

# **Watershed Improvement Review Board**

## **Final Report**

**Project Name:** Viking Lake Watershed

**Project Sponsor:** Southwest Regional Water District (SWRWD)  
formerly Page 1 Regional Water District

**Application Number:** 5040

**Date:** December 31, 2008

**Financial Accountability**

<b>Summary: Watershed Improvement Funds</b>			
<b>Grant Agreement Budget Line Item</b>	<b>Total Funds Approved (\$)</b>	<b>Total Funds Expended (\$)</b>	<b>Available Funds (\$)</b>
Septic System Renovation	58,500	55,575	2,925
Totals	58,500	55,575	2,925
Difference			2,925

**Summary: Total Project Funding**

<b>Funding Source</b>	<b>Cash</b>		<b>In-Kind Contributions</b>		<b>Total</b>	
	<b>Approved Application Budget (\$)</b>	<b>Actual (\$)</b>	<b>Approved Application Budget (\$)</b>	<b>Actual (\$)</b>	<b>Approved Application Budget (\$)</b>	<b>Actual (\$)</b>
WIRB	58,500	0	0	0	58,500	55,575
RD Grant	49,500	0	0	0	49,500	41,269
RD Loan	31,000	0	0	0	31,000	31,000
Totals					139,000	127,844

Watershed Improvement Fund contribution: Approved application budget:

\_\_42\_\_%

Actual:

\_\_43\_\_%

The WIRB funds were used solely for construction costs and the agreement was signed on 8/1/06. These funds were approved applications for both the loan and grant portions of the project prior to application to the WIRB for additional funding. Both the RD Grant and RD Loan was signed in 7/26/06 with the loan being for forty years. The sewer loan was paid in full on 9/14/07.

**Environmental Accountability**

The small housing development, commonly known as Viking Village, contained an unknown number of residential septic systems which were not functioning in accordance with Iowa Code. Two open discharges were located and it was assumed that others existed. During periods of normal to above-normal rainfall, grey water was observed to be flowing into one of the primary tributaries to Viking Lake, below the development. Water monitoring tests conducted substantiated concerns that bacterial and nutrient contamination was coming from the development.

The system itself involved installing new septic tanks at each residence with a filter in the effluent/discharge pipe at each house. The wastewater effluent from the

septic tanks is periodically dosed into buried sand filters serving as the secondary treatment for the system. The effluent dosing allows metered volumes of wastewater to enter the sand filters by recording hours the pump runs to ensure maximum system efficiency. The system was equipped with an alarm to notify system managers if there was a malfunction in the equipment. Clean water is then outletted into a tertiary treatment wetland, on private property, for an extra measure of protection. This water then drains into a wetland, which was renovated during the Viking Lake Water Quality Project, located on DNR park property. A small water and sediment control basin was installed to protect the filter area, system equipment, and inspection pipes from overland flows. A discharge/sampling well was also installed to monitor system performance and provide a collection point for analytical samples.

Downstream monitoring results conducted by water quality project staff prior to the installation of the unified waste treatment system recorded levels as high as 31,000 cfu/ml of e. Coli. Since the installation of the system, levels have dropped to 17.3, 420, and 220 in the past two years. Livestock issues also prevail within this subwatershed. Combined monitoring results indicate that approximately 25% of the bacteria load was coming from the housing development before the septic system renovations. Post construction the typical reduction from the development was less than 1%. A wetland was also constructed during the project directly below this development which has resulted in a further reduction of bacterial levels, from the entire tributary, by a total of 96%.

The entire system, unified waste treatment system and wetlands, is effectively addressing the bacterial load from this tributary and neither system could have been installed without the installation of the other. Without the WIRB funding, it would not have been possible to install the wetland, which undoubtedly would have been overwhelmed by the loads coming from the housing development.

The impact the WIRB funding has had on water quality conditions has been tremendous, not to mention the social impacts that have resulted. Several public and individual tours have been conducted, post construction, which have educated citizens as to the benefits derived from the project. Prior to the installation of this system, two residences had been vacated because the families could not afford the projected renovation costs. Since the installation all dwellings are occupied due to strong support from project partners who found a way to keep the monthly costs for renovations affordable.

