PRELIMINARY ENGINEERING REPORT

Wastewater Collection & Treatment System

Town of Hayden

Jennings County, Indiana

May 2010

Revised August 2011

Revised March 2012

BERNARDIN, LOCHMUELLER & ASSOCIATES, INC.

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PRELIMINARY ENGINEERING REPORT
WASTEWATER COLLECTION & TREATMENT SYSTEM
TOWN OF HAYDEN, INDIANA

1.0 GENERAL 1

2.0 Project Planning Area 3

2.1 Project Location 3

2.2 Environmental Resources Present 3

2.3 Growth Areas and Population Trends 3

3.0 Existing Facilities 6

3.1 History 6

3.2 Condition of Facilities 6

3.3 Existing Financial Status 6

4.0 Need For Project 7

4.1 Health, Sanitation and Security 7

4.2 System O&M 7

4.3 Growth 7

5.0 Alternatives Considered 10

5.1 Collection System Alternatives 10

5.1.1. Low Pressure Sewers With Grinder Pumps. 10

5.1.2 Low Pressure Sewers With Grinder Pumps, Sharing Where Feasible 14

5.1.3 STEP Collection System 16

5.1.4 STEP Collection System, Sharing Where Feasible 16

5.2 Treatment System Alternatives 20

5.2.1 Extended Aeration Biomechanical WWTP 20

5.2.2 Force Main to Existing North Vernon Collection & Treatment System 23

5.2.3 Recirculating Sand Filter 25

5.2.4 Recirculating Vertical Flow Constructed Wetland 27

5.3 Land Requirements 30

5.4 Construction Problems 30

6.0 Selection Of An Alternative 31

6.1 Present Worth Cost Analysis of Collection System Alternatives 31
6.2 Present Worth Cost Analysis of Treatment System Alternatives 32
7.0 Recommended Alternative 33
7.1 Project Design 33
7.2 Total Project Cost Estimate 35
7.3 Annual Operating Budget 36
7.3.1 Income 36
7.3.2 Operation & Maintenance Costs 36
7.3.3 Short-Lived Asset Reserve 36
8.0 Conclusions and Recommendations 38

APPENDICES

Appendix A: IDEM Notice of Violation and Proposed Agreed Order
Appendix B: Petition to IURC for Certificate of Territorial Authority
Appendix C: Land Purchase Agreement
Appendix D: Support Letters for Proposed Project
Appendix E: Rate and Financing Analysis
Appendix F: Preliminary Effluent Limits

INDEX OF FIGURES

Figure 2-1 Project Location Map
Figure 2-2 Project Planning Area
Figure 5-1 Preliminary Collection System Layout
Figure 5-2 Typical Grinder Pump Station
Figure 5-3 Typical STEP System Septic Tank
Figure 5-4 Biomechanical WWTP Treatment Alternative Location
Figure 5-5 Force Main to North Vernon Treatment Alternative Route
Figure 5-6 Typical Recirculating Sand Filter Treatment System
Figure 5-7 Typical Recirculating Vertical Flow Wetland Treatment System
Figure 7-1 Selected Alternative Preliminary Layout

