Climate Protection and Energy Efficiency Committee

A special meeting of the CPEEC was called to order at 4:05 P.M., on June 7, 2016, at the Alton Wastewater Treatment Plant, 19 Chessen Lane, Alton

Members present: Chairman Wayne Politsch, Laura Asher, Zeke Jabusch, Alderman David Boulds, and Jeff Dale

Members absent: Randy Hausmann and Adam Peipert

Staff / Guests: Matt Asselmeier and Steve Gibson

There were no changes to the agenda.

Steve Gibson, Operations Supervisor at the Wastewater Treatment Plant, gave the Committee a tour of the plant. He answered everyone's questions and discussed his plans for energy projects at the facility. The Committee expressed a desire to work more closely with Steve in areas of solar panels and other environmentally friendly programs. Steve provided the Committee with the attached description and overview of the plant.

Chairman Politsch presented information on the Madison County Energy Efficiency Loan Program. Matt Asselmeier reported that the City is exploring the loan for HVAC upgrades at the Public Works Building.

There were no comments from the public.

The meeting adjourned at 5:05 P.M.

Respectfully submitted,

Matthew H. Asselmeier, MPA, AICP

Enc.

CITY OF ALTON WASTEWATER TREATMENT PLANT

Historical Data

The original Alton Sewage Treatment Plant was placed in operation in 1964, consisting of two Parshall flow measurement flumes, a comminutor, an aerated grit chamber, two 60′ diameter primary clarifiers, two anaerobic digesters, sludge lagoons (which have been deleted) and an effluent pumping station. The south interceptor pumping station, the force main from that station to the plant, and the outfall sewer from the plant to the Mississippi River were constructed at the same time.

There have been improvement projects at the WWT Plant and at the south interceptor pumping station. During the mid-1970's, the aeration system, including aeration tanks, blowers, secondary clarifiers and then two vacuum filters were installed. It went on-line in 1978.

The south interceptor pumping station was updated in 1993. The pump station had three new pumps, with VFD's installed. Along with the update, a new bar screen, stand-by emergency generator and an additional 18" pipeline ran from the pump station to the plant for additional pumping capacity.

The pretreatment area was updated in 2000. A new brick building was constructed. It houses two new fine screens and two new pista grit removal units.

Finally, in 2002 the anaerobic digestion and the dewatering equipment were updated. The anaerobic digesters got updated with a better mixing system, new pumps, new heat exchanger and two new Dystor membrane covers were installed. The old dewatering equipment and vacuum filters were also removed and updated with two new Andritz two meter presses along with new sludge pumping and an updated auger type conveying system for sludge removal.

Sewage Treatment

Sewage treatment is one part in the chain that we call the "cycle of water". The story begins at the source – the lakes and streams from which we take our water supply – in our case, the Mississippi River. Raw water is processed through the water filtration plant for purification. The purified water enters your home through pipes to your faucets and

leaves your home through waste pipes to the sewer main in your street. These wastes flow through the system of sewers to the Alton Wastewater Treatment Plant, where objectionable constituents are removed. The wastewater treated in the sewage treatment plant is discharged back to the Mississippi River where it flows on and repeats the cycle endlessly, by either being directly used from the river by others, or by being evaporated and falling to the earth as rain.

Sewage treatment thus becomes more than the mere disposal of wastes, it is an important part in the conservation of water, the control of stream pollution and the protection of public health.

The Housecleaning Processes of Nature Clean Up Sewage

Nature takes care of its own wastes. In nature, dead organic material is of no use. It is set upon by microscopic organisms, broken down through biochemical reactions and made into food for new life. When wastes are discharged into water, as long as oxygen is present, small organisms feed on these wastes and consume oxygen, turning out odorless and stable end products. Sewage treatment accelerates the processes of nature. In a treatment plant, sewage is acted upon by small organisms such as algae and bacteria and the wastes are turned into stable, odorless compounds.

Summary of what takes place in a sewage treatment plant: first, sewage is screened to remove coarse impurities; solids are settled out; organic wastes acted upon by the organisms such as bacteria in the aeration tanks; and the solids settled out of the sewage are broken down by bacteria in heated and unheated controlled digesters.

The Alton Wastewater Treatment Process

The following information describes the sewage treatment process at the Alton plant as illustrated on the attached schematic.