### **Program Accountability**

The centralization of the Viking Village septic system has allowed the comprehensive Viking Lake Water Quality Project to eliminate the single remaining unresolved issue that plagued the lake. Funding to address this issue had been nearly impossible to acquire prior to the creation of the WIRB program. Other funding sources had been obtained, as mentioned previously, but the overall cost of the system renovation was too costly to make the project feasible.

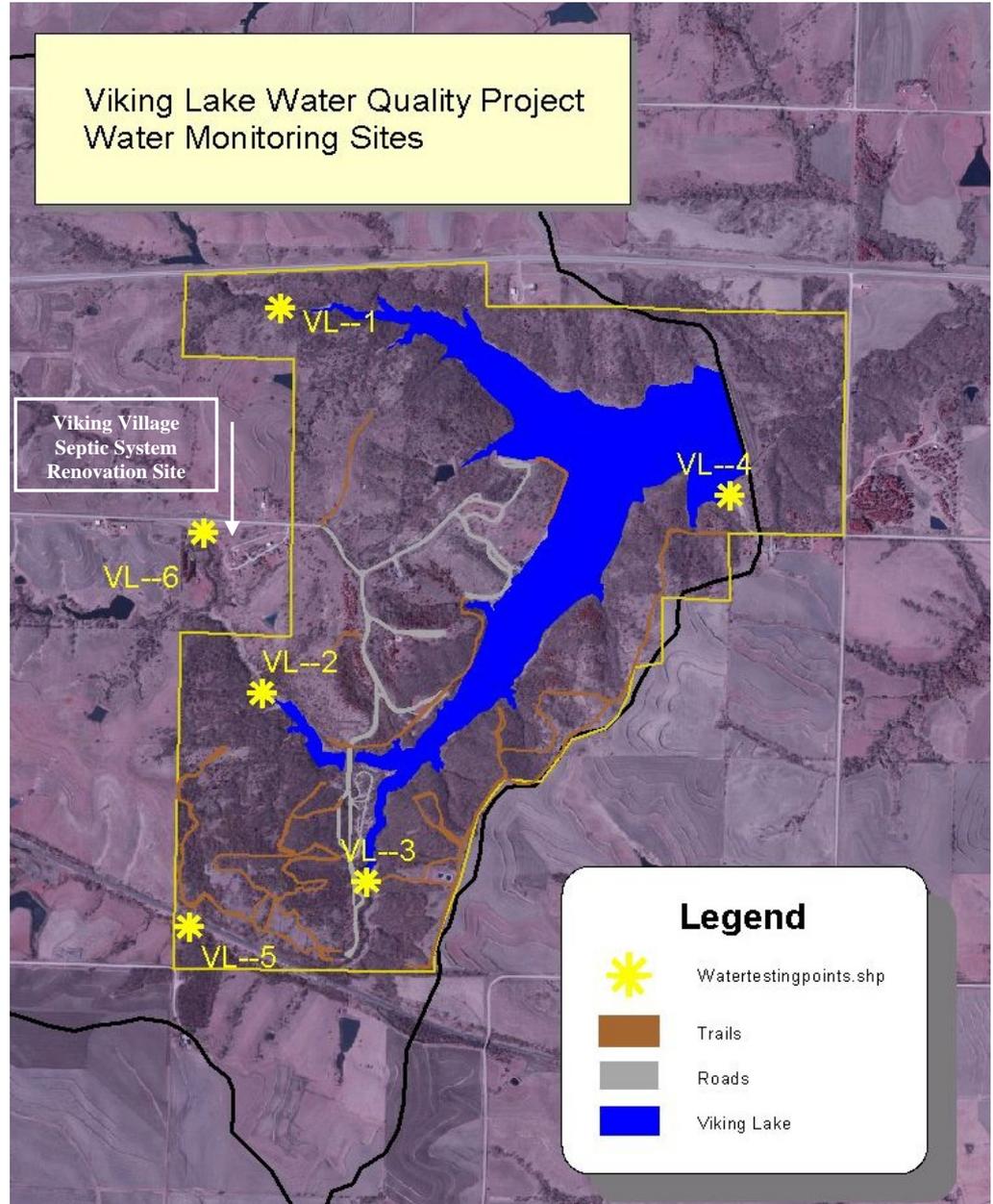
The principal challenge that project stakeholders were faced with was coming up with a viable option that would appease all entities. This is a very time consuming process to engineer, an alternative that was not only cost effective but also would resolve the problem. For other program managers pursuing similar projects, it would be recommended that plenty of lead time is given to develop these designs and discuss the project impacts with local stakeholders. Developing site specific system designs and securing all potential funding sources can take a couple years.