INDEX OF TABLES

Table 4-1 Design Wastewater Flows
Table 4-2 Design Wastewater Pollutant Concentrations
Table 5-1 Collection System Alternatives
Table 5-2 Low Pressure Sewers With Grinder Pumps – Construction Costs
Table 5-3 Low Pressure Sewers With Grinder Pumps – Short Lived Assets
Table 5-4 Low Pressure Sewers With Grinder Pumps – Annual O&M Costs
Table 5-5 Low Pressure Sewers With Shared Grinder Pumps – Construction Costs
Table 5-6 Low Pressure Sewers With Shared Grinder Pumps – Short Lived Assets
Table 5-7 Low Pressure Sewers With Shared Grinder Pumps – Annual O&M Costs
Table 5-8 STEP Collection System – Construction Costs
Table 5-9 STEP Collection System – Short Lived Assets
Table 5-10 STEP Collection System – Annual O&M Costs
Table 5-11 STEP Collection System With Shared Septic Tanks – Construction Costs
Table 5-12 STEP Collection System With Shared Septic Tanks – Short Lived Assets
Table 5-13 STEP Collection System With Shared Septic Tanks – Annual O&M Costs
Table 5-14 Treatment System Alternatives
Table 5-15 New Biomechanical WWTP – Construction Costs
Table 5-16 New Biomechanical WWTP – Short Lived Assets
Table 5-17 New Biomechanical WWTP – Annual O&M Costs
Table 5-18 Force Main To North Vernon – Construction Costs
Table 5-19 Force Main To North Vernon – Short Lived Assets
Table 5-20 Force Main To North Vernon – Annual O&M Costs

Table 5-21 Recirculating Sand Filter – Construction Costs
Table 5-22 Recirculating Sand Filter – Short Lived Assets
Table 5-23 Recirculating Sand Filter – Annual O&M Costs
Table 5-24 Recirculating Vertical Flow Constructed Wetland – Construction Costs
Table 5-25 Recirculating Vertical Flow Constructed Wetland – Short Lived Assets
Table 5-26 Recirculating Vertical Flow Constructed Wetland – Annual O&M Costs
Table 6-1 Present Worth Analysis of Collection System Alternatives
Table 6-2 Present Worth Analysis of Treatment System Alternatives
Table 7-1 Selected Alternative Total Construction Costs
Table 7-2 Selected Alternative Summary of O&M Costs
Table 7-3 Selected Alternative Summary of Short-Lived Assets (40-Year Evaluation)

1.0 GENERAL

Residents and businesses within the Community of Hayden currently collect and treat wastewater with septic tanks, while the Hayden Elementary School disposes of its wastewater through an elevated sand mound. The area has and continues to experience multiple septic system failures. The Jennings County Department of Health and Indiana Department of Environmental Management (IDEM) employed sampling and testing measures to show that Hayden area streams possessed elevated levels of Escherichia coli (E. coli) contamination, indicating the possible presence of fecal matter contamination from septic system drain lines. In response to this, a Notice of Violation and Proposed Agreed Order was filed in 2003 against the Jennings County Commissioners and against the Jennings Northwest Regional Utility (JNRU), Hayden's wastewater utility entity at that time. Copies of these documents are provided by **Appendix A**.

Hayden is no longer within the jurisdiction of JNRU and is now being managed by the Hayden Wastewater Utility Board, a non-for-profit utility formed under the Secretary of State. Oversight on funding and appointments will be provided by the Jennings County Commissioners while oversight on monthly rates will be provided by the Indiana Utility Regulatory Commission (IURC). A petition has been filed with the IURC for a Certificate of Territorial Authority (CTA). This document is provided by **Appendix B**.

The Preliminary Engineering Report will compare alternatives for wastewater collection, in addition to alternatives for wastewater treatment and disposal. Since these will be completely new systems, and since the recommendation of a collection system alternative is not dependent on the method of treatment, and vice versa, these systems are evaluated separately. The most cost-effective alternative each, for collection and for treatment, will be summarized together in the *7: Recommended Alternatives* section of this report.

Two (2) methods were evaluated for wastewater collection, including a low pressure sewer system with grinder pumps and a STEP collection system. Each of these collection system alternatives were also evaluated for the inclusion of shared facilities, where feasible, to identify any potential cost savings. This resulted in four (4) collection system alternatives:

Collection System Alternatives:

- Collection Alternative 1 (C1): Low pressure sewers with grinder pumps.
- Collection Alternative 2 (C2): Low pressure sewers with grinder pumps, sharing where feasible.
- Collection Alternative 3 (C3): STEP collection system.
- Collection Alternative 4 (C4): STEP collection system, sharing where feasible.

