning activities in Nebraska are presently handled by the NDEQ and Nebraska Environmental Quality Council. They are responsible for setting water quality criteria and establishing treatment requirements necessary for maintaining the defined level of water quality. The regulations require a minimum of secondary treatment for all municipal wastewater.

The need for treatment beyond secondary treatment is determined on the basis of the flow available in the receiving stream for dilution of the plant effluent.

The Nebraska Environmental Quality Council has set criteria for parameters of water quality in the various streams and impoundments in the State, in order to protect and enhance their value for designated uses. The State is in a continual process of reviewing all these classifications and uses and may be making substantial changes in the near future.

For surface waters there are anti-degradation clauses, as defined in NDEQ Title 117, Chapter 3, which require that existing water quality not be adversely affected. A State Resources Water - Class A is an outstanding State or National Resource that shall be maintained and protected.

State Resource Waters - Class B are waters whose existing quality is better than the established standards as of the date that such standards become effective. These waters will be maintained at this high quality unless it has been affirmatively demonstrated to the State that a change is justifiable as a result of necessary widespread economic or social development. If water quality is to be degraded, without changing existing water uses, the strictest statutory and regulatory requirements will be applied to new and existing point sources through the wastewater discharge permit process and new source performance standards.

A. Description of Standards

1. Beneficial Water Uses

   The beneficial surface water uses and their definitions listed below are existing or attainable under current water quality standards.

   The beneficial uses are assigned to each stream segment within or bordering upon the State of Nebraska. The proposed beneficial uses of water stated pertain to water quality.

Beneficial uses are classified by the following:

- Recreation
- Aquatic Life
- Coldwater (Class A and B)
- Warmwater (Class A and B)
- Water Supply
- Public Drinking Water
- Agricultural
- Industrial
- Aesthetics and Public Health

The following are definitions and criteria applied to each beneficial use from the NDEQ Water Quality Standards.

B. Recreation

1. Primary Contact Recreation

This use applies to surface waters that are used, or have a high potential to be used, for primary contact recreational activities. Primary contact recreation includes activities where the body may come into prolonged or intimate contact with the water, such that water may be accidentally ingested and sensitive body organs (e.g., eyes, ears, nose, etc.) may be exposed. Although the water may be accidentally ingested, it is not intended to be used as a potable water supply unless acceptable treatment is applied. These waters may be used for swimming, water skiing, canoeing, and similar activities.

a. Fecal Coliform Criteria

Bacteria of the fecal coliform group shall not exceed a geometric mean of 200/100 ml, nor equal or exceed 400/100 ml, in more than 10% of the samples. These criteria are based on a minimum of 5 samples taken within a 30-day period. This does not preclude fecal coliform limitations based on effluent guidelines.

These criteria apply during the recreational period of May 1 through September 30.

C. Aquatic Life

1. General Criteria

The following criteria apply to all aquatic life use classes.

a. pH (Hydrogen Ion Concentration)

Hydrogen Ion Concentrations, expressed as pH, shall be maintained between 6.5 and 9.0; unless pH values outside this range are due to natural conditions.

b. Temperature

The temperature of the receiving water shall not be increased by a total of more than 5°F (3°C) from natural, outside the mixing zone. The mixing zone is defined based on the receiving stream and ammonia concentrations, and is determined by the NDEQ. For cold waters the maximum limit is 72°F (22°C) with an allowable change of 5°F (3°C) from natural. For warm waters the maximum limit is 90°F (32°C).

c. Toxic Substances

Surface waters of the State shall be free from toxic substances in toxic amounts. No toxic substances alone or in combination with other substances in concentrations rendering the receiving water unsafe or unsuitable for aquatic life will be allowed.

d. Petroleum Oil

Petroleum oil shall not exceed 10 mg/L.

e. Total Dissolved Gases

Not to exceed 110% of the saturation value for gases at the existing atmospheric and hydrostatic pressures.

f. Hydrogen Sulfide

Not to exceed 0.002 mg/L as undissociated hydrogen sulfide.

g. Biological Criteria

Any human activity that would significantly impact or displace an identified "key species" shall not be allowed. Key species are identified as endangered, threatened, sensitive, or recreationally important aquatic species. Key species are designated by stream segment, if a significant population exists. The following list defines the aquatic species considered by the NDEQ to be key species.

Threatened Species	**Sensitive Species**
- Lake Sturgeon	- Lake Chub
- Pallid Sturgeon (Endangered)	- Brook Stickleback
- Northern Redbelly Dace	- Iowa Darter
- Pearl Dace	- Johnny Darter
- Fine Scale Shiner	- Orange Throat Darter
- Black Nose Shiner	- Black Nose Dace
- Topeka Shiner (Endangered)	- Grass Pickerel
	- Pumpkinseed
	- Golden Shiner
	- Common Shiner

2. Coldwater

These are waters that provide, or could provide, a habitat consisting of flow, water quality, and other characteristics such as substrate composition that are capable of maintaining populations of coldwater biota. Coldwater biota is considered to be life form in waters where temperatures seldom exceed 25°C (77°F).

a. Class A - Coldwater

These waters provide a habitat which supports natural reproduction of a salmonid (trout) population. These waters also are capable of maintaining populations of a variety of other coldwater fish and associated vertebrate and invertebrate organisms and plants on an annual basis.

- *Dissolved Oxygen*
  Criteria vary based on the time of year and are not detailed in this report. Dissolved oxygen ranges are from 4.0 to 9.5 mg/L.

- *Total Ammonia (as nitrogen)*
  Total Ammonia values vary from 6.56 mg/L at pH of 6.6 to 0.18 mg/L at an pH of 9.0 on a 30-day average, depending on temperature.

- *Residual Chlorine*
  Residual Chlorine shall not exceed 0.021 mg/L on a 4-day average.

b. Class B - Coldwater

These are waters that provide, or could provide, a habitat capable of maintaining populations of a variety of coldwater fish and associated vertebrate and invertebrate organisms and plants on an annual basis or which supports the seasonal migration of salmonids. These waters do not support natural reproduction of salmonid populations due to limitations of flow, substrate composition, or other habitat conditions, but salmonid populations may be maintained year-round if periodically stocked.

- *Dissolved Oxygen*
  Criteria vary based on the time of year and are not detailed in this report. Dissolved Oxygen ranges are from 4.0 to 6.5 ml/l D.O. with a 30-day mean of not less than 6.5 mg/L. This criterion applies from July 1 through March 31.

- *Total Ammonia (as nitrogen)*
  Total Ammonia varies from 6.56 mg/L at a pH of 6.6 to 0.18 mg/L at a pH of 9.0 on a 30-day average.

- *Residual Chlorine*
  Residual Chlorine not to exceed 0.21 mg/L in a 4-day average for streams. Lakes and impounded waters shall not exceed 0.011 mg/L on a 4-day average.

3. Warmwater
   These are waters that provide, or could provide, a habitat consisting of flow, water quality, and other characteristics such as substrate composition that are capable of maintaining populations of warmwater biota. Warmwater biota is considered to be life forms in waters where temperatures frequently exceed 25°C (77°F).

   a. Class A - Warmwater
      These waters provide, or could provide, a habitat suitable for maintaining 1 or more identified key species on a year-round basis. These waters also are capable of maintaining year-round populations of a variety of other warmwater fish and associated vertebrate and invertebrate organisms and plants.
      - *Dissolved Oxygen*
        Criteria vary based on the time of year and are not detailed in this report. Dissolved Oxygen ranges are from 3.0 to 6.0 mg/L D.O.

      - *Total Ammonia (as nitrogen)*
        Total Ammonia values vary from 6.56 mg/L at pH of 6.6 to 0.18 mg/L at a pH of 9.0 for March through October.

      - *Residual Chlorine*
        Residual Chlorine shall not exceed 0.021 mg/L. On a 4-day average for lakes, the value is 0.011 mg/L.

   b. Class B - Warmwater
      These are waters where the variety of warmwater biota is presently limited by flow, water quality (natural or irretrievable human-induced conditions), substrate composition, or other habitat characteristics. These waters are capable of maintaining populations of nonsensitive warmwater fish and associated vertebrate and invertebrate organisms and plants on an annual basis.
      - *Dissolved Oxygen*
        Dissolved Oxygen limits shall be maintained as follows:
        - 1-day minimum of not less than 3.0 mg/L.
        - 7-day mean minimum of not less than 4.0 mg/L.
        - 30-day mean of not less than 5.5 mg/L.

- *Total Ammonia (as nitrogen)*
  Total Ammonia values vary from 6.56 mg/L at pH of 6.6 to 0.18 mg/L at a pH of 9.0 for March through October.

D. Water Supply

1. Public Drinking Water
   These are surface waters that serve as a potable water supply. These waters must be treated (e.g., coagulation, sedimentation, filtration, chlorination) before the water is suitable for human consumption. After treatment these waters are suitable for human domestic drinking water, food processing, and similar uses.

   a. General Criteria
      Wastes or toxic substances introduced directly or indirectly by human activity in concentrations that would degrade the use (i.e., would produce undesirable physiological effects in humans) shall not be allowed.

   b. Numerical Criteria
      Numerical criteria for the parameters listed below shall not be exceeded. Any substance introduced directly or indirectly by human activity shall not be allowed to enter surface water if 1 or more of the following numerical standards would be exceeded. The numerical standards listed below are intended to protect beneficial use of public drinking water supply. If the natural background level of a parameter is greater than the numerical standards, this shall not in and of itself prohibit the use of the surface water. If the natural background level of a parameter is greater than the numerical standard listed below, the background level shall be used in-place of the numerical criteria.

Table III-1: Numerical Criteria for Water Supply

POLLUTANT	NUMERICAL LIMIT
Inorganics:	
Antimony	0.006 mg/L
Arsenic	0.05 mg/L
Asbestos	7 million fibers/liter with fiber length >10 icrons
Barium	2.0 mg/L
Beryllium	0.004 mg/L
Cadmium	0.005 mg/L
Chromium	0.1 mg/L
Cyanide (as free cyanide)	0.2 mg/L
Fluoride	4.0 mg/L
Mercury	0.002 mg/L
Nitrate-Nitrogen	10.0 mg/L
Nitrite-Nitrogen	1 mg/L
Selenium	0.05 mg/L
Thallium	0.002 mg/L
Organics:	
Alachlor	0.002 mg/L
Atrazine	0.003 mg/L
Benzene	0.005 mg/L
Benzo(a)pyrene	0.0002 mg/L
Carbofuran	0.04 mg/L
Carbon tetrachloride	0.005 mg/L
Chlorobenzene	0.1 mg/L
Chlordane	0.002 mg/L
cis-1,2-Dichloroethylene	0.07 mg/L
Dalapon	0.2 mg/L
Dibromochloropropane (DBCP)	0.0002 mg/L
Dichloromethane	0.005 mg/L
Di(2-ethylhexyl)adipate	0.4 mg/L
Di-(2-ethylhexyl)phthalate	0.006 g/l
Dinoseb	0.007 mg/L
Dioxin (2,3,7,8-TCDD)	0.00000003 mg/L
Diquat	0.02 mg/L
Endothall	0.1 mg/L
Endrin	0.002 mg/L
Ethylbenzene	0.7 mg/L
Ethylene dibromide	0.00005 mg/L
Glyphosate	0.7 mg/L
Lindane	0.004 mg/L
Methoxychlor	0.1 mg/L
Toxaphene	0.005 mg/L
2,4-D	0.1 mg/L
Heptachlor	0.0004 mg/L
Heptachlor epoxide	0.002 mg/L
Hexachlorobenzene	0.001 mg/L
Hexachlorocyclopentadiene	0.05 mg/L
Lindane	0.0002 mg/L

POLLUTANT	NUMERICAL LIMIT
Organics Cont'd:	
Methoxychlor	0.04 mg/L
o-Dichlorobenzene	0.6 mg/L
Oxamly (Vydate)	0.2 mg/L
2,4,5-TP Silvex	0.05 mg/L
2,4-D	0.07 mg/L
PCB's	0.0005 mg/L
Pentachlorophenol	0.001 mg/L
Picloram	0.5 mg/L
Simazine	0.004 mg/L
Styrene	0.1 mg/L
trans-1,2-dichloroethylene	0.01 mg/L
1,2,4-Trichlorobenzene	0.07 mg/L
Trichloroethylene	0.005 mg/L
Tetrachloroethylene	0.005 mg/L
Toluene	1.0 mg/L
Total trihalomethanes	0.1 mg/L
Toxaphene	0.003 mg/L
Vinyl chloride	0.002 mg/L
Xylenes	10.0 mg/L
1,2-Dichloropropane	0.005 mg/L
1,2-Dichloroethane	0.005 mg/L
1,1-Dichloroethylene	0.007 mg/L
1,1,1-Trichloroethane	0.2 mg/L
1,1,2-Trichloroethane	0.005 mg/L
p-Dichlorobenzene	0.075 mg/L
Radionuclides:	
Beta particles and photon emitters	4 millirems per year
Combined radium-226 & radium-228	5 pCi/l
Gross alpha particle activity (including radium-226, but excluding radon and uranium)	15 pCi/l
Other Parameters Affecting Use:	
Aluminum	0.2 mg/L
Chloride	250 mg/L
Copper	1 mg/L
Foaming Agents (Methylene-blue active substances)	0.5 mg/L
Iron	0.3 mg/L
Manganese	0.05 mg/L
Silver	0.10 mg/L
Sulfate	250 mg/L
Total Dissolved Solids	500 mg/L
Zinc	5 mg/L

2. Agricultural

   a. General Criteria (applies to all agricultural use classes)
   Wastes or toxic substances introduced directly or indirectly by human activity concentrations that would degrade the use (i.e., would produce undesirable physiological effects in crops or livestock) shall not be allowed.

   b. Class A - Agricultural
   These are waters used for general agricultural purposes (e.g., irrigation and livestock watering) without treatment.
   - Conductivity - Not to exceed 2,000 ohms.
   - Nitrate and Nitrite as Nitrogen - Not to exceed 100 mg/L.
   - Selenium - Not to exceed 0.02 mg/L.

   c. Class B - Agricultural
   These are waters where the natural background water quality limits its use for agricultural purposes.

3. Industrial
   These are waters used for commercial or industrial purposes such as cooling water, hydroelectric power generation, or non-food processing water; with or without treatment. Water quality criteria to protect this use will vary with the type of industry involved. Where water quality criteria are necessary to protect this use, site-specific criteria will be developed.

E. Aesthetics and Public Health

This use applies to all surface waters of the State. To be aesthetically acceptable, waters shall be free from human-induced pollution that causes: 1) noxious odors; 2) floating, suspended, colloidal, or settleable materials that produce objectionable films, colors, turbidity, or deposits; and 3) the occurrence of undesirable or nuisance aquatic life (e.g., algal blooms). Surface waters shall also be free of junk, refuse, and discarded dead animals.

Table III-2: Effluent Water Quality Standards

Segment Description:	Big Blue River - Turkey Creek to Nebraska/Kansas
Segment No.:	10,000
Water Uses:	Warm Water Class A Agricultural Class A Recreational Use
Key Species:	Channel and Flathead Catfish

1. Water Quality Standards
   The Federal Water Pollution Control Act and its Amendments require that planning for publicly owned WWTF provide for secondary treatment, as a minimum and for scheduled application of Best Practicable Waste Treatment Technology (BPWTT) prior to July 1988. The EPA has

stipulated that a minimum of secondary treatment must be provided and that at least 3 basic alternatives must be considered to evaluate BPWTT. Two (2) of the considered alternatives are briefly described as follows:

a. Discharge to water course with secondary treatment, as a minimum, or such treatment as required to meet water quality standards.

b. Secondary treatment with land disposal of the effluent. For this method of disposal, runoff to the water course must be controlled, and the effluent quality, when it reaches the groundwater table, must meet effluent requirements for that use. The existing treatment plant effluent discharges into the Big Blue River. Effluent limitations established by the State water quality standards are summarized in Table III-3. The current discharge permit is included as part of this report in Appendix "B."

Table III-3: Effluent Water Quality Requirements 30-Day Avg

NPDES PERMIT NE0020915	
Parameter	**Current**
$CBOD_5$	25 mg/L
TSS	30 mg/L
Ammonia (March 1 through May 31)	36.9 mg/L
Ammonia (June 1 through October 31)	27.9 mg/L
Ammonia (November 1 through Feb. 28/29)	29.8 mg/L
E. Coli Coliform (May 1 through September 30)	126 cfu/100 mL
pH Range	6.5 – 9.0
Anticipated Total Nitrogen Limits	10 mg/L
Anticipated Total Phosphorus Limits	1 mg/L

Based on a review of the new NPDES discharge permit, the City should anticipate total nitrogen and phosphorus removal limits. The anticipated nutrient removal limits for nitrate of 10 mg/L or phosphorus of 1 mg/L are derived from the existing drinking water standards or the current limit of biological treatment capability, respectively.

The NDEQ generally adds water quality monitoring for parameters that will be added to future permits. The existing wastewater treatment process is not sufficient to provide nitrogen and phosphorus removal. It is recommended that the City work to modify their existing treatment process to account for nutrient removal requirements in anticipation of the next NPDES discharge permit revision. At the present time, the current process will not meet these limits.

IV. EXISTING TREATMENT PLANT EVALUATION

A. Review of Existing Plant

The WWTF in Beatrice consists of a comminutor, influent flow measurement, raw sewage pumping, and grit removal, pre-aeration before primary clarifiers, 2 primary clarifiers, 1 trickling filter, 8 RBCs, 2 final clarifiers, an effluent control structure and UV disinfection. The solids handling portion of the treatment plant consists of 3 aerated sludge holding tanks, sludge pumps, a gravity belt filter press, and composting. Refer to the process flow schematic depicted in Figure IV-1 the solids schematic depicted in Figure IV-2. The existing design parameters for the plant are as follows:

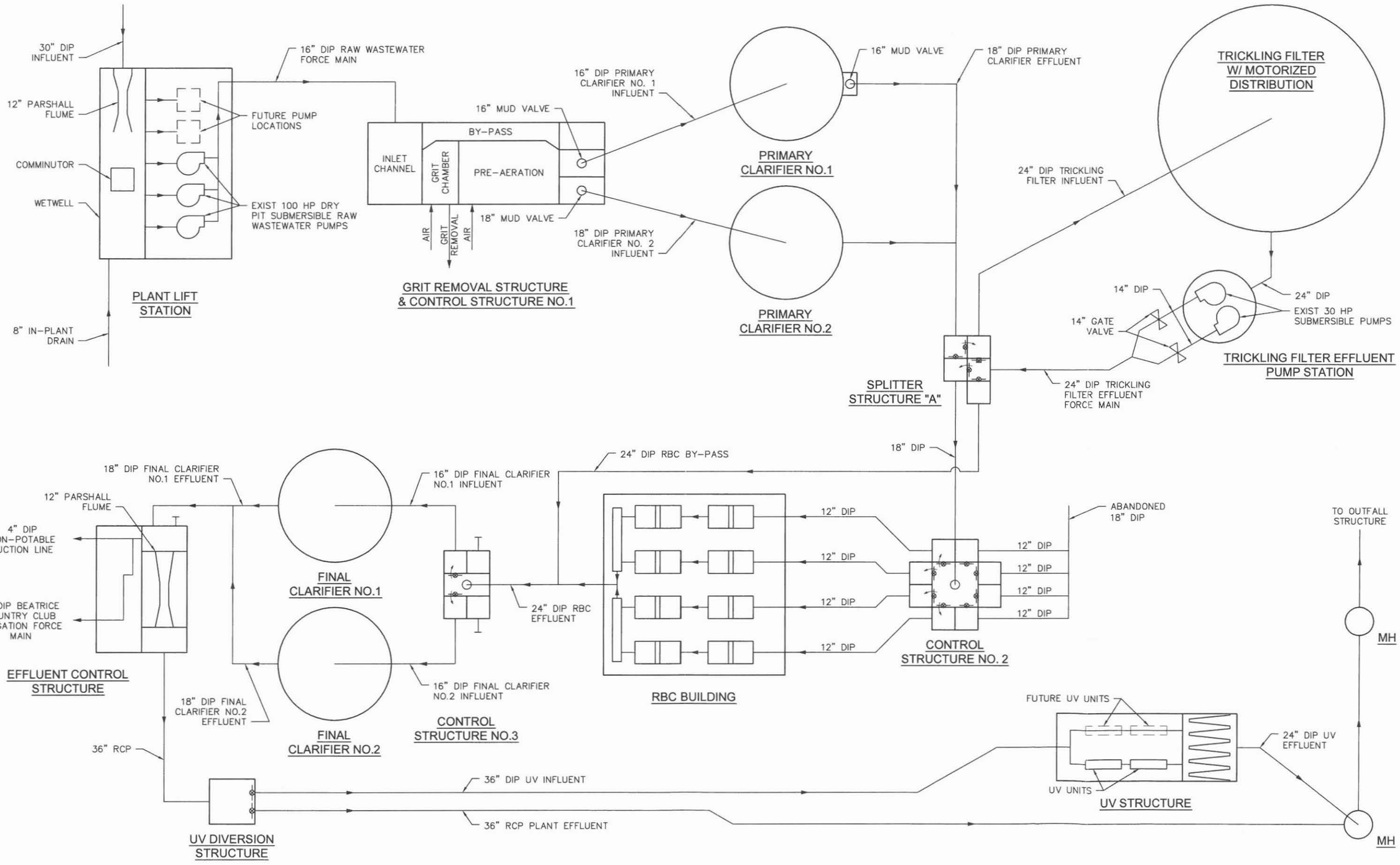
Table IV-1: Current WWTP Influent Parameters

FLOW	
Average Daily Dry Weather	1.31 MGD
Average Annual Max Month	1.63 MGD
Extreme Annual Day	5.83 MGD
INFLUENT BOD	
Average BOD	1,504 lbs/day
Max Month BOD	1,872 lbs/day
INFLUENT TSS	
Average TSS	2,249 lbs/day
Max Month TSS	2,798 lbs/day
ASSUMED TKN	
Average TKN	491.65 lbs/day
Max Month TKN	611.74 lbs/day
REMOVAL PERCENTAGES	
Total BOD Removal	92.0%
Total TSS Removal	94.4%

For reference, the design parameters from the 1995 Facility Plan are also provided. It should be noted that these parameters were determined prior to the trickling filter being retrofitted and initiated.

Table IV-2 – Previous WWTP Design Parameters

INFLUENT FLOW	
Average Daily Dry Weather	1.65 MGD
Peak Dry Weather	3.36 MGD
Peak Wet Weather	4.44 MGD
INFLUENT BOD	
Total BOD	3,033 lbs/day
Soluble BOD	1,545 lbs/day
INFLUENT TSS	
Average TSS	3,447 lbs/day
REMOVAL PERCENTAGES	
Total BOD Removal – Primary Clarifier	30.0%
Total Soluble BOD Removal – Primary Clarifier	30.0%
Total TSS Removal – Primary Clarifier	58.0%
Total Soluble BOD Removal – RBC's	80.5%



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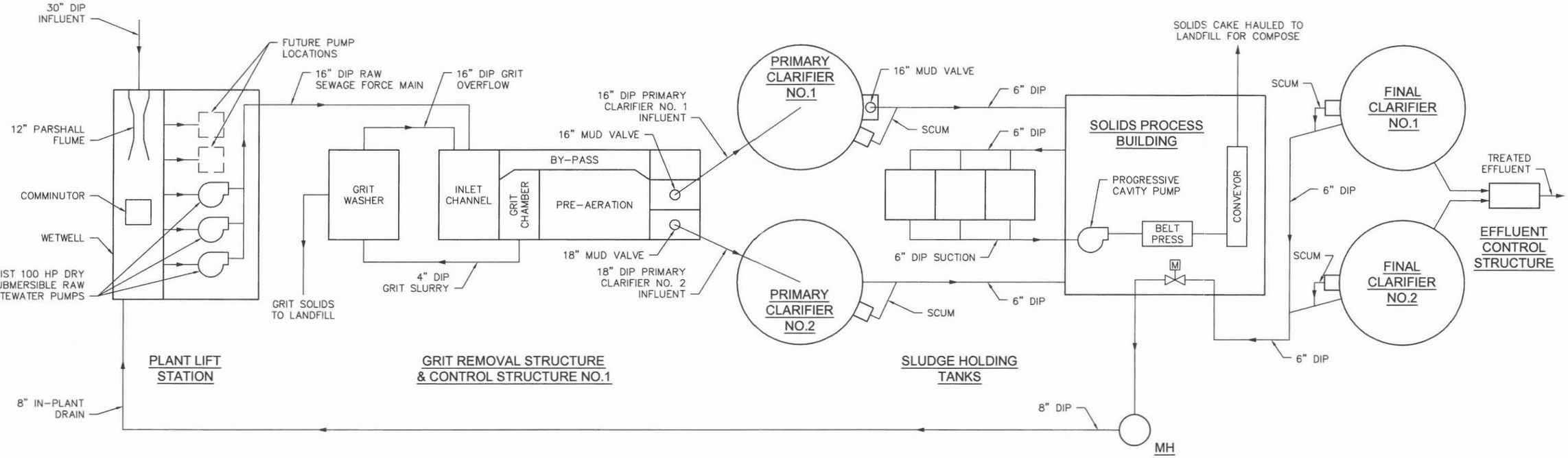
PROJECT NO: 013-2627	BEATRICE WASTEWATER TREATMENT FACILITY PROCESS FLOW SCHEMATIC	OLSSON ASSOCIATES	FIGURE
DRAWN BY: KGM		1111 Lincoln Mall, Suite 111 P.O. Box 84608 Lincoln, NE 68501-4608 TEL 402.474.6311 FAX 402.474.5160	IV-1
DATE: 2/26/14			



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DATE: Feb 27, 2014 9:10am XREFS:

PROJECT NO: 013-2627	BEATRICE WASTEWATER TREATMENT FACILITY SOLIDS SCHEMATIC	OLSSON ASSOCIATES	FIGURE
DRAWN BY: KGM		1111 Lincoln Mall, Suite 111 P.O. Box 84608 Lincoln, NE 68501-4608 TEL 402.474.6311 FAX 402.474.5160	IV-2
DATE: 2/26/14			

It is anticipated that the future NPDES permit will require the following new limits which will require upgrading the WWTF:

- Ammonia limit could be 1/3 the current limit
- Nitrogen – assume 10 mg/L (drinking water standard)
- Total Phosphorus – assume 1.5 mg/L
- Year-round disinfection may also be required which would require covering the UV to prevent freezing

The existing plant process is not capable of providing the anticipated removal of Ammonia, Nitrogen, and Total Phosphorus. A review of the existing treatment process was provided to determine required upgrades for future NPDES limits as well as other additional upgrades. The following summarizes the condition of each treatment component and recommended improvements:

B. Influent Lift Station

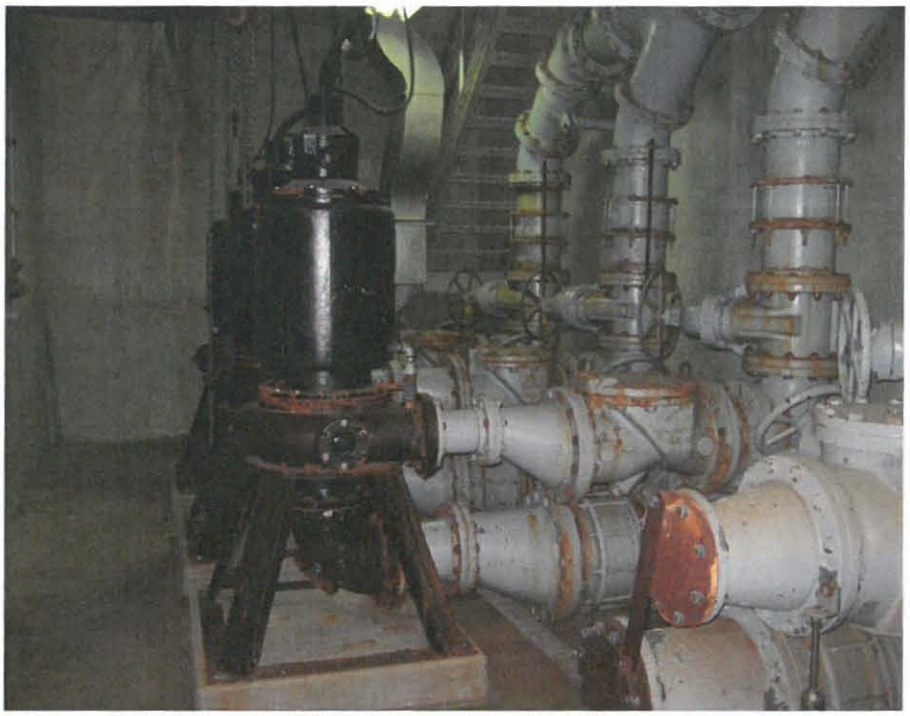
The Influent Lift Station originally had a bar screen in the influent flow channel. The screen had become a maintenance problem and was removed and replaced with a communitor. To reduce debris that could impact Operation and Maintenance (O&M) for future processes, it is advisable that the communitor be removed and that screening be added to the lift station. For purposes of this project and establishing costs, a mechanical bar screen with a washer compactor washer was considered. Information regarding the Vulcan VMR-42 multi-rake bar screen and the EWP 250/600 washing press for flow rates of 3.5 to 4.0 MGD is provided in the Appendices.

Existing Communitor

There are a few areas on the walls of the lower levels of the lift station where ground water is leaking through the walls. It is recommended that repairs be performed in these areas by core drilling and injecting hydrophilic grout, or other similar types of repair, into the affected areas.

Leak in Concrete Wall

The 3 raw sewage lift station pumps were recently replaced. These pumps have a peak design point of 3,125 gpm at 85 Total Dynamic Head (TDH). The secondary pumping rate is 1,215 gpm at 56 feet TDH These pumps appear to have been sized incorrectly, or were designed for a higher plant capacity. In either case, they are too large and are not running efficiently. It is recommended that these pumps remain in-place for future use and 2 smaller pumps be installed in the space available from the original plant design.



Existing Dry Pit Submersible Raw Sewage Pumps

The 2 smaller pumps would be sized using the design point of 2,326 gpm at 55 feet TDH (45 feet static head), with 45 HP motors. Additional information regarding the recommended new pumps is provided in the Appendices.

The existing motors are 100 HP, in size. With 3 existing 100 HP motors and a proposed change to two (2) 45 HP motors, the overall reduction in horsepower is 210 HP. The City has requested a cost/benefit comparison of the electrical savings between the new raw wastewater pumps with lower horsepower requirements and the existing pumps. Olsson is collecting the necessary data to perform this analysis, but it was not available at the time of publication. This information will be provided separately to the City.

A summary of the recommended Influent Lift Station Improvements is as follows:

- Install influent screening
- Repair concrete
- Install new raw sewage pumps

C. Grit Removal

The grit removal and pre aeration chamber appears to be functioning effectively. The utility has done some recent work on the grit removal load out facility including lining the hopper with stainless steel. The operator did indicate that the splitter structure from the grit chamber is used to feed both primary clarifiers may need to be evaluated as the levels in both clarifiers are not equal. There are currently no recommended improvements to these facilities, but it is recommended that the splitter structure be evaluated to determine if modifications are necessary so that the hydraulic operating levels are equalized.

Grit Settling Chambers

Grit Load Out

D. Primary Clarifiers

The primary clarifiers are 55 feet in diameter and approximately 7.0 feet deep. At current peak flows with both clarifiers in use the detention time is 1.84 hours and has a surface overflow rate of 683 gpd/sf. The wier loadings is 9,406 gallons per day per foot of weir length All of the above parameters are adequate based on design standards from "Ten States Standards." These clarifiers appear to function well. The main issue identified with the clarifiers is that they don't operate at the same weir elevation. Because of this, it appears that 1 clarifier is providing all of the primary treatment. It is believed that this is caused by the splitter box between the grit chamber and the primary clarifiers. It is recommended that further evaluation be conducted to correct this issue. If these clarifiers continue in use, they will need painting and some repair work for long-term use.

Primary Clarifiers

E. Trickling Filter

The trickling filter has a diameter of 146 feet and a media depth of approximately 7 feet. Based on current max month BOD loadings, the applied BOD is 11.9 lbs BOD/1,000 cu. ft. media volume. The trickling filter was constructed initially with the plant, and then taken off-line. The trickling filter was refurbished and re-commissioned, with design documents dated January 2000. Based on the above BOD loading rate, the trickling filter should be able to meet current cBOD, TSS and Ammonia discharge standards without further treatment. Samples were collected at 3 locations, referenced previously, throughout the plant. The sample results indicate that the trickling filter is not getting the anticipated BOD removal and the Rotating Biological Contractor's (RBC's) are providing more removal than the trickling filter. The ammonia removal shown in the first round of sampling was minimal. The ability to removal total nitrogen is very limited, based on the first round of sampling.

This may be a result of the splitter box between the primary clarifiers, trickling filter, and RBC's allowing flow from the trickling filter to short circuit back to the trickling filter or flow to bypass the trickling filter or a combination of these issues coupled with an unknown trickling filter recirculation rate. The cause is anticipated to be in the gate operating elevation. It was noted by the City that modifications to the operating gates allows the wastewater to freeze on top of the trickling filter media.

It is recommended that the Board of Public Works (BPW) provide additional sampling, flow metering, and operational adjustments to determine the current recirculation rate as well as to make adjustments to eliminate short circuiting. If the trickling filter can be improved to remove 80-90% of the BOD rather than 30% as is the current condition, the RBC's may be able to be taken out-of-service, thus saving the BPW significant energy costs. With operational modifications, the tricking filter should remain in-service until future process changes are implemented at which time the trickling filter basin could be converted to a sludge holding basin.

Trickling Filter

F. Rotating Biological Contactor (RBC)

The plant currently has an RBC facility with4 trains and 4 stages per train. Each train has 2 shafts each with a media area of 216,000 sf/shaft. As discussed when reviewing the trickling filter operation, it was determined by sampling and laboratory testing that the bulk of the BOD removal is being provided by the RBC's. This was unexpected. There appears to be some ammonia removal being done based on the sample results obtained. It is recommended that additional ammonia and/or organic nitrogen removal is necessary in order to meet future anticipated total nitrogen limits. Based on the expected removal with the trickling filter working the influent loading to the first stage, the RBC's should be 2.39 lbs BOD per thousand square foot surface area. This is within the recommended loadings for an RBC; however, if the trickling filter is taken out-of-service the first stage loading jumps to 6.46 lbs BOD/1,000 sf media. This is significantly higher than the recommended 2.5 lbs BOD/1,000 sf.

The operation of the tricking filter should be modified to try to maximize BOD removal at the trickling filter. If the removal rate can be improved, the RBCs can then be evaluated to determine if they can be taken off-line. Ultimately, the RBC's will not be required once future process changes are implemented resulting in demolition of the RBC's and building or demolition of the equipment and re-use of the building.

RBC Facility

G. Final Clarifiers

The final clarifiers are approximately 55 feet in diameter and approximately 7.0 feet deep. This gives a detention time at peak flow rates of 1.84 hours and a surface overflow rate of 684 gallons per day per square foot. The final clarifiers are operating properly. There are no immediate recommendations on modifications to these clarifiers. However, once the future process is determined, the clarifiers could be considered for use in the future process. If they are not used in the future process, they can be demolished or abandoned in-place.

Final Clarifiers

H. Ultraviolet (UV) Disinfection System

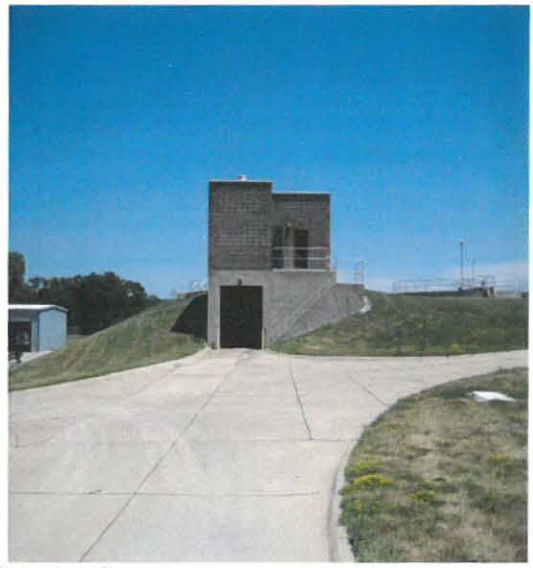
The UV system consists of 2 channels with 2 banks per channel. This system was upgraded in 2013 to add 2 racks in the second channel in order to provide higher energy efficiency. The old banks in the first channel remain in-place to provide redundancy.

Future regulations and treatment process will not require additional disinfection. However, it is anticipated that future regulations may require year-round disinfection. The UV system bulbs and ballasts consist of an exterior installation. They are not protected from freezing in the winter should year-round disinfection be required. Therefore, it is recommended that if year-round disinfection be required, the UV system be enclosed and heated.

UV Disinfection Facility

I. Solids Processing

The existing solids processing equipment consists of a 2 meter belt press with a hydraulic throughput of 100 gallons per minute. The facilities and equipment are in good shape with the exception of an over abundance of piping and valves that require maintenance. Immediate improvements could include removal of unnecessary piping and valves, or these modifications could wait until will generate more sludge and require more sludge storage. Should the City want to process the solids, an additional belt press or other dewatering equipment is recommended. The City could also choose to land apply liquid sludge.



