



City of Grand Island

Tuesday, January 31, 2006

Study Session

Item -1

Waste Water Treatment Plant Update

Staff Contact: Steve Riehle, City Engineer / Public Works Director

Council Agenda Memo

From: Steven P. Riehle, Public Works Director
Meeting: January 31, 2006
Subject: Waste Water Treatment Plant Update
Item #'s: 1
Presenter(s): Steven P. Riehle, Public Works Director

Background

An update regarding activities at the Wastewater Treatment Plant (WWTP) will be given to the City Council. The presentation will be given by Tom Heineman of CH2M Hill Consulting Engineers, Steve Riehle, Public Works Director, Ben Thayer, Wastewater Treatment Plant Superintendent and supervisory staff from the plant.

Discussion

The discussion will include the following:

- Wastewater Division of Public Works – Who we are and what we do
- Wastewater Collection and Treatment Process
- WWTP Responsibilities
- WWTP Drivers
- Recent WWTP Projects
- 2002 Presentation to City Council
- Progress towards goals outlined in 2002 City Council Presentation
- Recent Challenges
- Response to Challenges

The presentation will address immediate improvements as well as short term and long term improvements to the wastewater treatment plant. A major part of the presentation will focus on odor improvements with the solids (sludge) handling process and the compost operation.

Conclusion

This item is presented to the City Council in a Study Session to allow for any questions to be answered and to create a greater understanding of the issue at hand.

Grand Island's Wastewater Treatment Plant – Balancing Multiple Responsibilities: Requirements, Costs, and Benefits

Presentation to Grand Island City Council – January 31, 2006

Wastewater Division of Public Works – Who we are and what do we do.

- The Wastewater Division of Grand Island's Public Works Department is responsible for the operation and maintenance (O&M) of approximately 215 miles of sanitary sewer collection piping, 15 sewage lift stations, and the wastewater treatment plant (WWTP), which treats approximately 12 million gallons of sewage each day.
- The Wastewater Division employs 27 full-time individuals who carry out the Division's responsibilities.
- The WWTP can't "take time off," because the wastewater never stops coming. As a result, the WWTP is in full operation 24 hours per day, 7 days a week, 365 days per year.
- The WWTP was originally constructed at its current location in 1964. Significant upgrades were carried out in 1980 and 1995. More recent upgrades include solids handling and ultraviolet light (UV) disinfection facilities. Several of the facilities at the WWTP date back to the original 1964 plant construction, including the influent pump station, bar screens, Parshall flume, aerated grit basins, primary clarifiers, and two of the three final clarifiers.
- A collection of "Fast Facts" on wastewater collection and treatment operations are included as Attachment 1.

Wastewater Collection and Treatment Process

- Wastewater originating from our homes and businesses flows through a wastewater collection piping network to the WWTP. Given the flat topography in the Grand Island area, a number of lift stations are required within this piping network to lift the wastewater to allow it to continue to flow by gravity to the WWTP. In addition to treating wastewater from the citizens of Grand Island, the WWTP treats significant flows and loads from several local industries, including CNH, Chief Industries, McCain Foods, St. Francis, and Swift.
- The treatment processes at the WWTP are divided into a "liquid train" and a "sludge train."
- The liquid train removes pollutants from the wastewater (mainly biochemical oxygen demand (BOD), total suspended solids (TSS), ammonia, and nitrate) prior to the discharge of treated effluent (liquid) to the Utility Ditch, which leads to the Wood River. Liquid treatment processes include bar screens, primary clarifiers, activated sludge aeration basins, final clarifiers, and a soon to be completed UV disinfection system.
- As the wastewater is cleaned (treated), two types of sludges are produced as by-products; namely "primary sludge" and "secondary sludge." Primary sludge consists of material that settles to the bottom of the primary clarifiers, whereas secondary sludge

consists mostly of biological mass that is produced in the activated sludge system. These sludges must be treated in accordance with federal and state regulations prior to disposal.

- The sludge treatment process consists of belt filter presses that remove a portion of the liquid from the solids (sludges) followed by solids composting. Liquids removed through the belt filter press process are returned to the primary clarifiers for treatment.
- A schematic of the wastewater treatment process is included as Attachment 2.

WWTP Responsibilities

- The WWTP is strictly regulated by the Nebraska Department of Environmental Quality (NDEQ) through a National Pollutant Discharge Elimination System (NPDES) permit. This permit contains stringent effluent limits for several pollutants, which must consistently be met. These limits are designed to protect public health and the environment.
- Failure to comply with effluent limits may result in substantial fines.
- The WWTP's compliance record is outstanding.

WWTP Drivers

- Meeting the requirement of its NPDES permit, thereby protecting public health and the environment, is a primary goal of the WWTP. However, this is by no means the only driver the City must be responsive to when prioritizing capital improvement projects. Other drivers include, but are not limited to, the following:
 - Availability of funds, generated by sewer use fees
 - Odor control, and other aesthetics such as noise and appearance
 - Treatment capacity to accommodate economic growth in Grand Island
 - Replacement and rehabilitation of aging equipment and facilities
 - Operability of facilities
- Balancing these drivers is an ongoing challenge for the City.
- Over the years, one significant area of citizen concern has been odor control. We have been striving to address those concerns while also addressing the other requirements and drivers.