Sewage enters the plant through two large interceptor sewers. Wastewater from parts of Alton and several outlying communities enters through a 42" sewer. From Alton, sewage passes through a 36" sewer and then is pumped to the plant. There are approximately 200 miles of both sanitary and combined sewer lines in the City of Alton.

BAR SCREENS on each interceptor sewer block the passage of large material such as sticks, rags, metal, bricks and balls that could clog or damage treatment equipment.

Objects that are screened are either mechanically or manually removed and then disposed of in a sanitary landfill.

The flow passes through the interceptors where it is individually measured with the aid of special structures called Parshall Flumes. The measured flow then converges and is channeled to the new pretreatment building.

Before 2000, the two old comminutors (essentially two huge garbage grinders) shred and ground up the solids remaining in the waste water into smaller particles, where it then went through an aerated grit chamber.

The two old comminutors were taken out of service along with the old aerated grit chamber. However, the structures were left standing and are used as an emergency by-pass of the new pretreatment building, if ever needed.

The new pretreatment building contains two Parkson aqua guard fine screens, also equipped with screening washers and roto-press compactors for compacting the debris for less volume. The roto press units compress the debris into a log type object where it is then discharged into two yard dumpsters. It is then picked up by our waste hauler where it is properly disposed of in a landfill.

The fine screens remove larger objects and debris down to 3/8" in size. During normal operation, one fine screen and one pista grit unit is in operation. Float controls and timers are used to vary cycle times and rates of operation. Normally, one fine screen and one pista grit unit are in service, however, if flows increase above 12 mgd, then both sides can operate together as well as the pista grit units. It has also been equipped with a PLC control unit, where it can control various gate functions of opening and closing the gates.

The flow then passes through our two pista grit units. The hydraulics force the grit to the chamber floor. The grit moves to the bottom, towards the center. The flow moves circumferentially and downward to the bottom, still moving in a circle towards the outside. The settled solids move toward the center where they pick up velocity because the area of flow is decreasing. When the solids approach the middle, the rotating propeller increases velocity to the point that the lighter organics are lifted and returned to the flow, passing through the pista grit chamber. The grit moves inward and drops into the center storage hopper.

The pista-grit hopper is sized to hold up to 24 hours accumulation. The grit is pumped through the turbo pump. It is controlled by adjustable timers. We try to operate every couple of hours to prevent grit accumulation in the storage chamber. The pump cycles, the discharge pipe runs into a concentrator and then into the conveyor hopper, where the grit settles out, allowing water to recycle back to the chamber. The grit can then be augured into a dumpster. It is also hauled off by our waste hauler and properly disposed of in a landfill.

After passing through the pista grit units, the sewage is divided equally between two primary clarifiers, where a large portion of the organic matter is allowed to settle. Approximately 60% of the suspended solids settle to the bottom of the primary clarifiers and become PRIMARY SLUDGE. Grease, scum and other floating materials are collected on the surface of the clarifiers and conveyed to a holding tank. Both the primary sludge and floating debris are pumped to the anaerobic digesters.

The ANAEROBIC DIGESTERS are two units, each 40′ in diameter, and 30′ deep. The contents of the first digester, where the solids from the primary clarifiers are received, is heated to 95° Fahrenheit and mixed continuously with a new Vaughn chopper pump. New mixing piping and nozzles have also been added for better mixing. It also has the capability to be controlled by timers and can be adjusted to various times to alternate mixing. In this controlled environment, natural bacteria are cultivated to reduce and stabilize the organic solids. After 30-60 days of the bacterial action and subsequent settling of the solids in the second anaerobic digester, the DIGESTED SLUDGE is pumped to the solids dewatering facilities. A description of those facilities will be given later.

From the primary clarifiers, the liquid sewage (still containing a large quantity of organic waste) flows to the Activated Sludge Process. The liquid sewage is mixed with the sludge from the final clarifiers and aerated in the AERATION (CONTACT) TANKS. These tanks are 15′ deep, 30′ wide and 192′ long. Air is blown through the sewage/sludge mixture from the diffusers to maintain desirable living conditions for the countless billions of microorganisms inhabiting the mixture. The solid material present in the mixture consists of sewage sludge that is teeming with microscopic life, and is known as activated sludge, from which the process derives its name. These microorganisms feed on the pollutional

materials in the sewage and thus reduce the colloidal and dissolved materials to solids that will settle in the final clarifiers. As long as the proper environment is provided, these microorganisms will do an efficient job of removing the pollutional materials from the sewage.