Solids Processing

J. Electrical Systems

The electrical systems don't currently require modification with the exception of being able to support new equipment for any pumps added at the Influent Lift Station. Electrical modifications will be required to support treatment plant upgrades resulting from the selected new treatment process.

K. Controls

The existing control systems are simple and not well connected. There are PLC/HMI (touchscreens) at some locations, but very little coordination between these systems. The following is a summary of the controls present at the treatment plant facilities:

- Collection System Lift Stations:
  10 lift stations.
  MDS spread spectrum radios with Starnet RTUs.
  Repeat signal off 2 towers in town.
  There are reported to work well, but have issues during storms.
  We recommend they verify remotes are transmitting at maximum allowable wattage.

- Headworks:
  ControlWave Micro PLC.
  Maple Systems HMI.
  VFD pump control works fine.
  Lift Station master radio located here.
  PLC digital outputs for auto dialer located in Administration Building, but must be hard wired.
  The Operators would like to add muffin monster status and failure indication.

- Administration Building:
  Allen Bradley PLC.
  Panelview C1000 HMI.
  All it does is trend influent and effluent flows.

  Verbatim Gateway auto dialer located here and is hard wired from head works. Chief complaint is that they have run out of dialer channels. Existing dialer may be expandable.

- Trickling Filter Control in RBC Building:
  Allen Bradley SLC5/04 PLC and Panelview 1,000 HMI.
  Works fine.
  Appears to be serially connected to headworks for alarm dial out.

- UV Building:
  Trojan 3000 plus installed last year (2013).
  Schneider PLC and Bejer HMI. This is reported to be very slow to operate.
  UV is not connected to anything so there is no alarm notification. This is a concern because if system remains shut down too long they will be out of compliance.

- Control/Monitoring System Needs/Wants Specifically Mentioned:
  More dialer channels.
  Separate water from wastewater in tower control panels. These are repeater stations for radio controls.
  Occasional radio system signal loss during storms.
  Connection of all PLC's to a common place.
  UV alarms.

There are minor items that can be addressed. It is not recommended that controls be upgraded until the new process is implemented. At the time of adding a new process to the wastewater facility, the entire control system should be considered for upgrades and tied into a new SCADA system that will also control the new process.

V. RECOMMENDED IMPROVEMENTS TO EXISTING PLANT

A. Summary of Improvements

As described above, when reviewing the existing plant there were several improvements are recommended to meet current conditions. They are summarized as follows:

- Influent Lift Station
  - Install Screening
  - Repair Concrete
  - Install 2 Additional Smaller Raw Sewage Pumps
- Grit Removal
  - Modify Splitter Box to Primary Clarifiers to Balance Flow
- Primary Clarifiers
  - Evaluate/adjust Splitter Box to balance hydraulics in both clarifiers
- Trickling Filter
  - Modify operations to Increase BOD Removal
- RBC's
  - If efficiency can be increased in trickling filter, consider shutting down RBC's
- Final Clarifiers
  - None
- Cover UV System
  - If year-round disinfection is required a Cover Should be Provided
- Solids Processing
  - Increase capacity to accommodate future processes
- Electrical Systems
  - Improve as required to support new equipment at Influent Lift Station and to support future processes
- Controls
  - Short Term – Minor modifications to Existing Control System at the Plant
  - Long-Term – Provide SCADA System to support future processes

B. Operation & Maintenance Costs

The recommended improvements to the existing plant will require minor additional O&M costs. However, it is recommended that in preparation for future permit limits, the BPW conduct monthly sampling of the influent wastewater for BOD, Ammonia, TKN, Total Phosphorous, Total Nitrogen, cBOD, TSS, Fat, Oil and Grease (FOG's), and pH. Collection of this data over the next 4 years will provide information that will be essential for designing future processes and treatment improvements. It is anticipated that this will cost $1,000 a month in addition to the current monthly influent sampling costs.

C. Capital Costs

Table V-1 includes a preliminary opinion of costs for the recommended improvements to the existing plant. Further information regarding the proposed improvements is included in Appendix "B."

Table V-1: Preliminary Opinion of Costs for Existing Plant Improvements

ITEM	COST
Influent Lift Station	
➢ Screening	$401,000
➢ Repair Concrete	$2,500
➢ Add Raw Sewage Pumps	$181,000
Grit Removal	
➢ Modify Splitter Box to Primary Clarifiers	$7,500
Primary Clarifiers	
➢ No Modifications	NA
Trickling Filter	
➢ Adjust Recirculation Rate, Modify Splitter Box	NA
RBC's	
➢ No modifications Unless Efficiencies Improved at Trickling Filter	NA
Final Clarifiers	
➢ No Modifications	NA
UV System	
➢ Enclose UV System (incl. doors, CMU walls, ventilation, garage/access door(s), etc.) ➢ Extend monorail for UV System access	$67,500
Solids Processing	
➢ No Modifications	NA
Electrical Systems	
➢ No Modifications	NA
Controls	
➢ Minor Modifications	$25,000
Total Construction Costs	**$684,500**
Contingency – 20%	$136,900
Overhead, Legal, Fiscal, Engineering	$136,900
Total Project Cost	**$958,300**
Annual Cost (20 Years, 3.5%, A/P)	**$67,487**
Annual Additional Influent Sampling Costs	**$12,000**

VI. ALTERNATE WASTEWATER TREATMENT SYSTEMS

A. General

The existing trickling filter and RBC's are not adequate to provide nutrient removal, and additional improvements will be required. There are several ways to meet nutrient limits for total nitrogen and total phosphorous. After discussion with the City Staff, the following 3 alternatives were considered for further evaluation:

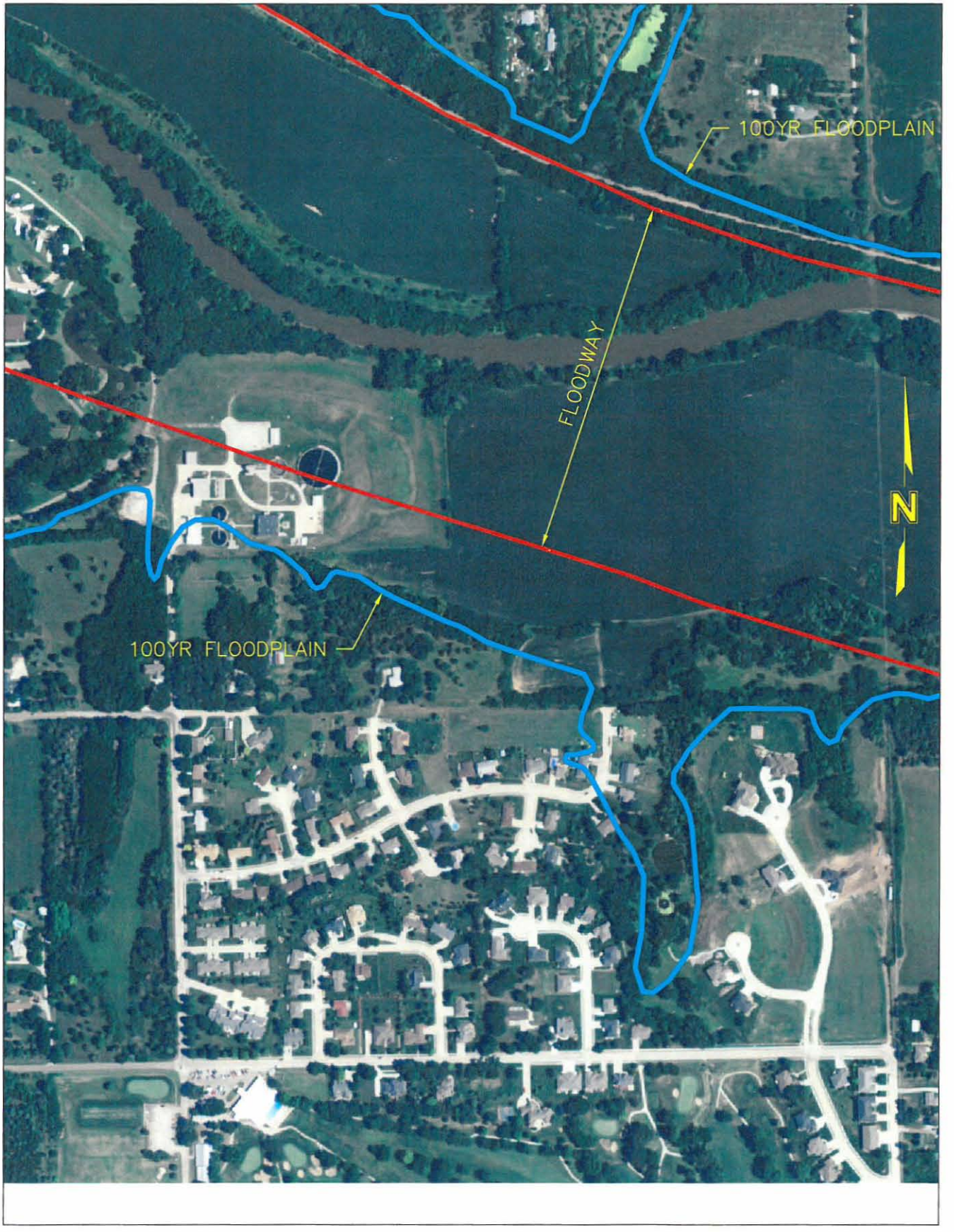
- Biolac Treatment
- Oxidation Ditch
- Sequencing Batch Reactors (SBR's)

All of these alternatives re activated sludge processes and do not use the existing trickling filters or RBS. Each alternative can meet future nutrient limits. In addition to process consideration, the existing site has limitations that must be considered, primarily related to the floodplain and floodway. Refer to Figure VI-1. A summary of the processes and the economics of each alternative are presented below.

B. Biolac Process

Biolac stands for Biological Aeration Chain systems. The basic Biolac process layout consists of a basin or lagoon equipped with floating aeration chains. The aspects of the Biolac system lie in the approach to aeration and mixing. The key component is the floating aeration chain. This is a series of fine bubble diffusers assemblies that suspended from a chain of floats stretched across the basin surface. The gentle, controlled oscillation of the chains and diffusers distributes the oxygen transfer and mixing energy evenly throughout the basin area. No additional airflow is required to maintain mixing. The chains typically move laterally 8 to 30 feet (for activated sludge applications) under normal operating conditions, mixing the volume of water in the traversed path and maintaining the mixed liquor solids in suspension.

The system utilizes a long sludge age design. Sludge Age, also known as Solids Retention Time (SRT), or Mean Cell Retention Time (MCRT), defines the operating characteristics of the biological treatment system. A longer sludge age dramatically lowers effluent BOD and Ammonia levels, especially in colder climates. While most extended aeration systems reach their maximum mixing capability at sludge ages of approximately 15-25 days, the Biolac system efficiently and uniformly mixes the aeration volumes associated with a 30-70 day sludge age.



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DATE: Mar 25, 2014 1:00pm XREFS:

PROJECT NO: 013-2627	WWTP SITE FLOODPLAIN & FLOODWAY	OLSSON ASSOCIATES	1111 Lincoln Mall, Suite 111 P.O. Box 84608 Lincoln, NE 68501-4608 TEL 402.474.6311 FAX 402.474.5160	FIGURE
DRAWN BY: EJB				V1-1
DATE: 1/28/14				

Biological Nutrient Removal (BNR) in a Biolac System utilizes moving aeration chains that vary the basin dissolved oxygen content by creating a unique moving wave of multiple oxic and anoxic zones. This repeat cycling of environments nitrifies and denitrifies the wastewater without recycle pumping or additional external basins. Nitrogen removal to 8 mg/L is standard, with many installations achieving less than 3-4 mg/L Total N.

Biological Phosphorus removal can also be accomplished by incorporating an anaerobic, or Bio-P, zone. With the Bio-P zone, phosphorus levels of less than 2 mg/L are standard.

The Biolac long sludge age process produces BOD levels of less than 10 mg/L and complete nitrification (less than 1 mg/L ammonia)

The large quantities of biomass in the system are extremely stable an able to treat widely fluctuating loads with few operating changes.

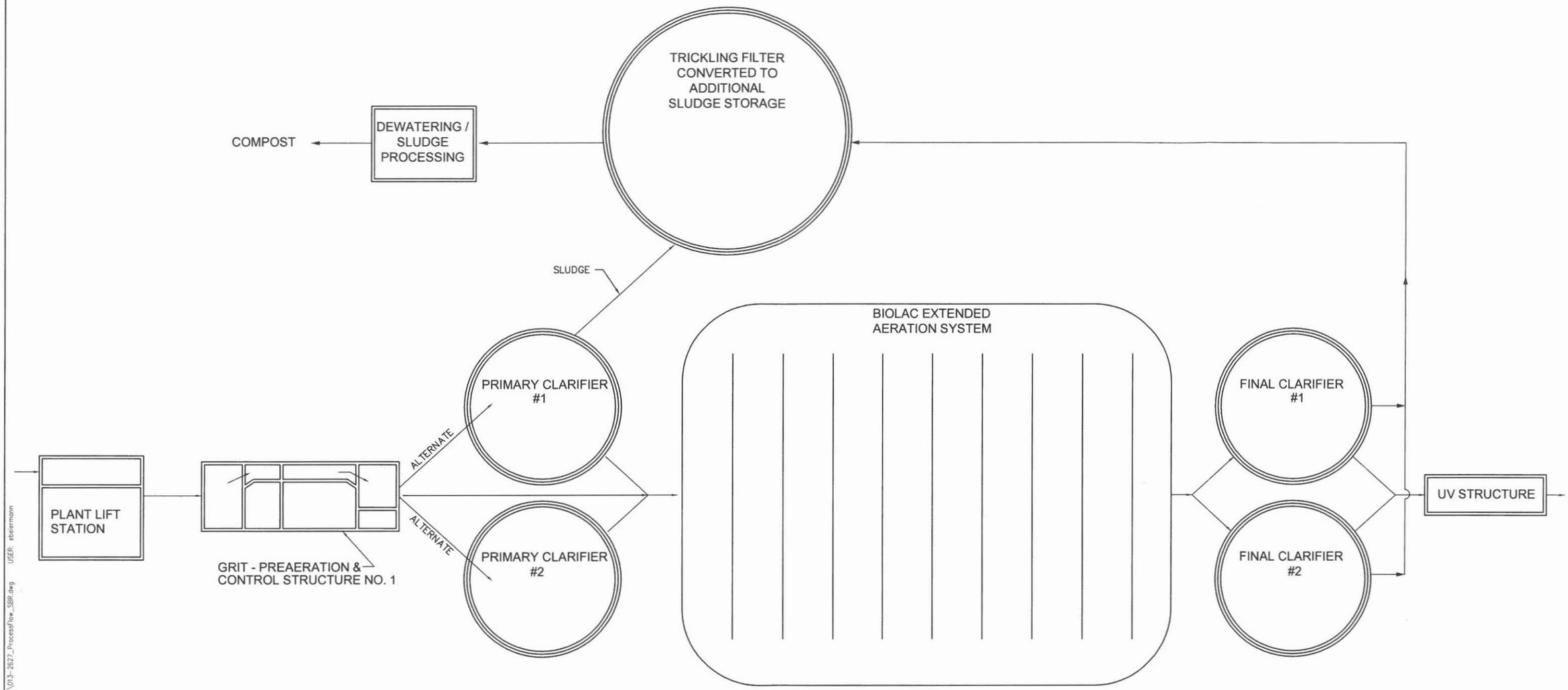
Benefits:

- 90% or more total BNR in a single basin
- Multiple treatment zones
- 25-30% lower energy costs
- Minimal operator attention
- Simple, low-cost construction, available as lined earthen basins or concrete basins
- Alkalinity recovery.

The process flow schematic for implementing this process at Beatrice's facility is provided in Figure VI-2. The existing primary clarifiers would be re-used, the final clarifiers would be re-used or new finals added, the RBC's would be abandoned, the tricking filter would be converted to a sludge storage basin and additional sludge handling equipment would be required unless the City chooses to land apply the sludge, and is denoted as sludge dewatering improvements in the opinion of costs for this option.

The main disadvantage of the Biolac system is the footprint of the lagoon. The footprint of the lagoon will be large and will require it to be built in the floodway, on private property or both, refer to Figure VI-3. If in the floodway, mitigation would be required due to the size of the basin footprint. If it is necessary to purchase private property, the current price is anticipated to be $10,000 per acre.

Appendix "C" contains proposed process preliminary sizing and estimates of opinions of costs for the various added treatment process and plant modifications. A summary of the cost estimate is presented in Table VI-1.



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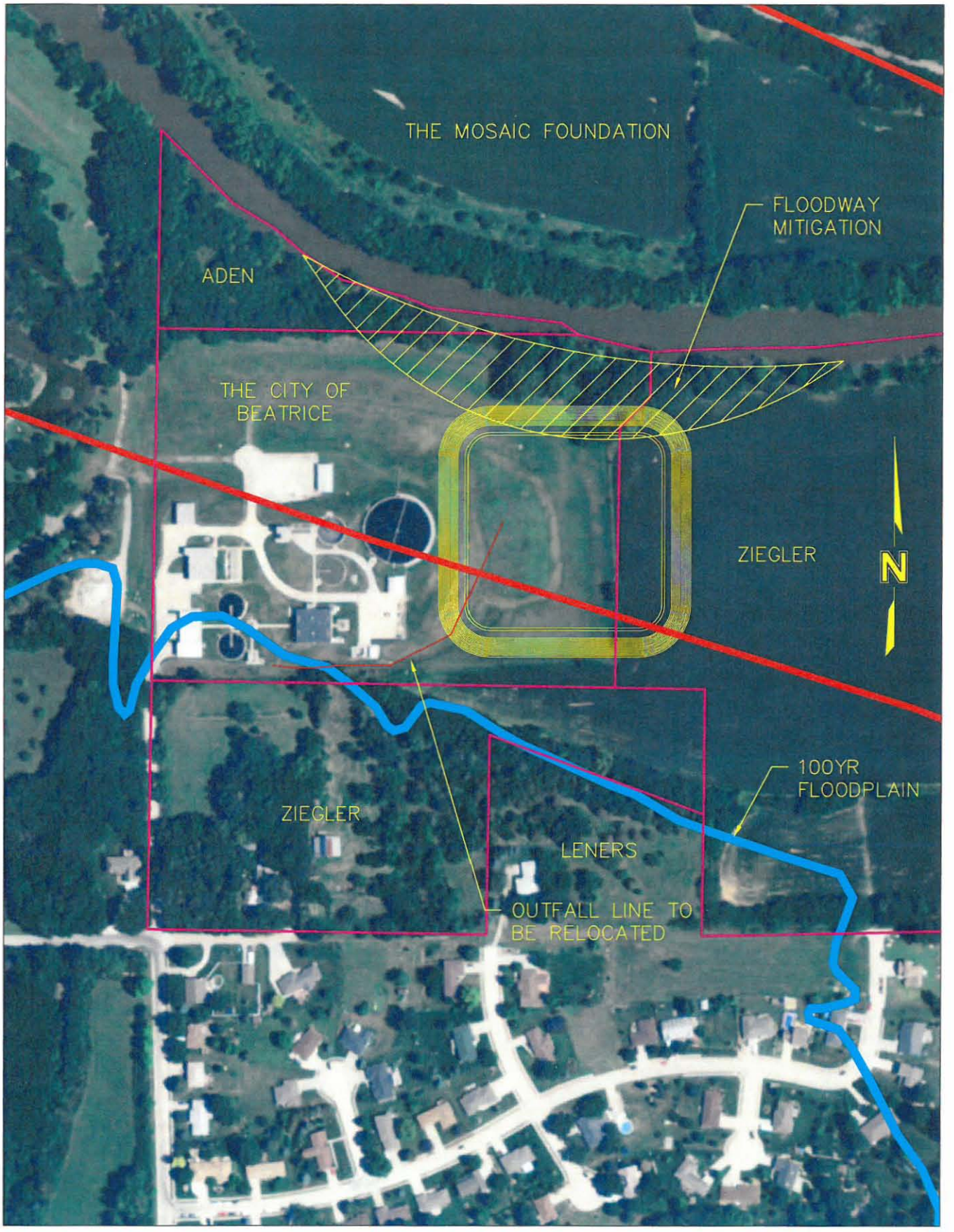
DATE: Feb 27, 2014 9:10am XREFS:

PROJECT NO: 013-2627	BEATRICE WASTEWATER TREATMENT FACILITY OPTION 1 - PROCESS FLOW SCHEMATIC BIOLAC	FIGURE
DRAWN BY: JBD		V1-2
DATE: 2/26/14		

OLSSON ASSOCIATES
1111 Lincoln Mall, Suite 111
P.O. Box 84608
Lincoln, NE 68501-4608
TEL 402.474.6311
FAX 402.474.5160



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DATE: Mar 25, 2014 1:01pm XREFS:

PROJECT NO: 013-2627 DRAWN BY: EJB DATE: 1/28/14	SITE LAYOUT BIOLAC SYSTEM	OLSSON ASSOCIATES	1111 Lincoln Mall, Suite 111 P.O. Box 84608 Lincoln, NE 68501-4608 TEL 402.474.6311 FAX 402.474.5160	FIGURE V1-3

Table VI-1: Preliminary Opinion of Costs – Biolac System

ITEM	COST
Earthwork	$768,000
Biolac Equipment	$720,000
Clarifiers	$778,000
Return Sludge Pump Station	$534,000
Site Piping	$774,000
Gravity Sewer – Outfall Relocation	$112,500
Fencing	$30,000
Seeding	$10,000
Blower Building	$250,000
Trickling Filter and Existing Sludge Holding Tank Conversion	$500,000
Site Work	$860,000
Sludge Dewatering Improvements	$750,000
Electrical & New Process Controls	$1,075,000
SCADA System & Integration	$300,000
Floodway Mitigation	$1,190,000
Total Construction Costs	**$8,651,500**
Contingency – 20%	$1,730,300
Overhead, Legal, Fiscal, Engineering	$1,730,300
Land Acquisition	$60,000
Total Project Cost	**$12,173,000**
Annual Cost (20 Years, 3.5%, A/P)	**$856,505**

C. Oxidation Ditch Process

This option involves abandonment of the portions of the City's existing facilities and construction of new facilities at the existing plant site.

Flow would enter the plant at the Influent Lift Station. A new mechanical bar screen and compactor washer would be provided to remove objectionable solids from the system.

From the lift station, flow would be pumped to a new secondary treatment system. This process is a conventional oxidation ditch, which includes a common division wall. The proposed process does not include the addition of a final clarifier as an integral part of the aeration basin. This system would use "Race Track" configuration aeration/mixing basin approximately 80 feet wide, 170 feet long, and 20 feet deep. The existing final clarifiers would be re-used.

Flow from the aeration basins would go to 2 new circular final clarifiers (or the existing final clarifiers could be considered for re-use. From the final clarifiers, flow would enter the UV disinfection structure. The discharge from the UV structure would discharge to the Big Blue River through the existing outfall line.

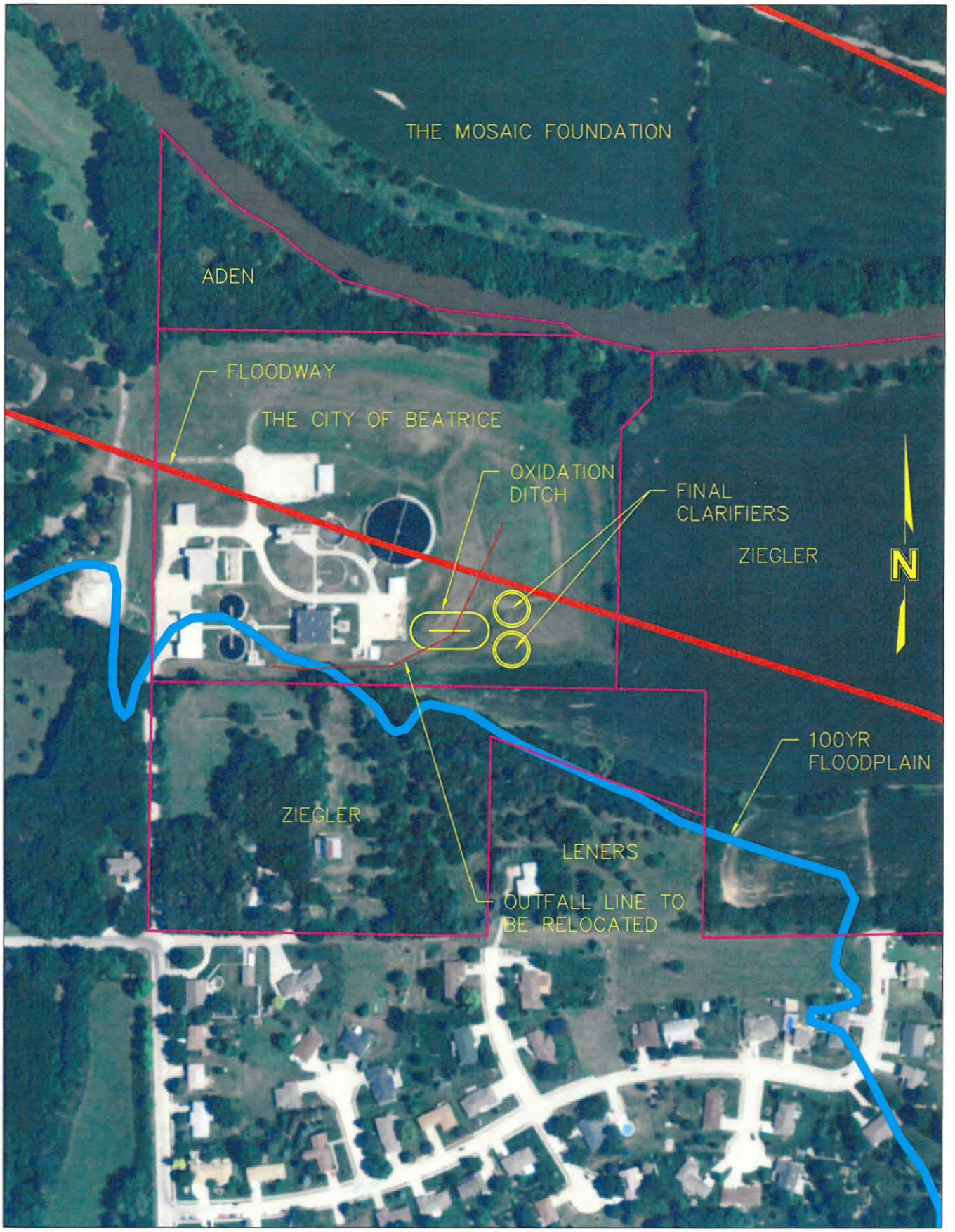
The proposed site layout is shown in Figure VI-4. The footprint of the improvements could be constructed on City property and outside of the floodway.

The proposed process schematic is shown in Figure VI-5. One (1) primary clarifier could be used, but not required. The final clarifiers would be re-used or new finals added, the RBC's would be abandon, the tricking filter would be converted to a sludge storage basin and additional sludge handling equipment would be required unless the City chooses to land apply the sludge, and is denoted as sludge dewatering improvements in the opinion of costs for this option.

Appendix "C" contains proposed process preliminary sizing and estimates of opinions of costs for the various added treatment process and plant modifications. A summary of the cost estimate is presented in Table VI-2.

Table VI-2: Preliminary Opinion of Costs – Oxidation Ditch

ITEM	COST
Site Work and Excavation	$947,000
Gravity Sewer – Outfall Relocation	$112,500
Oxidation Ditch	$1,623,000
Final Clarifiers	$778,000
Blower Building	$350,000
Return Sludge Pump Station	$534,000
Trickling Filter and Existing Sludge Holding Tank Conversion	$500,000
Fencing	$20,000
Seeding	$10,000
Site Piping	$823,000
Sludge Dewatering Improvements	$750,000
Electrical & New Process Controls	$1,142,000
SCADA System & Integration	$300,000
Total Construction Costs	**$7,890,000**
Contingency – 20%	$1,578,000
Overhead, Legal, Fiscal, Engineering	$1,578,000
Total Project Cost	**$11,046,000**
Annual Cost (20 Years, 3.5%, A/P)	**$777,208**



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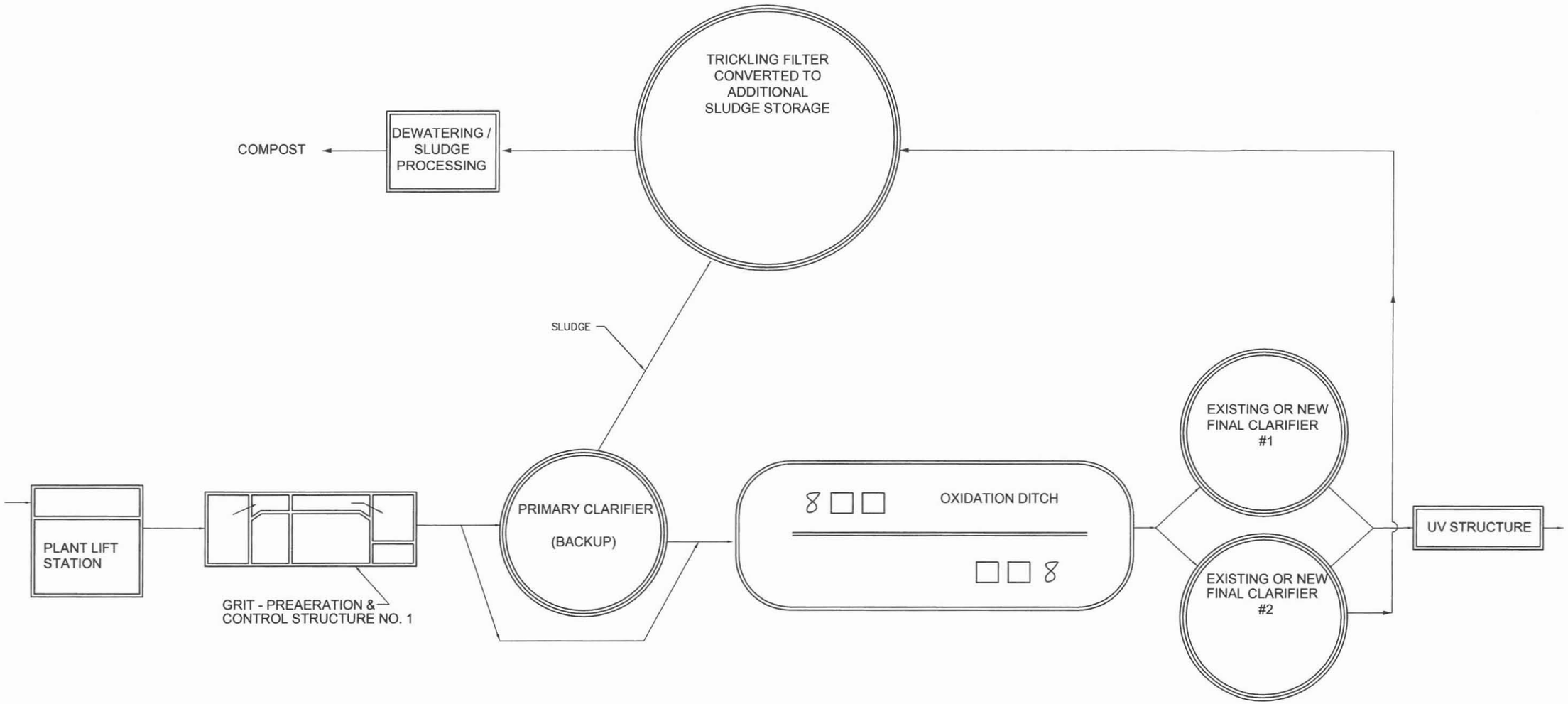
DATE: Mar 25, 2014 1:01pm XREFS:

PROJECT NO: 013-2627 DRAWN BY: EJB DATE: 1/28/14	SITE LAYOUT OXIDATION DITCH	OLSSON ASSOCIATES	1111 Lincoln Mall, Suite 111 P.O. Box 84608 Lincoln, NE 68501-4608 TEL 402.474.6311 FAX 402.474.5160	FIGURE V1-4



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DATE: Feb 27, 2014 9:10am XREFS:

PROJECT NO: 013-2627	BEATRICE WASTEWATER TREATMENT FACILITY	OLSSON ASSOCIATES	FIGURE
DRAWN BY: JBD	OPTION 2 - PROCESS FLOW SCHEMATIC OXIDATION DITCH	1111 Lincoln Mall, Suite 111 P.O. Box 84608 Lincoln, NE 68501-4608 TEL 402.474.6311 FAX 402.474.5160	V1-5
DATE: 2/26/14			

D. Sequencing Batch Reactor (SBR) Process

This alternative would re-use the existing primary treatment system and at the Influent Lift Station would include a new mechanical bar screen and compactor washer would be provided to remove objectionable solids from the system.

Following the primary clarifiers 3 new SBR structures would be required. These structures would be approximately 80 feet square each and 20 feet deep. A floating mixer would be provided in each tank. There would be several retrievable diffuser assemblies in each basin and 2 decanters per basin.

It will be necessary to convert the existing trickling filter to additional sludge storage should the existing belt press be out-of-service for an extended period of time. The existing sludge holding tanks would be used routinely for sludge storage.

As part of the SBR system, a new Blower Building would be required. Also a computerized process control system would be required.

The decant from the SBR's would be directed through the UV disinfection system.

The following is a brief discussion of the SBR process.

Depending on the treatment requirement of SBR (ammonia and phosphorus removal), the fill phase will be composed of static fill, mixed fill, and react fill components.

With static fill, influent flow is introduced to the reactor without mixing and aeration. Closely related to this phase of operation is the mixed fill phase. As the name implies, this phase provides reactor mixing without aeration, which creates either an anoxic or anaerobic condition.

React fill is that portion of the fill phase accompanied by both mixing and aeration, while influent flow is added.

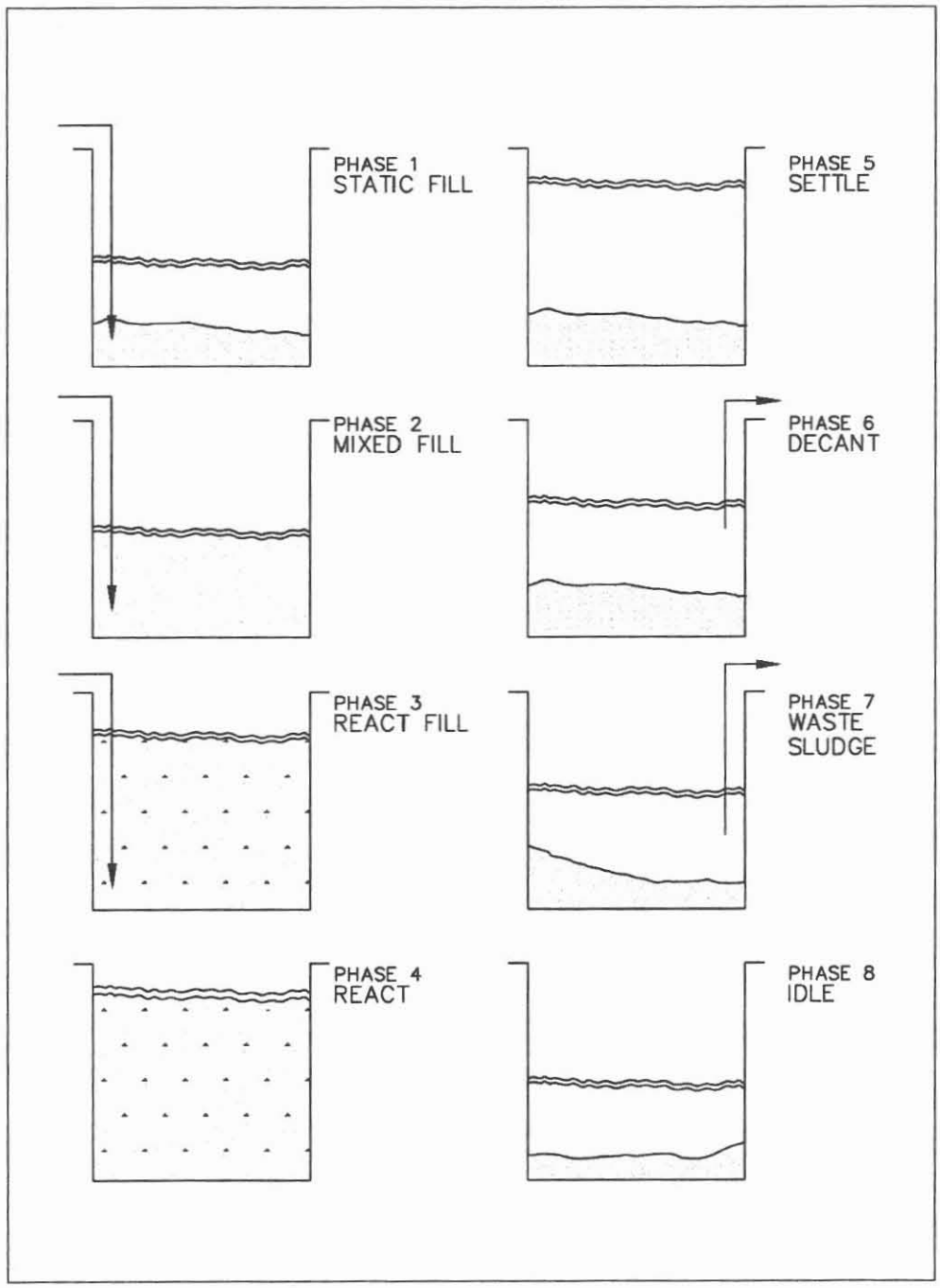
The react phase occurs with aeration and mixing without the addition of influent flow. The react phase is typically time measured.