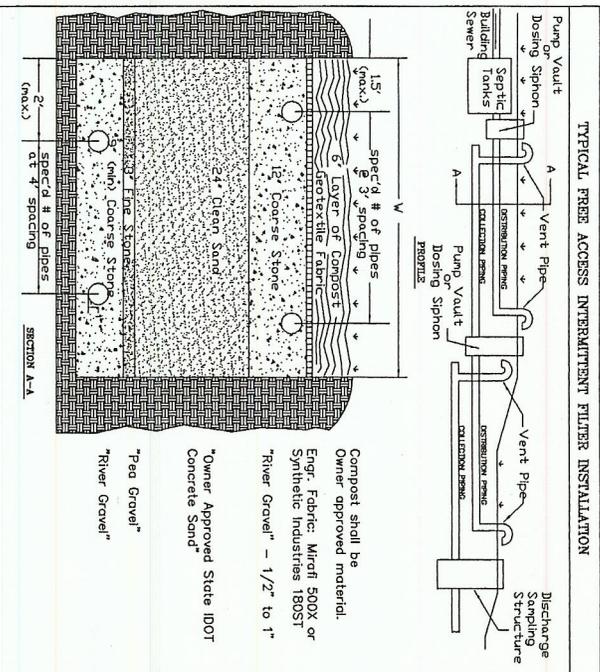
Example of algae-choked water suffering from nutrient enrichment



Only surviving preconstruction photo of pipe which outletted directly into lake tributary. Photo taken during no flow conditions.

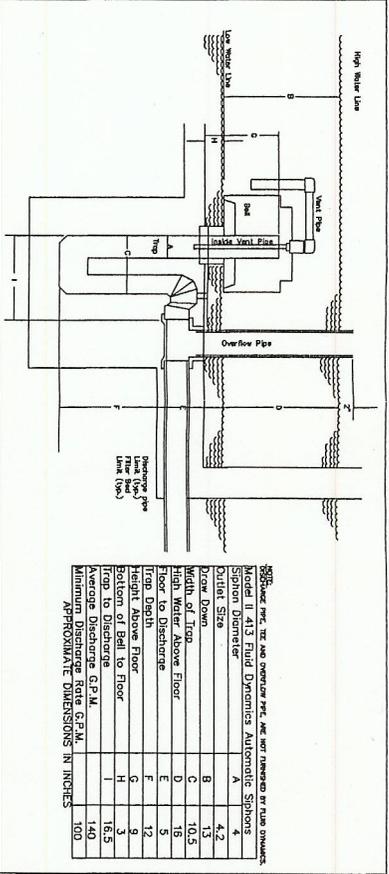


\* DETAILS SHOWN BELOW ARE NOT TO SCALE

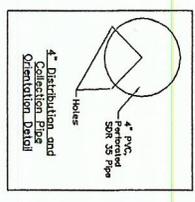


Compost shall be  
Owner approved material.  
Eng. Fabric: Mirofi 500X or  
Synthetic Industries 180ST  
"River Gravel" - 1/2" to 1"  
"Owner Approved State IDOT  
Concrete Sand"  
"Pea Gravel"  
"River Gravel"