Four (4) methods were evaluated for wastewater treatment: a new biomechanical WWTP for Hayden; pumping the collected wastewater to the existing North Vernon collection and treatment system; and a recirculating sand filter (RSF) within Hayden.

- Treatment Alternative 1 (T1): New biomechanical WWTP.
- Treatment Alternative 2 (T2): Force main to existing North Vernon collection & treatment system.
- Treatment Alternative 3 (T3): Recirculating sand filter.
- Treatment Alternative 4 (T4): Recirculating vertical flow wetland.

An analysis was conducted for the feasibility and implementation of these collection and treatment alternatives, as detailed within *5: Alternatives Considered.* In *6: Selection of An Alternative*, a present-worth analysis of the alternatives is provided in order to develop a recommendation for the collection and treatment alternatives that would be most suitable for the community of Hayden.

The recommended alternatives are C1: Low Pressure Sewers with Grinder Pumps for collection and T3: Recirculating Sand Filter for treatment, as discussed in *7: Proposed Project.* The total project cost is $3,310,000, as detailed by **Table 7-2.** Operation and Maintenance (O&M) costs and required short-lived asset reserves are estimated by **Table 7-4** and **Table 7-5**, respectively.

2.0 Project Planning Area

2.1 Project Location

The unincorporated community of Hayden is located in southeast Indiana within Jennings County. It is situated in the Hayden Quadrant, Sections 9 and 10, Township 6N, Range 7E; and along US 50, approximately six (6) miles east of I-65 and seven (7) miles west of SR 7.

A majority of the community lies along or on roads that intersect with CR 700 W. The Hickory Hills Subdivision, located in the southeastern portion of Hayden, is accessed off of US 50. Most of the community lies north of US 50, but there are some homes that are located along the south side of US 50. There is an existing railroad that runs east-west through the center of Hayden. Running north-south through Hayden is Sixmile Creek, which is tributary to the Vernon Fork of the Muscatatuck River.

The selection of homes to be included in the service area was determined based on factors that considered the spacing of homes in proximity to the project area and to each other that may limit the ability to simply replace the existing, failing septic tanks to current standards. **Figures 2-1 and 2-2** provide maps of the project location and project planning area.

2.2 Environmental Resources Present

It is expected that there will be minimal environmental impact created by the proposed project. Current land use within Hayden is residential and agricultural with few commercial or institutional entities. No floodplains will be affected by the construction of this project. No structures are being constructed in wetlands or on hydric soils. Suitable habitat for the Indiana bat is available on the treatment site; however, the U.S. Fish and Wildlife Service concluded that not enough habitats will be eliminated to adversely affect the species. To avoid incidental removal of occupied roost trees, tree clearing during the period of April 1 – September 30 will be avoided. Refer to the *Environmental Report* for additional information.

2.3 Growth Areas and Population Trends

According to STATS Indiana[1], Jennings County experienced a 0.8%[2] net gain in population growth over the 10 year period between July 1, 2000 and July 1, 2010[3]. It is expected that this growth will continue over the length of the design period (20 years). A population growth of 1.0% will be assumed for the analysis of future growth capacity in *4.3 Growth.*