The sewage/sludge mixture is discharged from the aeration (contact) tanks to the FINAL CLARIFIERS where the biological solids are allowed to settle. The settled solids (activated sludge) are collected with mechanical scrapers and then pumped back to the reaeration (stabilization) tanks as RETURN ACTIVATED SLUDGE.

In the REAERATION (STABILIZATION) TANKS, the settled activated sludge is reaerated separately to rejuvenate the organisms. After being rejuvenated, the organisms flow back into the aeration (contact) tanks as seeding material for the new sewage received. More activated sludge is produced than is required for seeding material. This excess is removed from the system as WASTE ACTIVATED SLUDGE.

The waste activated sludge is removed to the AEROBIC DIGESTERS. The waste sludge is aerated for several days to stabilize the organic solids. Aerobic digesters are similar in purpose to the anaerobic digesters without the need for heat. The aerobic digestion process is designed to stabilize activated sludge without the more complex operational control necessary for the anaerobic digestion process. The stabilized sludge is pumped to the press building.

The clear water overflowing the final clarifiers is disinfected with chlorine, May through October, before being discharged from the plant. The water either flows freely during normal conditions or is pumped during high river stages. Either way, the effluent water travels through approximately .9 mile of pipe to the Mississippi River.

A portion of the effluent water is diverted before it leaves the plant, to a NON-POTABLE WATER PUMPING AND DISTRIBUTION SYSTEM. Although the effluent water cannot be consumed, it is safe and economical to use as pump seal water, for equipment clean-up and chemical mixing and other similar uses.

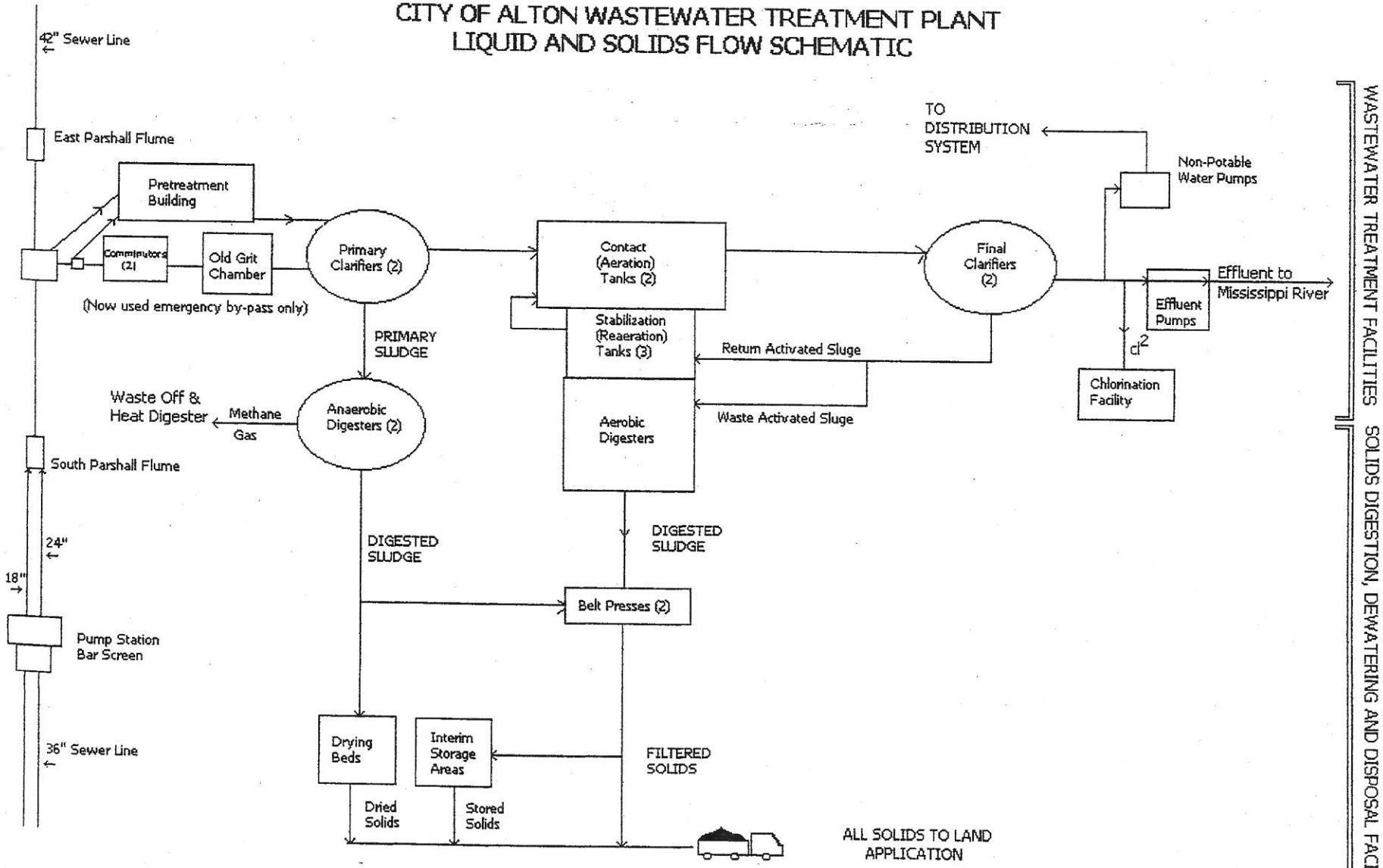
The anaerobically digested sludge and aerobically digested sludge are further dewatered to make possible and economize their final disposal. The anaerobically digested sludge may be dewatered by drying beds or removed by the belt presses.