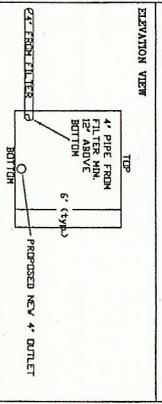
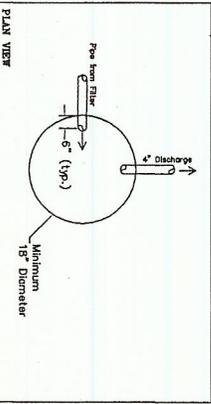
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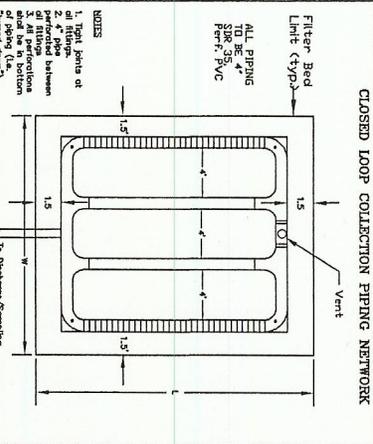
**PIPING NOTE**  
All piping in filter shall be SDR 35, 4", Perforated PVC. All other piping shall be Schedule 40 PVC.



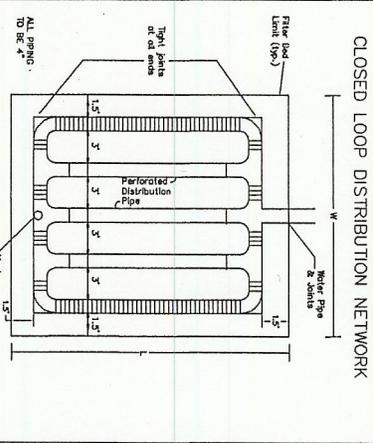
\* DETAILS SHOWN BELOW ARE NOT TO SCALE  
DISCHARGE SAMPLE STRUCTURE (TYP.)



CLOSED LOOP COLLECTION PIPING NETWORK



\* DETAILS SHOWN BELOW ARE NOT TO SCALE  
CLOSED LOOP DISTRIBUTION NETWORK



NOTE: Closed loop collection piping shall have a 1% slope on the piping and a 1% slope on the pipe from pipe shall be on the right end of the collection pipe system.  
NOTE: For W of 15 feet, use 4 pipes at 4' spacing.  
L For First Stage filters is 45 feet.  
L For Second Stage filters is 30 feet.

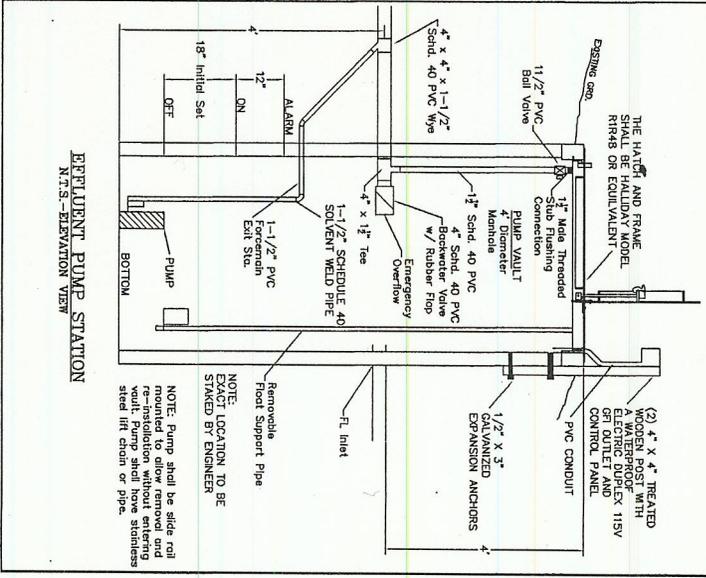
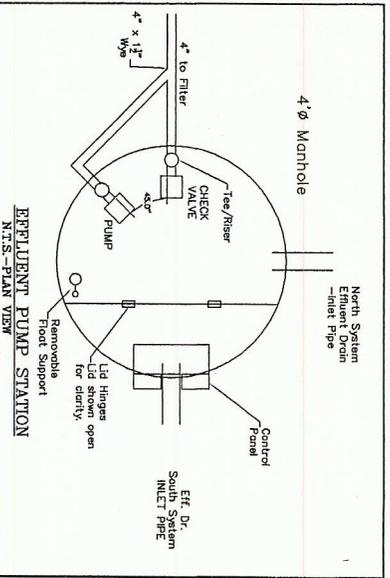
NOTE: FOR W OF 15 FEET, USE 5 PIPES AT 3' SPACING.  
FOR W OF 12 FEET, USE 4 PIPES AT 3' SPACING.  
L For First Stage filters is 45 feet.  
L For Second Stage filters is 30 feet.