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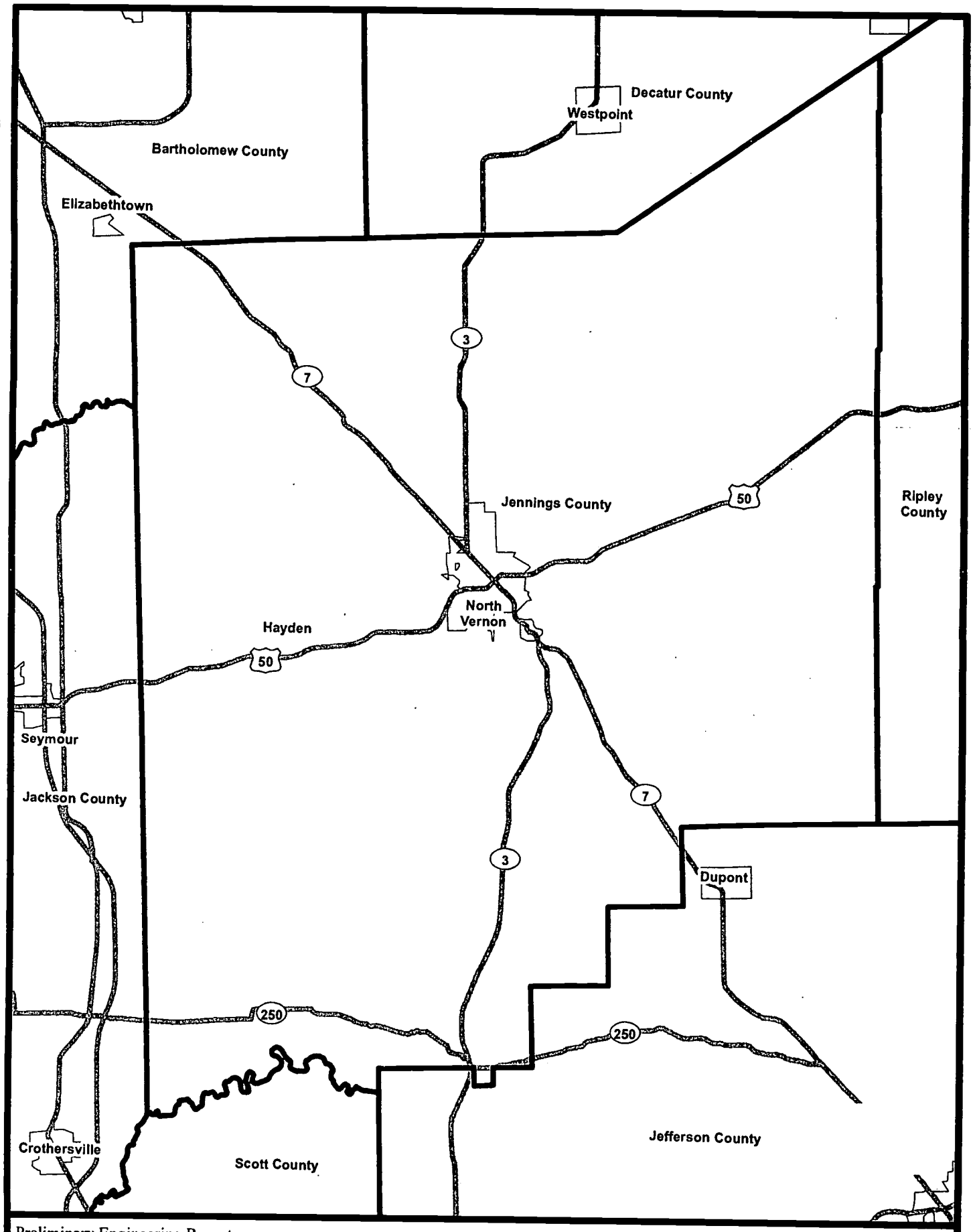
[1] STATS Indiana is the statistical data utility for the State of Indiana, developed and maintained by the Indiana Business Research Center at Indiana University's Kelley School of Business.

[2] http://www.stats.indiana.edu/population/popTotals/2010_cntyest.asp

[3] At the time of writing (March 1, 2012), U.S. Census Bureau data regarding 2010 population statistics were not yet available for Jennings County, Indiana.