Settle represents the quiescent phase during which no aeration or mixing occurs, normally time controlled.

Decant is that phase when clarified effluent is withdrawn from the basin and is usually controlled by level.

The final phase, idle is used when there is more than 1 basin. This phase allows the reactor to remain idle until the fill phase is completed in the basin being filled.

Effluent is discharged through the effluent control and UV structures prior to entering the Big Blue River. This information is illustrated below.



SBR Operational Process

Advantages of the SBR are as follows:

1. Tolerates Substantial Organic Shock Loads. Because the SBR reactor services as an equalization basin during the fill phase, it can easily tolerate high peak hourly flows and/or substantial organic shock loads without degradation in effluent quality. In fact, continuous flow activated sludge systems subjected to excessive diurnal variations can show significant improvements in performance when converted to the SBR process.

2. Availability of Phase Management. Since the treatment of waste is by phases, it is possible to manage each phase so it meets specified requirements. Any of the phases can be increased or decreased, or otherwise modified to attain desired effluent quality.

3. Resists Solids Washout. Mixed liquor solids cannot be washed out by hydraulic surges since it can be held in the tank as long as necessary.

4. Pumping Requirements Reduced. No return activated sludge pumping is required, since the mixed liquor is always in the reactor.

5. Ideal Quiescent Settling Conditions. Solid-liquid separation occurs under ideal quiescent conditions. During the settle phase, short-circuiting is non-existent. Since the settle area is the same as the reactor area, low surface settling rates are achieved, resulting in settling of even small floc particles.

6. Aeration Efficiency Intensified. Since the dissolved oxygen level is zero during the initial fill phases, a greater oxygen driving gradient exists during the react phase, thus achieving high overall oxygen transfer efficiency with the same aeration applied.

7. Filamentous Growth Manageable. Filamentous growth can be controlled by varying the operating strategies during the fill phase. Filamentous organisms need anoxic condition to survive; but providing an anaerobic or anoxic condition during the fill phase, the filaments are managed.

8. Nutrient Removal Without Chemical Addition. An SBR system can be operated to achieve nitrification and denitrification without chemical addition. Nitrification can be achieved by increasing the duration of the react phase or the mixed/aerated portion of the fill react phase. Denitifrication can be achieved by increasing the length of the static fill or mixed fill phases so that zero or near zero dissolved oxygen conditions exist during these periods

Sludge that will be generated from the SBR system will be pumped to the converted sludge holding or storage basin.

Figure VI-6 shows the proposed site layout. The footprint of the improvements could be constructed on City property and outside of the floodway.

Figure VI-7 shows a proposed flow schematic for this process. One (1) primary clarifier could be used, but not required. The final clarifiers and RCB would be abandoned, the tricking filter would be converted to a sludge storage basin and additional sludge handling equipment would be required unless the City chooses to land apply the sludge, and is denoted as sludge dewatering improvements in the opinion of costs for this option.

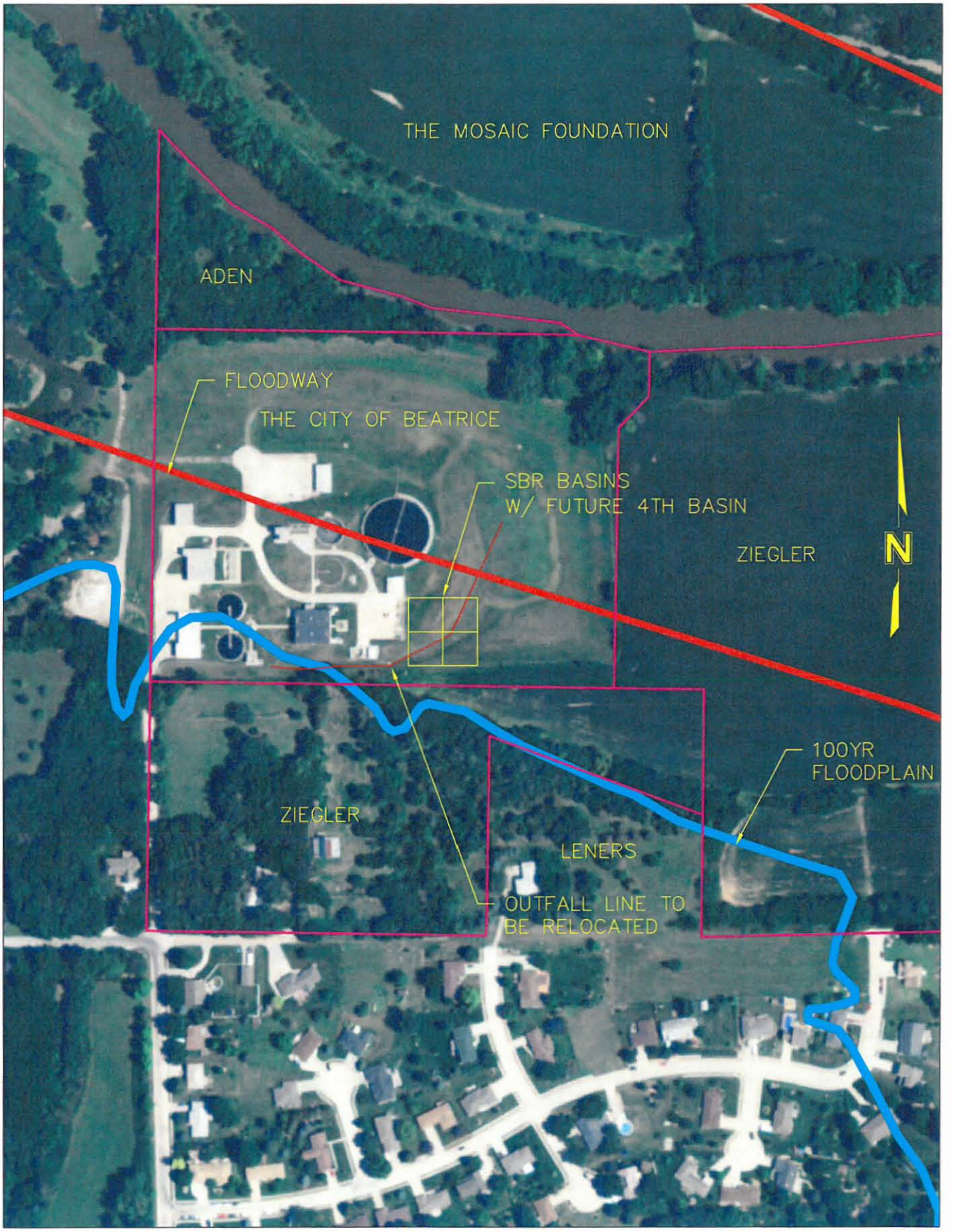
Appendix "C" contains proposed process preliminary sizing and estimates of opinions of costs for the various added treatment process and plant modifications. A summary of the cost estimate is presented in Table VI-3.

Table VI-3: Preliminary Opinion of Costs – SBR

ITEM	COST
Site Work	$776,000
Gravity Sewer – Outfall Relocation	$112,500
SBR Basins	$2,279,000
Blower Building	$350,000
Trickling Filter and Existing Sludge Holding Tank Conversion	$500,000
Fencing	$20,000
Seeding	$10,000
Site Piping	$582,000
Sludge Dewatering Improvements	$750,000
Electrical & New Process Controls	$970,000
SCADA System & Integration	$300,000
Total Construction Costs	**$6,650,000**
Contingency – 20%	$1,330,000
Overhead, Legal, Fiscal, Engineering	$1,330,000
Total Project Cost	**$9,310,000**
Annual Cost (20 Years, 3.5%, A/P)	**$655,062**

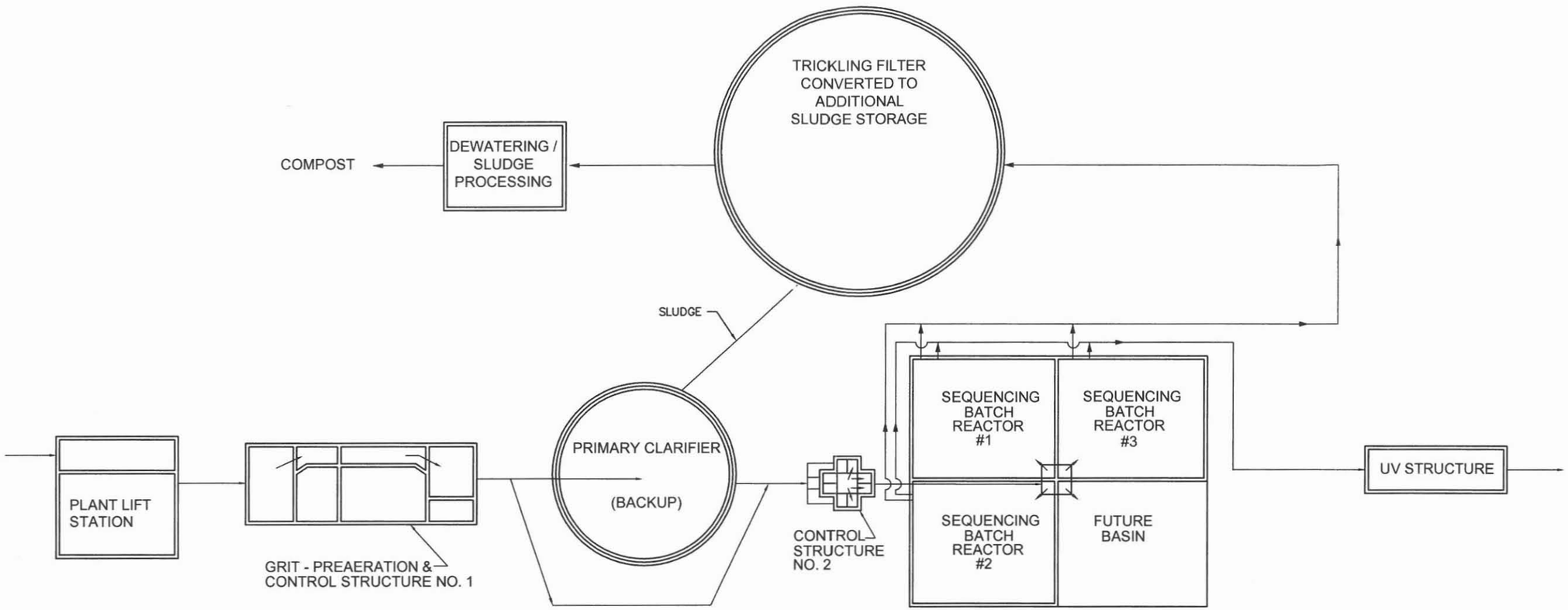
E. O&M Comparison

Annual O&M costs for the treatment alternatives correspond to detailed estimates for each alternative, and are shown in Table VI-4.



DWG: F:\Projects\013-2627_PBIN\Preliminary_Plans\Floodplain Figure.dwg USER: jday
DATE: Mar 25, 2014 1:05pm XREFS:

PROJECT NO: 013-2627	SITE LAYOUT SBR PROCESS	OLSSON ASSOCIATES	1111 Lincoln Mall, Suite 111 P.O. Box 84608 Lincoln, NE 68501-4608 TEL 402.474.6311 FAX 402.474.5160	FIGURE
DRAWN BY: EJB				V1-6
DATE: 1/28/14				



DWG: F:\Projects\013-2627_PBW\Preliminary_Plans\013-2627_Processflow_SBR.dwg USER: jboy
DATE: Mar 25, 2014 1:47pm XREFS:

PROJECT NO: 013-2627	BEATRICE WASTEWATER TREATMENT FACILITY OPTION 3 - PROCESS FLOW SCHEMATIC SBR	FIGURE
DRAWN BY: JBD		V1-7
DATE: 2/26/14		

OLSSON ASSOCIATES
1111 Lincoln Mall, Suite 111
P.O. Box 84608
Lincoln, NE 68501-4608
TEL 402.474.6311
FAX 402.474.5160

Table VI-4: Preliminary Opinion of Cost – O&M Costs ($/Year)

ITEM	BIOLAC PROCESS COST	OXIDATION DITCH PROCESS COST	SBR PROCESS COST
Power	$142,000	$150,000	$106,000
Labor	$50,000	$45,000	$40,000
Supplies	$5,000	$5,000	$5,000
Maintenance & Repairs	$25,000	$25,000	$15,000
Testing	$10,000	$10,000	$10,000
Biosolids & Dewatering	$41,000	$41,000	$41,000
Contingency	$55,000	$56,000	$44,000
Total O&M Costs	**$328,000**	**$332,000**	**$261,000**

Power costs were determined from the blower operation for each process, using an energy cost of $0.07 per kilowatt-hour, which represents the average electrical cost at the WWTP from March 2013 to February 2014. The costs in Table VI-4 do not include sewer line maintenance, lift stations, interest, taxes, depreciation, or bond payments.

F. Opinion of Costs and Present Worth Analysis

After compilation of all the previously mentioned data, the present worth of each alternative was calculated based on an annual interest rate of 4.0%. The planning period used for the analysis was 20 years. The treatment alternatives were evaluated on a monetary cost basis. The alternates have been evaluated on the basis of environmental effects, implementation capability, contribution to water quality objectives and goals, energy and resources use, reliability, and public acceptability.

The following pages include cost estimates for each of the different alternates being evaluated. Table VI-5 summarizes the economic evaluation made for the different alternatives.

Table VI-5: Preliminary Opinion of Cost – Present Worth Analysis

ITEM	BIOLAC PROCESS COST	OXIDATION DITCH PROCESS COST	SBR PROCESS COST
Capital	$8,652,000	$7,890,000	$6,650,000
Overhead	$3,461,000	$3,156,000	$2,660,000
Land	$60,000	$0	$0
Present Worth-New Treatment Process	$12,173,000	$11,046,000	$9,310,000
Present Worth-Existing Plant Improvements	$958,300	$958,300	$958,300
Present Worth – Total	$13,131,300	$12,004,300	$10,268,300
Term	20 years	20 years	20 years
Interest Rate	3.5%	3.5%	3.5%
Annual Payment	$924,000	$845,000	$723,000
O&M	$328,000	$332,000	$261,000
Net Annual Costs	**$1,252,000**	**$1,177,000**	**$984,000**

VII. SELECTED PLAN

With all of the information prepared as part of this document, it is possible to weigh the advantages and disadvantages of each proposed improvement. This comparison is meant to help the community to know which improvements should be completed expeditiously, and which improvements may be eliminated from consideration.

A. Summary of Selected Plan

The selected treatment alternative is to construct a new SBR treatment plant at the existing facility. The SBR option presents the lowest upfront capital cost and also has the lowest annual cost over a 20-year period. In addition, the SBR has an advantage over the oxidation ditch in that it has multiple basins and inherent redundancy, which allows maintenance to occur without shutting down the treatment process. The SBR treatment process is very dependable, reliable, and easily expandable.

B. Operation and Maintenance

Treatment plant staff needs for O&M of the plant will approximately the same in comparison to the present treatment plant operation.

City personnel should need minimal additional training to develop the capabilities required for performing all duties associated with the plant operation.

It is proposed that an O&M manual be prepared for the plant during construction of the facilities. In accordance with Federal regulations, the operation and maintenance manual would be completed by the time that plant construction is completed. The O&M manual would, consequently, be finished in time to assist with operator orientation and training.

Items to be included in the manual are sections on reporting procedures for bypassed flow or overflows, water quality standards, normal plant operation, manpower requirements and staffing including qualifications and certification, record keeping, plant operation reports, emergency operating procedures, safety, utilities, and electric systems.

C. Capital Costs

Preliminary opinions of construction costs have been made for the selected plan. The estimate is included in the previous section for the various components (see Table VI-3). It is emphasized that dollar figures given reflect present day cost levels.

Modifications to the preliminary estimate will be made to reflect requirements of the final plans and specifications.

VIII. FINANCING

Several funding options are available to the City, including Revenue Bonds, General Obligation Bonds, Water Wastewater Advisory Committee (WWAC) which includes Community Development Block Grants (CDBGs), Drinking Water State Revolving Fund (DWSRF), and United States Department of Agriculture Rural Development (USDA RD) programs, and Public-Private Partnerships.

1. Revenue Bonds

   These bonds are tax-exempt bonds in which the debt service is paid by a dedicated revenue source, such revenue from the sale of water to consumers, property or sales taxes.

2. General Obligation Bonds

   General obligation bonds are backed by the full faith and credit of the taxing authority. Utility revenues can be used to pay the annual debt service, and/or a tax can be levied on properties within the City. These are considered to be more secure than revenue bonds. As with revenue bonds, voter approval is often required prior to issuance. General obligation bonds typically have an interest rate lower than revenue bonds.

3. WWAC

   In order to assist communities seeking funding for water projects, Nebraska established the WWAC in 1997. WWAC is an advisory panel for municipalities, counties, and Rural Water Districts (RWDs) that seek public financing from the following programs: CDBG, DWSRF, or USDA RD.

   Communities seeking funds must go through the WWAC, which consists of representatives from NDEQ, Nebraska Department of Health & Human Services (NDHHS), Nebraska Department of Economic Development (NeDED), and USDA RD. The process for submitting to the WWAC includes a pre-application and a completed facility plan or preliminary engineering report. The pre-application and other associated guidance can be found at: http://deq.ne.gov/.

   The WWAC reviews submittals monthly to determine actions taken. If the project is selected for funding, and the community meets the eligibility requirements, the WWAC will recommend 1 or a combination of funding sources. It should be noted that competition for funding is highly competitive, and the City may not qualify for funding from all agencies.

   a. CDBG Funding

      CDBG is a highly competitive program administered by the NeDED. In order to be eligible for a CDBG grant, a community must have a maximum population less than 50,000 and a minimum of 51% of low to moderate income families. Applications are accepted throughout any given year. CDBG provides matching grants for water or wastewater project to a maximum of $350,000. The City's match ranges from 25 to 75%, as determined by the program.

The RDD considers reasonable user rates to be $30-32 per month per household for 5,000 gallons used. Loan amounts are based on the reasonable rate amount multiplied by the number of user households. If repayment of loans increase monthly residential rates beyond this reasonable amount RDD grant monies will be sought to maintain rates at such levels. If monthly rates are below this reasonable amount they will need to be increased to such an amount in order for a loan to be secured.

Grants are made in combination with direct loans or with funding from other sources. Grants may be up to 75% of eligible project costs, but are limited to the amount necessary to enable the residents to be charged reasonable user rates. The MHI of the service area must be below that of the non-metropolitan MHI for the state as well as generally below the national poverty rate or 80% of the state figure. Grants can only be made for projects which address health or safety issues.

- *Guaranteed Loans*
  This method is most often used when communities with populations of 10,000 or less identify a private lender interested in financing a project, but that lender will only do so if risk is reduced. Loan guarantees are 90% of the total loan amount. Interest rates are negotiated between the lender and the borrower and may be either fixed or variable, but must be in line with rates customarily charged to borrowers in similar circumstances.

4. Public-Private Partnerships

In addition to traditional funding methods, there are several forms of public-private partnerships that can be used to fund water projects. The first is a lease-purchase agreement. This is a contract in which a private entity funds the project, and the City makes scheduled lease payments until the lease is paid in full. Another option is complete privatization of the water system. The private entity funds the design, build, and operation of the facility, and the City pays for the private entity to provide water to the community.

The most appropriate funding mechanisms for the construction of the proposed treatment system improvements appear to be either conventional bond financing or financing through the state revolving loan fund. Both bond issues and loan payments are supported through the rates charged to the utility customer. SRF interest rates are estimated to be 2.5% while general obligation bond interest rates are approximately 4.5%. The interest rate provided in a blended rate over a 20-year period. It is recommended that the City's Financial Advisor be consulted for recommendations as to the best financing options, if desired.

b. State Revolving Fund (SRF) Loan Program
This loan program is administrated by the NDEQ and NDHHS through their DWSRF. Presently, the SRF loan would have a 20-year repayment term at an interest rate estimated at 1.5%. In addition, a 1.0% administration fee is charged on the unpaid loan balance. Therefore, the interest rate used for amortization of the loan would be 2.5%.

The City's eligibility to qualify for a State or Federal funds, SRF loan is dependent on the SRF Intended Use Plan (IUP). This process is repeated each year and allows for communities to submit their project needs to the State. The State then ranks the projects based on several criteria.

Funding for these types of projects are ongoing based on those projects considered to be high priority. The City is currently on the 2014 Clean Water IUP planning list for a project described as upgrade WWTF, with an estimated total cost of $1,900,000. Should additional funding be desired, it can be included in the WWAC application for consideration.

c. USDA RD Program
The Water and Waste Disposal Program of the USDA's Rural Development Division (RDD) provides funding through direct loans and grants and guaranteed loans to develop and/or upgrade rural water distribution and wastewater facilities.

- *Direct Loans and Grants*
  Public entities such as municipalities, counties, special purpose districts, Indian Tribes and corporations operated on a not-for-profit basis (communities) may apply for loans or grants to develop drinking water and waste disposal systems including solid waste disposal and storm drainage. In order to apply, communities must have a population of 10,000 or less, be unable to obtain sufficient credit from commercial sources at reasonable rates and terms and have a Medium Household Income (MHI) below the non-metropolitan MHI for the State of Nebraska.

  Loans may be made at 1 of 3 interest rates, the poverty rate, intermediate rate and market rate. The rate of the loan depends on the need to meet applicable health or sanitary standards and the MHI of the community. Once the loan rate is established, it remains fixed for the life of the loan maximum term, of which is up to 40 years. Normal term for treatment projects is 20 years. Funding preference is given to low income communities, communities with fewer than 5,500 residents, restoring deteriorating water supplies, improving, enlarging or modifying a water facility or an inadequate waste facility or merging small water facilities.

The rates available to the City may be dependent on the amount of financing desired.

In order to submit for state and federal funding through the WWAC, the City must have an approved Preliminary Engineering Report and must successfully navigate the application procedures, if this is the desired funding source.

IX. CAPITAL IMPROVEMENT PLAN AND IMPLEMENTATION

In this section, the capital improvement plan, institutional capabilities, financial needs, construction schedules, and requirements of Federal and State agencies are set forth, and responses provided.

A. Institutional Responsibilities

The City is required to have the "legal, institutional, managerial, and financial capability to insure adequate construction, O&M of treatment works." This capability is defined in Nebraska State Law 18-501 through 19-512, which gives cities the authority to levy taxes, issue revenue bonds and to operate wastewater facilities.

B. Capital Improvement Plan

Table IX-1 provides a summary of the recommended 10-year capital improvement plan.

Table IX-1: Capital Improvement Plan Summary

	Year	Description	Estimated Cost	Annual Cost*
1	2013	Current NPDES Permit Issued (June)	-	-
2	2014	Additional Influent Sampling **	-	$6,000
3	2014	Repair Concrete in Raw Pump Station; Design 2 New Raw Sewage Pumps; Determine/Adjust Recirculation Rate to Existing Trickling Filter; Complete Minor Control Modifications	$85,200	$5,995
4	2015	Additional Influent Sampling**	-	$12,000
5	2015	Install 2 New Raw Sewage Pumps; if Trickling Filter Efficiency can be Improved, Then RBC's can be taken off-line	$217,200	$15,282
6	2016	Additional Influent Sampling**	-	$12,000
7	2017	Additional Influent Sampling**	-	$12,000
8	2018	Additional Influent Sampling**	-	$6,000
9	2018	Next NPDES Permit Scheduled to be Issued (June); Begin Preliminary Design	$100,000	$7,036
10	2019	Final Design of SBR Treatment Process, Submit Plans and Specifications to the NDEQ; Include Control Upgrades, and Primary Clarifier Modifications; Influent Screening; If Year-round Disinfection is Required by New NPDES Permit, Enclose UV System	$1,055,900	$74,294
11	2020	Advertise for Bids & Initiate Construction	$2,760,000	$194,197
12	2021	Complete Construction and Start Up	$6,050,000	$425,685
Total			**$10,268,300**	**$723,000**

* Annual costs at 20 years and 3.5% with total annual costs rounded; doesn't include annual O&M

** Total Annual Costs do not include the additional influent sampling. The additional influent sampling only occurs for the next 4 years.

Note that the costs presented in Table IX-1 represent costs in 2014 dollars. The actual costs may need to be adjusted as different capital improvements are initiated. The capital improvement plan is representative of a 10-year schedule so that the City can assure that they are in compliance with the anticipated NPDES discharge permit for the WWTP.

Generally, a facility typically has an implementation timeframe of 3 years from the time a permit is issued wherein they must be in compliance. Annual costs were determined based on a 20-year payback period, an interest rate of 3.5%, and do not include O&M costs.

C. Implementation Steps

A necessary element of plan implementation is the scheduling of the design and construction of the proposed improvements. The steps required for completion of the project are given in the following tabulation.

SCHEDULE	
Event	**Date**
Approve Engineering Report	March 2014
Collect Additional Influent Data	June 2014 to June 2018
Evaluate Trickling Filter Operation	June 2014 to December 2014
Design New Pump Installation at Influent Lift Station	July 2014 to December 2014
Install New Pumps at Influent Lift Station	2015
Arrange for Interim Financing and/or Acquire Funding for Project(s)	Winter of 2017 to 2018
Preliminary Design of Project(s)	January to June 2018
Final Design of Project(s)	June 2018 to June 2019
Submit Plans and Specifications to NDEQ	June 2019
Advertise for Construction Bids	August 2019
Award Construction Contracts	September 2019
Construction Start	October 2019
Complete Construction and Start-Up Services	June 2021

The above schedule is based on having the facilities plan approved by March 2014. Delays in approval of the plan by review agencies will extend the design and construction periods accordingly. Some portions of the project can be scheduled through the design life of the project and these additions made in a phased project. Phasing of the project is possible, but because of the need for most improvements, it has not been presented at this time.

APPENDIX "A"
Wastewater Sampling Results

						Primary Clarifier Removal From Upstream Process				Trickling Filter Removal From Upstream Process				WWTP Effluent Removal From Upstream Process	
Average	**Avg Flow**	**WWTP Influent**		**Primary Clarifier Effluent**		**Removal**		**Trickling Filter Effluent**		**Removal**		**WWTP Effluent**		**Removal**	
	MGD	**mg/l**	**lbs/day**	**mg/l**	**lbs/day**	**lbs/day**	**%**	**mg/l**	**lbs/day**	**lbs/day**	**%**	**mg/l**	**lbs/day**	**lbs/day**	**%**
Ammoniacal Nitrogen, mg/L	1.14	19.3	183.50	20.7	196.81	-13.31	-7.25	9.88	93.97	102.84	52.25	1.54	14.641704	79.33	84.42
BOD, mg/L	1.14	168.33	1600.45	105.33	1001.47	598.98	37.43	72.33	687.72	313.75	31.33	16.33	155.2908	532.43	77.42
Soluble BOD, mg/L	1.14	42.33	402.49	34.33	326.43	76.06	18.90	17.67	167.97	158.46	48.54	5.33	50.7072	117.26	69.81
TSS, mg/L	1.14	196.33	1866.66	77.67	738.42	1128.24	60.44	69.00	656.02	82.40	11.16	15	142.614	513.41	78.26
pH		7.62		7.68				7.79				7.917			

Ref. Lab #: 509683
Report Number
13-354-2033

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REPORT OF ANALYSIS

Mail to: **OLSSON ASSOCIATES**
CRAIG REINSCH
1111 LINCOLN MALL
LINCOLN NE 68508-

For: (8354) OLSSON ASSOCIATES
(402)474-6311

WASTEWATER STUDY

Date Reported: 12/20/13
Date Received: 12/12/13
Date Sampled: 12/11/13
Time Sampled: 1230

Lab number: 2214284 Sample ID: 1A + B RBC INFLUENT

Analysis	Level Found	Units	Detection Limit	Method	Analyst-Date	Verified-Date
Ammoniacal Nitrogen	13.6	mg/L	0.25	SM 4500-NH3 C	lkd-12/18	cmw-12/20
Biochemical oxygen demand	59	mg/L	2	SM 5210B	krs-12/13	cmw-12/20
Lab BOD Setup Date/Time	13dec13/1140	NA	NA	NA	krs-12/13	cmw-12/20
Sampling Date/Time	11dec13/1230	NA	NA	NA	krs-12/13	cmw-12/20

For questions contact

Heather Ramig
Client Service Representative
heather.ramig@midwestlabs.com (402)829-9891

ORDER NUMBER:
509683

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PAGE NUMBER:
1

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ACCOUNT NO: 8354
OLSSON ASSOCIATES
CRAIG REINSCH
1111 LINCOLN MALL
LINCOLN, NE 68508-

SAMPLE DESCRIPTION
WASTEWATER STUDY

PO NUMBER:

COPY TO:

12-12-13 12:20 RCVD

Automatic Order Submittal Form

PLACED BY: hlr3 on Dec 04, 2013

	SAMPLE ID	DATE/TIME SAMPLED	MX	TESTS REQUESTED	# CONT	COMMENTS
1	1A+B RBC INFLUENT	12/11/13 12:30pm	WA	AMMONIACAL N,BOD 2214284 2	2	
2						
3						
4						
5						
6						
7						
8						
9						
10						

(1) 2214284-2214284

Sampled by: *(Signature)*	Temp on Arrival	Cooler arrived Intact?	Relinquished by: *(Signature)*	Date/Time	Received by: *(Signature)*
JAMES BURROUGHS	2.2°C				
Relinquished by: *(Signature)*	**Date/Time**	**Received by: *(Signature)***	**Relinquished by: *(Signature)***	**Date/Time**	**Received in Lab by: *(Signature)***

CHAIN OF CUSTODY

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Regulatory

This sheet **MUST** be filled out before samples can be processed. To ensure that holding times are met, it is your responsibility that a completed form comes attached to the Chain of Custody.

Is this sample for regulatory/permit reporting? ☐ **Yes** ☒ **No**

What city/state was your sample collected in? BEATRICE, NE (WWTP)

Which agency/state are you reporting to? —

What type of sample? (Circle One)

Drinking Water **Ground Water** **Wastewater**

Solid Waste **Hazardous Waste** **UST**

Storm Water **Process Water**

RC Form 14

Ref. Lab #: 509684
Report Number
13-352-2189

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REPORT OF ANALYSIS

Mail to: **OLSSON ASSOCIATES**
CRAIG REINSCH
1111 LINCOLN MALL
LINCOLN NE 68508-

For: (8354) OLSSON ASSOCIATES
(402)474-6311

WASTEWATER STUDY

Date Reported: 12/18/13
Date Received: 12/12/13
Date Sampled: 12/11/13
Time Sampled: 1235

Lab number: 2214281 Sample ID: 1A + B, RBC EFFLUENT

Analysis	Level Found	Units	Detection Limit	Method	Analyst-Date	Verified-Date
Ammoniacal Nitrogen	1.90	mg/L	0.10	SM 4500-NH3 C	lkd-12/17	cmw-12/18
Biochemical oxygen demand	28	mg/L	2	SM 5210B	krs-12/13	cmw-12/18
Lab BOD Setup Date/Time	13dec13/1135	NA	NA	NA	krs-12/13	cmw-12/18
Sampling Date/Time	11dec13/1235	NA	NA	NA	krs-12/13	cmw-12/18

For questions contact

Heather Ramig

Heather Ramig
Client Service Representative
heather.ramig@midwestlabs.com (402)829-9891

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LINCOLN, NE 68508-

SAMPLE DESCRIPTION
WASTEWATER STUDY

PO NUMBER:

COPY TO:

12-12-13 12:20 RCVD

Automatic Order Submittal Form

PLACED BY: hlr3 on Dec 04, 2013

	SAMPLE ID	DATE/TIME SAMPLED	MX	TESTS REQUESTED	# CONT	COMMENTS
1	1A+B, RBC EFFLUENT	12/11/2013 12:35 PM	WA	AMMONIACAL N,BOD 2214281 ✓	2	
2						
3						
4						
5						
6						
7						
8						
9						
10						

(1) 2214281-2214281

Sampled by: *(Signature)* JAMES BURROUGHS	Temp on Arrival 3.1	Cooler arrived intact?	Relinquished by: *(Signature)*	Date/Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date/Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date/Time	Received in Lab by: *(Signature)*

CHAIN OF CUSTODY

Midwest Laboratories®
13611 B Street Omaha, NE 68144 P: (402) 334-7770 F: (402) 334-9121 www.midwestlabs.com

Regulatory

This sheet **MUST** be filled out before samples can be processed. To ensure that holding times are met, it is your responsibility that a completed form comes attached to the Chain of Custody.

Is this sample for regulatory/permit reporting? ☐ **Yes** ☒ **No**

(1) add 2214281-2214281

What city/state was your sample collected in? BEATRICE, NE (WWTP)

Which agency/state are you reporting to? —

What type of sample? (Circle One)

Drinking Water **Ground Water** **Wastewater**

Solid Waste **Hazardous Waste** **UST**

Storm Water **Process Water**

RC Form 14

Ref. Lab #: 509679
Report Number
13-354-2041

Midwest Laboratories Inc.®
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REPORT OF ANALYSIS

Mail to: **CITY OF BEATRICE**
DEAN KELCH
1300 BEAVER STREET
BEATRICE NE 68310-

For: (1933) CITY OF BEATRICE
(402)223-5211

WASTEWATER STUDY
PER OLSSON ASSOC

Date Reported: 01/02/14
Date Received: 12/13/13
Date Sampled: 12/12/13
Time Sampled: 1100

Lab number: 2214938

Analysis	Level Found	Units	Detection Limit	Method	Analyst-Date	Verified-Date
Sample ID: INFLUENT						
Ammoniacal Nitrogen	20.9	mg/L	0.50	SM 4500-NH3 C	lkd-12/19	cmw-12/20
Biochemical oxygen demand	160	mg/L	20	SM 5210B	krs-12/13	cmw-12/20
Lab BOD Setup Date/Time	13dec13/1620	NA	NA	NA	krs-12/13	cmw-12/20
Lab Soluble BOD Setup Date/Time	13dec13/1622	NA	NA	NA	krs-12/13	cmw-12/20
Sampling Date/Time	12dec13/1330	NA	NA	NA	krs-12/13	cmw-12/20
Soluble biochemical oxygen demand	37	mg/L	2	SM 5210B	krs-12/13	cmw-12/20
Total suspended solids	229	mg/L	4	SM 2540 D	jsa-12/16	cmw-12/20
pH	7.86	S.U.		EPA 150.1	dmg-12/13	cmw-12/20
Sample ID: PRIMARY						
Ammoniacal Nitrogen	26.0	mg/L	0.50	SM 4500-NH3 C	lkd-12/19	cmw-12/20
Biochemical oxygen demand	102	mg/L	2	SM 5210B	krs-12/13	cmw-12/20
Lab BOD Setup Date/Time	13dec13/1625	NA	NA	NA	krs-12/13	cmw-12/20
Lab Soluble BOD Setup Date/Time	13dec13/1630	NA	NA	NA	krs-12/13	cmw-12/20
Sampling Date/Time	12dec13/1330	NA	NA	NA	krs-12/13	cmw-12/20
Soluble biochemical oxygen demand	39	mg/L	2	SM 5210B	krs-12/13	cmw-12/20
Total suspended solids	87	mg/L	4	SM 2540 D	jsa-12/16	cmw-12/20
pH	7.95	S.U.		EPA 150.1	dmg-12/13	cmw-12/20

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REPORT OF ANALYSIS

Account: 1933 CITY OF BEATRICE Report Number: 13-354-2041

Analysis	Level Found	Units	Detection Limit	Method	Analyst-Date	Verified-Date
Sample ID: TRICKLING FILTER						
Ammoniacal Nitrogen	12.7	mg/L	0.25	SM 4500-NH3 C	lkd-12/19	cmw-12/20
Biochemical oxygen demand	80	mg/L	2	SM 5210B	krs-12/13	cmw-12/20
Lab BOD Setup Date/Time	13dec13/1633	NA	NA	NA	krs-12/13	cmw-12/20
Lab Soluble BOD Setup Date/Time	13dec13/1635	NA	NA	NA	krs-12/13	cmw-12/20
Sampling Date/Time	12dec13/1330	NA	NA	NA	krs-12/13	cmw-12/20
Soluble biochemical oxygen demand	20	mg/L	2	SM 5210B	krs-12/13	cmw-12/20
Total suspended solids	78	mg/L	4	SM 2540 D	jsa-12/16	cmw-12/20
pH	8.04	S.U.		EPA 150.1	dmg-12/13	cmw-12/20
Sample ID: EFFLUENT						
Ammoniacal Nitrogen	2.59	mg/L	0.10	SM 4500-NH3 C	lkd-12/19	cmw-12/20
Biochemical oxygen demand	15	mg/L	2	SM 5210B	krs-12/13	cmw-12/20
Lab BOD Setup Date/Time	13dec13/1640	NA	NA	NA	krs-12/13	cmw-12/20
Lab Soluble BOD Setup Date/Time	13dec13/1644	NA	NA	NA	krs-12/13	cmw-12/20
Sampling Date/Time	12dec13/1330	NA	NA	NA	krs-12/13	cmw-12/20
Soluble biochemical oxygen demand	6	mg/L	2	SM 5210B	krs-12/13	cmw-12/20
Total suspended solids	18	mg/L	4	SM 2540 D	jsa-12/16	cmw-12/20
pH	8.14	S.U.		EPA 150.1	dmg-12/13	cmw-12/20

For questions contact

Heather Ramig

Heather Ramig
Client Service Representative
heather.ramig@midwestlabs.com (402)829-9891

ORDER NUMBER:
509679

Midwest Laboratories, Inc.