Recent WWTP Projects

- Table 1 summarizes recent projects completed at the WWTP and the associated drivers that were addressed.
- The solids handling facility improvements eliminated three of the primary sources of odors at the WWTP.
 - Sludge holding/dewatering facilities
 - Aerobic digesters
 - Sludge storage lagoon

TABLE 1 – SUMMARY OF RECENTLY COMPLETED WWTP PROJECTS

			Need Addressed				
<i>Project</i>	<i>Year Completed</i>	<i>Construction Cost (Millions of Dollars)</i>	<i>Regulatory Compliance</i>	<i>Treatment Capacity/ Growth</i>	<i>Odor Control/Odor Reduction</i>	<i>Aging Infrastructure</i>	<i>Operability of WWTP</i>
Solids Handling Facility Improvements	2005	\$8.4					
<i>Belt Filter Press (including biofilter)</i>				X	X	X	X
<i>Aerobic Digesters (use discontinued)</i>					X		
<i>Polymer System</i>				X		X	X
<i>Grit Handling</i>						X	X
<i>Sludge Storage Lagoon (use discontinued)</i>					X		
Primary Clarifier Improvements (final gear drive replacement)	2004	\$0.1				X	
Secondary Clarifier Improvements (replacement of mechanisms)	2005	\$0.8	X			X	X
UV Disinfection System	2006	\$1.9	X				

2002 Presentation to City Council

- A study to evaluate sludge handling and disposal methods at the WWTP was completed by CH2M HILL in 2002. The purpose of the study was to make recommendations for phased improvements to the sludge handling and treatment practices at the WWTP, and to review the timing of the “Phase II” improvements identified in the 1993 WWTP Facility Plan.
- A presentation was made to City Council in July 2002 summarizing the results of this study. WWTP processes evaluated included primary and secondary sludge treatment, grease handling, grit removal, and primary and secondary clarification. The presentation outlined a 4-phase approach to implementing the recommended improvements:
 - Phase I improvements included projects to address the three most significant sources of odors at the WWTP, as well as addressing capacity, aging infrastructure, and WWTP operability concerns for sludge processes. The three sources of odor were the aerobic digesters, sludge storage lagoon, and sludge holding/dewatering facilities.
 - Phase II improvements related to odor control included primary clarifier launder covers and scrubbing odors from these launders. This phase also included improvements to the secondary clarifier mechanisms due to aging infrastructure.
 - Phase III improvements related to odor control and treatment capacity. Phase III included moving the compost operation offsite and construction of a third primary clarifier which would also include launder covers and scrubbing for odor control.
 - Phase IV improvements included construction of a fourth secondary clarifier to increase capacity in response to growth.

Progress towards goals outlined in 2002 City Council Presentation

- Design of Phase I improvements included pilot testing of belt press technology for sludge dewatering, and pilot testing of composting for both primary and secondary sludges.
- Construction of Phase I improvements was completed in February 2005.

Recent Challenges

- Regulatory changes imposed by NDEQ with our NPDES permit renewal, dated October 1, 2003, resulted in the need to construct the UV disinfection facilities. These facilities were required to be under contract for construction by October 1, 2005 and are required to be fully operational by October 1, 2006.
- Significant increases in wastewater flow and loading from Swift created challenges for liquid and sludge handling/treatment.

City's Response to Challenges

- In spite of significant loading increases, the WWTP has remained in compliance with its NPDES permit limits.
- Consulted with Swift regarding planned improvements to their anaerobic sludge lagoon to assess impacts to our WWTP operations.
- The composting process was modified to adapt to increased sludge production and changing balance of primary and secondary sludges.
- Scope of Services were written for Wastewater Collection and Facility Plan Updates
 - Entered into Agreement with CH2M HILL at end of October, 2005
 - Kickoff workshop was held at the end of October, 2005
 - Project includes accelerated study of short- and long-term sludge treatment/handling methods
 - Following workshop in January 2006, immediately implemented short-term sludge treatment/handling/disposal methods.

Attachment 1 – “Fast Facts”



Wastewater Treatment Plant (WWTP)