Preliminary Engineering Report
Hayden, Indiana

0 10,000 20,000 40,000 Feet

Figure 2-1
Project Location Map
Hayden, Indiana

N W E S

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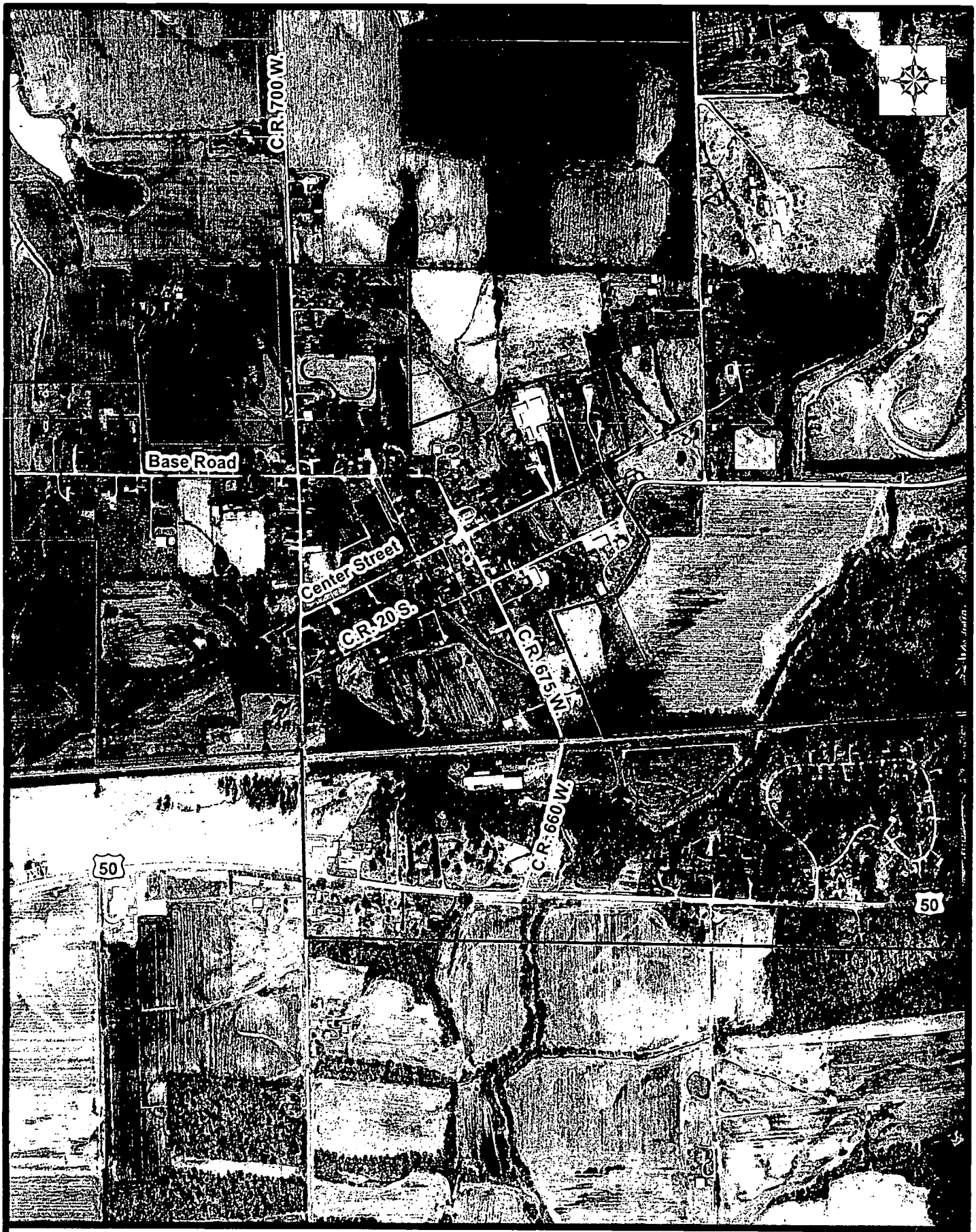

Preliminary Engineering Report
Hayden, Indiana

0 400 800 1,600 Feet

Figure 2-2
Project Planning Area
Hayden, Indiana

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3.0 Existing Facilities

3.1 History

There are no wastewater collection facilities and there are no centralized treatment facilities within Hayden and its proposed service area. Residences and businesses currently collect and treat wastewater with individual septic tanks. The Hayden Elementary School treats wastewater through an elevated sand mound.

