Report on Detail Plans and Specifications
Village of Mt. Gilead
Wastewater Treatment Plant Improvements
PTI # 90-834

The detail plans and specifications for the Village of Mt. Gilead WWTP Improvements project were received by Ohio EPA on March 1, July 21, and August 23, 2005. These plans and specifications were prepared by Poggemeyer Design Group of Bowling Green, Ohio. The proposed improvements are under consideration for a Water Pollution Control Loan Fund (WPCLF) loan.

EXISTING CONDITIONS

The Village of Mt. Gilead Wastewater Treatment Plant located in Morrow County (*see Figures 1 and 2)* is a conventional activated sludge facility followed by secondary clarification and disinfection. Although the plant seems to be adequately maintained, there are tanks that date back to the 1950s (which would typically be beyond the serviceable life) and the latest major update to the tanks was roughly 20 years ago. The plant is fed by an existing network of gravity sewers and due to the age of the sewers, inflow and infiltration occurs during significant precipitation events. A complete sanitary sewer evaluation study was completed in 1977. Since that time, an extensive manhole rehab/replacement as well as relining/replacement of sanitary lines has been completed. Presently, the Village is removing two siphons and replacing a line within the fair grounds in an attempt to eliminate the low lying flooding that often occurs after rain events to the north and east of the WWTP. This construction is being funded by Issue II monies and future repairs of existing manholes will be done in phases with Issue II monies if funding is available. Otherwise, other funding options will be explored as this is a significant part of their ongoing plan to address their I/I issues. Upon completion of the I/I improvements, the Village should realize a reduced average flow which has been taken into account with the design flow.

The plant is operating as designed except for the fact that the comminutor is out of service and the center activated sludge retention basin is being used for storing mixed liquor. The existing plant is designed for an average flow of 474,000 gallons per day, however, the plant is currently receiving an average of 613,000 gallons per day. The proposed design flow for the new plant will be 820,000 gpd and is almost twice the present design flow yet is reasonable given the 20 year projection as well as the current flows.

ANTIDEGRADATION REVIEW

This project is for a construction loan that will allow for an upgraded WWTP which will facilitate an increase in plant capacity. Although the plant is expanding, the proposed design will meet Ohio EPA's BADCT criteria and in some cases exceed those criteria. Ohio EPA has concluded (based on modeling) that the upgrade will actually improve the minimum average D.O. within the receiving Stream at the expanded design flow

and proposed effluent limits, due to the lower ammonia loadings and higher effluent D.O. concentrations. The expanded plant will also reduce instream ammonia concentrations due to lower ammonia effluent limits. This project will result in increased loading rates of $CBOD_5$ and Total Suspended Solids to waters of the State of Ohio . However, lowering of water quality as a result of this project will not exceed applicable water quality standards. Additionally, construction will not take place near or across any stream bed, and the construction contract includes provisions for erosion and sediment control.

The NPDES Permit Modification for this antidegradation project was public noticed on May 10, 2005. A public hearing was not requested nor were any comments received.

PROPOSED IMPROVEMENTS

The Village of Mt. Gilead proposes to construct a new pump station, replace the existing five raw sewage pumps with three horizontal end suction pumps (1,100 gpm variable speed drive pumps), a new screen and grit removal system with a peak flow of 3.2 mgd, an orbal oxidation ditch, a final clarifier (42' in diameter) and splitter box, UV disinfection/post aeration, RAS/WAS pump replacement (total of 3) and sludge transfer pump replacement (total of 2), one 428,000 gallon aerobic digester, conversion of the anaerobic digester to aerobic digestion (202,000 gallons), digester blower building for new digesters including three positive displacement blowers, standby power generator, administrative building improvements and a SCADA system. The Septage Receiving Facility improvements include one 10,000 gallon septage receiving tank, one automatic invoicing system, one keypad access system, one 800 cfm positive displacement blower (package), one fine bubble diffused aeration for sludge tank, one 428,000 gallon sludge storage tank, one hydraulic mixer (Rotomix) for sludge storage tank and chemical feed equipment (*see Attachment 1 for Proposed Design Criteria*).

The plant is proposed to be expanded from 0.474 mgd to 0.820 mgd. The entire design flow will be treated to a BADCT level. The monthly average $CBOD_5$ concentration is 8mg/l which is more stringent than BADCT. Although the plant is expanding the ammonia summer loading, 30-day and 7-day decreased by 2.3 kg/d and 3.3 kg/d; and the winter reduction 30-day and 7-day is 5.08 kg/d and 9.07 kg/d. With the increase in D.O. in the effluent from 5mg/l to 6mg/l, there is an actual net gain in oxygen demand in the discharge in the new plant versus the old plant. The new plant will also prevent the overflows of untreated effluent which had occurred in the past. Additional future infiltration, inflow reduction and sewer work has been planned as previously discussed.

Septage Receiving Facility

During weekdays only, the Septage Receiving Station will receive 10,000 gallons/day or 50,000 gallons/week at 1.5% solids which equates to 25,000 gallons/week at 3% solids. The septage screen unit will have a flow meter to record the septage flow and a keypad PIN security system to identify and login the septage haulers. After stabilization, screening

and grit removal, the septage will be treated in the oxidation ditch and the solids will be removed in the final clarifiers. The waste solids will then be transferred to the sludge holding tanks. The waste solids will be thickened to 3% solids in the gravity sludge thickener prior to aerated storage. There will be one aerobic digester dedicated to the septage receiving storage which will provide 428,000 gallons of storage out of a total of roughly 1.03 million gallons of storage. The storage tank (62 feet in diameter by 18.3 feet side water depth) will be constructed to meet the total sludge storage requirements for 120 days.