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PAGE NUMBER:
1

ACCOUNT NO: 1933
CITY OF BEATRICE
DEAN KELCH
1300 BEAVER STREET
BEATRICE, NE 68310-

SAMPLE DESCRIPTION
WASTEWATER STUDY
PER OLSSON ASSOC
PO NUMBER:

COPY TO:

12-13-13 12:27 RCVD

Automatic Order Submittal Form

PLACED BY: hlr3 on Dec 04, 2013

	SAMPLE ID	DATE/TIME SAMPLED	MX	TESTS REQUESTED	# CONT	COMMENTS
1	Influent 1-A+B 24 Hour Comp	12-11-13 11 AM Start 12-12-13 11 AM Stop	WA	AMMONIACAL N,BOD,PH,SBOD,TSS 2214938 2	2	All packed in ice
2	Primary 2-A+B 24 Hour Comp	12-11-13 11 AM Start 12-12-13 11 AM Stop	WA	AMMONIACAL N,BOD,PH,SBOD,TSS 2214939 2	2	"
3	Trickling Filter 3-A-B 24 Hr Comp	12-11-13 11:30 AM Start 12-12-13 11:30 AM Stop	WA	AMMONIACAL N,BOD,PH,SBOD,TSS 2214940 2	2	"
4	Effluent 4-A-B 24 HR Comp	12-11-13 11:30 AM Start 12-12-13 11:30 AM Stop	"	" " 2214941 2	2	"
5						
6						
7				(4) 2214938-2214941		
8						
9						
10						

Sampled by: (Signature)	Temp on Arrival	Cooler arrived intact?	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Johnny Barta	1.8				
Relinquished by: (Signature)	**Date/Time**	**Received by: (Signature)**	**Relinquished by: (Signature)**	**Date/Time**	**Received in Lab by: (Signature)**
Johnny Barta	12-12-13 1 PM				

CHAIN OF CUSTODY

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Regulatory

This sheet **MUST** be filled out before samples can be processed. To ensure that holding times are met, it is your responsibility that a completed form comes attached to the Chain of Custody.

Is this sample for regulatory/permit reporting? ☐ Yes ☒ No

(4) add 2214938-2214941

What city/state was your sample collected in? Beatrice Nebraska

Which agency/state are you reporting to? Olsson Engineering

What type of sample? (Circle One)

Drinking Water **Ground Water** **Wastewater**

Solid Waste **Hazardous Waste** **UST**

Storm Water **Process Water**

RC Form 14

Ref. Lab #: 509680
Report Number
13-360-2050

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REPORT OF ANALYSIS

Mail to: **CITY OF BEATRICE**
DEAN KELCH
1300 BEAVER STREET
BEATRICE NE 68310-

For: (1933) CITY OF BEATRICE
(402)223-5211

WASTEWATER STUDY
PER OLSSON ASSOC

Date Reported: 01/02/14
Date Received: 12/18/13
Date Sampled: 12/17/13
Time Sampled: 0900

Lab number: 2216154 Sample ID: INFLUENT 24 HR COMP

Analysis	Level Found	Units	Detection Limit	Method	Analyst-Date	Verified-Date
Ammoniacal Nitrogen	18.3	mg/L	0.50	SM 4500-NH3 C	lkd-12/23	jjd-12/26
Biochemical oxygen demand	162	mg/L	20	SM 5210B	krs-12/18	jjd-12/26
Lab BOD Setup Date/Time	18dec13/1837	NA	NA	NA	krs-12/18	jjd-12/26
Lab Soluble BOD Setup Date/Time	18dec13/1840	NA	NA	NA	krs-12/18	jjd-12/26
Sampling Date/Time	17dec13/1100	NA	NA	NA	krs-12/18	jjd-12/26
Soluble biochemical oxygen demand	48	mg/L	2	SM 5210B	krs-12/18	jjd-12/26
Total suspended solids	180	mg/L	4	SM 2540 D	jsa-12/20	jjd-12/26
pH	7.51	S.U.		EPA 150.1	jdb-12/18	jjd-12/26

For questions contact

Heather Ramig
Client Service Representative
heather.ramig@midwestlabs.com (402)829-9891

ORDER NUMBER:
509680

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PAGE NUMBER:
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ACCOUNT NO: 1933
CITY OF BEATRICE
DEAN KELCH
1300 BEAVER STREET
BEATRICE, NE 68310-

SAMPLE DESCRIPTION
WASTEWATER STUDY
PER OLSSON ASSOC
PO NUMBER:

COPY TO:

12-18-13 12:14 RCVD

Automatic Order Submittal Form

PLACED BY: hlr3 on Dec 04, 2013

	SAMPLE ID	DATE/TIME SAMPLED	MX	TESTS REQUESTED		# CONT	COMMENTS
1	Influent — 24 Hr Comp 1A+B	12-16-13 9AM 12-17-13 9AM	WA	AMMONIACAL N,BOD,PH,SBOD,TSS	2216154 2	2	
2	Primary 24 Hr Comp 2A+B	12-16-13 9:10 AM 12-17-13 9:10 AM	WA	AMMONIACAL N,BOD,PH,SBOD,TSS	2216155 2	2	
3	Trickling 24 Hr Comp filter 3A+B	12-16-13 9:20 AM 12-17-13 9:20 AM	WA	AMMONIACAL N,BOD,PH,SBOD,TSS	2216156 2	2	
4	Effluent + 24 Hr comp 4A+B	12-16-13 9:30 AM 12-17-13 9:30 AM	WA	Ammoniacal, N, BOD, PH, SBOD, TSS	2216157 2	2	
5							
6							
7							
8							
9							
10							

(4) 2216154-2216157

Sampled by: (Signature)	Temp on Arrival	Cooler arrived intact?	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Johnny Burton	2.2°C	yes			
Relinquished by: (Signature)	**Date/Time**	**Received by: (Signature)**	**Relinquished by: (Signature)**	**Date/Time**	**Received in Lab by: (Signature)**
Johnny Burton	11-7-13 11AM				

CHAIN OF CUSTODY

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Regulatory

This sheet **MUST** be filled out before samples can be processed. To ensure that holding times are met, it is your responsibility that a completed form comes attached to the Chain of Custody.

(4) add 2216154-2216157

Is this sample for regulatory/permit reporting? ☐ Yes ☒ No

What city/state was your sample collected in? Beatrice Nebr

Which agency/state are you reporting to? Olsson Associates Wastewater Study

What type of sample? (Circle One)

Drinking Water **Ground Water** **Wastewater**

Solid Waste **Hazardous Waste** **UST**

Storm Water **Process Water**

RC Form 14

Midwest Laboratories

Checklist

SAMPLE ACCEPTANCE CHECKLIST
Document Number: RC CHKLIST 001
Revision Number: 1 Effective Date: 2/12/13
Page 1 of 1 Approval: DFJ

(4) add **2216154-2216157**

Thermometer Used: Therm Fisher IR 14

Sample Temperature (°C): 2.2

Cooler Intact: (Yes) No
Received on Ice: (Yes) No
Hand Delivered: Yes (No)

Date & Initials of person accepting samples: 12-18-13 ABD

				Comments:
Chain of Custody present?	(Yes)	No	N/A	
Chain of Custody complete?	(Yes)	No	N/A	
Sample ID(s):	(Yes)	No	N/A	
Sample Location(s):	(Yes)	No	N/A	
Client Contact:	(Yes)	No	N/A	
Analysis Requested:	(Yes)	No	N/A	
Sampler name on COC?	(Yes)	No	N/A	
Date & Time of collection:	(Yes)	No	N/A	
Sample labels match COC?	(Yes)	No	N/A	
Written in indelible ink?	(Yes)	No	N/A	
Labels indicate proper preservation?	(Yes)	No	N/A	
Chain of Custody relinquished with signature?	(Yes)	No	N/A	
Samples arrived within hold time?	(Yes)	No	N/A	
Sufficient volume?	(Yes)	No	N/A	
Appropriate containers used?	(Yes)	No	N/A	
Filtered volume received for dissolved tests?	Yes	No	N/A	
Headspace in VOA vials?	Yes	No	N/A	
Trip Blank present?	Yes	No	N/A	
Temperature Blank present?	Yes	No	N/A	

Client Notification/Resolution: Date/Time Contacted: _____

Person Contacted: _____ Contacted By: _____

Comments/Resolution: _____

Report Number
13-360-2051

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REPORT OF ANALYSIS

Mail to: CITY OF BEATRICE
DEAN KELCH
1300 BEAVER STREET
BEATRICE NE 68310-

For: (1933) CITY OF BEATRICE
(402)223-5211

WASTEWATER STUDY
PER OLSSON ASSOC

Date Reported: 01/02/14
Date Received: 12/18/13
Date Sampled: 12/17/13
Time Sampled: 0900

Lab number: 2216155 Sample ID: PRIMARY 24 HR COMP

Analysis	Level Found	Units	Detection Limit	Method	Analyst-Date	Verified-Date
Ammoniacal Nitrogen	18.1	mg/L	0.50	SM 4500-NH3 C	lkd-12/23	jjd-12/26
Biochemical oxygen demand	86	mg/L	2	SM 5210B	krs-12/19	jjd-12/26
Lab BOD Setup Date/Time	19dec13/1030	NA	NA	NA	krs-12/19	jjd-12/26
Lab Soluble BOD Setup Date/Time	19dec13/1035	NA	NA	NA	krs-12/19	jjd-12/26
Sampling Date/Time	17dec13/1100	NA	NA	NA	krs-12/19	jjd-12/26
Soluble biochemical oxygen demand	30	mg/L	2	SM 5210B	krs-12/19	jjd-12/26
Total suspended solids	71	mg/L	4	SM 2540 D	jsa-12/20	jjd-12/26
pH	7.57	S.U.		EPA 150.1	jdb-12/18	jjd-12/26

For questions contact

Heather Ramig
Client Service Representative
heather.ramig@midwestlabs.com (402)829-9891

ORDER NUMBER:
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PAGE NUMBER:
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ACCOUNT NO: 1933
CITY OF BEATRICE
DEAN KELCH
1300 BEAVER STREET
BEATRICE, NE 68310-

SAMPLE DESCRIPTION
WASTEWATER STUDY
PER OLSSON ASSOC
PO NUMBER:

COPY TO:

12-18-13 12:14 RCVD

Automatic Order Submittal Form

PLACED BY: hlr3 on Dec 04, 2013

	SAMPLE ID	DATE/TIME SAMPLED	MX	TESTS REQUESTED	# CONT	COMMENTS
1	Influent — 24 Hr Comp A+B	12-16-13 9AM 12-17-13 9AM	WA	AMMONIACAL N,BOD,PH,SBOD,TSS 2216154 2	2	
2	Primary 24 Hr Comp A+B	12-16-13 9:10 AM 12-17-13 9:10 AM	WA	AMMONIACAL N,BOD,PH,SBOD,TSS 2216155 2	2	
3	Trickling 24 Hr Comp Filter A+B	12-16-13 9:20 AM 12-17-13 9:20 AM	WA	AMMONIACAL N,BOD,PH,SBOD,TSS 2216156 2	2	
4	Effluent — 24 Hr Comp A+B	12-16-13 9:30 AM 12-17-13 9:30 AM	WA	Ammoniacal, N, BOD, PH, SBOD, TSS 2216157 2	2	
5						
6						
7				(4) 2216154-2216157		
8						
9						
10						

Sampled by: (Signature)	Temp on Arrival	Cooler arrived intact?	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Johnny Barta	2.2°C	yes			
Relinquished by: (Signature)	**Date/Time**	**Received by: (Signature)**	**Relinquished by: (Signature)**	**Date/Time**	**Received in Lab by: (Signature)**
Johnny Barta	11-7-13 11AM				

CHAIN OF CUSTODY

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Regulatory

This sheet **MUST** be filled out before samples can be processed. To ensure that holding times are met, it is your responsibility that a completed form comes attached to the Chain of Custody.

(4) add 2216154-2216157

Is this sample for regulatory/permit reporting? ☐ Yes ☒ No

What city/state was your sample collected in? Beatrice Nebr

Which agency/state are you reporting to? Olsson Associates Wastewater Study

What type of sample? (Circle One)

Drinking Water **Ground Water** **Wastewater**

Solid Waste **Hazardous Waste** **UST**

Storm Water **Process Water**

RC Form 14

Midwest Laboratories
Checklist

SAMPLE ACCEPTANCE CHECKLIST
Document Number: RC CHKLIST 001
Revision Number: 1 Effective Date: 2/12/13
Page 1 of 1 Approval: DFJ

(4) add **2216154-2216157**

Thermometer Used: Therm Fisher IR 14

Sample Temperature (°C): 2.2

Cooler Intact: (Yes) No
Received on Ice: (Yes) No
Hand Delivered: Yes (No)

Date & Initials of person accepting samples: 12-18-13 ABD

				Comments:
Chain of Custody present?	(Yes)	No	N/A	
Chain of Custody complete?	(Yes)	No	N/A	
Sample ID(s):	(Yes)	No	N/A	
Sample Location(s):	(Yes)	No	N/A	
Client Contact:	(Yes)	No	N/A	
Analysis Requested:	(Yes)	No	N/A	
Sampler name on COC?	(Yes)	No	N/A	
Date & Time of collection:	(Yes)	No	N/A	
Sample labels match COC?	(Yes)	No	N/A	
Written in indelible ink?	(Yes)	No	N/A	
Labels indicate proper preservation?	(Yes)	No	N/A	
Chain of Custody relinquished with signature?	(Yes)	No	N/A	
Samples arrived within hold time?	(Yes)	No	N/A	
Sufficient volume?	(Yes)	No	N/A	
Appropriate containers used?	(Yes)	No	N/A	
Filtered volume received for dissolved tests?	Yes	No	N/A	
Headspace in VOA vials?	Yes	No	N/A	
Trip Blank present?	Yes	No	N/A	
Temperature Blank present?	Yes	No	N/A	

Client Notification/Resolution: Date/Time Contacted: _____

Person Contacted: _____ Contacted By: _____

Comments/Resolution: _____

Report Number
13-360-2052

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REPORT OF ANALYSIS

Mail to: **CITY OF BEATRICE**
DEAN KELCH
1300 BEAVER STREET
BEATRICE NE 68310-

For: (1933) CITY OF BEATRICE
(402)223-5211

WASTEWATER STUDY
PER OLSSON ASSOC

Date Reported: 01/02/14
Date Received: 12/18/13
Date Sampled: 12/17/13
Time Sampled: 0920

Lab number: 2216156 Sample ID: TRICKLING FILTER 24 HR COMP

Analysis	Level Found	Units	Detection Limit	Method	Analyst-Date	Verified-Date
Ammoniacal Nitrogen	8.42	mg/L	0.25	SM 4500-NH3 C	lkd-12/23	jjd-12/26
Biochemical oxygen demand	62	mg/L	2	SM 5210B	krs-12/19	jjd-12/26
Lab BOD Setup Date/Time	19dec13/1040	NA	NA	NA	krs-12/19	jjd-12/26
Lab Soluble BOD Setup Date/Time	19dec13/1044	NA	NA	NA	krs-12/19	jjd-12/26
Sampling Date/Time	17dec13/1100	NA	NA	NA	krs-12/19	jjd-12/26
Soluble biochemical oxygen demand	13	mg/L	2	SM 5210B	krs-12/19	jjd-12/26
Total suspended solids	63	mg/L	4	SM 2540 D	jsa-12/20	jjd-12/26
pH	7.69	S.U.		EPA 150.1	jdb-12/18	jjd-12/26

For questions contact

Heather Ramig
Client Service Representative
heather.ramig@midwestlabs.com (402)829-9891

ORDER NUMBER:
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PAGE NUMBER:
1

ACCOUNT NO: 1933
CITY OF BEATRICE
DEAN KELCH
1300 BEAVER STREET
BEATRICE, NE 68310-

SAMPLE DESCRIPTION
WASTEWATER STUDY
PER OLSSON ASSOC
PO NUMBER:

COPY TO:

12-18-13 12:14 RCVD

Automatic Order Submittal Form

PLACED BY: hlr3 on Dec 04, 2013

	SAMPLE ID	DATE/TIME SAMPLED	MX	TESTS REQUESTED		# CONT	COMMENTS
1	Influent — 24 Hr Comp 1A+B	12-16-13 9AM 12-17-13 9AM	WA	AMMONIACAL N,BOD,PH,SBOD,TSS	2216154 Z	2	
2	Primary 24 Hr Comp 2A+B	12-16-13 9:10 AM 12-17-13 9:10 AM	WA	AMMONIACAL N,BOD,PH,SBOD,TSS	2216155 Z	2	
3	Trickling 24 Hr Comp Filter 3A+B	12-16-13 9:20 AM 12-17-13 9:20 AM	WA	AMMONIACAL N,BOD,PH,SBOD,TSS	2216156 Z	2	
4	Effluent 24 Hr Comp 4A+B	12-16-13 9:30 AM 12-17-13 9:30 AM	WA	Ammoniacal, N, BOD, PH, SBOD, TSS	2216157 Z	2	
5							
6							
7							
8							
9							
10							

(4) 2216154-2216157

Sampled by: (Signature)	Temp on Arrival	Cooler arrived intact?	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Johnny Barta	2.2°C	yes			
Relinquished by: (Signature)	**Date/Time**	**Received by: (Signature)**	**Relinquished by: (Signature)**	**Date/Time**	**Received in Lab by: (Signature)**
Johnny Barta	11-17-13 11AM				

CHAIN OF CUSTODY

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Regulatory

This sheet **MUST** be filled out before samples can be processed. To ensure that holding times are met, it is your responsibility that a completed form comes attached to the Chain of Custody.

Is this sample for regulatory/permit reporting? ☐ Yes ☒ No

What city/state was your sample collected in? Beatrice Nebr

Which agency/state are you reporting to? Olsson Associates Wastewater Study

What type of sample? (Circle One)

Drinking Water **Ground Water** **Wastewater**

Solid Waste **Hazardous Waste** **UST**

Storm Water **Process Water**

RC Form 14

Midwest Laboratories

Checklist

SAMPLE ACCEPTANCE CHECKLIST
Document Number: RC CHKLIST 001
Revision Number: 1 Effective Date: 2/12/13
Page 1 of 1 Approval: DFJ

(4) add **2216154-2216157**

Thermometer Used: Therm Fisher IR 14

Sample Temperature (°C): 2.2

Cooler Intact: (Yes) No
Received on Ice: (Yes) No
Hand Delivered: Yes (No)

Date & Initials of person accepting samples: 12-18-13 ABD

				Comments:
Chain of Custody present?	(Yes)	No	N/A	
Chain of Custody complete?	(Yes)	No	N/A	
Sample ID(s):	(Yes)	No	N/A	
Sample Location(s):	(Yes)	No	N/A	
Client Contact:	(Yes)	No	N/A	
Analysis Requested:	(Yes)	No	N/A	
Sampler name on COC?	(Yes)	No	N/A	
Date & Time of collection:	(Yes)	No	N/A	
Sample labels match COC?	(Yes)	No	N/A	
Written in indelible ink?	(Yes)	No	N/A	
Labels indicate proper preservation?	(Yes)	No	N/A	
Chain of Custody relinquished with signature?	(Yes)	No	N/A	
Samples arrived within hold time?	(Yes)	No	N/A	
Sufficient volume?	(Yes)	No	N/A	
Appropriate containers used?	(Yes)	No	N/A	
Filtered volume received for dissolved tests?	Yes	No	N/A	
Headspace in VOA vials?	Yes	No	N/A	
Trip Blank present?	Yes	No	N/A	
Temperature Blank present?	Yes	No	N/A	

Client Notification/Resolution: Date/Time Contacted: _____

Person Contacted: _____ Contacted By: _____

Comments/Resolution: _____

Report Number
13-360-2053

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REPORT OF ANALYSIS

Mail to: CITY OF BEATRICE
DEAN KELCH
1300 BEAVER STREET
BEATRICE NE 68310-

For: (1933) CITY OF BEATRICE
(402)223-5211

WASTEWATER STUDY
PER OLSSON ASSOC

Date Reported: 01/02/14
Date Received: 12/18/13
Date Sampled: 12/17/13
Time Sampled: 0930

Lab number: 2216157 Sample ID: EFFLUENT 24 HR COMP

Analysis	Level Found	Units	Detection Limit	Method	Analyst-Date	Verified-Date
Ammoniacal Nitrogen	0.90	mg/L	0.10	SM 4500-NH3 C	lkd-12/23	jjd-12/26
Biochemical oxygen demand	17	mg/L	2	SM 5210B	krs-12/18	jjd-12/26
Lab BOD Setup Date/Time	18dec13/1842	NA	NA	NA	krs-12/18	jjd-12/26
Lab Soluble BOD Setup Date/Time	18dec13/1844	NA	NA	NA	krs-12/18	jjd-12/26
Sampling Date/Time	17dec13/1100	NA	NA	NA	krs-12/18	jjd-12/26
Soluble biochemical oxygen demand	5	mg/L	2	SM 5210B	krs-12/18	jjd-12/26
Total suspended solids	n.d.	mg/L	4	SM 2540 D	jsa-12/20	jjd-12/26
pH	7.82	S.U.		EPA 150.1	jdb-12/18	jjd-12/26

Notes:
n.d. - Not Detected.

For questions contact

Heather Ramig
Client Service Representative
heather.ramig@midwestlabs.com (402)829-9891

ORDER NUMBER:
509680

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PAGE NUMBER:
1

ACCOUNT NO: 1933
CITY OF BEATRICE
DEAN KELCH
1300 BEAVER STREET
BEATRICE, NE 68310-

SAMPLE DESCRIPTION
WASTEWATER STUDY
PER OLSSON ASSOC
PO NUMBER:

COPY TO:

12-18-13 12:14 RCVD

Automatic Order Submittal Form

PLACED BY: hlr3 on Dec 04, 2013

	SAMPLE ID	DATE/TIME SAMPLED	MX	TESTS REQUESTED	# CONT	COMMENTS
1	Influent — 24 Hr Comp 1A+B	12-16-13 9AM 12-17-13 9AM	WA	AMMONIACAL N,BOD,PH,SBOD,TSS 2216154 2	2	
2	Primary 24 Hr Comp 2A+B	12-16-13 9:10 AM 12-17-13 9:10 AM	WA	AMMONIACAL N,BOD,PH,SBOD,TSS 2216155 2	2	
3	Trickling 24 Hr Comp Filter 3A+B	12-16-13 9:20 AM 12-17-13 9:20 AM	WA	AMMONIACAL N,BOD,PH,SBOD,TSS 2216156 2	2	
4	Effluent + 24 Hr Comp 4A+B	12-16-13 9:30 AM 12-17-13 9:30 AM	n/a	Ammoniacal, N, BOD, PH, SBOD, TSS 2216157 2	2	
5						
6						
7						
8						
9						
10						

(4) 2216154-2216157

Sampled by: (Signature)	Temp on Arrival	Cooler arrived intact?	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Johnny Barta	2.2°C	yes			
Relinquished by: (Signature)	**Date/Time**	**Received by: (Signature)**	**Relinquished by: (Signature)**	**Date/Time**	**Received in Lab by: (Signature)**
Johnny Barta	11-17-13 11AM				

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Regulatory

This sheet **MUST** be filled out before samples can be processed. To ensure that holding times are met, it is your responsibility that a completed form comes attached to the Chain of Custody.

(4) add 2216154-2216157

Is this sample for regulatory/permit reporting? ☐ Yes ☒ No

What city/state was your sample collected in? Beatrice Nebr

Which agency/state are you reporting to? Olsson Associates Wastewater Study

What type of sample? (Circle One)

Drinking Water **Ground Water** (**Wastewater**)

Solid Waste **Hazardous Waste** **UST**

Storm Water **Process Water**

RC Form 14

Midwest Laboratories

Checklist

SAMPLE ACCEPTANCE CHECKLIST
Document Number: RC CHKLIST 001
Revision Number: 1 Effective Date: 2/12/13
Page 1 of 1 Approval: DFJ

(4) add **2216154-2216157**

Thermometer Used: Therm Fisher IR 14

Sample Temperature (°C): 2.2

Cooler Intact: (Yes) No
Received on Ice: (Yes) No
Hand Delivered: Yes (No)

Date & Initials of person accepting samples: 12-18-13 ABD

				Comments:
Chain of Custody present?	(Yes)	No	N/A	
Chain of Custody complete?	(Yes)	No	N/A	
Sample ID(s):	(Yes)	No	N/A	
Sample Location(s):	(Yes)	No	N/A	
Client Contact:	(Yes)	No	N/A	
Analysis Requested:	(Yes)	No	N/A	
Sampler name on COC?	(Yes)	No	N/A	
Date & Time of collection:	(Yes)	No	N/A	
Sample labels match COC?	(Yes)	No	N/A	
Written in indelible ink?	(Yes)	No	N/A	
Labels indicate proper preservation?	(Yes)	No	N/A	
Chain of Custody relinquished with signature?	(Yes)	No	N/A	
Samples arrived within hold time?	(Yes)	No	N/A	
Sufficient volume?	(Yes)	No	N/A	
Appropriate containers used?	(Yes)	No	N/A	
Filtered volume received for dissolved tests?	Yes	No	N/A	
Headspace in VOA vials?	Yes	No	N/A	
Trip Blank present?	Yes	No	N/A	
Temperature Blank present?	Yes	No	N/A	

Client Notification/Resolution: Date/Time Contacted: _____

Person Contacted: _____ Contacted By: _____

Comments/Resolution: _____

Ref. Lab #: 509678
Report Number
13-360-2080

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REPORT OF ANALYSIS

Mail to: CITY OF BEATRICE
DEAN KELCH
1300 BEAVER STREET
BEATRICE NE 68310-

For: (1933) CITY OF BEATRICE
(402)223-5211

WASTEWATER STUDY
PER OLSSON ASSOC

Date Reported: 01/02/14
Date Received: 12/19/13
Date Sampled: 12/18/13
Time Sampled: 1100

Lab number: 2216823

Analysis	Level Found	Units	Detection Limit	Method	Analyst-Date	Verified-Date
Sample ID: INFLUENT						
Ammoniacal Nitrogen	18.7	mg/L	0.50	SM 4500-NH3 C	lkd-12/24	jjd-12/26
Biochemical oxygen demand	183	mg/L	20	SM 5210B	krs-12/19	jjd-12/26
Lab BOD Setup Date/Time	19dec13/1700	NA	NA	NA	krs-12/19	jjd-12/26
Lab Soluble BOD Setup Date/Time	19dec13/1705	NA	NA	NA	krs-12/19	jjd-12/26
Sampling Date/Time	18dec13/1145	NA	NA	NA	krs-12/19	jjd-12/26
Soluble biochemical oxygen demand	42	mg/L	2	SM 5210B	krs-12/19	jjd-12/26
Total suspended solids	180	mg/L	4	SM 2540 D	jsa-12/20	jjd-12/26
pH	7.49	S.U.		EPA 150.1	jdb-12/19	jjd-12/26
Sample ID: PRIMARY						
Ammoniacal Nitrogen	18.0	mg/L	0.50	SM 4500-NH3 C	lkd-12/24	jjd-12/26
Biochemical oxygen demand	128	mg/L	2	SM 5210B	krs-12/19	jjd-12/26
Lab BOD Setup Date/Time	19dec13/1710	NA	NA	NA	krs-12/19	jjd-12/26
Lab Soluble BOD Setup Date/Time	19dec13/1712	NA	NA	NA	krs-12/19	jjd-12/26
Sampling Date/Time	18dec13/1145	NA	NA	NA	krs-12/19	jjd-12/26
Soluble biochemical oxygen demand	34	mg/L	2	SM 5210B	krs-12/19	jjd-12/26
Total suspended solids	75	mg/L	4	SM 2540 D	jsa-12/20	jjd-12/26
pH	7.52	S.U.		EPA 150.1	jdb-12/19	jjd-12/26

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REPORT OF ANALYSIS

Account: 1933 CITY OF BEATRICE Report Number: 13-360-2080

Analysis	Level Found	Units	Detection Limit	Method	Analyst-Date	Verified-Date
Sample ID: TRICKLING FILTER						
Ammoniacal Nitrogen	8.53	mg/L	0.25	SM 4500-NH3 C	lkd-12/24	jjd-12/26
Biochemical oxygen demand	75	mg/L	2	SM 5210B	krs-12/19	jjd-12/26
Lab BOD Setup Date/Time	19dec13/1720	NA	NA	NA	krs-12/19	jjd-12/26
Lab Soluble BOD Setup Date/Time	19dec13/1722	NA	NA	NA	krs-12/19	jjd-12/26
Sampling Date/Time	18dec13/1145	NA	NA	NA	krs-12/19	jjd-12/26
Soluble biochemical oxygen demand	20	mg/L	2	SM 5210B	krs-12/19	jjd-12/26
Total suspended solids	66	mg/L	4	SM 2540 D	jsa-12/20	jjd-12/26
pH	7.65	S.U.		EPA 150.1	jdb-12/19	jjd-12/26
Sample ID: EFFLUENT						
Ammoniacal Nitrogen	1.13	mg/L	0.10	SM 4500-NH3 C	lkd-12/24	jjd-12/26
Biochemical oxygen demand	17	mg/L	2	SM 5210B	krs-12/19	jjd-12/26
Lab BOD Setup Date/Time	19dec13/1730	NA	NA	NA	krs-12/19	jjd-12/26
Lab Soluble BOD Setup Date/Time	19dec13/1735	NA	NA	NA	krs-12/19	jjd-12/26
Sampling Date/Time	18dec13/1145	NA	NA	NA	krs-12/19	jjd-12/26
Soluble biochemical oxygen demand	5	mg/L	2	SM 5210B	krs-12/19	jjd-12/26
Total suspended solids	12	mg/L	4	SM 2540 D	jsa-12/20	jjd-12/26
pH	7.79	S.U.		EPA 150.1	jdb-12/19	jjd-12/26

For questions contact

Heather Ramig

Heather Ramig
Client Service Representative
heather.ramig@midwestlabs.com (402)829-9891

ORDER NUMBER:
509678

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PAGE NUMBER:
1

ACCOUNT NO: 1933
CITY OF BEATRICE
DEAN KELCH
1300 BEAVER STREET
BEATRICE, NE 68310-

SAMPLE DESCRIPTION
WASTEWATER STUDY
PER OLSSON ASSOC
PO NUMBER:

COPY TO:

12-19-13 13:12 RCVD

Automatic Order Submittal Form

PLACED BY: hlr3 on Dec 04, 2013

	SAMPLE ID	DATE/TIME SAMPLED	MX	TESTS REQUESTED	# CONT	COMMENTS
1	Influent 24 hr Comp 1-A+B	12-17-13 11 AM 12-18-13 10 AM	WA	AMMONIACAL N,BOD,PH,SBOD,TSS 2216823 2	2	
2	Primary 24 hr Comp 2-A+B	12-17-13 10:55 AM 12-18-13 10:55 AM	WA	AMMONIACAL N,BOD,PH,SBOD,TSS 2216824 2	2	
3	Trickling filter 24 HR Comp 3-A-B	12-17-13 11:30 AM 12-18-13 11:30 AM	WA	AMMONIACAL N,BOD,PH,SBOD,TSS 2216825 2	2	
4	Effluent 24 Hr Comp 4-A-B	12-17-13 11:45 AM 12-18-13 11:45 AM	WA	AMMONIACAL N, BOD, PH, SBOD, TSS 2216826 2	2	
5						
6	-all times per containers- 11:45					
7						
8						
9						
10						

(4) 2216823-2216826

Sampled by: (Signature)	Temp on Arrival	Cooler arrived Intact?	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
John Barta	0.4	ok			
Relinquished by: (Signature)	**Date/Time**	**Received by: (Signature)**	**Relinquished by: (Signature)**	**Date/Time**	**Received in Lab by: (Signature)**
John Barta	11-18-13 11:45 AM				

CHAIN OF CUSTODY

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Regulatory

This sheet **MUST** be filled out before samples can be processed. To ensure that holding times are met, it is your responsibility that a completed form comes attached to the Chain of Custody.

Is this sample for regulatory/permit reporting? ☐ Yes ☒ No

(4) add 2216823-2216826

What city/state was your sample collected in? Beatrice Nebr

Which agency/state are you reporting to? Olsson Associates Olsson Engineering

What type of sample? (Circle One)

Drinking Water **Ground Water** **Wastewater**

Solid Waste **Hazardous Waste** **UST**

Storm Water **Process Water**

RC Form 14

APPENDIX "B"
Current NPDES Permit

6-26-13

Nebraska Department of Environmental Quality

Wastewater Section
Suite 400, The Atrium, 1200 'N' Street
PO Box 98922
Lincoln, NE 68509-8922
Tel. 402/471-4220
Fax 402/471-2909

Authorization to Discharge Under the National Pollutant Discharge Elimination System (NPDES)

This NPDES permit is issued in compliance with the provisions of the Federal Water Pollution Control Act (33 U.S.C. Secs. 1251 *et. seq.* as amended to date), the Nebraska Environmental Protection Act (Neb. Rev. Stat. Secs. 81-1501 *et. seq.* as amended to date), and the Rules and Regulations promulgated pursuant to these Acts. The facility and outfall(s) identified in this permit are authorized to discharge wastewater and are subject to the limitations, requirements, prohibitions and conditions set forth herein. This permit regulates and controls the release of pollutants in the discharge(s) authorized herein. This permit does not relieve permittees of other duties and responsibilities under the Nebraska Environmental Protection Act, as amended, or established by regulations promulgated pursuant thereto.

NPDES Permit No.:	**NE0020915**
IIS File Number:	**57650**
Facility Name:	**Beatrice Wastewater Treatment Facility**
Permittee:	**City of Beatrice**
Facility Location:	**1300 Beaver Avenue, Beatrice, NE 68310**
Facility Mailing Address:	**1300 Beaver Avenue, Beatrice, NE 68310**
Latitude/Longitude:	**40.25163 North / 96.73342 West**
Legal Description:	**SW ¼, SE ¼, Section 3, Township 3 N, Range 6 E, Gage County, NE**
Receiving Water:	**Big Blue River, (Segment BB1-10000 of the Big Blue River Basin)**
Effective Date:	**July 1, 2013**
Expiration Date:	**June 30, 2018**

Pursuant to a Delegation Memorandum dated July 26, 1999 and signed by the Director, the undersigned hereby executes this document on behalf of the Director.

Signed this 26th day of June, 2013

Jay D. Ringenberg
Deputy Director, Programs

Q1 Q2 Q3 Q4
1 2 3 4 5 6 7 8 9 10 11 12

PSB

TABLE OF CONTENTS

Part I. Outfall 001 Discharge to Receiving Stream Requirements.

The discharge of treated sanitary wastewater from the Outfall 001, final effluent, is authorized and shall be monitored and limited as specified in the table(s) below. Monitoring shall be conducted by sampling after all treatment processes and prior to discharge into the receiving waters, unless an alternative or more specific monitoring point is specified by the NDEQ.

A. Requirements for Flow, Temperature, pH, Nutrients, CBOD, and TSS

Table 1: Discharge Limits and Monitoring Requirements for Outfall 001

Parameters	Storet #	Units	Discharge Limits		Monitoring Frequency	Sample Type
			Monthly Average	Daily Maximum		
Flow	50050	MGD	Report	Report	Daily	Measured or Calculated
Temperature	00011	°F	Report	Report	Weekly	Grab
Total Nitrogen	00600	mg/l	Report	Report	Weekly	24-Hour Composite
Total Phosphorous	00665	mg/l	Report	Report	Weekly	24-Hour Composite

Parameters	Storet #	Units	Discharge Limits		Monitoring Frequency	Sample Type
			Monthly Average	7 Day Average		
Carbonaceous Biochemical Oxygen Demand	80082	mg/l	25.0	30.0	Weekly	24-Hour Composite
		kg/day	284	454		
Total Suspended Solids	00530	mg/l	30.0	45.0	Weekly	24-Hour Composite
		kg/day	341	511		

Parameters	Storet #	Units	Discharge Limits		Monitoring Frequency	Sample Type
			Daily Minimum	Daily Maximum		
pH[a]	00400	SU	6.5	9.0	Weekly	Grab

(a) pH shall be measured within 15 minutes of collection sample.

B. Seasonal Requirements for E. coli

Table 2: Seasonal Discharge Limits and Monitoring Requirements for E. coli[a]

Parameters	Storet #	Units	Discharge Limits		Monitoring Frequency	Sample Type
			Monthly Average	Daily Maximum		
E. coli[b]	31648	#/100 ml	126	410	Weekly	Grab

(a) E. coli limits and monitoring requirements do not apply to discharges occurring from October 1 through April 30.
(b) E. coli analysis has a six hour holding time.