3.2 Condition of Facilities

The Hayden area is currently experiencing septic system failures, which is causing sanitary problems. Several site investigations were conducted by IDEM at the request of the Jennings County Health Department. In a letter to the Jennings County Board of County Commissioners, dated December 30, 2003, it was indicated by IDEM that the unincorporated Town of Hayden was determined to be in violation of several environmental statues and rules. Samples obtained from local ditches which drain into Sixmile Creek revealed E. coli bacteria concentrations in amounts sufficient to be deleterious, in violation of IC 13-30-2-1, IC 13-18-4-5 and 327 IAC 2-1-6(a)(1).

In 2007, the Jennings County Board of County Commissioners then entered into an Agreed Order with IDEM to begin actions to eliminate the discharge of untreated sewage to waters of the State. This includes the construction of a sanitary collection system, connecting to a means of wastewater treatment, in accordance with an IDEM issued construction permit.

3.3 Existing Financial Status

According to the Economic Research Service of the U.S. Department of Agriculture, the median household income (MHI) in Jennings County was $41,869 in 2010, which equates to being 6.2% less than the overall MHI for the State of Indiana in 2010. However the MHI for the Town of Hayden is much lower, with a recently conducted income survey showing that 72% of the community qualifies for a low-moderate income status.

4.0 Need For Project

4.1 Health, Sanitation and Security

The need for a new wastewater collection and treatment project for the community of Hayden is for the correction of environmental problems due to unauthorized discharge of untreated wastewater to area streams. The need is also for the health and sanitation issues that are inherently present with the occurrence of these polluted discharges.

The Notice of Violation and the Agreed Order to address the implementation of proper wastewater disposal in Hayden, is as described in *3.2 Condition of Facilities*, and is provided by **Appendix A**. This project will also be necessary in order to comply with the requirements of the Agreed Order in a timely manner and to avoid costly penalties associated with continued violations, as described therein.

4.2 System O&M

There is no existing wastewater collection and treatment system and therefore, the health and sanitation issues in Hayden cannot be corrected or alleviated through the identification of system O&M inadequacies and inefficiencies.

Rehabilitation of the existing individual septic tanks will not resolve the health and sanitation issues in Hayden. The majority of the lots within the town limits are of insufficient size to comply with the current Indiana State Department of Health rules for on-site septic systems.

4.3 Growth

The community of Hayden has approximately 162 residences, four (4) small businesses, one (1) elementary school and one (1) church. This includes the residences within the Hickory Hills Subdivision. There are no significant wastewater contributors in the proposed service area and this is not expected to change.

The Hayden Elementary School has an average daily flow (ADF) of approximately 2,600 gallons per day (gpd) throughout the school year. It will be assumed that the Hayden Baptist Church will not typically meet on the same days as the school and therefore, a total average daily flow of 2,600 gpd will be used in combination for these two facilities.

Each business is assumed to have ten employees and it is also assumed that each of these employees will use 50 gpd. Therefore, the estimated use for each business is 2,000 gpd.

Based on previous experience with similar projects, an average daily usage of 160 gpd per household will be used, which equates to an estimated residential water usage of 25,920 gpd (or approximately 26,000 gpd). Together with the estimates for the businesses and elementary school and church, the estimated current average daily use is 30,600 gpd.

Based on the projected growth discussed in *2.3 Growth Areas and Population Trends*, the future wastewater flows are estimated to grow at a similar rate. To project the design capacity necessary to support future growth, it was assumed that the predicted population trends would also apply to the growth in the number of new residences. This assumption was also applied to the projected average daily water use of the elementary school and church. Applying the projected 1% growth rate, per each year over the 20-year design period, resulted in future conditions where the proposed facilities would need to support 196 residences, 5 businesses, and an average daily usage of 3,150 gpd total from the elementary school and church. This information is summarized in **Table 4-1**.