These improvements are being made as part of Mt. Gilead's plan to alleviate the plant's effluent permit limit violations.

DESIGN DATA

Basis of Design	Design	Current Conditions
Design Flow	*0.820 mgd*	*0.613 mgd*
Peak Flow	*3.18 mgd*	*2.5 mgd*
BOD Loading	*2,162 lbs/day*	*1,663 lbs/day*
SS Loading	*3,358 lbs/day*	*2,584 lbs/day*
Design Population	*4,336*	*6,310*

NPDES PERMIT LIMITS

Proposed NPDES Permit Limits for 0.820 mgd (Average Daily Flow)				
Parameter	Concentration (mg/l)		Loading (kg/day)	
	Summer	Winter	Summer	Winter
$CBOD_5$ (mg/l)	*8*	*10*	*54.7*	*68*
Suspended Solids (mg/l)	*12*	*12*	*82*	*82*
Ammonia Nitrogen (NH_3)	*1.0*	*3.0*	*6.8*	*20.7*
Fecal Coliform #/100ml	*1,000*	*2,000*	—	—
pH, Standard Units	*6.5 < pH < 9.0*			
Dissolved Oxygen	*6.0mg/l*			
Oil and Grease	*Not to Exceed 10 mg/l*			
Design Flow	*0.820 mgd*			

CONSTRUCTION COST

The total estimated construction cost for the WWTP improvements is $5,477,825. The loan request covers both the proposed improvements of the WWTP and the proposed Septage Receiving Facility construction at a cost of $566,344.

CONCLUSION

The detail plans and specifications for the Village of Mt. Gilead Waste Water Treatment Plan Improvements appear to be acceptable and in compliance with all applicable rules and regulations. It is recommended that these documents be approved, and that a Permit-to-Install be issued. This is an approval of technical aspects of the plans and specifications for the sanitary sewer works, and does not imply an approval for a WPCLF loan.

Reviewed By:

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Approved By:

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Attachment 1 - Proposed Design Criteria

(Wastewater Treatment Plant Improvements PTI # 90-834)

Pump Station (replaces existing)	
Number of **Pumps**	Three
Type	Suction Lift - Centrifugal
Capacity (gpm)	1,500
TDH (feet)	44.2
Speed (RPM)	1,030
Motor HP	30
Number of Wet Wells	One
Surface Area	8 feet x 21 feet
Side Water Depth	5.5 feet
Capacity	7,225 gallons
Septage Receiving Tank (new)	
Capacity	10,000 gallons
Bar Screens (replaces existing)	
Mechanical	One
Type	Fixed Bar Drum Screen
Drive Unit	460 volts, 3 phase, 2 HP
Manual	One
Size	3 feet
Grit Tank (replaces existing)	
Number of **Tanks**	One
Surface Area Dimensions	14 feet x 14 feet = 196 sf
Side Water Depth	12 feet -3 inches
Flow Velocity	1 fps
Number of **Blowers**	One
Type	Diffused Air
Capacity	80 cfm @ 6 psi
Number of **Pumps**	One
Type	Vortex Centrifugal
Capacity (each)	150 gpm
TDH (feet)	16
Speed	1,200 RPM
Motor HP	5.0

Extended Aeration (replaces existing)

Number of **Tanks**	One Tank with Two Channels
Surface Area Dimensions (*total for entire tank*)	93 feet x 159 feet = 12,194 sf
Side Water Depth	14.5 ft
Aeration/Mixing	Mechanical Surface
Capacity	200 lb oxygen/hr
Oxygen Supplied:	1.17 (lb oxygen/lb BOD_5)
	4.6 (lb oxygen/lb TKN)
MLSS (design)	4,532
F/M ration	0.05 - 0.20
Organic Loading (lb BOD_5 /1000 cf)	16
RAS flow (% at ADDF)	100
WAS flow (% at ADDF)	1.15

Settling Tanks (new and in addition to two existing settling tanks)

Number of **Tanks**	One
Surface Area Dimensions	42 feet
Side Water Depth	12 feet
Weir Length	118 feet
Surface Overflow Rate	986 gpd/sf @PHF
Weir Overflow Rate	11,552 gpd/ft @PHF

Sludge Collection (replaces existing)

Type	Suction Header
Size	6 inches
Sludge **Pumps**	Four (Septage Receiving = 1)
Type	Centrifugal
Capacity	570 gpm
TDH (feet)	25
Speed	1,200 RPM
Motor HP	20
Sludge **Skimmer** Type	Surface
Size	6 inches

Sludge Thickening (new)

Number of Thickeners	One
Type	Gravity
Surface Area Dimensions	35 feet diameter = 962 sf
Side Water Depth	8 feet
Solid Surface Loading	3.3 lb / sf
Thickened Sludge Concentration	4%

Sludge Stabilization (new and in addition to one existing sludge stabilization tank)

Number of **Tanks**	Two
Surface Area Dimensions	62 feet diameter = 3,020 sf
Side Water Depth	18.3 feet
Number of **Aerators**	60 diffusers
Type of Aerators	EPDM Fine Bubble
Oxygen Supplied	800 cfm @ 10.5 psi
Others	15 scfm/1,000 cf

(Note: Septage Receiving has one dedicated sludge stabilization system that will be new)

UV Channel, Equipment (new)

Number of **Channels**	One
Type	Horizontal
Capacity	3.2 mgd
Surface Area Dimensions	1.34 feet x 12 feet
Side Water Depth	2.0 feet
Number of Modules per Channel	6
Number of **Lamps**	6
UV Transmittance	254 nanometers @ 65%