**DETAILS**

THIS DRAWING	11-18-05
DESIGNED BY	JENNIFER HELVIN
PLOTTED ON	
REV. DATE	
REV. BY	
REV. DRAWN BY	
FIELD DATA	

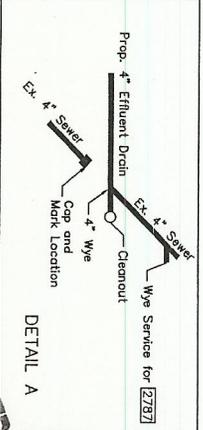
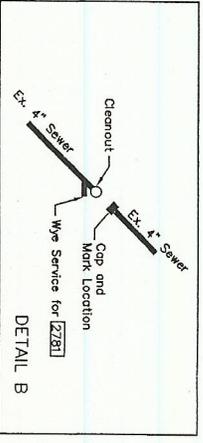
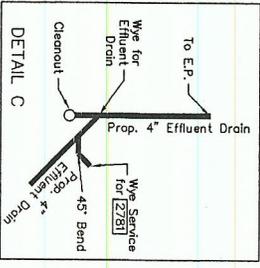
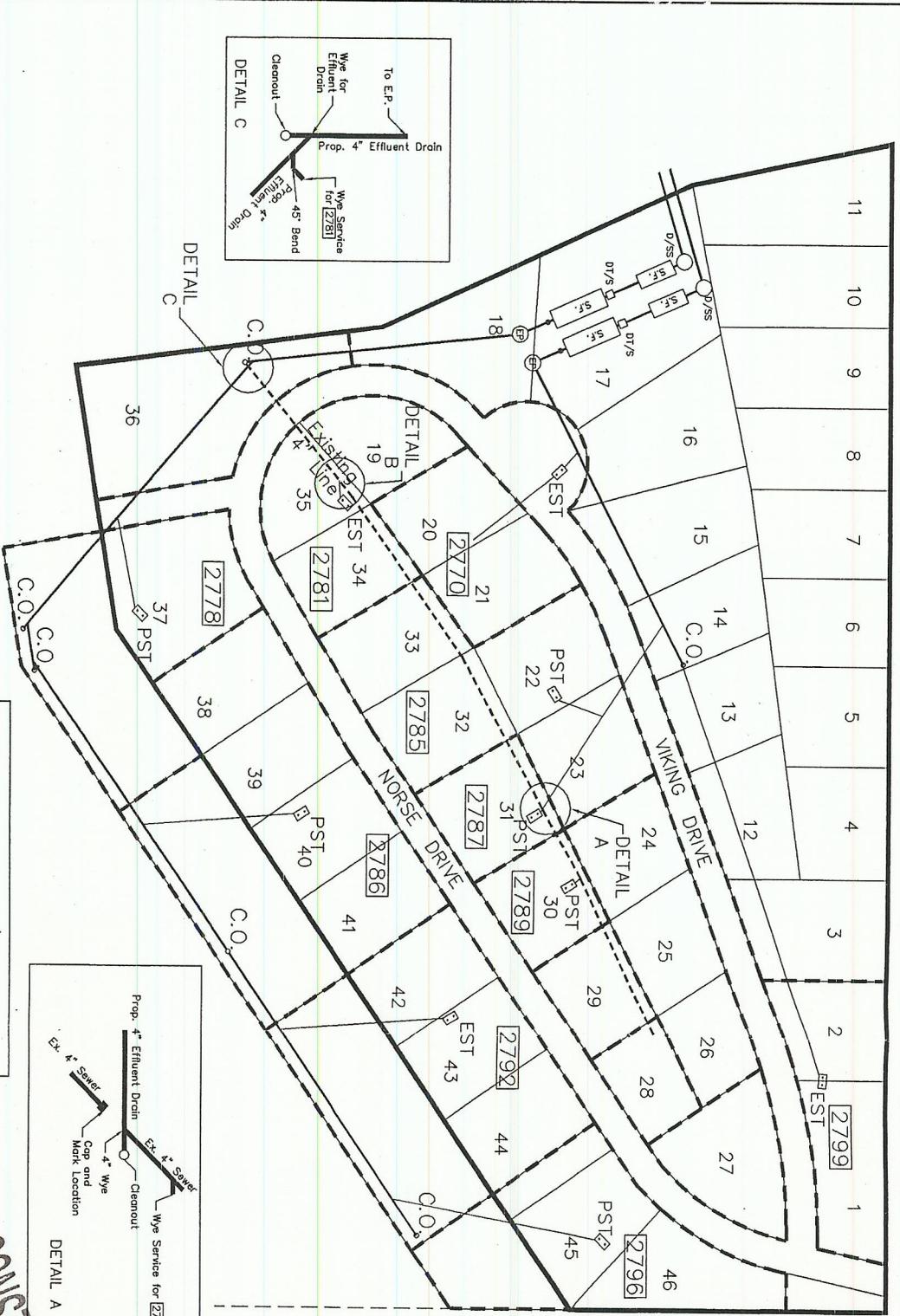
PROPERTY OWNER/DEVELOPER	PAGE 1
	RURAL WATER DISTRICT
DESIGNED BY	JENNIFER HELVIN
REV. DATE	
REV. BY	
REV. DRAWN BY	
FIELD DATA	