C. Seasonal Requirements for Ammonia

Table 3: Seasonal Discharge Limits and Monitoring Requirements for Ammonia

Parameters	Storet #	Units	Discharge Limits		Monitoring Frequency	Sample Type
			Monthly Average	Daily Maximum		
Spring Ammonia (March 1 – May 31)	00610	mg/l	36.9	74.1	Weekly	24-Hour Composite
		kg/day	191.4	384.3		
Summer Ammonia (June 1 – Oct. 31)	00610	mg/l	27.9	56.1	Weekly	24-Hour Composite
		kg/day	120.4	242.1		
Winter Ammonia (Nov. 1 – Feb. 28 [29])	00610	mg/l	29.8	59.8	Weekly	24-Hour Composite
		kg/day	149.4	299.9		

D. Annual Requirements for Atrazine, Metals and Toxicity

Table 4: Annual Discharge Limits and Monitoring Requirements for Toxicity

Parameters	Storet #	Units	Discharge Limits		Monitoring Frequency	Sample Type
			Maximum			
Atrazine	39033	mg/l	Report	Report	Annual	24-Hour Composite
Cadmium, Dissolved	01025	mg/l	Report	Report	Annual	24-Hour Composite
Chromium, Dissolved	01030	mg/l	Report	Report	Annual	24-Hour Composite
Copper, Dissolved	01040	mg/l	Report	Report	Annual	24-Hour Composite
Lead, Dissolved	01049	mg/l	Report	Report	Annual	24-Hour Composite
Mercury, Total	71900	mg/l	Report	Report	Annual	24-Hour Composite
Nickel, Dissolved	01065	mg/l	Report	Report	Annual	24-Hour Composite
Selenium, Dissolved	01145	mg/l	Report	Report	Annual	24-Hour Composite
Zinc, Dissolved	01090	mg/l	Report	Report	Annual	24-Hour Composite
Acute Toxicity – *Ceriodaphnia sp*	61425	TUa	Report	1.0	Annual	24-Hour Composite
Acute Toxicity – *Pimephales promelas*	61427	TUa	Report	1.0	Annual	24-Hour Composite

E. Pollutant Scan Requirements

Table 5: Pollutant Scan Requirements

Parameters	Storet #	Units	Discharge Limits Value	Monitoring Frequency	Sample Type
Dissolved Oxygen	00300	mg/l	Report	Annual	Grab
Nitrate/Nitrite	00630	mg/l	Report	Annual	24-Hour Composite
Total Kjeldahl Nitrogen	00625	mg/l	Report	Annual	24-Hour Composite
Oil and Grease	00552	mg/l	Report	Annual	Grab
Total Dissolved Solids	70295	mg/l	Report	Annual	24-Hour Composite

Part II. Influent Requirements

To comply with these monitoring requirements, samples shall be taken at the head works of the wastewater treatment facility prior to the treatment system. Influent wastewater shall be monitored as specified in the table below.

Table 6: Monitoring Requirements for Influent Wastewater

Parameters	Storet #	Units	Discharge Limits Value	Monitoring Frequency	Sample Type
Flow	50050	MGD	Report	Monthly[a]	Measured or Calculated
Carbonaceous Biochemical Oxygen Demand	80082	mg/l	Report	Monthly	24 Hour Composite
Total Suspended Solids	00530	mg/l	Report	Monthly	24 Hour Composite

Other Parameters	Storet #	Units	Discharge Limits Daily Minimum	Discharge Limits Daily Maximum	Monitoring Frequency	Sample Type
pH[b]	00400	SU	Report	Report	Monthly	Grab

(a) Influent flow must be monitored on the same day as sample collection for CBOD, TSS, and pH.
(b) pH analysis shall occur within 15 minutes of sample collection.

Part III. Biosolids Monitoring Requirements

The sludge disposal requirements of this permit are set forth below. The disposal of domestic sewage sludge is subject to the requirements of 40 CFR Part 503. While the NDEQ Title 119 adopts 40 CFR 503 and allows the NDEQ to administer sludge requirements under State law, the Federal sludge program is not delegated to the State. The Federal regulatory program is administered by EPA Region VII. The permittee should contact EPA Region VII to ensure they are in compliance with this Federal regulatory program. The current contact at EPA can be obtained upon request from NDEQ.

A. Approval

Submission of the Sludge Application Form, Attachment 1, constitutes notice that the Wastewater Treatment Facility intends to land apply sludge and requests approval by the NDEQ. The applicant is eligible to receive automatic approval provided the applicant indicates compliance with and understanding of the regulations and conditions contained in 40 CFR Part 503, and when all of the conditions set forth below are met, unless the Department acts to provide a conditional or circumstantial approval.

1. Sludge application is in compliance with the Federal 503 regulations, including all requirements related to vector and pathogen control.
2. Sludge is not applied within 200 feet of any actively used groundwater well, except for those used exclusively for irrigation.
3. Sludge is not being applied within 1000 feet of any public drinking water supply well.
4. Application sites are not subject to public access.
5. Retain a listing for review by the NDEQ of land application sites used during the year and their legal descriptions plus total tonnage of sludge that was land-applied or disposed of during the year.
6. Submit an annual sludge report to NDEQ by February 19th of each year. Retain copies on site of all reports pursuant to the Federal 503 regulations. The Permittee preparing and/or applying sewage sludge shall develop all of the information required in 40 CFR § 503.17 and include this information in its "Annual Sludge Report".

    a. Since, the NDEQ is not delegated the Federal sludge program, EPA has requested that NDEQ include the following statement to make you aware of this Federal requirement. An "Annual Sludge Report" shall be submitted to EPA by February 19th of each year as implemented by the Federal EPA through 503 Sludge regulations. The annual report shall be submitted to the following address:

        EPA Region 7 Biosolids Coordinator
        WWPD / WENF
        11201 Renner Boulevard
        Lenexa, KS 66219

B. Non-compliance Reporting Requirements

The permittee shall report to the NDEQ any instance(s) of noncompliance with 40 CFR Part 503. This Non-compliance Report shall be submitted to the NDEQ no later than 7 days after the permittee becomes aware of the non-compliance. The Non-compliance Report shall contain the basic information required and specified in Appendix A of this NPDES permit.

C. Withdrawal of Site Approval(s)

The Department may withdraw site approval(s) for any of the following:

1. Failure to comply with the regulations contained in 40 CFR Part 503.
2. Potential risks or known impacts to surface or ground water quality.
3. Potential risks to the environment.
4. Potential risks to public health and / or welfare.
5. Other site specific or facility specific considerations.

D. Sludge Monitoring Requirements

Sludge shall be monitored as specified below. A representative sample shall be collected and analyzed prior to application. A representative sample is defined as a sample that is a composite of several sludge samples within the same batch.

Table 7: Sludge Monitoring Requirements

Parameters	Storet #	Units	Sludge Reporting	Measurement Frequency	Sample Type
pH	00400	SU	Report	Annually	Composite
Ammonia (N)	82294	mg/kg	Report	Annually	Composite
Total Solids	78477	mg/kg	Report	Annually	Composite
Nitrate (N)	61539	mg/kg	Report	Annually	Composite
Total Nitrogen	78470	mg/kg	Report	Annually	Composite
Cadmium, Total	78476	mg/kg	Report	Annually	Composite
Chromium, Total	78473	mg/kg	Report	Annually	Composite
Copper, Total	78475	mg/kg	Report	Annually	Composite
Lead, Total	78468	mg/kg	Report	Annually	Composite
Nickel, Total	78469	mg/kg	Report	Annually	Composite
Zinc, Total	78467	mg/kg	Report	Annually	Composite
Arsenic, Total	61521	mg/kg	Report	Annually	Composite
Mercury, Total	78471	mg/kg	Report	Annually	Composite
Molybdenum, Total	78465	mg/kg	Report	Annually	Composite
Selenium, Total	61518	mg/kg	Report	Annually	Composite

Abbreviations: SU – standard units, mg/kg – milligrams per kilograms

Part IV. Other Requirements and Conditions

A. Requirements for removal of CBOD and TSS

The 30-day average percent removal of CBOD and TSS by the WWTF shall not be less than 85%.

B. Narrative Limits, Discharges authorized under this permit:

1. Shall not be toxic to aquatic life in surface waters of the State outside the mixing zones allowed in NDEQ Title 117, *Nebraska Surface Water Quality Standards*;
2. Shall not contain pollutants at concentrations or levels that produce objectionable films, colors, turbidity, deposits, or noxious odors in the receiving stream or waterway; and
3. Shall not contain pollutants at concentrations or levels that cause the occurrence of undesirable or nuisance aquatic life in the receiving stream.

C. Additional Monitoring

The Department may require increases in the monitoring frequencies set forth in this permit to address new information concerning a discharge, evidence of potential noncompliance, suspect water quality in a discharge, evidence of water quality impacts in the receiving stream or waterway, or other similar concerns.

D. Method Detection Limit Reporting Requirements

The minimum detection limit (MDL) is defined as the level at which the analytical system gives acceptable calibration points. If the analytical results are below the MDL then the reported value on the DMR shall be a numerical value less than the MDL (e.g. <0.005).

E. Certified Operator Requirements

This facility is to be operated and maintained by operators certified in accordance with NDEQ Title 197, *Rules and Regulations for the Certification of Wastewater Treatment Facility Operators in Nebraska*.

F. Whole Effluent Toxicity Corrective Action

If the whole effluent toxicity tests results exceed the toxicity limitations in this permit, this is a permit violation and the permittee must initiate corrective actions according to the United States Environmental Protection Agency Document EPA 833-B-99-002, *Toxicity Reduction Evaluation Guidance for Municipal Wastewater Treatment Plants*.

G. Permit Attachments

The attachments to this permit (e.g., forms and guidance) may be modified without a formal modification of the permit.

H. Permit Modification and Reopening

This permit may be reopened and modified after public notice and opportunity for a public hearing for reasons specified in NDEQ Title 119 - *Rules and Regulations Pertaining to the Issuance of Permits under the National Pollutant Discharge Elimination System*, Chapter 24.

Table of Contents for Appendix A

Standard Conditions that Apply to NPDES and NPP Permits

Attachment 1. Additional Pollutant Monitoring for Selected POTWs

The **permittee** shall monitor the effluent for the parameters set forth in the Tables below using the analytical methods in 40 CFR 136. The monitoring is required during the current permit term and the analytical data obtained from the monitoring shall be submitted as an attachment to the next NPDES permit application.

Table 1: Metals Monitoring						
Parameters	Units	Effluent Data	Analytical method	Method detection limit	Monitoring Frequency (b)	Sample Type
Antimony, Total Recoverable	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Arsenic, Total Recoverable	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Beryllium, Total Recoverable	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Cadmium, Total Recoverable	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Chromium, Total Recoverable	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Copper, Total Recoverable	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Lead, Total Recoverable	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Mercury, Total Recoverable	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Nickel, Total Recoverable	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Selenium, Total Recoverable	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Silver, Total Recoverable	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Thallium, Total Recoverable	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Zinc, Total Recoverable	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Footnotes:						

Table 2c: Inorganic Compounds						
Parameters	Units	Effluent Data	Analytical method	Method detection limit	Monitoring Frequency (b)	Sample Type
Cyanide	mg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Chloride	mg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Total Phenolic Compounds	mg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Total Phosphorus	mg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Hardness, as $CaCO_3$	mg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Footnotes:						

Table 3: VOC Monitoring						
Parameters	Units	Effluent Data	Analytical method	Method detection limit	Monitoring Frequency (b)	Sample Type
Acrolein	µg/L	Report	Report	Report	3 tests per permit term	Grab
Acrylonitrile	µg/L	Report	Report	Report	3 tests per permit term	Grab
Benzene	µg/L	Report	Report	Report	3 tests per permit term	Grab
Bromoform	µg/L	Report	Report	Report	3 tests per permit term	Grab
Carbon Tetrachloride	µg/L	Report	Report	Report	3 tests per permit term	Grab
Chlorobenzene	µg/L	Report	Report	Report	3 tests per permit term	Grab
Chlorodibromomethane	µg/L	Report	Report	Report	3 tests per permit term	Grab
Chloroethane	µg/L	Report	Report	Report	3 tests per permit term	Grab
2-Choroethylvinyl Ether	µg/L	Report	Report	Report	3 tests per permit term	Grab
Chloroform	µg/L	Report	Report	Report	3 tests per permit term	Grab
Dichorobromomethane	µg/L	Report	Report	Report	3 tests per permit term	Grab
1,1-Dichloroethane	µg/L	Report	Report	Report	3 tests per permit term	Grab
1.2-Dichloroethane	µg/L	Report	Report	Report	3 tests per permit term	Grab
Trans 1,2-Dichloroethylene	µg/L	Report	Report	Report	3 tests per permit term	Grab
Footnotes						

Table 4 – VOC Monitoring						
Parameters	Units	Effluent Data	Analytical method	Method detection limit	Monitoring Frequency (b)	Sample Type
1,1-Dichroethylene	µg/L	Report	Report	Report	3 tests per permit term	Grab
1,2-Dichloropropane	µg/L	Report	Report	Report	3 tests per permit term	Grab
1,3-Dichloropropylene	µg/L	Report	Report	Report	3 tests per permit term	Grab
Ethylbenzene	µg/L	Report	Report	Report	3 tests per permit term	Grab
Methyl Bromide	µg/L	Report	Report	Report	3 tests per permit term	Grab
Methyl Chloride	µg/L	Report	Report	Report	3 tests per permit term	Grab
Methylene Chloride	µg/L	Report	Report	Report	3 tests per permit term	Grab
1,1,2,2-Tetrachloroethane	µg/L	Report	Report	Report	3 tests per permit term	Grab
Tetrachloroethylene	µg/L	Report	Report	Report	3 tests per permit term	Grab
Toluene	µg/L	Report	Report	Report	3 tests per permit term	Grab
1,1,1-Trichloroethane	µg/L	Report	Report	Report	3 tests per permit term	Grab
1,1,2-Trichloroethane	µg/L	Report	Report	Report	3 tests per permit term	Grab
Trichloroethylene	µg/L	Report	Report	Report	3 tests per permit term	Grab
Vinyl Chloride	µg/L	Report	Report	Report	3 tests per permit term	Grab
Footnotes						

Table 5c. Acid Extractable Compounds						
Parameters	Units	Effluent Data	Analytical method	Method detection limit	Monitoring Frequency (b)	Sample Type
p-Chloro-m-Cresol	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
2-Chlorophenol	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
2,4-Dichlorophenol	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
2,4-Dimethylphenol	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
4,6-Dinitro-o-Cresol	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
2,4-Dintrophenol	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
2-Nitrophenol	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
4-Nitrophenol	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Pentachlorophenol	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Phenol	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
2,4,6-Trichlorophenol	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Footnotes:						

Table 6: Base Neutral Compounds						
Parameters	Units	Effluent Data	Analytical method	Method detection limit	Monitoring Frequency (6)	Sample Type
Acenaphthene	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Acenaphthylene	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Anthracene	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Benzidine	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Benzo(a)anthracene	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Benzo(a)pyrene	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
3,4 Benzo-fluoranthene	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Benzo(ghi)perylene	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Benzo(k)fluoranthene	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Bis (2-chloroethoxy)methane	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Bis (2-chloroethyl)ether	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Bis (2-chlorosiopropyl)ether	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Bis (2-ethylhexyl)phthalate	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
4-bromophenyl phenylether	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Butyl benzyl phthalate	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Footnotes						

Table 7: Base Neutral Compounds						
Parameters	Units	Effluent Data	Analytical method	Method detection limit	Monitoring Frequency (b)	Sample Type
2-Chloronaphthalene	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
4-Chorphenyl phenyl ether	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Chrysene	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Di-N-butyl phthalate	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Di-N-octyl phthalate	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Dibenzo(A,H) anthracene	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
1,2-Dichorobenzene	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
1,3-Dichlorobenzene	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
1,4-Dichlorobenzene	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
3,3-Dichlorobenzidine	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Diethyl phthalate	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Dimethyl phthalate	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
2,4-Dinitrotoluene	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
2,6-Dinitrotolune	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
1,2-Diphenylhydrazine	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Footnotes						

Table 8: Base Neutral Compounds						
Parameters	Units	Effluent Data	Analytical method	Method detection limit	Monitoring Frequency (b)	Sample Type
Fluoranthene	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Fluorene	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Hexachlorobenzene	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Hexachlorobutadiene	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Hexachlorocyclopentadiene	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Hexachloroethane	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Indeno(1,2,3-CD)pyrene	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Isophorone	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Naphthalene	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Nitrobenzene	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
N-nitrosodi-n-propylamine	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
N-nitrosodimethylamine	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
N-nitrosodiphenylamine	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Phenanthrene	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Pyrene	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
1,2,4-Trichlorobenzene	µg/L	Report	Report	Report	3 tests per permit term	24 hour composite
Footnotes						

Appendix A

Conditions applicable to all NPDES permits

The following conditions apply to all NPDES permits.

1. **Information Available**
   a. All permit applications, fact sheets, permits, discharge data, monitoring reports, and any public comments concerning such shall be available to the public for inspection and copying, unless such information about methods or processes is entitled to protection as trade secrets of the owner or operator under Neb. Rev. Stat. §81-1527, (Reissue 1999) and NDEQ Title 115, Chapter 4.

2. **Duty to Comply**
   a. The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Federal Clean Water Act and the Applicable State Statutes and Regulations and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application.
   b. The permittee shall comply with effluent standards or prohibitions established under section 307(a) of the Clean Water Act for toxic pollutants and with standards for sewage sludge use or disposal established under section 405(d) of the CWA within the time provided in the regulations that establish these standards or prohibitions or standards for sewage sludge use or disposal, even if the permit has not yet been modified to incorporate the requirement.

3. **Violations of this permit**
   a. Any person who violates this permit may be subject to penalties and sanctions as provided by the Clean Water Act.
   b. Any person who violates this permit may be subject to penalties and sanctions as provided by the Nebraska Environmental Protection Act.

4. **Duty to Reapply**
   a. If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit.

5. **Need to Halt or Reduce Activity not a Defense**
   a. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

6. **Duty to Mitigate**
   a. The permittee shall take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

7. **Proper Operation and Maintenance**
   a. 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 conditions of this permit. Proper operation and maintenance also includes effective performance based on designed facility removals, effective management, adequate operator staffing and training, adequate process controls, adequate funding that reflects proper user fee schedules, 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 conditions of the permit.

8. **Permit Actions**
   a. This permit may be modified, revoked and reissued, or terminated for cause. 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.

9. **Property Rights**
   a. This permit does not convey any property rights of any sort, or any exclusive privilege.

10. **Duty to Provide Information**
   a. The permittee shall furnish to the Director, within a reasonable 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 to the Director upon request, copies of records required to be kept by this permit.

11. **Inspection and Entry**
   a. The permittee shall allow the Director, or an authorized representative (including an authorized contractor acting as a representative of the Administrator), upon presentation of credentials and other documents as may be required by law, to:
      i) Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;
      ii) Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
      iii) Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and
      iv) Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act, any substances or parameters at any location.

12. Monitoring and Records

a. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.

b. Except for records of monitoring information required by this permit related to the permittee's sewage sludge use and disposal activities, which shall be retained for a period of at least five years (or longer as required by 40 CFR part 503), the permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least 3 years from the date of the sample, measurement, report or application. This period may be extended by request of the Director at any time.

c. Records of monitoring information shall include:
   i) The date(s), exact place, time and methods of sampling or measurements;
   ii) The individual(s) who performed the sampling or measurements;
   iii) The date(s) analyses were performed;
   iv) The individual(s) who performed the analyses;
   v) The analytical techniques or methods used; and
   vi) The results of such analyses.

d. Monitoring must be conducted according to test procedures approved under NDEQ Title 119, Chapter 27 002unless another method is required under 40 CFR subchapters N– Effluent Guidelines and Standards Parts 425 to 471 or O– Sewer Sludge Parts 501 and 503.

e. Falsifies, Tampers, or Knowingly Renders Inaccurate
   i) On actions brought by EPA, The Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction: be punished by a fine of not more than $10,000, or by imprisonment for not more than 2 years, or both. If a conviction of a person is for a violation committed after a first conviction of such person under this paragraph, punishment is a fine of not more than $20,000 per day of violation, or by imprisonment of not more than 4 years, or both.
   ii) On action brought by the State, The Nebraska Environmental Protection Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction: be punished pursuant to Neb. Stat. §81-1508.01.

13. Signatory requirement

a. All applications, reports, or information submitted to the Director shall be signed and certified.
   i) All permit applications shall be signed as follows:

(a) For a corporation
  (i) By a responsible corporate officer: For the purpose of this section, a responsible corporate officer means:
    (a) A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation, or
    (b) The manager of one or more manufacturing, production, or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

(b) For a partnership or sole proprietorship
  (i) By a general partner or the proprietor.

(c) For a municipality, State, Federal, or other public agency
  (i) By either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes:
    (a) The chief executive officer of the agency, or
    (b) A senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of EPA).

b. Reports and Other Information
  i) All reports required by permits, and other information requested by the Director shall be signed by a person described in this section [paragraphs12. a. i) (a),(b), or (c)], or by a duly authorized representative of that person. A person is a duly authorized representative only if:
  (a) The authorization is made in writing by a person described in paragraphs 12. a. i) (a),(b), or (c);
  (b) The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the

company, (a duly authorized representative may thus be either a named individual or any individual occupying a named position) and;

(c) The written authorization is submitted to the Director.

c. Changes to Authorization

i) If an authorization of paragraphs 12. a. i) (a),(b), or (c);is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of this section must be submitted to the Director prior to or together with any reports, information, or applications to be signed by an authorized representative.

d. Certification

i) All applications, reports and information submitted as a requirement of this permit shall contain the following certification statement:

(a) I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

e. False Statement, Representation, or Certification

i) The CWA provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or non-compliance shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than 6 months per violation, or by both.

ii) The Nebraska Environmental Protection Act provides criminal penalties and sanctions for false statement, representation, or certification in any application, label, manifest, record, report, plan, or other document required to be filed or maintained by the Environmental Protection Act, the Integrated solid waste Management Act, or the Livestock Waste Management Act or the rules or regulations adopted and promulgated pursuant to such acts.

14. Reporting Requirements

a. Planned Changes

i) The permittee shall give notice to the Director as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when:

(a) The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in Title 119, Chapter 4 and 8. Or

(b) The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are subject neither to effluent limitations in the permit, nor to notification requirements under Title 119, Chapter 15.

(c) The alteration or addition results in a significant change in the permittee's sludge use or disposal practices, and such alteration, addition, or change may justify the application of permit conditions that are different from or absent in the existing permit, including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan; The sludge program is not delegated to the State so notification to the Regional Administrator for EPA in addition to the State are required.

b. Anticipated Noncompliance

i) The permittee shall give advance notice to the Director of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

c. Transfers

i) This permit is not transferable to any person except after notice to 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 under Title 119, Chapter 24 in some cases, modification or revocation and reissuance is mandatory.

d. Monitoring Reports

i) Monitoring results shall be reported at the intervals specified elsewhere in this permit.

ii) Monitoring results must be reported on a Discharge Monitoring Report (DMR) or forms provided or specified by the Director.

iii) Monitoring results shall be submitted on a quarterly basis using the reporting schedule set forth below, unless otherwise specified in this permit or by the Department.

Monitoring Quarters	DMR Reporting Deadlines
January - March	April 28
April - June	July 28
July - September	October 28
October - December	January 28

iv) For reporting results of monitoring of sludge use or disposal practices additional reports may be required by the Regional Administrator (RA).

v) If the permittee monitors any pollutant more frequently than required by the permit using test procedures approved in Title 119, Chapter 27, Section 002, or another method required for an industry-specific waste stream under 40 CFR subchapters N – Effluent Guidelines and Standards Parts 425 to 471 and subchapter or O– Sewer Sludge Parts 501 and 503, the results of such monitoring shall be included in the calculation and reporting of the data submitted in the DMR or sludge reporting form specified by the Director or RA.

vi) Calculations for all limitations which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified by the Director in the permit.

e. Compliance schedules.
   i) Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit shall be submitted no later than 14 days following each schedule date.

f. Twenty-four hour reporting.
   i) The permittee shall report any noncompliance which may endanger human health or the environment. Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances. A written submission shall also be provided within 5 days of the time the permittee becomes aware of the circumstances. 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 reoccurrence of the noncompliance.
   ii) The following shall be included as information which must be reported within 24 hours under this paragraph.
      (a) Any unanticipated bypass which exceeds any effluent limitation in the permit.
      (b) Any upset which exceeds any effluent limitation in the permit.
      (c) Violation of a maximum daily discharge limitation for any of the pollutants listed by the Director in the permit to be reported within 24 hours.

g. The Director may waive the written report on a case-by-case basis for reports under section 14. f. ii) (a), (b) and (c) if the oral report has been received within 24 hours.

h. Other noncompliance.
   i) The permittee shall report all instances of noncompliance not reported under paragraphs d., e., and f. of this section, at the time monitoring

reports are submitted. The reports shall contain the information listed in paragraph f. of this section.

i. Other information
   i) Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Director, it shall promptly submit such facts or information.

j. Noncompliance Report Forms
   i) Noncompliance Report Forms are available from the Department and shall be submitted with or as the written non-compliance report.
   ii) The submittal of a written noncompliance report does not relieve the permittee of any liability from enforcement proceedings that may result from the violation of permit or regulatory requirements.

15. Bypass

a. Definitions.
   i) Bypass means the intentional diversion of waste streams from any portion of a treatment facility.
   ii) 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 a bypass. Severe property damage does not mean economic loss caused by delays in production.

b. Bypass not exceeding limitations. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of paragraphs 15. c. and d. of this section.

c. Notice.
   i) Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible at least ten days before the date of the bypass.
   ii) Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required in paragraph 14. f. of this section (24-hour notice).

d. Prohibition of bypass.
   i) Bypass is prohibited, and the Director may take enforcement action against a permittee for bypass, unless:
      (a) Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

(b) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and

(c) The permittee submitted notices as required under paragraph 15. c. of this section.

e. The Director may approve an anticipated bypass, after considering its adverse effects, if the Director determines that it will meet the three conditions listed above in paragraph 15. d. i)(a), (b), and (c) .

16. Upset

a. Definition.

i) Upset means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

b. Effect of an upset.

i) An upset constitutes an affirmative defense to an action brought for noncompliance with such technology based permit effluent limitations if the requirements of paragraph 16. c. of this section are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

c. Conditions necessary for a demonstration of upset.

i) A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

ii) An upset occurred and that the permittee can identify the cause(s) of the upset;

iii) The permitted facility was at the time being properly operated; and

iv) The permittee submitted notice of the upset as required in paragraph 14. f. ii) (a), of this section (24 hour notice).

v) The permittee complied with any remedial measures required under paragraph (d) of this section.

d. Burden of proof.

i) In any enforcement proceeding, the permittee seeking to establish the occurrence of an upset has the burden of proof.

17. Other Rules and Regulations Liability

a. The issuance of this permit in no way relieves the obligation of the permittee to comply with other rules and regulations of the Department.

18. Severability

a. If any provision of this permit is held invalid, the remainder of this permit shall not be affected.

Other Conditions that Apply to NPDES and NPP Permits

19. Land Application of Wastewater Effluent

a. The permittee shall be permitted to discharge treated domestic wastewater effluent by means of land application in accordance with the regulations and standards set forth in NDEQ Title 119, Chapter 12 002. The Wastewater Section of the Department must be notified in writing if the permittee chooses to land apply effluent.

20. Toxic Pollutants

a. The permittee shall not discharge pollutants to waters of the state that cause a violation of the standards established in NDEQ Titles 117, 118 or 119. All discharges to surface waters of the state shall be free of toxic (acute or chronic) substances which alone or in combination with other substances, create conditions unsuitable for aquatic life outside the appropriate mixing zone.

21. Oil and Hazardous Substances/Spill Notification

a. Nothing in this permit shall preclude the initiation of any legal action or relieve the permittee from any responsibilities, liabilities or penalties under section 311 of the Clean Water Act. The permittee shall conform to the provisions set forth in NDEQ Title 126, Rules and Regulations Pertaining to the Management of Wastes. If the permittee knows, or has reason to believe, that oil or hazardous substances were released at the facility and could enter waters of the state or any of the outfall discharges authorized in this permit, the permittee shall immediately notify the Department of a release of oil or hazardous substances. During Department office hours (i.e., 8:00 a.m. to 5:00 p.m., Monday through Friday, except holidays), notification shall be made to the Nebraska Department of Environmental Quality at telephone numbers (402) 471-2186 or (877) 253-2603 (toll free). When NDEQ cannot be contacted, the permittee shall report to the Nebraska State Patrol for referral to the NDEQ Immediate Response Team at telephone number (402) 471-4545. It shall be the permittee's responsibility to maintain current telephone numbers necessary to carry out the notification requirements set forth in this paragraph.

22. Removed Substances

a. Solids, sludge, filter backwash or other pollutants removed in the course of treatment or control of wastewater shall be disposed of at a site and in a manner approved by the Nebraska Department of Environmental Quality.
   i) The disposal of nonhazardous industrial sludges shall conform to the standards established in or to the regulations established pursuant to 40 CFR, Part 257.
   ii) The disposal of sludge shall conform to the standards established in or to the regulations established pursuant to 40 CFR, Part 503.
   iii) If solids are disposed of in a licensed sanitary landfill, the disposal of solids shall conform to the standards established in NDEQ Title 132.

b. Publicly owned treatment works shall dispose of sewage sludge in a manner that protects public health and the environment from any adverse effects which may occur from toxic pollutants as defined in Section 307 of the Clean Water Act.

c. This permit may be modified or revoked and reissued to incorporate regulatory limitations established pursuant to 40 CFR, Part 503.

23. Representative Sampling

a. Samples and measurements taken as required within this permit shall be representative of the discharge. All samples shall be taken at the monitoring points specified in this permit and, unless otherwise specified, before the effluent joins or is diluted by any other waste stream, body of water or substance. Monitoring points shall not be changed without notification to the Department and with the written approval of the Director.
   i) Composite sampling shall be conducted in one of the following manners
      (a) Continuous discharge - a minimum of one discrete aliquot collected every three hours,
      (b) Less than 24 hours - a minimum of hourly discrete aliquots or a continuously drawn sample shall be collected during the discharge, or
      (c) Batch discharge - a minimum of three discrete aliquots shall be collected during each discharge.
   ii) Composite samples shall be collected in one of the following manners:
      (a) The volume of each aliquot must be proportional to either the waste stream flow at the time of sampling or the total waste stream flow since collection of the previous aliquot,
      (b) A number of equal volume aliquots taken at varying time intervals in proportion to flow,
      (c) A sample continuously collected in proportion to flow, and
   iii) Where flow proportional sampling is infeasible or non-representative of the pollutant loadings, the Department may approve the use of time composite samples.
   iv) Grab samples shall consist of a single aliquot collected over a time period not exceeding 15 minutes.

b. All sample preservation techniques shall conform to the methods adopted in NDEQ Title 119, Chapter 21 006 unless:
   i) In the case of sludge samples, alternative techniques are specified in the 40 CFR, Part 503, or
   ii) Other procedures are specified in this permit.
c. Flow Measurements
   i) Appropriate flow measurement devices and methods consistent with accepted scientific practices shall be used to insure the accuracy and reliability of measurements. The devices shall be installed, calibrated and maintained to insure that the accuracy of the measurements. The accepted capability shall be consistent with that type of device. Devices selected shall be capable of measuring flows with a maximum deviation of +/- 10%. The amount of deviation shall be from the true discharge rates throughout the range of expected discharge volumes. Guidance can be obtained from the following references for the selection, installation, calibration and operation of acceptable flow measurement devices:

24. Changes of Loadings to Publicly Owned Treatment Work (POTW)

a. All POTWs must provide adequate notice to the Director of the following:
   i) Any new introduction of pollutants into the POTW from an indirect discharger which would be subject to NDEQ Title 119, Chapter 26, if it were directly discharging those pollutants; and
   ii) Any substantial change in the volume or character of pollutants being introduced into that POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.
   iii) For purposes of this paragraph, adequate notice shall include information on the quality and quantity of effluent introduced into the POTW, and any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.

A. Definitions

Administrator: The Administrator of the USEPA.

Aliquot: An individual sample having a minimum volume of 100 milliliters that is collected either manually or in an automatic sampling device.

Annually: Once every calendar year.

Authorized Representative: Individual or position designated the authorization to submit reports, notifications, or other information requested by the Director on behalf of the Owner under the circumstances that the authorization is made in writing by the Owner, the authorization specifies the individual or postion who is duly authorized, and the authorization is submitted to the Director.

Bimonthly: Once every other month.

Biosolids: Sewage sludge that is used or disposed through land application, surface disposal, incineration, or disposal in a municipal solid waste landfill.

Biweekly: Once every other week.

Bypass: The intentional diversion of wastes from any portion of a treatment facility.

Certifying Official: See Section 13, Standard Conditions above.

Daily Average: An effluent limitation that cannot be exceeded and is calculated by averaging the monitoring results for any given pollutant parameter obtained during a 24-hour day.

Department: Nebraska Department of Environmental Quality.

Director: The Director of the Nebraska Department of Environmental Quality.

Industrial Discharge: Wastewater that originates from an industrial process and / or is noncontact cooling water and / or is boiler blowdown.

Industrial User: A source of indirect discharge (a pretreatment facility).

Monthly Average: An effluent limitation that cannot be exceeded. It is calculated by averaging any given pollutant parameter monitoring results obtained during a calendar month.

Operator: A person (often the general contractor) designated by the owner who has day to day operational control and/or the ability to modify project plans and specifications related to the facility.

Owner: A person or party possessing the title of the land on which the activities will occur; or if the activity is for a lease holder, the party or individual identified as the lease holder; or the contracting government agency responsible for the activity.

Outfall: A discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, or container from which pollutants are or may be discharged into Waters of the State.

Passive Discharge: A discharge from a POTW that occurs in the absence of an affirmative action and is not authorized by the NPDES permit (e.g. discharges due to a leaking valve, discharges from an overflow structure) and / or is a discharge from an overflow structure not designed as part of the POTW (e.g. discharges resulting from lagoon berm / dike breaches).

Publicly Owned Treatment Works (POTW): A treatment works as defined by Section 212 of the Clean Water Act (Public Law 100-4) which is owned by the state or municipality, excluding any sewers or other conveyances not leading to a facility providing treatment.

Semiannually: Twice every year

Significant Industrial User (SIU): All industrial users subject to Categorical Pretreatment Standards or any industrial user that, unless exempted under Chapter 1, Section 105 of NDEQ Title 119, discharges an average of 25,000 gallons per day or more of process water; or contributes a process waste stream which makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the POTW; or is designated as such by the Director on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's operation or for violating any National Pretreatment Standard or requirement.

Sludge: Any solid, semisolid, or liquid waste generated from a municipal, commercial, or industrial wastewater treatment plant, water supply treatment plant, or air pollution control facility or any other such waste having similar characteristics and effect.

30-Day Average: An effluent limitation that cannot be exceeded. It is calculated by averaging any given pollutant parameter monitoring results obtained during a calendar month.

Total Toxic Organics (TTO): The summation of all quantifiable values greater than 0.01 milligrams per liter (mg/l) for toxic organic compounds that may be identified elsewhere in this permit. (If this term has application in this permit, the list of toxic organic compounds will be identified, typically in the Limitations and Monitoring Section(s) and/or in an additional Appendix to this permit.)

Toxic Pollutant: Those pollutants or combination of pollutants, including disease causing agents, after discharge and upon exposure, ingestion, inhalation or assimilation into an organism, either directly from the environment or indirectly by ingestion through food chains will, on the basis of information available to the administrator, cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunction (including malfunctions in reproduction) or physical deformations in such organisms or their offspring.

Upset: An exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the permittee, excluding such factors as operational error, improperly designed or inadequate treatment facilities or improper operation and maintenance or lack thereof.

Volatile Organic Compounds (VOC): The summation of all quantifiable values greater than 0.01 milligrams per liter (mg/l) for volatile, toxic organic compounds that may be identified elsewhere in this permit. (See the definition for Total Toxic Organics above. In many instances, VOCs are defined as the volatile fraction of the TTO parameter. If the term "VOC" has application in this permit, the list of toxic organic compounds will be identified, typically in the Limitations and Monitoring Section(s) and/or in an additional Appendix to this permit.)

Waters of the State: All waters within the jurisdiction of this state including all streams, lakes, ponds, impounding reservoirs, marshes, wetlands, watercourses, waterways, wells, springs, irrigation systems, drainage systems, and all other bodies or accumulations of water, surface and underground, natural or artificial, public or private, situated wholly or partly within or bordering upon the state.

Weekly Average: An effluent limitation that cannot be exceeded. It is calculated by averaging any given pollutant parameter monitoring results obtained during a fixed calendar week. The permittee may start their week on any weekday but the weekday must remain fixed. The Department approval is required for any change of the starting day.

"X" Day Average: An effluent limitation defined as the maximum allowable "X" day average of consecutive monitoring results during any monitoring period where "X" is a number in the range of one to seven days.