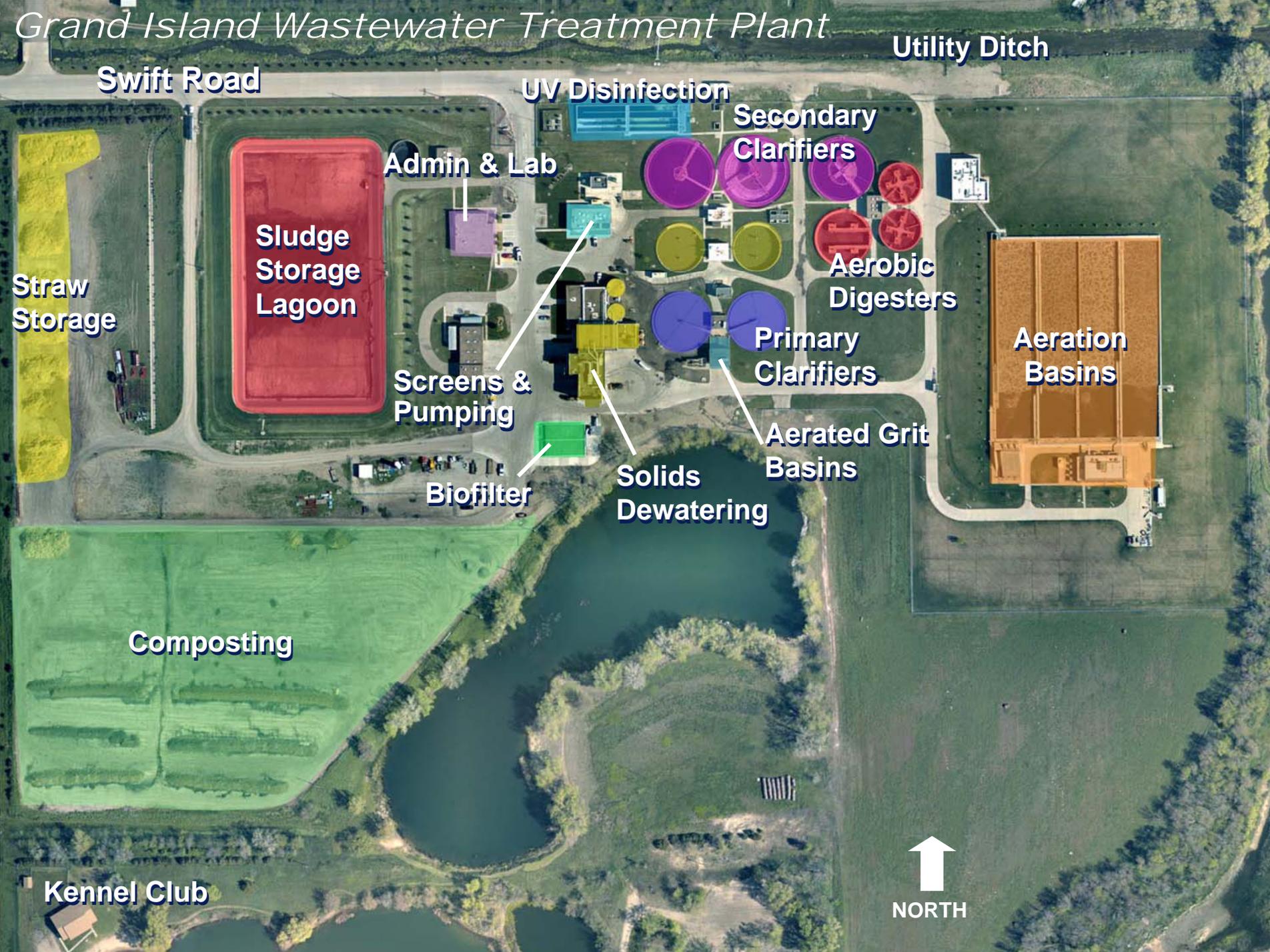
Fast Facts

- One wastewater treatment facility serves the entire community.
- Grand Island's wastewater facility is operational 24/7 and 365 days a year, with down times just for maintenance or special cleaning of individual plant processes.
- There are 27 full-time staff which operate and manage the facility.
- The city maintains over 215 miles of sewer collection pipelines and 15 lift stations (which pump sewage to the treatment facility).
- About 12 million gallons of sewage a day is treated.
- Sewage collected includes not only human waste, but also food waste, used wash-water, and industrial, food-process and agricultural wash-waste.
- 60 percent of the facility's sewage comes from our top ten customers.
- Approximately 10 separate treatment /cleaning steps are taken before wastewater is discharged. All environmental and health standards are met in achieving these steps. One of the process steps is odor control. Odors at the wastewater treatment plant are controlled by:
 - Preventing odors from forming by optimizing treatment processes.
 - Reducing odors by adding chemicals such as ferric chloride or oxygen.
 - Capturing odors by enclosing plant treatment processes.
 - Scrubbing or treating odorous air with equipment such as biofilters.
- The City has owned and operated a WWTP since the early 1900's. The current facility was constructed in 1964, with upgrades in 1980 and 1995. The Grand Island WWTP is now undertaking a two-phase facility improvement initiative in order to:
 - Improve capacity for treating waste.
 - Comply with new upcoming environmental regulations.
 - Improve odor control.

These initiatives began in 2003. Several parts of the initiative are now complete, but more remains to be done as the plan unfolds through 2006 and beyond.

Attachment 2 – WWTP Schematic

Grand Island Wastewater Treatment Plant



Utility Ditch

Swift Road

UV Disinfection

Secondary Clarifiers

Sludge Storage Lagoon

Admin & Lab

Aerobic Digesters

Straw Storage

Aeration Basins

Screens & Pumping

Primary Clarifiers

Solids Dewatering

Aerated Grit Basins

Biofilter

Composting

Kennel Club



NORTH

Wastewater Treatment Process Flow Diagram

Grand Island Wastewater Treatment