DRYING BEDS are shallow concrete beds with strips of sand for the water to filter through, retaining solids on top. An underdrain system carries the water back to the activated sludge system for further treatment. Sixteen drying beds are available, each 19′ wide, 103′ long and approximately 2½′ deep. The solids remain in the drying bed and are subject to the weather for drying to a state suitable for truck hauling. We also use the drying beds as an additional storage area for filtered sludge.

The aerobically digested sludge can be routed to the belt presses. Belt presses remove the solids from the aerobically digested sludge by adding polymer and squeezing out the sludge. The solids removed by the belt presses are ready for final disposal or may be diverted temporarily to the INTERIM STORAGE AREA if conditions are not yet acceptable at the disposal site. The interim storage area is simply a portion of the drying beds. We have two additional storage basins for working and storing the sludge.

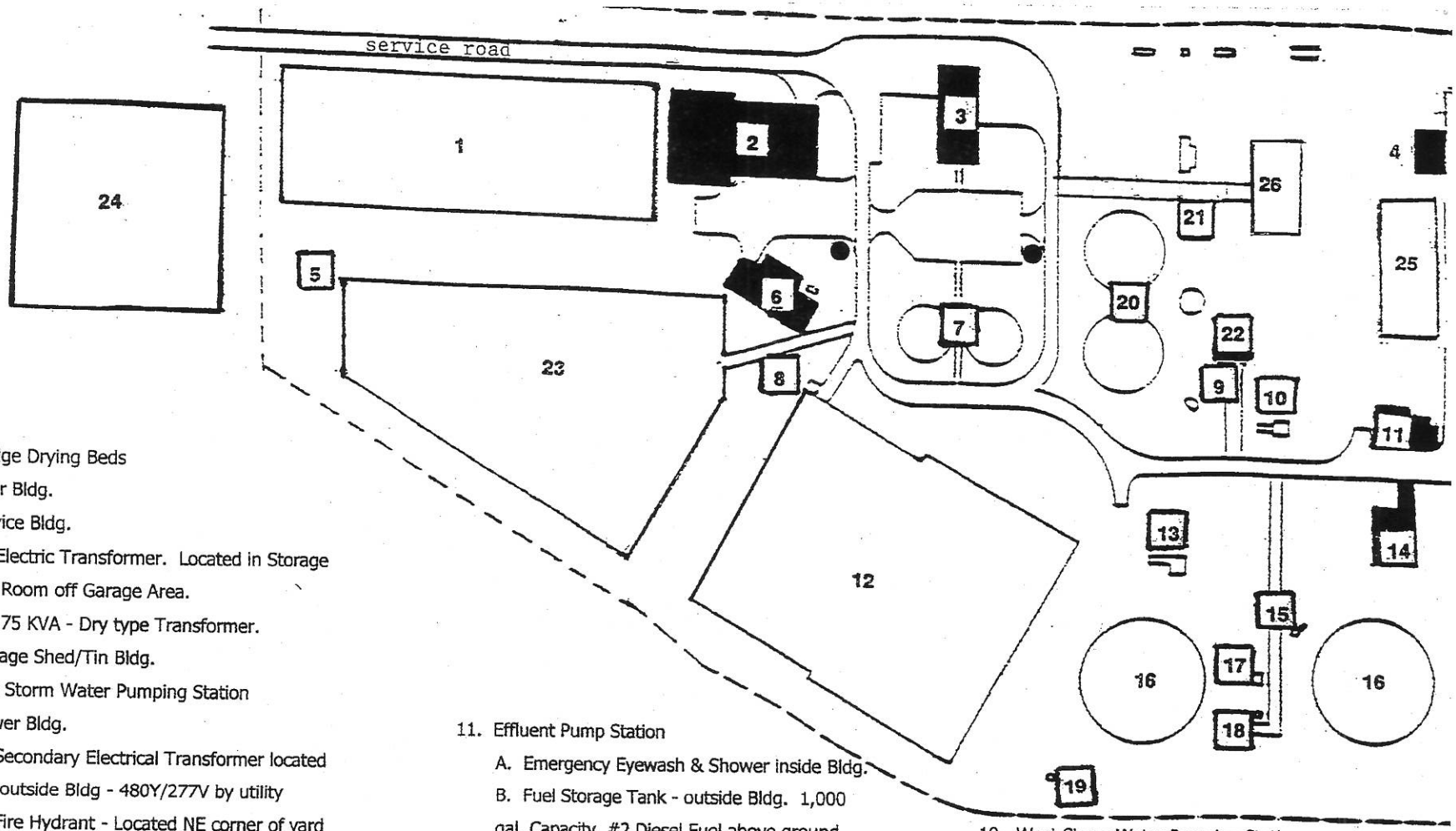
All sludge ultimately is disposed of primarily by application to farm ground to aid as soil supplement. Some sludge may be landfilled if weather conditions or crops temporarily prevent its agricultural use.

CITY OF ALTON WASTEWATER TREATMENT PLANT
LIQUID AND SOLIDS FLOW SCHEMATIC



MAP NOT TO SCALE

Revised February 2004



1. Sludge Drying Beds