B. Abbreviations

CFR: Code of Federal Regulations

kg/Day: Kilograms per Day

MGD: Million Gallons per Day

mg/L: Milligrams per Liter

NOI: Notice of Intent

NDEQ: Nebraska Department of Environmental Quality

NDEQ Title 115: *Rules of Practice and Procedure*

NDEQ Title 117: *Nebraska Surface Water Quality Standards*

NDEQ Title 118: *Ground Water Quality Standards and Use Classification*

NDEQ Title 119: *Rules and Regulations Pertaining to the Issuance of Permits under the National Pollutant Discharge Elimination System*

NDEQ Title 126: *Rules and Regulations Pertaining to the Management of Wastes*

NDEQ Title 132: *Integrated Solid Waste Management Regulations*

NPDES: National Pollutant Discharge Elimination System

NPP: Nebraska Pretreatment Program

POTW: Publicly Owned Treatment Works

µg/L: Micrograms per Liter

WWTF: Wastewater Treatment Facility

APPENDIX "C"
Existing Plant Upgrades

1/21/2014
Beatrice WWTP Evaluation and CIP
Preliminary Opinon of Costs for Existing Plant Improvements

Influent Lift Sation	**Quantity**	**Unit**	**Unit Cost**	**Extension**
Screening				
Bar Screen	1	LS	$340,000	$340,001
Installation	1	LS	$51,000	$51,001
Electrical	1	LS	$10,000	$10,001
Subtotal				**$401,003**
Contingnecy - 20%				$80,201
Overhead Legal, Fiscal, Engineering				$80,201
Total Budget Cost				**$561,404**
Repair Concrete				
Consmetic Concrete Repair	1	LS	$2,500	$2,500
Subtotal				**$2,500**
Contingnecy - 20%				$500
Overhead Legal, Fiscal, Engineering				$500
Total Budget Cost				**$3,500**
New Raw Sewage Pumps				
2 Pumps	1	LS	$98,184	$98,184
Panels/ Controls/ VFDs	1	LS	$48,312	$48,312
Installation	1	LS	$14,728	$14,728
Piping	1	LS	$10,000	$10,000
Electrical	1	LS	$10,000	$10,000
Subtotal				**$181,224**
Contingnecy - 20%				$36,245
Overhead Legal, Fiscal, Engineering				$36,245
Total Budget Cost				**$253,713**
Total Construction Costs				**$818,617**

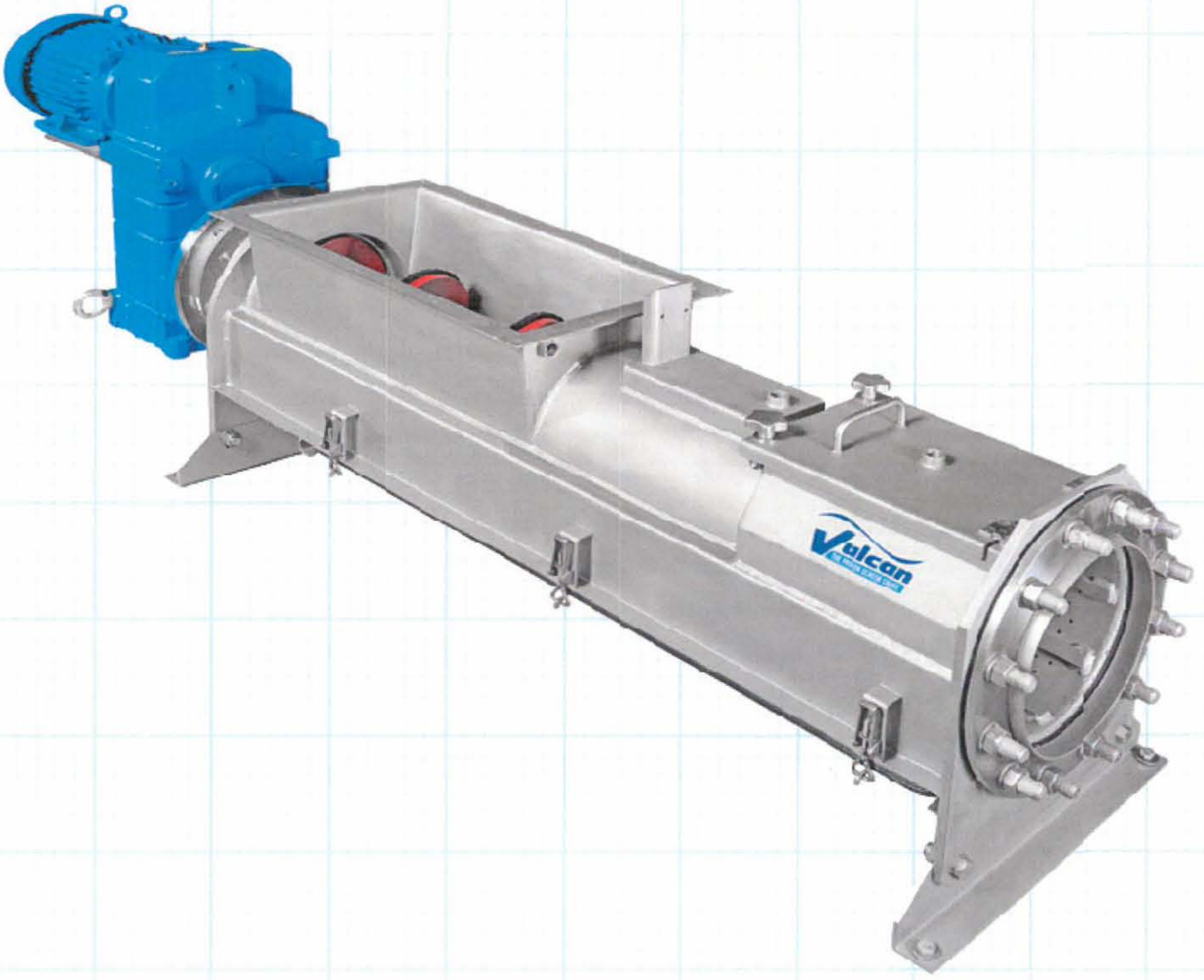
Grit Removal				
Modify Splitter Box	1	LS	$7,500	$7,500
Total Construction Costs				**$7,500**
Contingnecy - 20%				$1,500
Total Budget Cost				**$9,000**

UV System				
Enclose UV System - CUM Bldg	675	SF	$100	$67,500
Total Construction Costs				**$67,500**
Contingnecy - 20%				$13,500

Overhead Legal, Fiscal, Engineering			$13,500
Total Budget Cost			**$94,500**
Controls			
Minor Modifications	1 LS	$25,000	$25,000
Total Construction Costs			**$25,000**
Contingnecy - 20%			$5,000
Overhead Legal, Fiscal, Engineering			$5,000
Total Budget Cost			**$35,000**
Total Existing Plant Construction Costs			$684,727
Contingnecy - 20%			$136,945
Overhead Legal, Fiscal, Engineering			$136,945
Total Budget Cost			**$958,617**
Annual Cost (20 Years, 3.5%, A/P)			**$67,487**

Model EWP Washing Press

Product Information Guide



Find more product information at:

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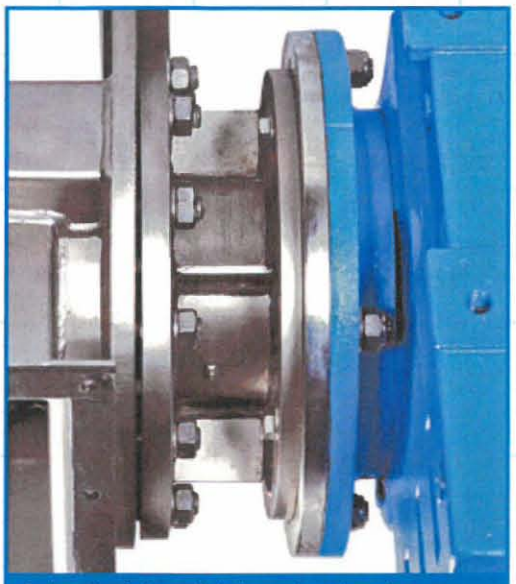
Vulcan
THE PROVEN SCREEN CHOICE

Model EWP Washing Press



A detail of the axial thrust bearing that connects the gear reducer to the press body and the shafted spiral. This bearing handles the load created during compaction and carries the overhung load of the spiral. This protects the gear reducer and extends the life of the unit.

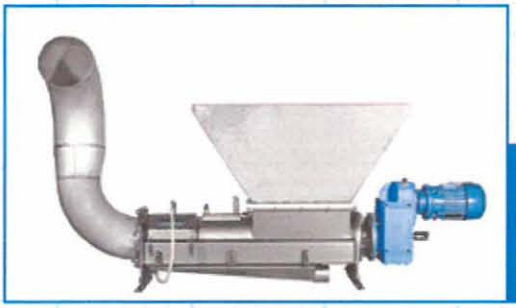
The **Model EWP Washing Press** is a spiral press used to wash organic matter out of screenings material. The Washing Press washes, dewaters, compacts and transports screenings to a conveyor, container or other suitable receiving device.

Construction

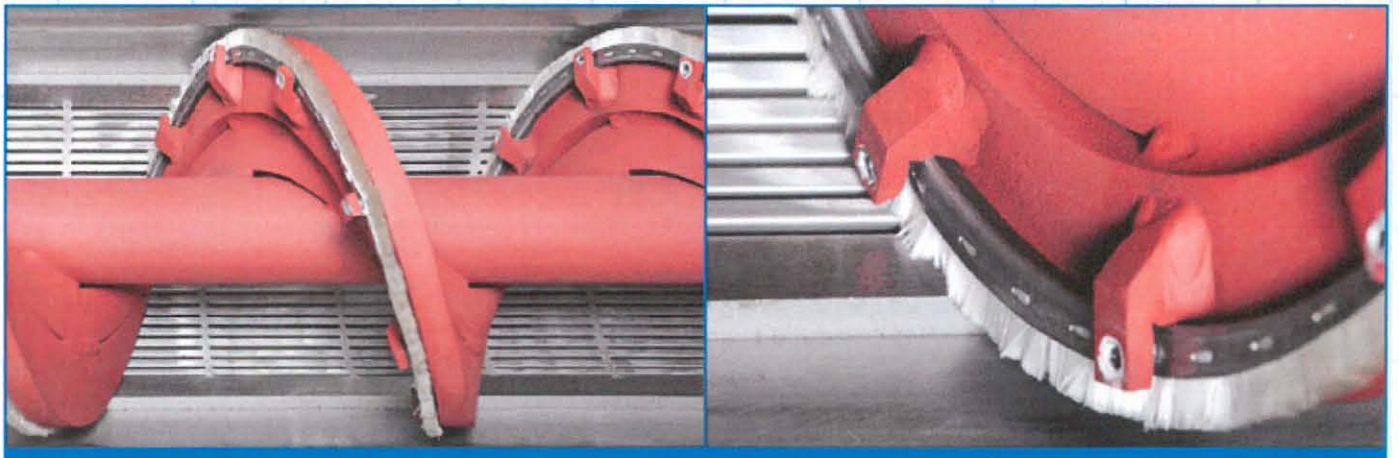
The Washing Press consists of a press body with separate washing and dewatering sections, hollow shaft spiral, axial thrust bearing (see photo on left), gear reducer and motor, drain pan, washwater spray connections and sequencing valves.

The press body is constructed of stainless steel. A wedge wire drain constructed of individual profile bars is mounted on the bottom of the press and extends from the inlet hopper through the washing section. The wedge wire, with 2 mm spacings, guarantees clog-free drainage of the washwater, while ensuring screenings capture.

The spiral, of alloy steel construction, is welded to the hollow shaft. The hollow shaft contains perforations located in the washing zone to introduce washwater to the screenings from the inside out. A nylon brush is attached to the trailing edge of the spiral to ensure debris is thoroughly removed from the drainage area. The drain pan is constructed of stainless steel, and is located directly under the press body. A flushing nozzle periodically rinses the drain pan. Sealed with a gasket, and secured with a latching system, the drain pan is easily removed for service.



Model EWP Washing Press with an inlet hopper and discharge pipe.
The inlet hopper can be directly connected to a primary screening device such as a Model FT Mensch Screen, Model VMR Multi-Rake Screen, or Model ESR Stair Screen, and can be fed by a conveyor or sluice trough. The discharge pipe can be fitted with a bagging assembly, or feed directly into a receiving container.

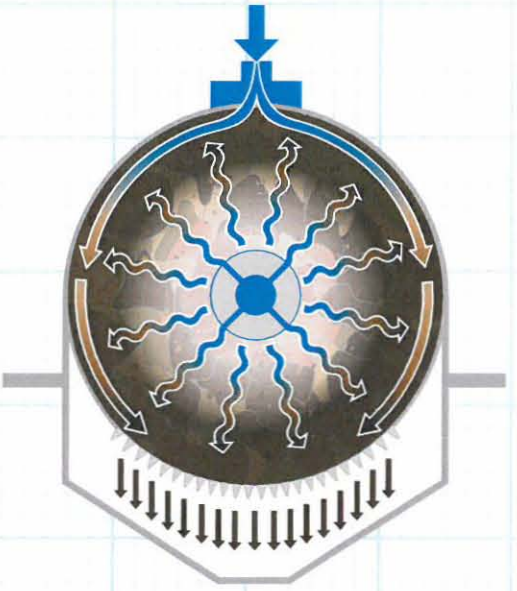


Note the substantial construction of the shafted spiral. A nylon brush is affixed to the trailing edge of the spiral to ensure the drain is clean, even when greasy material is present. Beneath the spiral you can see the wedgewire drain. The profiled bars (See section A-A on the diagram, right page) used in the drain construction allow for greater flow and prevent blinding.
The spiral is cantilevered off the thrust bearing and does not rest in the housing. This reduces wear on the nylon brush and the press body by eliminating metal-to-metal contact.

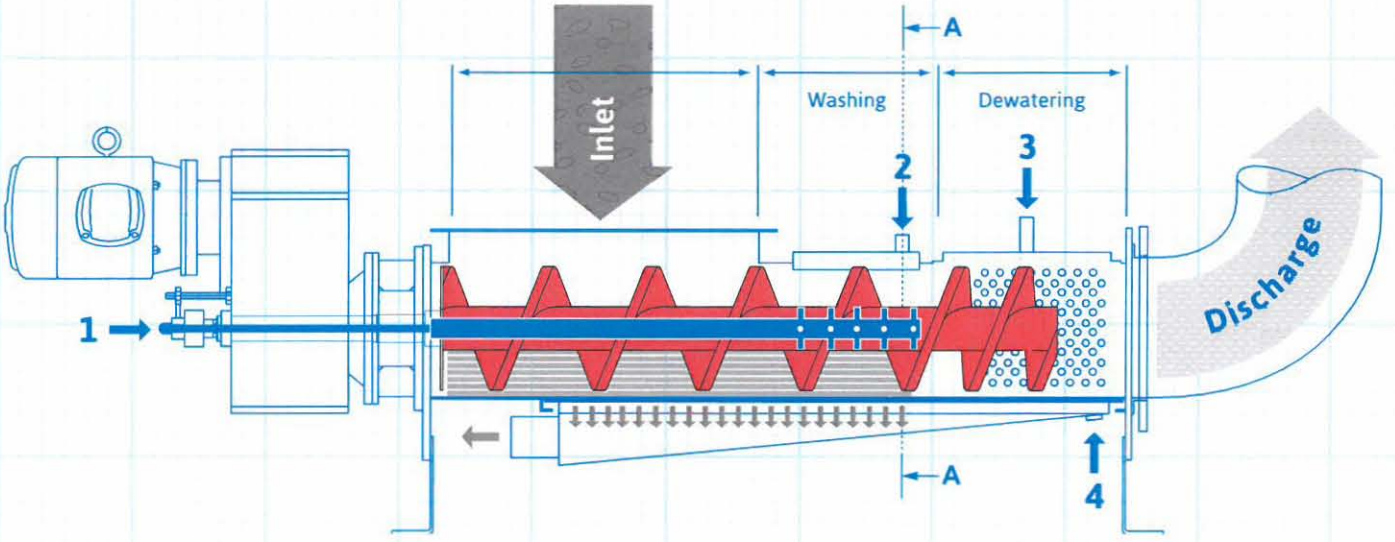
Operation

The Washing Press receives the screenings from a primary screening device, sluice trough, or conveyor through the inlet hopper. The spiral transports the screenings from the inlet to the washing zone where they are compacted and washed. In the washing zone, washwater is injected into the screenings from the openings in the hollow shaft of the spiral, and from a nozzle at the top of the unit.

To maximize washing, after the press compacts the screenings the spiral reverses, pulling apart the compacted screenings. The cycle is repeated a minimum of four times, recompacting the screenings and squeezing out excess washwater and organics. The repetition helps the press achieve up to 90% organic removal from the screenings. As the screenings move into the dewatering zone, the pitch of the spiral decreases, further compacting the screenings for maximum water extraction prior to entering the discharge pipe. From inlet hopper to discharge, the screenings volume is reduced from 70% up to 85%.



▲ Section A-A through the washing zone.



▲ Sequence of Valve Operations

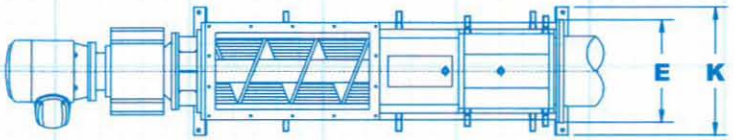
1 Injects washwater into the washing zone through the hollow shaft spiral.

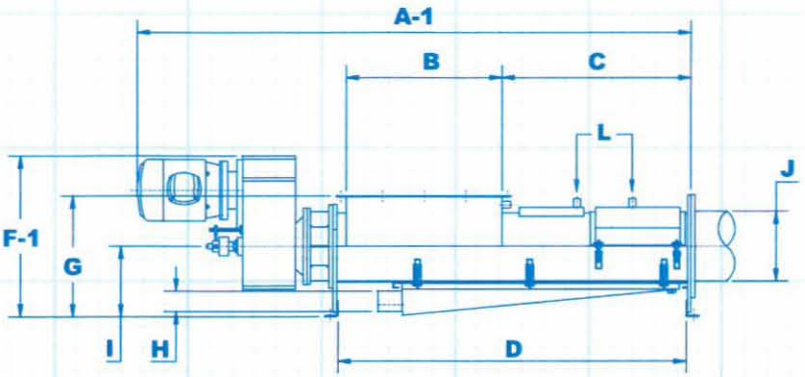
2 Injects washwater into the top of the washing zone.

3 Flushes dewatering zone.

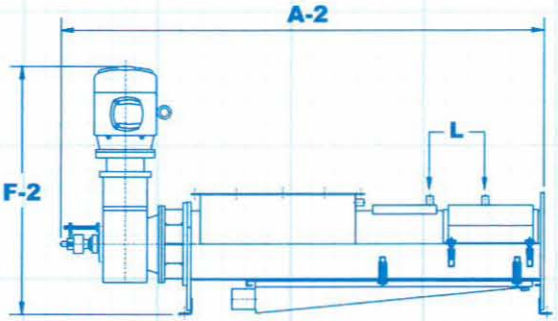
4 Flushes drain pan.

Model EWP Washing Press





▲ Parallel Drive Configuration



▲ Right Angle Drive Configuration

Type	A-1	A-2	B	C	D	E	F-1	F-2	G	H	I	J	K	L	MOTOR
EWP 250/600	86"	75"	24"x10"	29"	57"	16"	24"	40"	19"	3"	12"	10"ø	20"	1/2"	5 HP
EWP 250/800	94"	83"	32"x10"	29"	65"	16"	24"	40"	19"	3"	12"	10"ø	20"	1/2"	5 HP
EWP 250/1000	101"	91"	40"x10"	29"	73"	16"	24"	40"	19"	3"	12"	10"ø	20"	1/2"	5 HP
EWP 250/1200	109"	97"	48"x10"	29"	81"	16"	24"	40"	19"	3"	12"	10"ø	20"	1/2"	5 HP
EWP 250/1600	125"	113"	63"x10"	29"	92"	16"	24"	40"	19"	3"	12"	10"ø	20"	1/2"	5 HP
EWP 250/2000	141"	128"	78"x10"	29"	107"	16"	24"	40"	19"	3"	12"	10"ø	20"	1/2"	5 HP
EWP 300/600	98"	85"	24"x12"	34"	58"	19"	30"	50"	22"	4"	13"	12"ø	21"	3/4"	7.5 HP
EWP 300/800	106"	93"	32"x12"	34"	65"	19"	30"	50"	22"	4"	13"	12"ø	21"	3/4"	7.5 HP
EWP 300/1000	113"	100"	40"x12"	34"	73"	19"	30"	50"	22"	4"	13"	12"ø	21"	3/4"	7.5 HP
EWP 300/1200	122"	108"	48"x12"	34"	81"	19"	30"	50"	22"	4"	13"	12"ø	21"	3/4"	7.5 HP
EWP 300/1600	137"	124"	63"x12"	34"	96"	19"	30"	50"	22"	4"	13"	12"ø	21"	3/4"	7.5 HP
EWP 400/600	117"	98"	24"x16"	42"	70"	23.5"	39"	62"	27.5"	4"	14.5"	16"ø	26"	3/4"	10 HP
EWP 400/800	125"	106"	32"x16"	42"	78"	23.5"	39"	62"	27.5"	4"	14.5"	16"ø	26"	3/4"	10 HP
EWP 400/1000	132"	114"	40"x16"	42"	86"	23.5"	39"	62"	27.5"	4"	14.5"	16"ø	26"	3/4"	10 HP
EWP 400/1200	141"	122"	48"x16"	42"	94"	23.5"	39"	62"	27.5"	4"	14.5"	16"ø	26"	3/4"	10 HP

▼ Input Capacity of Raw Screenings

Type	Continuous Mode	Batch Mode
EWP 250	Up to 99 ft³/hr	Up to 33 ft³/hr
EWP 300	Up to 159 ft³/hr	Up to 53 ft³/hr
EWP 400	Up to 247 ft³/hr	Up to 82 ft³/hr

▼ Wash Water Requirements

Type	Requirements
EWP 250	19 gpm at 35 psi minimum – 60 psi maximum
EWP 300	27 gpm at 35 psi minimum – 60 psi maximum
EWP 400	27 gpm at 35 psi minimum – 60 psi maximum

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Model VMR
Multi-Rake Screen

Product Information Guide

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Vulcan
THE PROVEN SCREEN CHOICE

Model VMR Multi-Rake Screen

Chain Take-Up Mechanism

Wiper Mechanism

Internal to screen frame with no brushes or water required.

Stainless Steel Side Frame

Full Frame (as shown), and Spliced Frame (for installation in existing buildings) are available. Standard side frames are formed from 1/4" thick stainless steel plate with four engineered bends for rigidity creating a side frame width of 28" - the strongest frames in the industry.

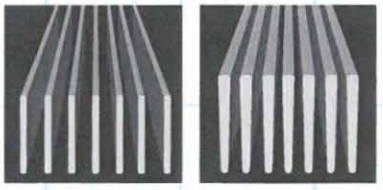
Dead Plate

Rake Heads

Multiple, large-capacity rake heads with deep tooth penetration and positive engagement of the bar rack.

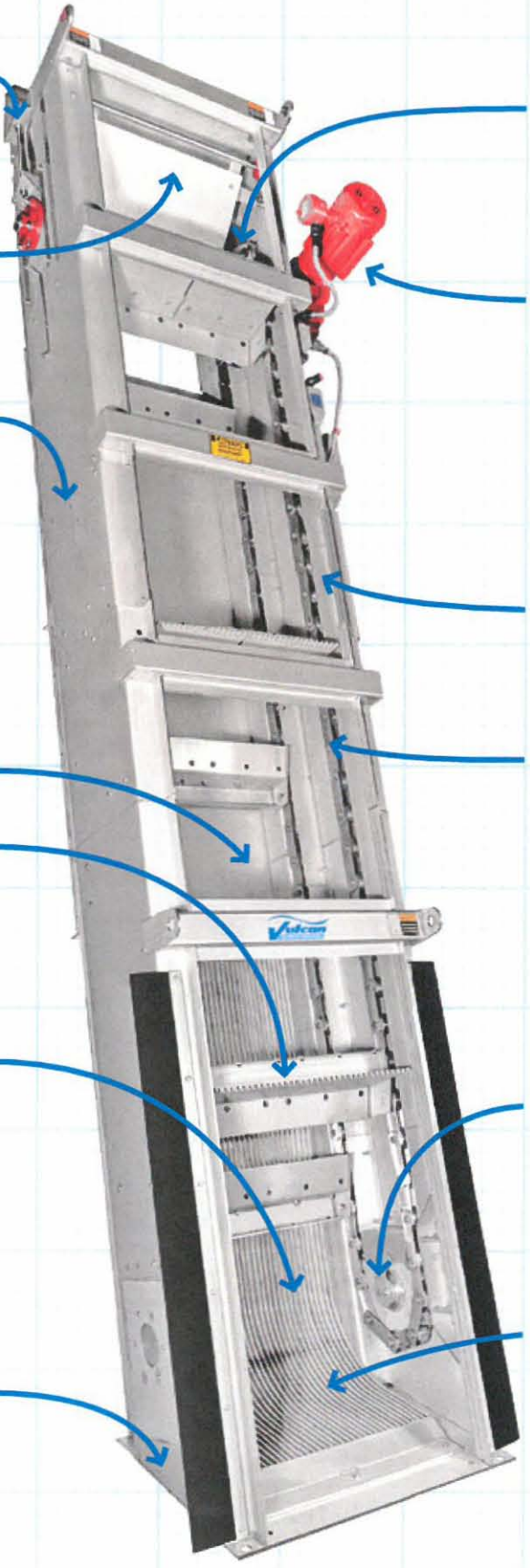
Choice of Rectangular or Trapezoidal Bar Rack

Bar spacing from 1/4" to 3"+



Sized For Your Project

Channel widths from 18 inches to 8 feet, and depths to over 50 feet.



Upper Stainles Steel Drive Sprockets

Drive Options

TEFC and explosion-proof motors available with variable frequency drive (VFD) for soft start and flexible operating speed control.

Stainless Steel Chain Guides

Drive Chains

Heavy-duty stainless steel roller chains.

Lower Engagement System

With choice of guide rail bearings or sprockets.

Lower Curved Bar Rack Bars

Engineered for Capacity, Known for Reliability

Since 1978, Vulcan has been a leader in manufacturing quality wastewater equipment. The **VMR Multi-Rake Screen** continues this tradition of excellence, incorporating many of the same features found in our Mensch Severe Duty™ Bar Screen. Coupling these tried and true features with Vulcan's own UL approved fully automatic and multiple speed controls produces quick and efficient screenings removal.

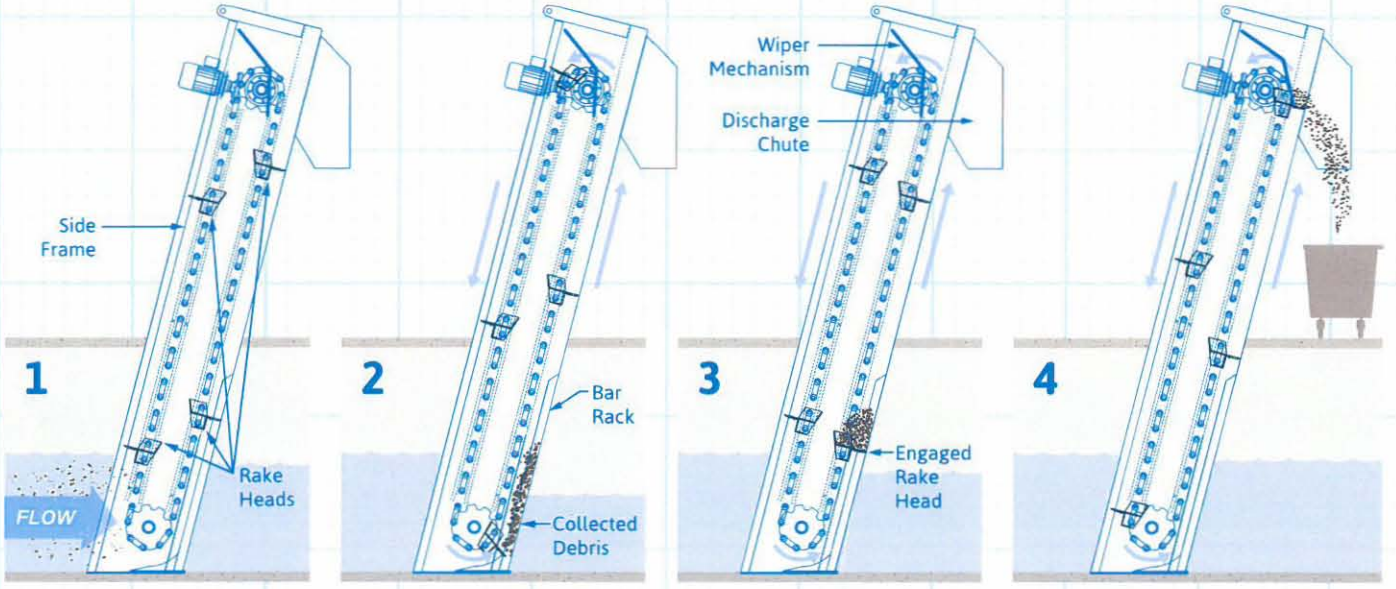
Designed for use in high screenings volume applications, the VMR Multi-Rake Screen can efficiently remove large amounts of screenings with continuous operation. The versatility of the VMR Multi-Rake Screen makes it ideal for special applications of extreme channel depth and severe screen blinding. Heavy duty components used in the VMR Multi-Rake Screen ensure a long and productive service life even under the most severe conditions.

The VMR Multi-Rake screen is an automatic, self-cleaning mechanical bar screen designed for tough primary and secondary screening applications.

The VMR Multi-Rake Screen can be customized for new construction as well as existing channels.

Electrical Controls

Each control panel we provide is designed and manufactured by highly skilled technicians in our own electrical facility to meet the specifications for the particular project. Our panels are UL Listed and can meet UL 508A or UL 698A standards. Prior to shipment, each panel is fully assembled and tested with the equipment. Panels can be installed as free standing, wall mounted or screen mounted. Control system design can include a variety of relay or programmable logic devices to interact with today's SCADA and HMI systems. Our standard control package includes timers with ultrasonic differential level control for starting and stopping the screen. Variable Frequency Drives (VFD) provide soft motor starts and a wide range of operating speeds to accommodate each particular application. Motor current is monitored to prevent damage to the screen drive system if something were to lodge into the bar rack. A reversing feature allows back cleaning of the bar rack to dislodge the object and then reverses again to continue screening.



▲ Sequence of Operations

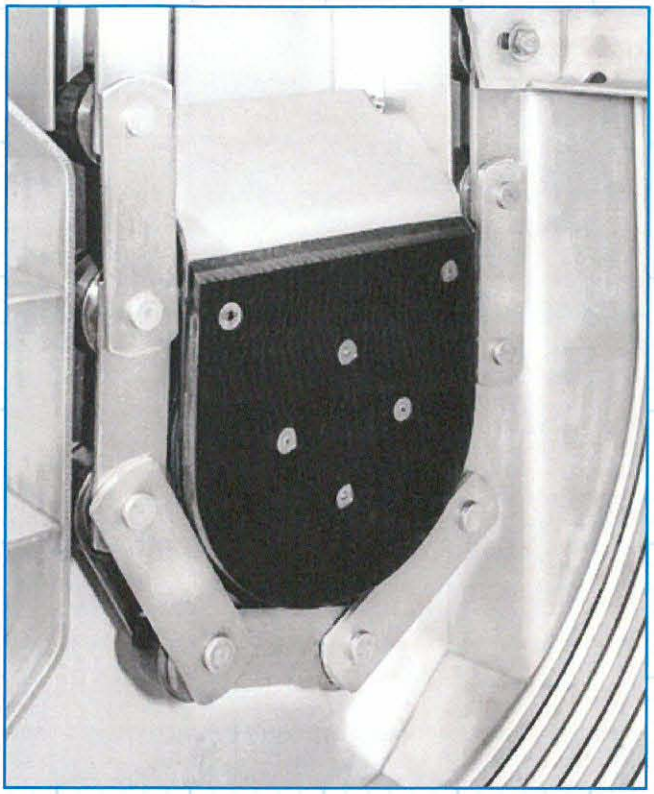
1 The bar rack begins to collect screenings while the bar screen is in the idle position.

2 As screenings collect and the bar rack blinds, the upstream water level rises which initiates a cleaning cycle.

3 One of the multiple rakes engages the bar rack, clearing up the debris and transporting it up the dead plate toward the discharge point.

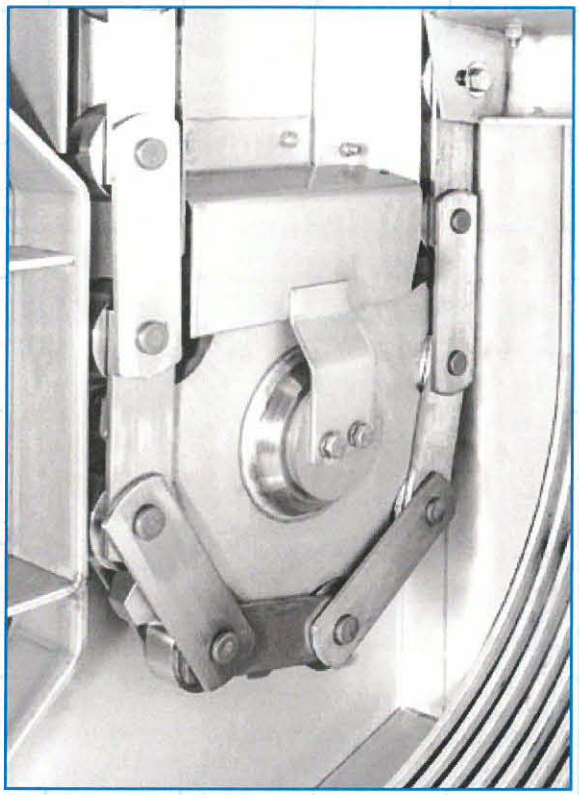
4 When the rake reaches the discharge point, a wiper assembly cleans the rake and directs the screenings to a receiving device (i.e. conveyor, screenings press, dumpster).

Model VMR Multi-Rake Screen



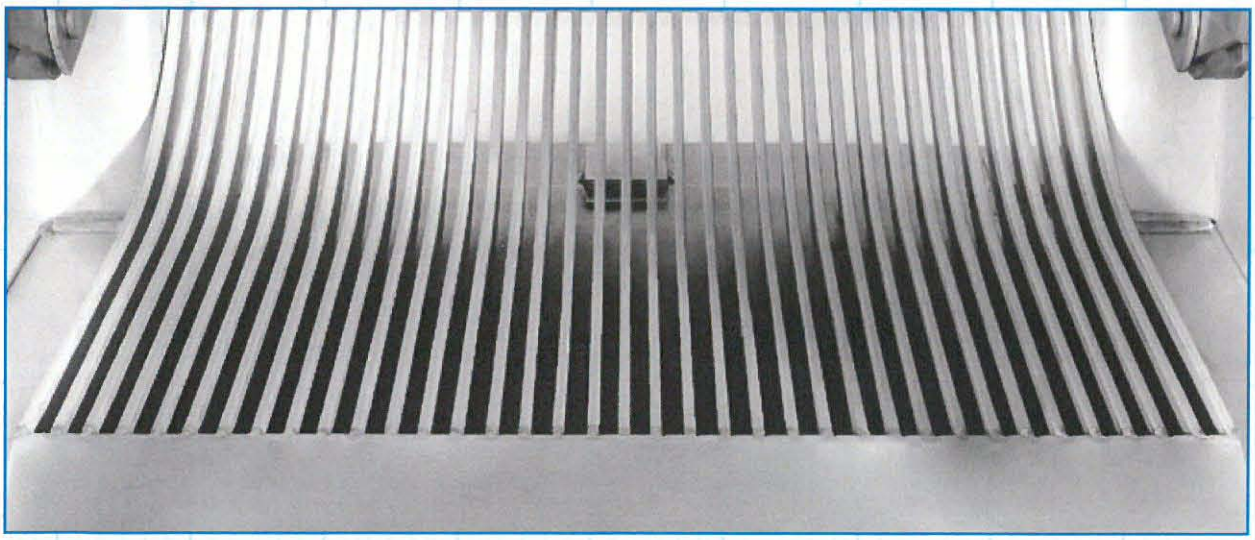
▲ Option 1

Heavy-duty stainless steel chain and lower guide rail engagement system



▲ Option 2

Heavy-duty stainless steel chain and lower sprocket engagement system



▲ Lower Curved Bar Rack

Find more product information at:
vulcanindustries.com

212 S. Kirlin Street
Missouri Valley, Iowa 51555 USA
712-642-2755 Fax 712-642-4256

Vulcan
THE PROVEN SCREEN CHOICE

Ben Day

From: Brittany Travers <brittany@wtgmidwest.com>
Sent: Friday, January 17, 2014 11:51 AM
To: Ben Day
Cc: Jim Condon; Matthew Streeter
Subject: Beatrice, NE - Vulcan VMR Screen
Attachments: Model EWP Washing Press Brochure.pdf; Model VMR Multi-Rake Screen Brochure (R2).pdf

Ben,

For the project at Beatrice, Vulcan would propose one (1) Model VMR-42 Multi-Rake Bar Screen (to fit the existing 3'-6" wide x 6'-6" deep channel) and one (1) Model EWP 250/600 Washing Press. Budget price is $340,000.00 and includes 304 s.s. construction, ¼" bar spacing, 84 degree screen angle, 3' screen discharge height above upper operating floor level (elev. 1260.75'), s.s chains and sprockets, washing press inlet hopper and discharge piping, timer with ultra sonics for control of screen operation, xp-proof motors, NEMA 7 local controls, NEMA 4X main controls (including Allen-Bradley PLC for control of washing press operation), freight, factory start up service (1-trip of 2-days on site) and 1-year warranty. Note that we have included three (3) frame splices, but have not included any additional $$ in case the screen manufacturer is required to supervise the installation (i.e. reconnecting the chains and bolting together the screen frame sections).

If you have any questions, feel free to contact me. Thanks and have a great weekend!

PLEASE NOTE NEW COMPANY NAME AND EMAIL ADDRESS!!!