Table 4-1: Design Wastewater Flows

Flow	Gallons Per Day
Current Average Daily Flow	
Residential 162 @ 160 gpd	25,920 gpd
Business 4 @ 500 gpd	2,000 gpd
School/Church	2,600 gpd
Average Daily Water Use	30,600 gpd
x 0.9 = Design Average Daily Flow	**27,600 gpd**
x 1.5 = Current Design Peak Daily Flow[1]	**41,400 gpd**
Future Average Daily Flow[2]	
Residential 196 @ 160 gpd	31,360 gpd
Business 5 @ 500 gpd	2,500 gpd
School/Church	3,150 gpd
Average Daily Water Use	37,100 gpd
x 0.9 = Design Average Daily Flow	**33,400 gpd**
x 1.5 = Future Design Peak Daily Flow[1]	**50,100 gpd**

1. Peaking factor of 1.5 typical for septic tank design.
2. Based on projected design period growth rate of 1.0%.

It is expected that the wastewater produced in this area will be a typical domestic wastewater. The few commercial facilities within the proposed service area are not expected to have a significant effect on the waste characteristics. The predicted waste characteristics, based on the projected future wastewater flows provided by **Table 4-1**, are summarized in **Table 4-2**.

Table 4-2: Design Wastewater Pollutant Concentrations

Pollutant	Concentration (mg/L)[1]	Loading (lbs/day)
$CBOD_5$	210	58.5
TSS	110	30.6
NH_3-N	80	22.3

1. Source: Metcalf & Eddy, New Edition. Selected concentrations based on an average between strong and medium waste due to the use of new sewer with little infiltration.

5.0 Alternatives Considered

This Preliminary Engineering Report will consider four alternatives for wastewater collection and four alternatives for wastewater treatment and disposal, for the community of Hayden. Since these will be completely new systems, and since the recommendation of a collection system alternative is not dependent on the method of treatment, and vice versa, these systems will be evaluated separately. The evaluation of collection system alternatives will be presented first, followed by the evaluation of the treatment system alternatives.

Cost estimations and summaries of O&M requirements will be provided, in addition to figures displaying the preliminary layouts. A cost-effective analysis was conducted and is summarized by *6: Selection Of An Alternative,* in order to determine the alternative that should be recommended for implementation.

5.1 Collection System Alternatives

Domestic wastewater management begins with collection. This report evaluates four collection alternatives, as listed in Table 5-**1**.