2. Filter Bldg.
3. Service Bldg.
   A. Electric Transformer. Located in Storage Room off Garage Area.
      75 KVA - Dry type Transformer.
4. Storage Shed/Tin Bldg.
5. East Storm Water Pumping Station
6. Blower Bldg.
   A. Secondary Electrical Transformer located outside Bldg - 480Y/277V by utility
   ● B. Fire Hydrant - Located NE corner of yard
7. Digester Bldg.
   A. 2 Anaerobic Digesters w/ Membrane covers, "methane gas" storage.
   ● B. Fire Hydrant - Located NE corner of yard
8. Aerobic Sludge Pumping Station
9. Main Diversion Structure
10. Spraywater Pumping Station
11. Effluent Pump Station
    A. Emergency Eyewash & Shower inside Bldg.
    B. Fuel Storage Tank - outside Bldg. 1,000 gal. Capacity, #2 Diesel Fuel above ground.
12. Aeration Tanks
13. Air Lift Structure
14. Chlorine Bldg. Refer to sep. Dwg. Of Floor Plan & details
15. Scum Pumping Station
16. Secondary Clarifiers
17. Diversion Structure
18. Dewatering Structure
19. West Storm Water Pumping Station
20. Primary Bldg.
21. Grit Removal Tank - old
22. Outdoor Equipment Bldg
23. Sludge Storage Area 1
24. Sludge Storage Area 2
25. New Vehicle Storage Bldg.
26. Pretreatment Bldg.
27. Levee Structure, Eff. Pipe.
28. Eff. Pipe Discharge Structure at Mississippi River

CITY OF ALTON - WASTEWATER TREATMENT PLANT
#19 Chessen Lane, Alton, IL 62002
(618) 463-3558

AREA SITE PLAN
Revised January 2004