Brittany (Hirschbrunner) Travers | WTG Midwest, Inc.
Clocktower Village | 643 N 98th St, MB 145 | Omaha, NE 68114
Ph. 402-201-2023 | Fax 888-421-2856 | Cell 402-880-0321 | brittany@wtgmidwest.com
www.wtgmidwest.com

From: Ben Day [mailto:jday@olssonassociates.com]
Sent: Wednesday, January 15, 2014 12:25 PM
To: Brittany Hirschbrunner (brittany@wtgmidwest.com)
Cc: Jim Condon
Subject: Beatrice - Bar Screen

Brittany,

We're looking for a budget quote for Vulcan mechanical bar screens:

- ¼" or 3/8" Screen Opening
- Flow – 3.5 – 4.0 MGD

Attached are a couple plans that should show you the height requirement as well as the channel dimensions.

We would like a high level budget number for the screen, drives, etc... a complete package.

Thank you,

Ben Day, PE | Water/Wastewater | Olsson Associates
1111 Lincoln Mall, Suite 111 | Lincoln, NE 68508 | jday@olssonassociates.com
TEL 402.474.6311 | DIR 402.458.5693 | FAX 402.474.5160


Please consider the environment before printing this e-mail.

ELECTRIC PUMP

201 4th Ave SW
New Prague, MN 56071
Office: 952-758-6600
Toll Free: 800-536-5394
Fax: 952-758-7778

TO: Olsson Associates
Ben Day / (402) 474-6311 / jday@olssonassociates.com

REF: WWF – Influent Pump Station
Beatrice, NE

DATE: January 29, 2014

Electric Pump is pleased to submit this budgetary quote for the following equipment:

Influent Pumps – Dry-Pit Submersibles & Controls

2,326 GPM @ 55' TDH with 44' Static

Pumps:

Two (2) Flygt NT3202-641MT dry-pit submersible pumps capable of delivering *2,301gpm @ 54.8ft TDH with 44ft of static*. Pump to be furnished with the following:

- 45hp, 460V, 3phase, 60Hz, explosion proof motor
- Hard Iron Impeller
- Suction Elbow 12" x Discharge Elbow 8"
- Stand for pumps ***(concrete bases by others)***
- 50' Power cable
- Kellem grips for pump power cables ***(diameter of power cable 1.06")***
- Flygt Mini-Cas for pump monitoring ***(mounted in control panel)***

One (1) Lot of freight and startup services

Controls:

One (1) ArcSafe® Model PCC-DD3-45 as represented by Electric Pump and manufactured by Starnet Technologies. One (1) ArcSafe® Pump Control Center for pump control and alarming. UL labeled and serialized control panel carrying a UL label indicating suitable for use with intrinsically safe circuits extending to classified hazardous locations. ArcSafe® Model PCC-DD3-45 - Duplex, 480V 3-Phase 150Amp, with Variable Frequency Drives with Bypass Contactors for operation of two (2) 45Hp 55FLA Submersible Pumps with the following options included.

- One (1) Arcsafe Pump Control Center ***(programming by engineer)***
- Two (2) Variable Frequency Drives
- One (1) Lightning transformer
- One (1) Surge Protection

One (1) Transducer
Two (2) Floats
One (1) Lot of freight and startup services

Total Budgetary Selling Price: $166,123.00 plus tax

Budgetary Breakdown:

Xylem Flygt Pump and Accessories $98,184.00

Arrow Starnet "Arc Safe" Controls/VFD's $67,939.00

Option on Controls:
Two (2) Separate Mounting Normal Duty Torque AC Inverter with By Pass Contactors, 460 volt/3PH/60Hz, NEMA 12 Painted Steel, padlockable with circuit breaker; input and output reactors, 4-20 mAdc output, HOA switch, Run and Fault Pilot Lights nameplate and viewing window for keypad

Varispeed High Performance IGBT All-Digital AC Inverter with the following features:

- Door mounted digital operator English language
- Advanced Sleep function (programmable for output frequency, current, feedback signal or external input)
- Set-point in "user" units,
- Hand mode reference from analog signal or from parameter setting
- Minimum frequency programmable
- Feedback readout on display
- Set-point readout on display
- Alarm and Fault programmable
- Programmable start level and delay time
- Pump Protection function
- All parameters program in user units
-

One (1) Customs Duplex Pump Station Control Panel, NEMA 12 painted steel, 3 point lockable latch kit, 120V, 1 phase, 60 Hz incoming power, suitable for wall mounting next to drive cabinets. The proposed panel shall be factory fabricated, assembled, wired and tested and ready for installation and connection to VFD's, pressure transducer, mercury free float switches and incoming power.

- Aluminum Inner door/Hard plastic door pocket
- Line terminal block for incoming power
- Phase monitor/Voltage/Surge protection
- Control Circuit breaker
- Transformer – with breaker as required
- Condensation Heater with adjustable thermostat with breaker
- AB – PLC with Panelview (Programming by Olsson & Associates)
  Transducer
  Backup Floats
- Mini Cas Circuitry
- Running time hour meters for each pump
- Alarm light and Horn with Silence button
- Alarm Contacts for signals to future SCADA
- Component Identification as specified
- Panel components and wire markers
- Terminal Strip, Panduit
- UL Listed

The above Item A, FOB factory with freight allowed to Beatrice, NE. including, approval data/drawing, maintenance manual, startup service and owner instruction and one (1) year warranty from date of startup.

Budgetary Optional Control System $48,312.00

If you have any questions or concerns with the contents of this proposal please feel free to contact us at (800) 383-7867.

Thanks you for your consideration,

Steven Forsythe/Dave Bloch

cc: Steve Squires (612) 803-3884
cc: Jim Gray (712) 420-5679

Note the following:

- Anchor bolts, Junction Box, Reducers, Valves, Piping, Disconnects, Meter Sockets, Transfer Switches, Generator Receptacles, Transmitters, Hubs, Conduit, Installation of equipment and anything that's not specifically mentioned in this proposal is the responsibility of others

xylem
Let's Solve Water

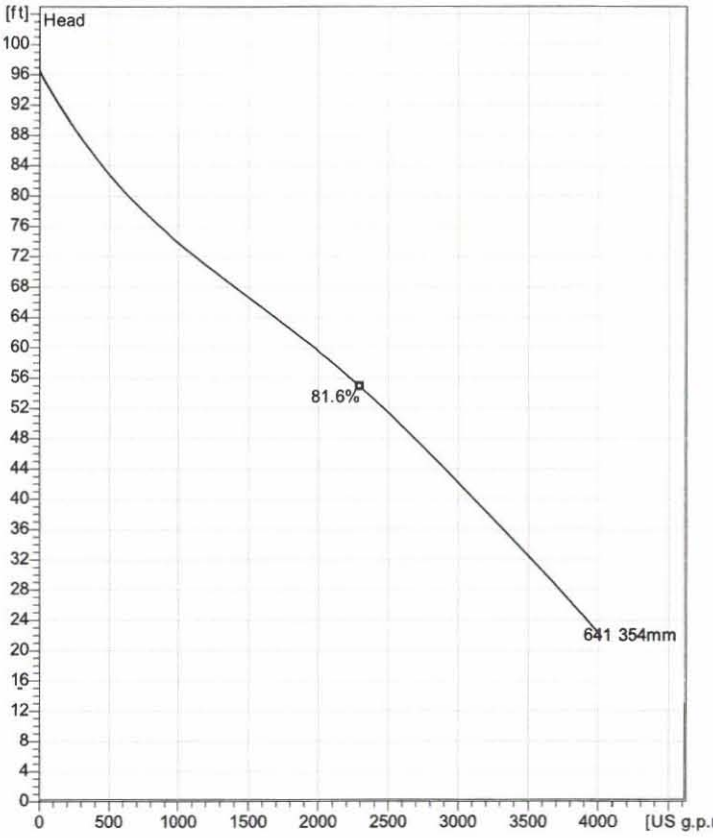
Design Point:
2,326 gpm @ 55' TDH with 44' Static

Beatrice, NE
WWF

NT 3202 MT 3~ 641

Technical specification

FLYGT



Curve according to: ISO 9906 grade 2 annex 1 or 2

Installation: T - Vertical Permanent, Dry

Note: Picture might not correspond to the current configuration.

General

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Possible to be upgraded with Guide-pin® for even better clogging resistance. Modular based design with high adaptation grade.

Impeller

Impeller material	Hard-Iron ™
Outlet width	7 7/8 inch
Inlet diameter	250 mm
Impeller diameter	354 mm
Number of blades	2
	0 inch

Motor

Motor #	N3202.095 30-23-6AA-D 45hp
Stator variant	1
Frequency	60 Hz
Rated voltage	460 V
Number of poles	6
Phases	3~
Rated power	45 hp
Rated current	55 A
Starting current	330 A
Rated speed	1170 rpm
Power factor	
1/1 Load	0.85
3/4 Load	0.82
1/2 Load	0.73
Efficiency	
1/1 Load	89.5 %
3/4 Load	90.0 %
1/2 Load	89.5 %

Configuration

Project	Project ID	Created by	Created on	Last update
			2014-01-15	

xylem
Let's Solve Water

NT 3202 MT 3~ 641

FLYGT

Performance curve

Pump

Outlet width	7 7/8 inch
Inlet diameter	250 mm
Impeller diameter	13 15/16"
Number of blades	2
	0 inch

Motor

Motor #	N3202.095 30-23-6AA-D 45hp
Stator variant	1
Frequency	60 Hz
Rated voltage	460 V
Number of poles	6
Phases	3~
Rated power	45 hp
Rated current	55 A
Starting current	330 A
Rated speed	1170 rpm

Power factor	
1/1 Load	0.85
3/4 Load	0.82
1/2 Load	0.73
Efficiency	
1/1 Load	89.5 %
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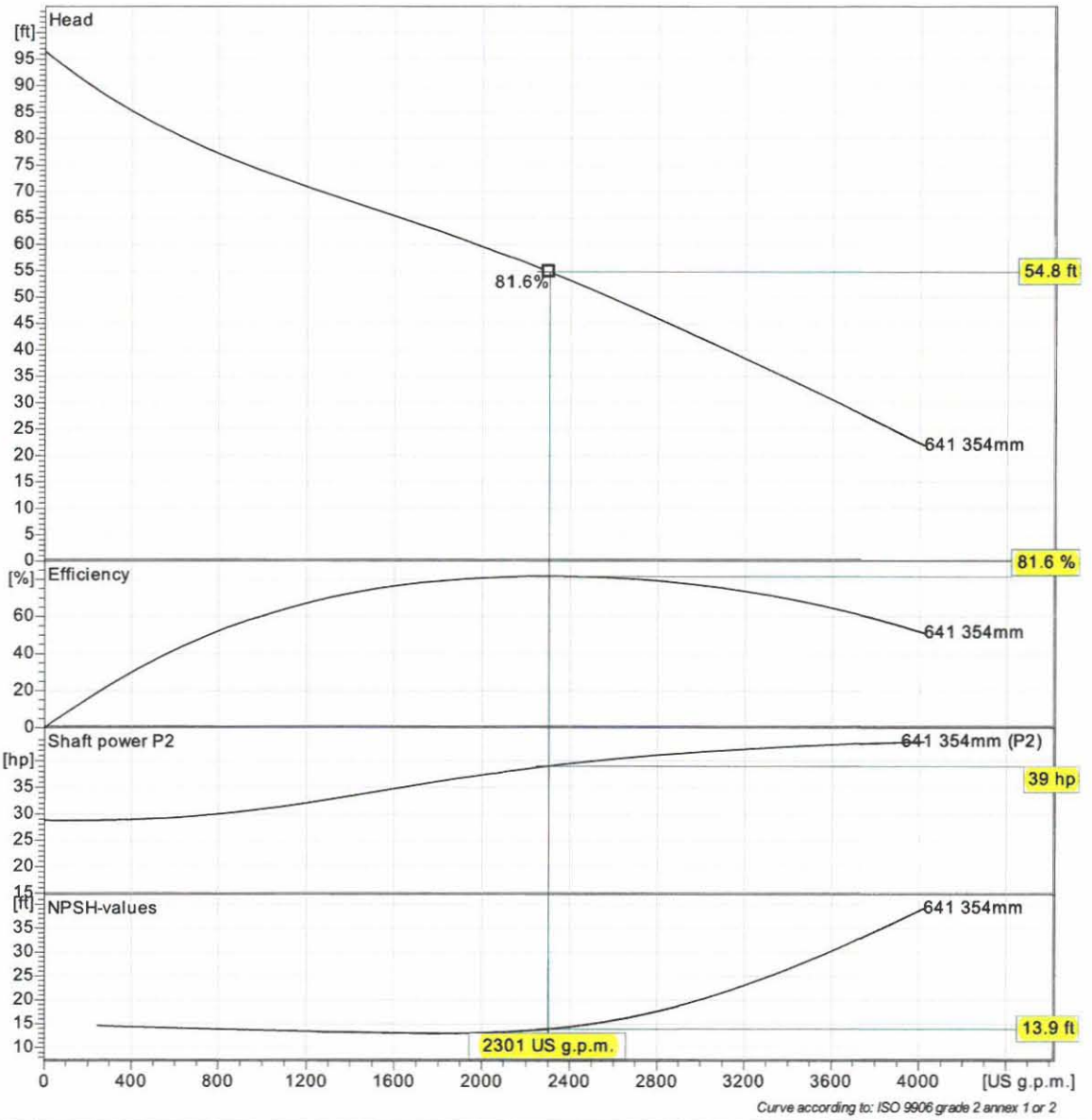
1/2 Load	89.5 %



Curve according to: ISO 9906 grade 2 annex 1 or 2

Duty point		Shaft power	NPSHre	Hyd eff.	Guarantee
Flow	Head				HI_Class_A
2330 US g.p.m.	55 ft			%	No

Project	Project ID	Created by	Created on	Last update
			2014-01-15	

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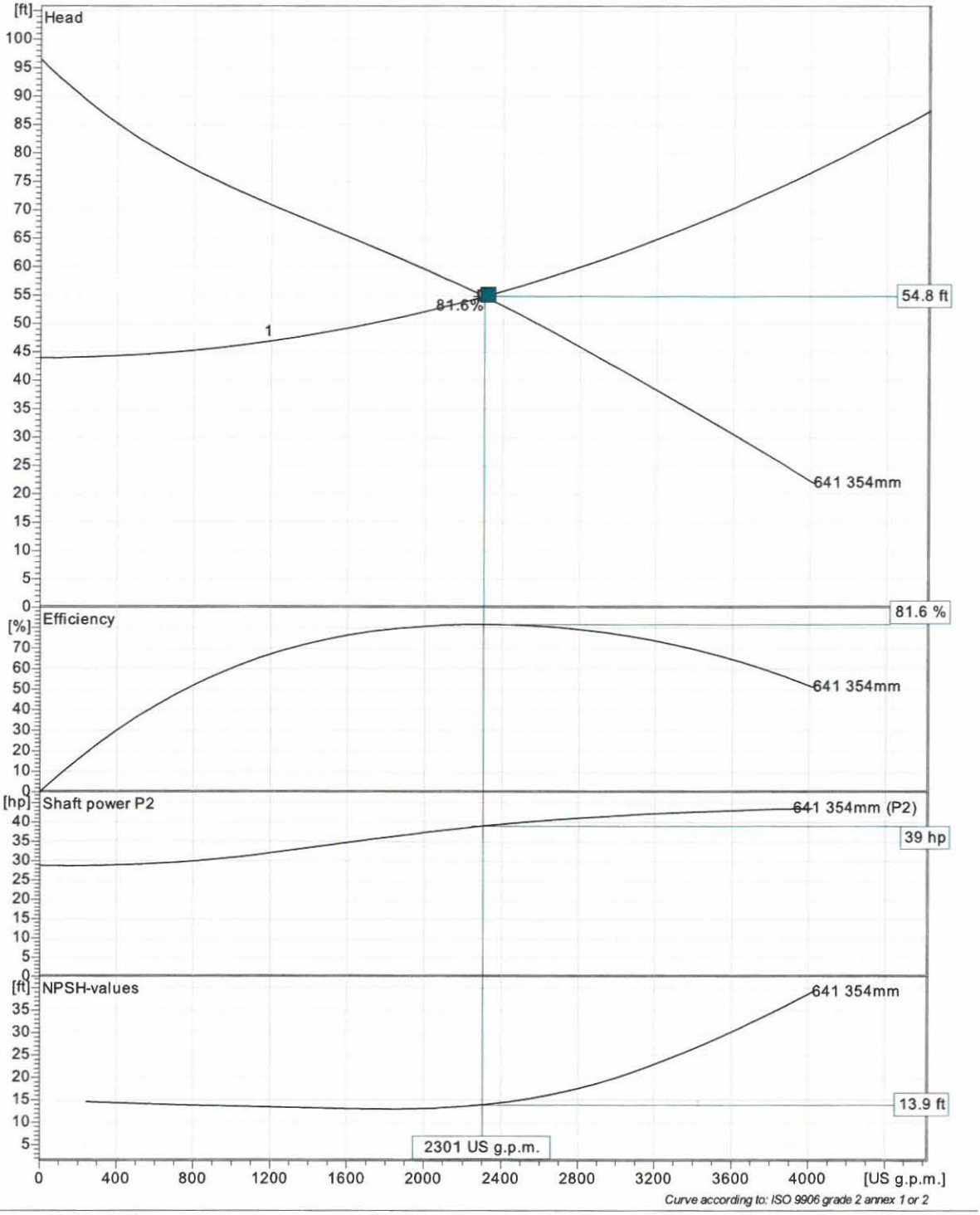
NT 3202 MT 3~ 641

FLYGT

Duty Analysis



Curve according to: ISO 9906 grade 2 annex 1 or 2

Pumps running /System	Individual pump			Total					
	Flow	Head	Shaft power	Flow	Head	Shaft power	Hyd eff.	Specific energy	NPSHre
1	2300 US g.p.m.	54.8 ft	39 hp	2300 US g.p.m.	54.8 ft	39 hp	81.6 %	234 kWh/US MG	13.9 ft

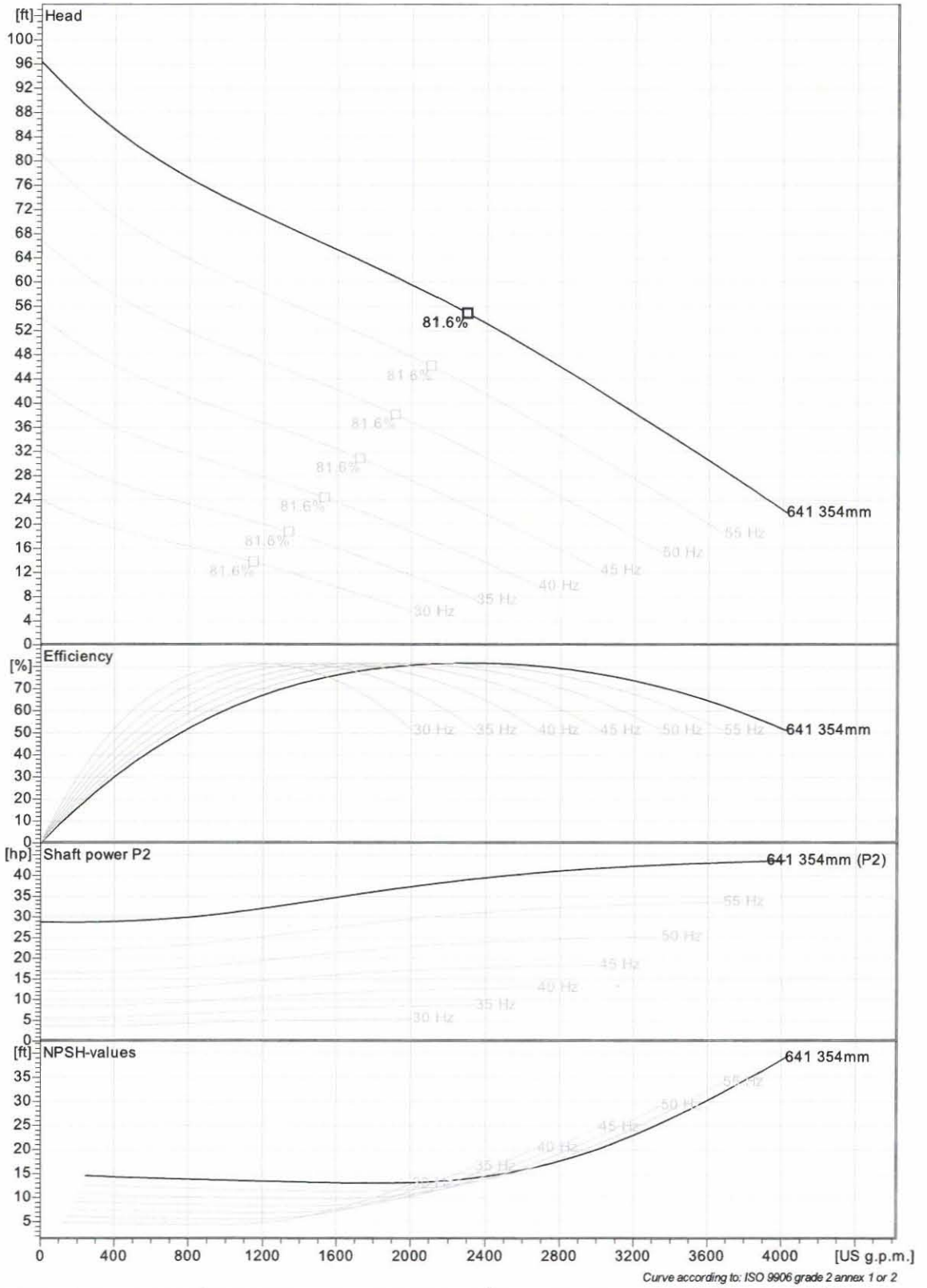
Project	Project ID	Created by	Created on	Last update
			2014-01-15	

xylem
Let's Solve Water

NT 3202 MT 3~ 641

FLYGT

VFD Curve



Curve according to: ISO 9906 grade 2 annex 1 or 2

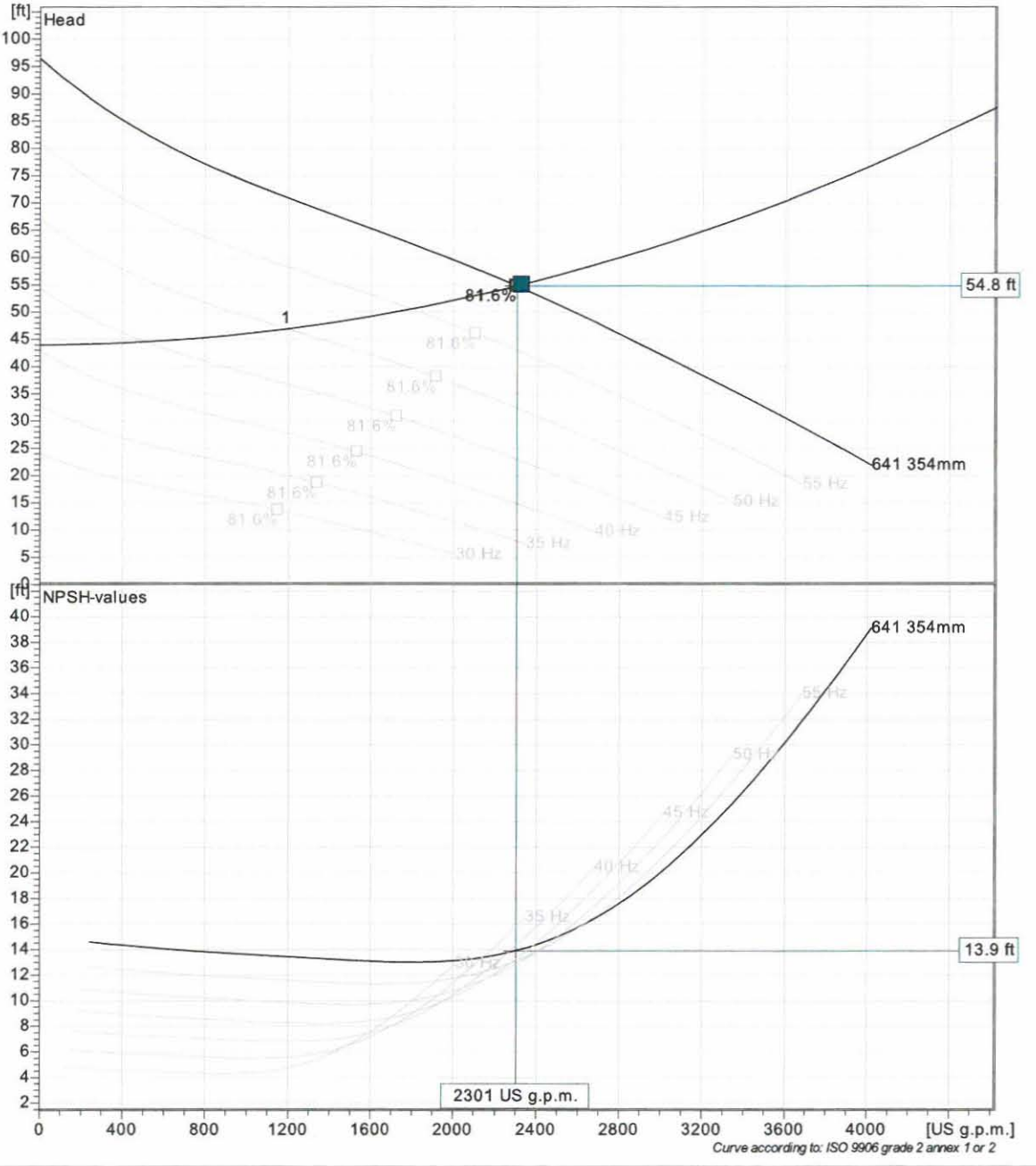
Project	Project ID	Created by	Created on	Last update
			2014-01-15	

xylem
Let's Solve Water

NT 3202 MT 3~ 641

FLYGT

VFD Analysis

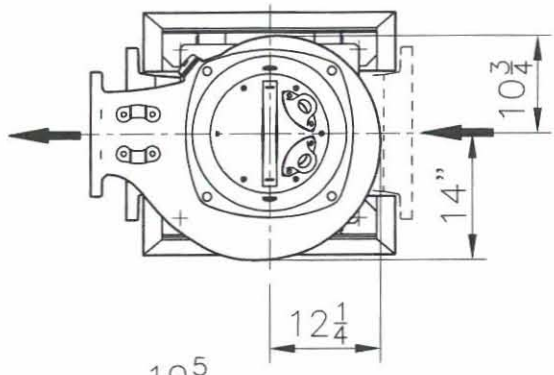


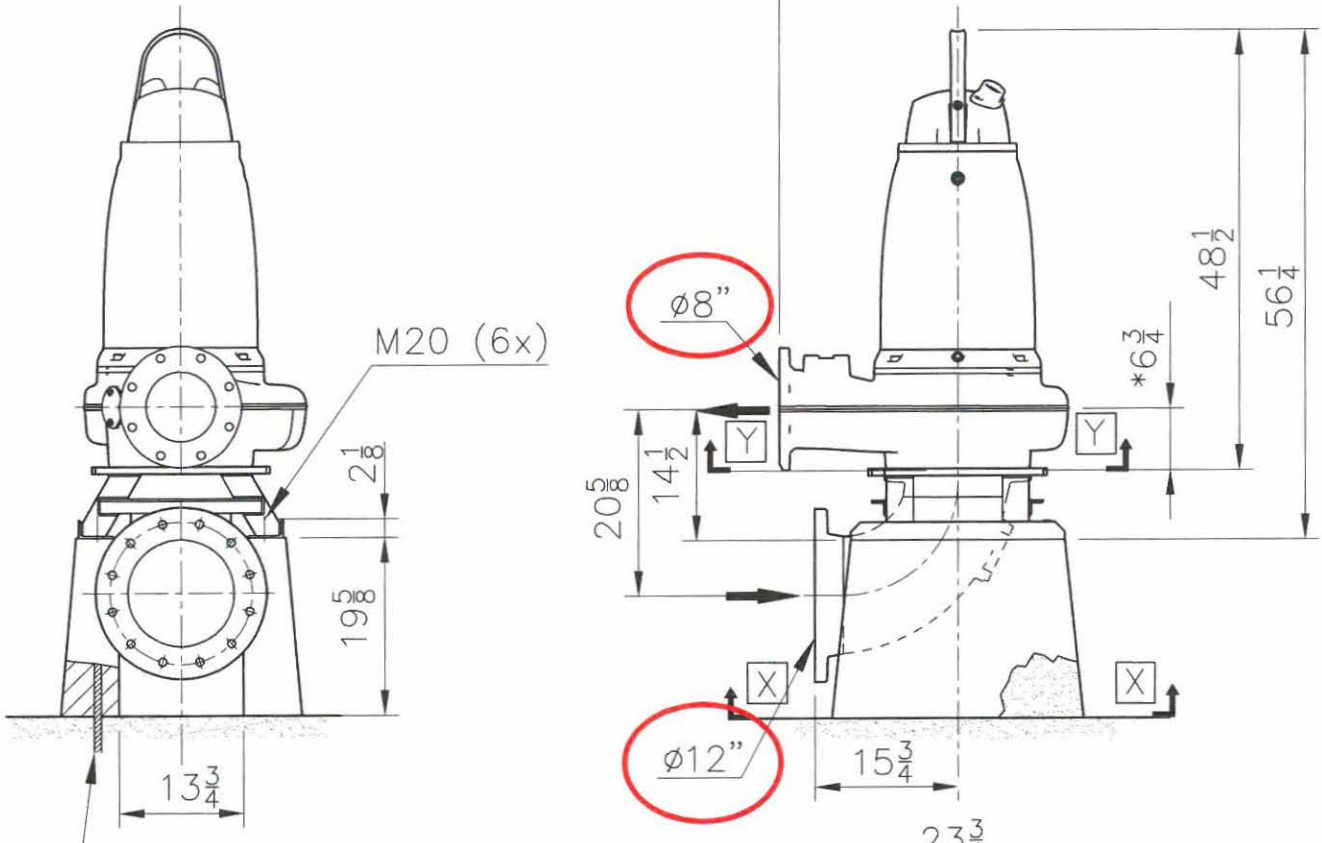
Curve according to: ISO 9906 grade 2 annex 1 or 2

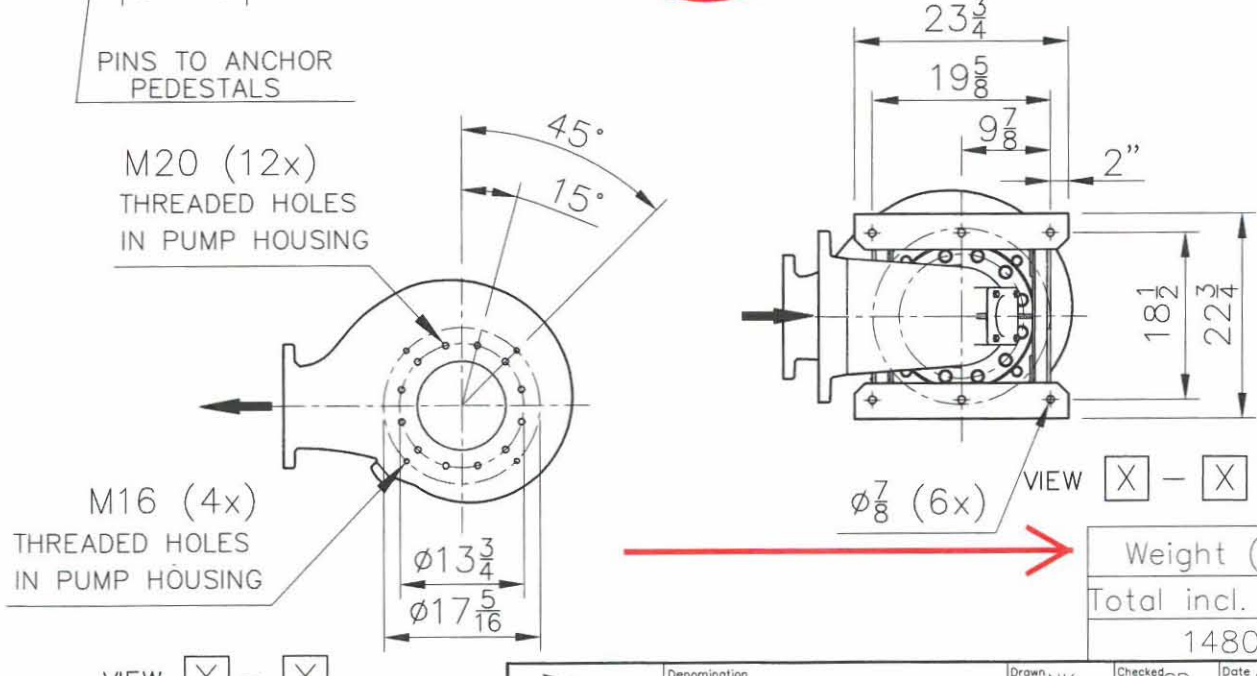
	Individual pump				Total					
Pumps running /System	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hyd eff.	Specific energy	NPSHre
1	60 Hz	2300 US g.p.m.	54.8 ft	39 hp	2300 US g.p.m.	54.8 ft	39 hp	81.6 %	234 kWh/US MG	13.9 ft
1	55 Hz	1770 US g.p.m.	50.3 ft	28 hp	1770 US g.p.m.	50.3 ft	28 hp	80.3 %	219 kWh/US MG	11.3 ft
1	50 Hz	1160 US g.p.m.	46.8 ft	19 hp	1160 US g.p.m.	46.8 ft	19 hp	72.4 %	228 kWh/US MG	9.81 ft
1	45 Hz	483 US g.p.m.	44.5 ft	12.2 hp	483 US g.p.m.	44.5 ft	12.2 hp	44.5 %	367 kWh/US MG	8.76 ft
1	40 Hz									
1	35 Hz									

Project	Project ID	Created by	Created on	Last update
			2014-01-15	

NOTE:
PUMP CAN BE ROTATED ABOUT IT'S CENTERLINE TO 4 POSITIONS RELATIVE TO THE INLET ELBOW:
INCREMENTS ARE 90°
* DIMENSION TO INLET ELBOW FLANGE
ONLY FOR 6 POLES







Weight (lbs)
Total incl. stand
1480

FLYGT AUTOCAD DRAWING	Denomination: Dimensional drwg NT 3202 MT Ø12"/Ø8" 6-poles	Drawn by NK	Checked by SB	Date 091002
		Scale		Reg. no 5399
		6665100		6

APPENDIX "D"

Proposed Process Preliminary Sizing and Opinion of Costs

BEATRICE
Complete Mix Activated Sludge Process
Design Calculation Using Ross E. McKinney Method

I. Influent Wastewater Characteristics (Current)

Ave. Daily Flow in MGD:	1.30
Max. Dry Weather r Flow in MGD:	1.63
Min. Daily Flow in MGD:	0.4
TBOD in mg/l:	206
TSS in mg/l:	376
TKN in mg/l:	45
NH4 in mg/l:	25
Max.Temperature: in Degree C:	26
Min.Temperature: in Degree C:	12
pH:	7

II. Aeration Tank Characteristics

Volume in MG:	12
HRT@Ave.Daily F Flow in Hrs:	221.5

III. Effluent Wastewater Characteristics

TSS:	10

IV. CMAS Equations

A.Carbonaceous Unmetabolized
Substrate in Effluent (F) in mg/l

$$F = Fi/Kmt+1$$

@ Max. T mperature :

F= 0.04084

@ Min. Temperature:

F= 0.10806

B.Nitrogenous Unmetabolized Substrate in Effluent (Fn) in mg/l

Fn = NH4/Kmnt+1

@ Max. Temperature:

F= 0.0006

@ Min. Temperature:

F= 0.0016

C.Solids Retention Time (Ts) in da Hours

Mtinput = 800 mg/l Design MLSS

Ts= Mtinput*t/0.5Fi+SSin(Ci+Cii-Ci*Cii)

Ts= 572.08 Hours 23.84 Days

D.Active Biomass ss (Ma) in mg/l

Ma= Ks*F/Ke+(1/Ts)

@ Max. Temperature:

Ma= 24.5205

@ Min. Temperature:

Ma= 59.541

E.Active Nitrogenous Biomass (Ma) in mg/l

Man= Ksn*Fn/Ke+(1/Ts)

@ Max. Temperature:

Man= 2.2498

@ Min. Temperature:

Man= 5.46459

F.Endogenous Mass (Me) in mg/l

Me= 0.2*Ke*Ma*Ts

@ Max. Temperature:

Me= 85.156

@ Min. Temperature:

Me= 78.1224

G.Nitrogenous Endogenous Mass (Men) in mg/l

Men= 0.2*Ke*Man*Ts

@ Max. Temperature:

Men= 7.81324

@ Min. Temperature:

Men= 7.16996

H. Inert Non-Degradable Organic Mass (Mi) in mg/l

Mi= Ts/t*SSin*Ci(1-Cii)

Mi= 291.285

I.Carbonaceous Volatile Mass (Mv) in mg/l

Mv= Ma+Me+Mi

@ Max. Temperature:

Mv= 400.961

@ Min. Temperature:

Mv= 428.948

J.Nitrogenous Volatile Mass (Mvn) in mg/l

Mvn= Man+Men

@ Max. Temperature:

Mvn= 10.063

@ Min. Temperature:

Mvn= 12.6345

K.Inert Inorganic Mass (Mii) in mg/l

Mii= Ts/t*Cii*SSin+0.1(Ma+Me)

@ Max. Temperature:

Mii= 253.705

@ Min. Temperature:

Mii= 256.504

L.Nitrogenous Inert Inorganic Mass (Miin) in mg/l

Miin= 0.1(Man+Men)

@ Max. Temperature:

Miin= 1.0063

@ Min. Temperature:

Miin= 1.26345

M.Total Carbonaceous Mass (Mt) in mg/l

Mt= Ma+Me+Mi+Mii

@ Max. Temperature:

Mt= 654.666

@ Min. Temperature:

Mt= 685.452

N.Total Nitrogenous Mass(Mtn) in mg/l

Mtn= Man+Men+Miin

@ Max. Temperature:

Mtn= 11.0693

@ Min. Temperature:

Mtn= 13.898

O.Total Combined Mass (Mtcn) in mg/l

MTcn= Mt+Mtn

@ Max. Temperature:

Mtcn= 665.735

@ Min. Temperature:

Mtcn= 699.35

P. Waste Activated Sludge (Mtw) in lbs./day

Mtw= Mt*8.3454*Flow*(t/Ts)-SSeff*8.3454*flow

@ Max. Temperature:

Mtw= 2641.95

Assume Dry Solids Concentration of 0.80%

GPD Wasted= 39572

@ Min. Temperature:

Mtw= 2771.29

Assume Dry Solids Concentration of 0.80%

GPD Wasted = 41509

Q.Waste Activated Sludge (Mtwn) in lbs./day w/nitrification

Mtwn= Mtcn*8.3454*Flow*t/Ts-SSeff.*8.3454*Flow

@ Max. Temperature:

Mtwn= 2688.45

Assume Dry Solids Conc. of 0.80%

GPD Wasted = 40268

@ Min. Temperature:

Mtwn= 2829.68

Assume Dry solids Conc. of 0.80%

GPD Wasted = 42384

Temperature Correction Factor

Km@Max in 1/hr:	22.7646
Km@Min.T in 1/hr:	8.60068
Kmn@Ma in 1/hr:	189.705
Kmn@Min.T in 1/hr:	71.6724
Ks@Max.T in 1/hr:	19.274
Ks@Min.T in 1/hr:	7.28191
Ke@Max.T in 1/hr:	0.0304
Ke@Min.T in 1/hr:	0.0115
Ksn@Max.T in 1/hr:	121.411
Ksn@Min.T in 1/hr:	45.8703

Other Factors:

Ci=	0.4	Inert organic fraction
Cii=	0.25	Inert inorganic fracti

SYSTEM EVALUATION
BIOLAC TREATMENT,BEATRICE, NEBRASKA
USING PROJECTED LOADINGS

PROPOSED FLOW AND LOAD CHARACTERISTICS

FLOW	1.31	AVE MGD	1.63	PEAK MGD	3.25	MGD ASSUMED PEAK HOUR	
BOD	1,504	AVE LBS/DAY	2,811	MAX	138	MG/L	AVE
SS	2,249	AVE LBS/DAY	5,113	MAX	206	MG/L	AVE
AMMONIA	492	AVE LBS/DAY	704	MAX	45	MG/L	AVE

BIOLAC ALTERNATIVE DESIGN

FLOW 1.31 MGD

LAGOON SIZING

STORAGE
10 DAYS
13,100,000 GALLONS
1,751,337 CUBIC FEET

SIZE 116,756 SQ FT
2.68 ACRES EACH LAGOON
W/O SIDE SLOPES

USE 2 TO 1 SIDE SLOPE

BOTTOM SIZE 342 FT SQUARE
DEPTH 15 FT
TOP WIDTH 402 FT SQUARE
TOP AREA 161,359 SQ FT
3.7 ACRES

LAGOON EARTHWORK

16 FT TOP WIDTH
15 FT WATER DEPTH
3 FT FREEBOARD
1.5 TO 1 SIDE SLOPE
264 CU. FT AREA PER FOOT
1600 LINEAR FEET OF DIKE

422,400 TOTAL VOLUME IN CUBIC FEET
15,644 TOTAL VOLUME IN CUBIC YARDS
1.4 Compaction Factor
21,902 Total Cubic Yards Dike Volume
To balance excavation must equal fill
372 AVE BASIN SIZE
76,754 CUBIC YARD BASIN EXCAVATION
54,852 EXCESS CUBIC YARDS FOR DISPOSAL

76,754 CUBIC YARDS EXCAVATION

BIOLAC EQUIPMENT 720,000
BLOWER BUILDING $250,000 POSSIBLE TO USE EXISTING BIOLAC BLDG FOR BLOWERS

AERATION BASIN SIZING

DETENTION TIME 30 DAYS

VOLUME REQ'D 1,250,000 GALLONS
167,112 CU FT
DEPTH 18 FT
AREA 9,284 SQ FT

LENGTH 96.4 FT
98 USE

AERATION BASIN STRUCTURE

NUMBER	1
LENGTH	98
WIDTH	98
DEPTH	18
FREEBOARD	2
WALLS	386
	$550.00
BASE	801
	$350.00
TOTAL	$492,821
ADD EXC	$49,282
TOTAL ST	$542,103
EQ	$250,000

TOTAL ST & EQ $793,000

CLARIFIERS

NUMBER	2 EA
DIAMETER	72 FT
DEPTH	14 FT
WALL THICKNESS	1.33 FT
BASE THICKNESS	2 FT

WALL CONCRETE 9,500 CF
352 CY
TOTAL ALL 703.72 CY
COST/CY $550

COST PER CLARIFIER $193,522

BASE CONCRETE 5,415.10 CF
200.56 CY
TOTAL ALL 401.12
COST/CY $350

COST PER CLARIFIER $70,196

TOTAL CONCRETE COST PER CLARIFIER	$263,718
TOTAL CONCRETE COST ALL CLARIFIERS	$527,436
EQUIPMENT COST ALL CLARIFIERS	$250,000
TOTAL CLARIFIER COST	$777,436

RETURN SLUDGE PUMPING STATION

SIZE		
LENGTH	40	FT
WIDTH	20	FT
HEIGHT	30	FT
WALL THICKNESS	1.5	FT
BASE THICKNESS	2	FT
ROOF &FLOOR	1	FT

CONCRETE		
WALLS	5400	CF
	200	CY
BASE	2112	CF
	78	CY
FLOOR	800	CF
	30	CY
ROOF	800	CF
	30	CY
COST		
WALLS	$550	PER CY
BASE	$350	PER CY
ROOF	$650	PER CY
FLOOR	$650	PER CY
TOTAL	$175,896	

EQUIPMENT				
PUMPS 2000 GPM	2	EA	$45,000	$90,000
PUMPS 1000 GPM	1	EA	$30,000	$30,000
PIPING				$147,948
EXCAVATION	3000	CY	$5.00 PER CY	$15,000
MISC				$25,000
CONTROLS				$50,000
TOTAL				$533,844

POSSIBLE USE OF EXISTING SLUDGE HOLDING AND TRICKLING FILTER

EXISTING SHT VOLUME

EXISTING TANKS	3	
LENGTH	21.5	FT
WIDTH	21.5	FT
DEPTH	10	FT
VOLUME	4,623	CU FT/TANK
	34,576	GALLONS
VOLUME ALL TANKS	103,729	GALLONS

EXISTING TRICKLING FILTER STORAGE VOLUME

DIAMETER	130	FT
DEPTH	7	FT
VOLUME	92,913	CU FT
	694,986	GALLONS
TOTAL SLUDGE STORAGE VOLUME	798,715	GALLONS
SLUDGE GENERATION FROM CMAS	42,000	GAL/DAY AT 0.8% SOLIDS
DETENTION TIME	19.02	DAYS

NEW AERATION	$150,000
BLOWERS	$100,000
TRICKLING FILTER CONVERSION	$250,000
	$500,000

AERATION
DESIGN CALCULATIONS

LOCATION: TECUMSEH, NEBRASKA

DESIGN LOADINGS

FLOW	1.31	MGD				
PEAK FLOW	3.25	MGD				
BOD5	138	mg/l		7387.387387	5855.86	1054.05405
AMMONIA (NH3-N)	0	mg/l				
TKN	56.4	mg/l			1054.05	194.439043
BOD5	2811	LBS/DAY	BASED ON DESIGN FLOW			
AMMONIA (NH3-N)	0	LBS/DAY	BASED ON DESIGN FLOW			117.117117
TKN	616	LBS/DAY	BASED ON DESIGN FLOW			21.6043382

ASSUMPTIONS

O2 PER LB OF BOD	1.2	LBS
O2 PER LB OF NH3-N	0	LBS
O2 PER LB OF TKN	4.6	LBS
TOTAL AERATION TIME	24	HRS/DAY
BASIN SIDE WATER DEPTH	15	FT

AERATION BASIN

AIR REQUIREMENTS

ANTICIPATED NUMBER OF BLOWERS = 2

O2 REQUIRED FOR BOD =	3373	LBS O2
O2 REQUIRED NH-3 =	0	LBS O2
O2 REQUIRED TKN =	2834	LBS O2
TOTAL O2 REQUIRED =	6208	LBS O2/DAY
	258.7	LBS 02/HR (AOR) (24 HOURS)

AOR:

$$SOR = \frac{\text{ALPHA}*(1.024^{T-20})*\text{BETA}*\left|\frac{(1+D/67.8)(aP/b+T)-C}{(1+D/67.8)*9.092}\right|}{}$$

C = RESIDUAL O2 IN BASIN =			2 MG/L
ALPHA =	0.85		
BETA =	0.9		
TEMP =	20	DEG C	
ALTITUDE =	1080	FT MSL	
P =	734	mm Hg	
D = AVE. DIFFUSER DEPTH =			12 FT
a =	0.658		
b =	35		
CORRECTION FACTOR =		0.5801	
SOR =	10701	LBS/DAY	
	445.89	LBS/HR FOR 24 HRS	
	445.89	LBS/HR FOR	24.0 HRS

CONSTANTS TABLE

T (DEG C)	a	b
5-15	0.578	29
16-25	0.658	35
26-33	0.738	44

WEIGHT OF OXYGEN =	0.0175	LB O2 PER CU FT AIR
TYPE OF DIFFUSER =	FINE	
EFFICIENCY	1.4%	PER FT IMMERSION DEPTH
	USE 1.4% FOR FINE BUBBLE AND 1% FOR COURSE BUBBLE	
REQUIRED SCFM =	2528	
150 Percent	3791.562552	
REQUIRED SCFM PER BLOWER =	3792	

CORRECTION FOR INLET CONDITIONS

	INLET TEMPERATURE =	100	DEG F
P =	14.696	PSIA	
P1 =	INLET PRESSURE (DUE TO ALTITUDE) =	14.19	PSIA
T =	68F + 460 = 528 R		
T1 =	INLET TEMP DEG F + 460 =	560	DEG R

CALCULATED FLOW RATE

P*Q = M*R*T
M = P*Q/R*T Q = CFM*144 = 363990.005
M = 285.11 LB M/MIN

Q2 = M*R*T1/P1
Q2 = 4166 ICFM BASED ON WATER DET. TIME

DISCHARGE PRESSURE

PSIG = (DIFFUSER DEPTH (MAX) * .4335)+ LINE LOSS & DIFFUSER LOSS

PSIG = 12 * .4335 + 1 PSI
PSIG = 6.20

BLOWER HORSEPOWER

$$BHP = \frac{.227*ICFM*[(P2/P1)^{.283}-1]}{\text{BLOWER EFFICIENCY}}$$

P2 = P1 + BLOWER DISCHARGE PRESSURE (STATIC PRESSURE FROM BLOWER SUBMERGENCE + 1PSI LINE LOSSES)
TYPICAL BLOWER EFFICIENCY IS = 70.0%

P2 = 21.66

BHP = 172.28

BHP = 86.14 PER BLOWER

DIFFUSER DESIGN

AIR REQUIREMENTS =	3792	SCFM
DIFFUSER TYPE =	RETRIEVABLE TUBE	
CAPACITY PER TUBE =	4.8	SCFM
NUMBER OF DIFFUSERS		
# OF RACKS	4	RACKS OF DIFFUSERS
TUBS PER RACKS	197	DIFFUSER TUBES PER RACK
TOTAL NUMBER =	788	TUBES

COST ESTIMATES

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL

EXCAVATION	76,754 CY	$10	$768,000		
BIOLAC EQUIPMENT	1 LS	$720,000	$720,000		
CLARIFIERS	1 LS	$777,436	$778,000		
RETURN SLUDGE PUMP STATION	1 LS	$533,844	$534,000		
PIPING	1 LS	$774,000	$774,000		
GRAVITY SEWER	1,500 LF	$75	$112,500		
FENCING	1,500 LF	$20	$30,000		
SEEDING	1 LS	$10,000	$10,000		
BLOWER BUILDING	1 LS	$250,000	$250,000		
TRICKLING FILTER & EXISTING SHT CONVERSIC	1 LS	$500,000	$500,000		
SITE WORK	1 LS	$860,000	$860,000		
SLUDGE DEWATERING IMPROVEMENTS	1 LS	$750,000	$750,000		
ELECTRICAL & CONTROLS	1 LS	$1,075,000	$1,075,000		
SCADA SYSTEM AND INTEGRATION	1 LS	$300,000	$300,000		
FLOOD PROTECTION	1 LS	$1,190,000	$1,190,000		
		SUBTOTAL	$8,651,500	$8,652,000	
		20.00% CONTINGENCY	$1,730,300		
		LAND ACQUISITION	$60,000		
		ENGINEERING, ADMIN &ETC	$1,730,300	$3,461,000	
		PROJECT TOTAL	$12,173,000		

DEBT PAYMENT **$856,505**
20 YEARS
3.50% INTREST RATE

ANNUAL OPERATION AND MAINTENANCE COST CALCULATION

		Power Calculated at		$ 0.070 per KWH			
LIFT STATION TO BIOLAC SYSTEM		15 HP		17.5 HR/DAY	95,813 KWH/YR	6,707	
AERATION SYSTEM POWER							
BLOWERS		172.28 HP		24 HR/DAY	1,509,195 KWH/YR	105,644	
RAS PUMPING		20 HP		24 HR/DAY	175,200 KWH/YR	12,264	
FINAL CLARIFIERS		2 HP		24 HR/DAY	17,520 KWH/YR	1,226	
SLUDGE HOLDING TANK AERATION		25 HP		24 HR/DAY	219,000 KWH/YR	15,330	$142,000
DEWATERING		2.7 MILLION GAL	$0.02 PER GALLON			$41,000	
LABOR						$50,000	
MAINTENANCE AND REPAIR						$25,000	
SUPPLIES						$5,000	
TESTING						$10,000	
CONTINGENCIES	20.00%					$55,000	
TOTAL O & M COSTS						$327,171	

SYSTEM EVALUATION
OXIDATION DITCH TREATMENT BEATRICE, NEBRASKA
USING PROJECTED LOADINGS

PROPOSED FLOW AND LOAD CHARACTERISTICS

FLOW	1.31	AVE MGD	1.63	PEAK MGD	3.25	MGD ASSUMED PEAK HOUR	
BOD	1,504	AVE LBS/DAY	2,811	MAX	138	MG/L	AVE
SS	2,249	AVE LBS/DAY	5,113	MAX	206	MG/L	AVE
AMMONIA/TKN	492	AVE LBS/DAY	704	MAX	45	MG/L	AVE

OXIDATION DITCH PROCESS DESIGN

DESIGN LOADINGS

FLOW	1.31	MGD	
PEAK FLOW	3.25	MGD	
BOD5	138	mg/l	
AMMONIA (NH3-N)	0	mg/l	
TKN	45	mg/l	
BOD5	2811	LBS/DAY	BASED ON DESIGN FLOW
AMMONIA (NH3-N)	0	LBS/DAY	BASED ON DESIGN FLOW
TKN	704	LBS/DAY	BASED ON DESIGN FLOW

ASSUMPTIONS

O2 PER LB OF BOD	1.2	LBS
O2 PER LB OF NH3-N	0	LBS
O2 PER LB OF TKN	4.6	LBS
TOTAL AERATION TIME	24	HRS/DAY
BASIN SIDE WATER DEPTH	18	FT

AERATION BASIN

TANK SIZE (EXISTING)
RACE TRACK

INSIDE RADIUS =		45	FT
OUTSIDE RADIUS =		65	FT
DISTANCE CENTER TO CENTER =		70	FT
SURFACE AREA =		9712	SQ. FT.

DETENTION TIME / VOLUME

		FLOOR	EL 47.0
SWD =	18 FT		EL 67.0
AERATION TANK VOLUME =		174807	CUBIC FEET
		1307557	GALLONS

DETENTION TIME AT DESIGN FLOW: 24.0 HRS

DETENTION TIME AT PEAK FLOW: 9.7 HRS

LOADING = 16.08 LBS..BOD/1000 CU. FT.

AIR REQUIREMENTS

ANTICIPATED NUMBER OF BLOWERS = 2

O2 REQUIRED FOR BOD =	3373	LBS O2
O2 REQUIRED NH-3 =	0	LBS O2
O2 REQUIRED TKN =	3238	LBS O2
TOTAL O2 REQUIRED =	6612	LBS O2/DAY
	275.5	LBS 02/HR (AOR) (24 HOURS)

$$SOR = \frac{AOR:}{ALPHA*(1.024^{T-20})*BETA*\left|\frac{(1+D/67.8)(aP/b+T)-C}{(1+D/67.8)*9.092}\right|}$$

C = RESIDUAL O2 IN BASIN =		2	MG/L
ALPHA =	0.85		
BETA =	0.9		
TEMP =	20	DEG C	
ALTITUDE	1080	FT MSL	
P =	734	mm Hg	
D = AVE. DIFFUSER DEPTH =		17	FT
a =	0.658		
b =	35		
CORRECTION FACTOR =	0.5895		
SOR =	11216	LBS/DAY	
	467.35	LBS/HR FOR 24 HRS	
	467.35	LBS/HR FOR 24.0	HRS

CONSTANTS TABLE

T (DEG C)	a	b
5-15	0.578	29
16-25	0.658	35
26-33	0.738	44

WEIGHT OF OXYGEN =	0.0175	LB O2 PER CU FT AIR
TYPE OF DIFFUSER =	FINE	
EFFICIENCY	1.4%	PER FT IMMERSION DEPTH
	USE 1.4% FOR FINE BUBBLE AND 1% FOR COURSE BUBBLE	
REQUIRED SCFM =	1870	
150 Percent	2805.24031	
REQUIRED SCFM PER BLOWER =	2805	

CORRECTION FOR INLET CONDITIONS

INLET TEMPERATURE =		100	DEG F
P =	14.696	PSIA	

P1 = INLET PRESSURE (DUE TO ALTITUDE) = 14.19 PSIA
T = 68F + 460 = 528 R
T1 = INLET TEMP DEG F + 460 = 560 DEG R

CALCULATED FLOW RATE

P*Q = M*R*T
M = P*Q/R*T Q = CFM*144 = 269303.0698
M = 210.95 LB M/MIN

Q2 = M*R*T1/P1
Q2 = 3082 ICFM BASED ON WATER DET. TIME

DISCHARGE PRESSURE

PSIG = (DIFFUSER DEPTH (MAX) * .4335)+ LINE LOSS & DIFFUSER LOSS

PSIG = 12 * .4335 + 1 PSI
PSIG = 6.20

BLOWER HORSEPOWER

$$BHP = \frac{.227*ICFM*[(P2/P1)^{.283}-1]}{\text{BLOWER EFFICIENCY}}$$

P2 = P1 + BLOWER DISCHARGE PRESSURE (STATIC PRESSURE FROM BLOWER SUBMERGENCE + 1PSI LINE LOSSES)
TYPICAL BLOWER EFFICIENCY IS = 70.0%

P2 = 22.98

BHP = 146.18

BHP = 73.09 PER BLOWER

DIFFUSER DESIGN

AIR REQUIREMENTS = 2805 SCFM

DIFFUSER TYPE = RETRIEVABLE TUBE

CAPACITY PER TUBE = 4.8 SCFM

NUMBER OF DIFFUSERS
OF RACKS 4 RACKS OF DIFFUSERS
TUBS PER RACKS 146 DIFFUSER TUBES PER RACK

TOTAL NUMBER = 584 TUBES

AERATION BASIN STRUCTURE

STRAIGHT RUN

NUMBER	2	
LENGTH	80	
WIDTH	37	
DEPTH	18	
FREEBOARD	2	
WALLS	711	
	$550.00	
BASE	548	
	$350.00	
TOTAL	$582,859	
ADD EXC	$58,286	
TOTAL ST	$641,145	

EXCAVATION 3,289 CY

CURVED

NUMBER	1	EA
DIAMETER	75	FT
DEPTH	18	FT
WALL THICKNESS	1.33	FT
FREEBOARD	2	FT
BASE THICKNESS	2	FT
EXTERIOR WALL CONCRETE	5,741	CF
	213	CY
TOTAL EXTERIOR WALL	212.62	CY
COST/CY	$550	
COST PER BASIN	$116,941	
BASE CONCRETE	8,835.73	CF
	327.25	CY
TOTAL ALL	327.25	
COST/CY	$350	
COST PER BASIN	$114,537	
TOTAL CONCRETE COST	$872,624	PER BASIN
EQ	$750,000	
TOTAL ST & EQ	$1,623,000	

CLARIFIERS

NUMBER	2	EA
DIAMETER	72	FT
DEPTH	14	FT
WALL THICKNESS	1.33	FT
BASE THICKNESS	2	FT
WALL CONCRETE	9,500	CF
	352	CY
TOTAL ALL	703.72	CY
COST/CY	$550	
COST PER CLARIFIER	$193,522	
BASE CONCRETE	5,415.10	CF
	200.56	CY
TOTAL ALL	401.12	

	COST/CY	$350	
COST PER CLARIFIER		$70,196	
TOTAL CONCRETE COST PER CLARIFIER			$263,718
TOTAL CONCRETE COST ALL CLARIFIERS			$527,436
EQUIPMENT COST ALL CLARIFIERS			$250,000
	TOTAL CLARIFIER COST		$777,436

RETURN SLUDGE PUMPING STATION

SIZE		
LENGTH	40	FT
WIDTH	20	FT
HEIGHT	30	FT
WALL THICKNESS	1.5	FT
BASE THICKNESS	2	FT
ROOF &FLOOR	1	FT

CONCRETE			
WALLS	5400	CF	
	200	CY	
BASE	2112	CF	
	78	CY	
FLOOR	800	CF	
	30	CY	
ROOF	800	CF	
	30	CY	
COST			
WALLS	$550	PER CY	
BASE	$350	PER CY	
ROOF	$650	PER CY	
FLOOR	$650	PER CY	
TOTAL	$175,896		

EQUIPMENT				
PUMPS 2000 GPM	2	EA	$45,000	$90,000
PUMPS 1000 GPM	1	EA	$30,000	$30,000
PIPING				$147,948
EXCAVATION	3000	CY	$5.00 PER CY	$15,000
MISC				$25,000
CONTROLS				$50,000
TOTAL				$533,844

SLUDGE PRODUCTION

SLUDGE YIELD	0.75	LBS/LB BOD
BOD	2,811	LBS
DAILY SLUDGE PRODUCTION	2,108	LBS
CONCENTRATION	0.80%	
VOLUME	263,548	LBS SLUDGE
	31,601	GALLONS/DAY

POSSIBLE USE OF EXISTING SLUDGE HOLDING AND TRICKLING FILTER

EXISTING SHT VOLUME

EXISTING TANKS	3	
LENGTH	21.5	FT
WIDTH	21.5	FT
DEPTH	10	FT
VOLUME	4,623	CU FT/TANK
	34,576	GALLONS
VOLUME ALL TANKS	103,729	GALLONS

EXISTING TRICKLING FILTER STORAGE VOLUME

DIAMETER	130	FT
DEPTH	7	FT
VOLUME	92,913	CU FT
	694,986	GALLONS

TOTAL SLUDGE STORAGE VOLUME	798,715	GALLONS
SLUDGE GENERATION FROM CMAS	31,601	GAL/DAY AT 0.8% SOLIDS
DETENTION TIME	25.28	DAYS

NEW AERATION	$150,000
BLOWERS	$100,000
TRICKLING FILTER CONVERSION	$250,000
	$500,000

COST ESTIMATES

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL	
EXCAVATION	3,289	CY	$10	$33,000	
OXIDATION DITCH	1	LS	$1,623,000	$1,623,000	
CLARIFIERS	1	LS	$777,436	$778,000	
RETURN SLUDGE PUMP STATION	1	LS	$533,844	$534,000	
PIPING	1	LS	$822,240	$823,000	
GRAVITY SEWER	1,500	LF	$75	$112,500	
FENCING	1,000	LF	$20	$20,000	
SEEDING	1	LS	$10,000	$10,000	
BLOWER BUILDING	1	LS	$350,000	$350,000	
TRICKLING FILTER & EXISTING SHT CONVERSION	1	LS	$500,000	$500,000	
SITE WORK	1	LS	$913,600	$914,000	
SLUDGE DEWATERING IMPROVEMENTS	1	LS	$750,000	$750,000	
ELECTRICAL & CONTROLS	1	LS	$1,142,000	$1,142,000	
SCADA SYSTEM AND INTEGRATION	1	LS	$300,000	$300,000	
			SUBTOTAL	$7,890,000	$0
		20.00%	CONTINGENCY	$1,578,000	
			LAND ACQUISITION		
			ENGINEERING, ADMIN &ETC	$1,578,000	$3,156,000
			PROJECT TOTAL	$11,046,000	

DEBT PAYMENT	**$777,208**
	20 YEARS
	3.50% INTREST RATE

ANNUAL OPERATION AND MAINTENANCE COST CALCULATION

		Power Calculated at		$ 0.070	per KWH			
LIFT STATION TO BIOLAC SYSTEM		15	HP	17.5	HR/DAY	95,813	KWH/YR	$6,707
AERATION SYSTEM POWER								
BLOWERS		146.18	HP	24	HR/DAY	1,280,493	KWH/YR	$89,635
MIXERS		40.00	HP	24	HR/DAY	350,400	KWH/YR	$24,528
RAS PUMPING		20	HP	24	HR/DAY	175,200	KWH/YR	$12,264
FINAL CLARIFIERS		2	HP	24	HR/DAY	17,520	KWH/YR	$1,226
SLUDGE HOLDING TANK AERATION		25	HP	24	HR/DAY	219,000	KWH/YR	$15,330
DEWATERING		2.7	MILLION GAL	$0.02	PER GALLON			$41,000
LABOR								$45,000
MAINTENANCE AND REPAIR								$25,000
SUPPLIES								$5,000
TESTING								$10,000
CONTINGENCIES	20.00%							$56,000
TOTAL O & M COSTS								$331,690

$150,000

SYSTEM EVALUATION
SBR TREATMENT BEATRICE, NEBRASKA
USING PROJECTED LOADINGS

PROPOSED FLOW AND LOAD CHARACTERISTICS

FLOW	1.31 AVE MGD	1.63 PEAK MGD	3.25 MGD ASSUMED PEAK HOUR		
BOD	1,504 AVE LBS/DAY	2,811 MAX	138 MG/L	AVE	
SS	2,249 AVE LBS/DAY	5,113 MAX	206 MG/L	AVE	
AMMONIA	492 AVE LBS/DAY	704 MAX	45 MG/L	AVE	

SBR PROCESS DESIGN

FLOW	1.63	MGD
BOD	2,811	LBS/DAY
TSS	5,113	LBS/DAY
AMMONIA	704	LBS/DAY

NEED DATA ENTRY

DESIGN LOADINGS

AVERAGE FLOW	1.31	MGD	
PEAK FLOW	1.63	MGD	
BOD5	2,811	LBS/DAY	257.3071 mg/l
AMMONIA (NH3-N)	704	LBS/DAY	51.78679 mg/l

ASSUMPTIONS

O2 PER LB OF BOD	1.24	LBS
O2 PER LB OF NH3-N	4.6	LBS
F:M	0.1	
MLSS	4000	
MLVSS	2600	
NUMBER OF BASINS	3	
BASINS PER TRAIN	1	
BASIN SIDE WATER DEPTH	18	FT

AERATION BASIN SIZING

LBS BOD/F:M = MLSS LBS
MLSS = 28,112 LBS

VOLUME

VOL(MG) = LBS MLSS/DESIGN MLSS PPM X 8.34
VOLUME = 0.843 MG
VOLUME = 112,658 CF

TANK SIZE

RECTANGULAR BASINS
WIDTH 80 LENGTH 80

DETENTION TIME

SWD = 14 FT AT LOW WATER LEVEL
SWD = 18 FT AT HIGH WATER LEVEL

DETENTION TIME 36.8 HRS

ACTUAL TANK VOLUME =

	89,600 CF EACH		PER TRAIN	89,600 CF
	670,208 GALLONS			670,208 GAL
TOTAL	268,800 CF			
	2,010,624 GALLONS			

AIR REQUIREMENTS

O2 REQUIRED FOR BOD =	3,486 LBS O2
O2 REQUIRED FOR NH3-N =	3,238 LBS O2
TOTAL O2 REQUIRED =	6,724 LBS O2/DAY
	280 LBS 02/HR (AOR)

SOR = AOR: / ALPHA*(1.024^T-20)*BETA* |(1+D/67.8)(aP/b+T)-C| / |(1+D/67.8)*9.092|

C = RESIDUAL O2 IN BASIN =		2	MG/L
ALPHA =	0.85		
BETA =	0.95		
TEMP =	20	DEG C	
ALTITUDE =	1080	FT MSL	
P =	734	mm Hg	
D = AVE DIFFUSER DEPTH =		17	FT
a =	0.658		
b =	35		

CONSTANTS TABLE

T (DEG C)	a	b

CORRECTION FACTOR =	0.8305		5-15	0.578	29
			16-25	0.658	35
SOR =	444 LBS/HR FOR 24 HRS		26-33	0.738	44

WEIGHT OF OXYGEN = 0.0175 LB O2 PER CU FT AIR
TYPE OF DIFFUSER = FINE
EFFICIENCY 1.5% PER FT IMMERSION DEPTH
USE 1.47% FOR FINE BUBBLE AND 1% FOR COURSE BUBBLE

REQUIRED CFM 1,693

CORRECTION FOR INLET CONDITIONS

INLET TEMPERATURE = 100 DEG F
P = 14.696 PSIA
P1 = INLET PRESSURE (DUE TO ALTITUDE) = 14.19 PSIA
T = 68F + 460 = 528 R
T1 = INLET TEMP DEG F + 460 = 560 DEG R

CALCULATED FLOW RATE

P*Q = M*R*T
M = P*Q/R*T Q = CFM*144 = 243,857.65
M = 127.34 LB M/MIN

Q2 = M*R*T1/P1
Q2 = 1,861 ICFM

BLOWER HORSEPOWER

$$BHP = \frac{.227*ICFM*[(P2/P1)^{.283}-1]}{\text{BLOWER EFFICIENCY}}$$

P2 = P1 + BLOWER DISCHARGE PRESSURE (STATIC PRESSURE
FROM BLOWER SUBMERGENCE + 0.8PSI LINE LOSSES)
TYPICAL BLOWER EFFICIENCY IS = 70.0%

P2 = 22.78 PSIA 8.59 PSIG

BHP = 87

ANNUAL O & M COST

TIME RUNNING BLOWER 24 HR/DAY

DAYS PER YEAR 365
COST PER kWh $0.07

ANNUAL COST FOR AIR $53,062

TOTAL ANNUAL COST $53,062

AERATION DIFFUSER EVALUATION

NUMBER OF TRAINS	1	
NUMBER OF TRAINS IN SERVICE	1	
DIFFUSERS PER TRAIN	1,000	
TOTAL DIFFUSERS	1,000	
DESIGN AIR RATE PER DIFFUSER	4.5	SCFM
AIR REQUIREMENT	1,693	SCFM
ACTUAL AIR RATE PER DIFFUSER	1.69	SCFM
RECOMMENDED AIRFLOW PER DIFFUSER	4.5	SCFM
RECOMMENDED NUMBER OF DIFFUSERS	376	
PEAK AIR PER DIFFUSER	4	SCFM
NUMBER OF DIFFUSERS AT PEAK AIRFLOW	423	
ADDITIONAL DIFFUSERS REQUIRED	-624	AT RECOMMENDED AIRFLOW

AERATION BASIN STRUCTURE

NUMBER	3	EXCAVATION	7,111 CY
LENGTH	80		
WIDTH	80		
DEPTH	18		
FREEBOARD	2		
WALLS	1067		
	$550.00		
BASE	1644		
	$350.00		
TOTAL	$1,161,911		
ADD EXC	$116,191		
TOTAL ST	$1,278,102		
EQ	$1,000,000		
TOTAL ST & EQ	$2,279,000		

SLUDGE PRODUCTION

SLUDGE YIELD 0.75 LBS/LB BOD

BOD 2,811 LBS

DAILY SLUDGE PRODUCTIO 2,108 LBS

CONCENTRATION	0.80%	
VOLUME	263,548	LBS SLUDGE
	31,601	GALLONS/DAY

POSSIBLE USE OF EXISTING SLUDGE HOLDING AND TRICKLING FILTER

EXISTING SHT VOLUME

EXISTING TANKS	3	
LENGTH	21.5	FT
WIDTH	21.5	FT
DEPTH	10	FT
VOLUME	4,623	CU FT/TANK
	34,576	GALLONS
VOLUME ALL TANKS	103,729	GALLONS

EXISTING TRICKLING FILTER STORAGE VOLUME

DIAMETER	130	FT
DEPTH	7	FT
VOLUME	92,913	CU FT
	694,986	GALLONS

TOTAL SLUDGE STORAGE VOLUME	798,715	GALLONS
SLUDGE GENERATION FROM CMAS	31,601	GAL/DAY AT 0.8% SOLIDS
DETENTION TIME	25.28	DAYS

NEW AERATION	$150,000
BLOWERS	$100,000
TRICKLING FILTER CONVI	$250,000
	$500,000

COST ESTIMATES

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL	
SITE WORK	1	LS	$775,800	$776,000	
GRAVITY SEWER	1,500	LF	$75	$112,500	
SBR BASINS	1	LS	$2,279,000	$2,279,000	
BLOWER BUILDING	1	LS	$350,000	$350,000	
REUSE EXISTING SHT & TF	1	LS	$500,000	$500,000	
FENCING	1,000	LF	$20	$20,000	
SEEDING	1	LS	$10,000	$10,000	
SITE PIPING	1	LS	$581,850	$582,000	
ELECTRICAL	1	LS	$969,750	$970,000	
SLUDGE DEWATERING ADDITIONS	1	LS	$750,000	$750,000	
SCADA SYSTEM AND INTEGRATIOI	1	LS	$300,000	$300,000	
			SUBTOTAL	$6,650,000	
		20.00%	CONTINGENCY	$1,330,000	
			ENGINEERING, ADMIN &ETC	$1,330,000	$2,660,000
			PROJECT TOTAL	$9,310,000	

DEBT PAYMENT **$655,062**
20 YEARS
3.50% INTREST RATE

ANNUAL OPERATION AND MAINTENANCE COST CALCULATION

		Power Calculated at	$ 0.070 per KWH			
LIFT STATION TO BIOLAC SYSTEM		15 HP	17.5 HR/DAY	95,813 KWH/YR	$6,707	
AERATION SYSTEM POWER						
BLOWERS		87 HP	24 HR/DAY	758,032 KWH/YR	$53,062	
MIXERS		50	24 HR/DAY	438,000 KWH/YR	$30,660	
SLUDGE HOLDING TANK AERATION		25 HP	24 HR/DAY	219,000 KWH/YR	$15,330	$106,000
DEWATERING		2.7 MILLION GAI	$0.02 PER GALLON		$41,000	
LABOR					$40,000	
MAINTENANCE AND REPAIR					$15,000	
SUPPLIES					$5,000	
TESTING					$10,000	
CONTINGENCIES	20.00%				$44,000	
TOTAL O & M COSTS					$261,000	

SUMMARY SHEET OPERATION & MAINTENANCE COSTS AND COST EFFECTIVE ANALYSIS
BEATRICE, NEBRASKA

TABLE ____ - PRELIMINARY OPINION OF COST – OPERATION & MAINTENANCE COSTS ($/YEAR)

Item	BIOLAC	OXIDATION DITCH	SBR
Power	$142,000	$150,000	$106,000
Labor	$50,000	$45,000	$40,000
Supplies	$5,000	$5,000	$5,000
Maintenance & Repair	$25,000	$25,000	$15,000
Testing	$10,000	$10,000	$10,000
Biosolids Dewatering	$41,000	$41,000	$41,000
Contingency	$55,000	$56,000	$44,000
TOTAL	**$328,000**	**$332,000**	**$261,000**

The costs in Table _____ does not include sewer line maintenance, lift stations, interest, tax, depreciation, or bond payments.

Economic Analysis

TABLE_____ - PRELIMINARY OPINION OF COST – COST EFFECT ANALYSIS

	BIOLAC	OXIDATION DITCH	SBR
Capital	$8,652,000	$7,890,000	$6,650,000
Overhead	$3,461,000	$3,156,000	$2,660,000
Land	$60,000	$0	$0
Present Worth - New Treatment Process	$12,173,000	$11,046,000	$9,310,000
Present Worth - Existing Plan Improvements	$958,300	$958,300	$958,300
Present Worth - Total	$13,131,300	$12,004,300	$10,268,300
Term, years	20	20	20
Interest Rate	3.50%	3.50%	3.50%
Annual Payment	$924,000	$845,000	$723,000
O&M	$328,000	$332,000	$261,000
Net Annual Cost	**$1,252,000**	**$1,177,000**	**$984,000**


PROFESSIONAL CIVIL ENGINEER
JOHN B.
DAY
E-10648
3/20/14
STATE OF NEBRASKA