WARNER ENGINEERING ASSOCIATES INC.	ENGINEERING
102 S. Saunders Ave.	PH: (319) 385-4180
Mt. Pleasant, IA 52641	FAX: (319) 385-4401
PROJECT ENGINEER	PROJECT LAND SURVEYOR
JAMES I. WARNER	WILLIAM L. PERRY
IOVA LICENSE #37487	IOVA LICENSE #5145



SHEET 2 OF 2

COUNTY ROAD 230TH STREET



**Certification:**  
I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

James I. Varner, P.E. #7487  
My license renewal date is December 31, 20\_\_\_\_  
Pages or sheets covered by this seal: \_\_\_\_\_  
Sheets 1 and 2 of 2

Date

THIS DRAWING  
PLOTTED ON  
DATE 11-16-05  
APPROVED BY:

PROPERTY OWNER/DEVELOPER:  
PAGE 1  
RURAL WATER DISTRICT

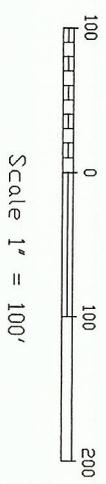
SITE PLAN  
VIKING VILLAGE  
WASTEWATER SYSTEMS

WARNER ENGINEERING ASSOCIATES INC.  
ENGINEERING SURVEYING  
102 S. Saunders Ave.  
PH: (319) 385-4180  
Mt. Pleasant, IA 52641  
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IOWA LICENSE #7487  
IOWA LICENSE #5145

**NOT FOR CONSTRUCTION  
FOR REVIEW ONLY**

**NOTE:** ALL SERVICE CONNECTIONS TO EFFLUENT DRAINS SHALL BE WYES. NO BENDS OF MORE THAN 45° ALLOWED IN ANY SERVICE LINE OR EFFLUENT DRAIN. MINIMUM SERVICE LINE AND EFFLUENT DRAIN GRADE IS 1%.

SHEET 1 OF 2



LEGEND	
	2770 Claude Peterson
	2778 Daryl Paul
	2781 Don Holm
	2785 Chris Bullington
	2786 Jack Cheers
	2787 Vacant
	2789 Vacant
	2792 Jim Bullington
	2796 Scott Burke
	2799 Karl Olson



Installation of the sand filters and dosing tank.



Completed earthwork and new seeding.



Finished project Year 1, looking south.



Finished project Year 2, looking south.