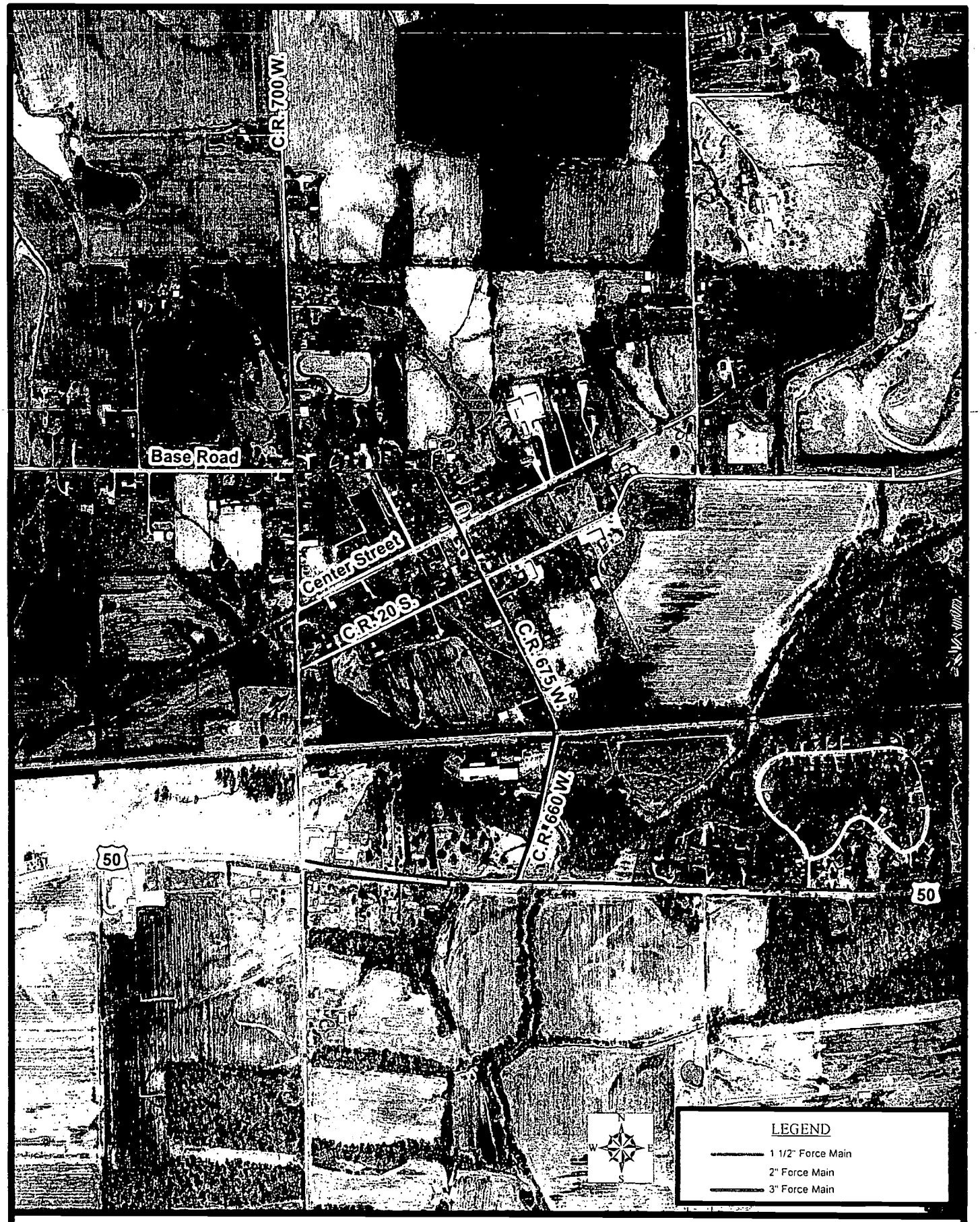
Table 5-1: Collection System Alternatives

Alternative #	Alternative Description
C1	Low Pressure Sewers with Grinder Pumps
C2	Low Pressure Sewers with Grinder Pumps, Sharing Where Feasible
C3	STEP Collection System
C4	STEP Collection System, Sharing Where Feasible

The layout of the low pressure sewer mains will be the same for all four alternatives and therefore, one figure (**Figure 5-1**) is used to represent the sewer collection main layout. The primary differences between the alternatives are found on the individual property sites.

5.1.1. Low Pressure Sewers With Grinder Pumps.

Low pressure sewers with grinder pumps use small pumps located in pump pits connected to one or more building laterals. The pumps grind the sewage solids into small particles and then discharge into a collection system consisting of small pressure force mains, generally 1-¼" to 4" in diameter. The low pressure sewers follow the existing ground just below the frost line. Power for the pumps must come from the buildings connected to the pump pit or from a metered drop on a power pole. **Figure 5-2** shows a typical grinder pump station.



Preliminary Engineering Report
Hayden, Indiana

0 400 800 1,600 Feet

Figure 5-1
Preliminary Collection System Layout
Hayden, Indiana

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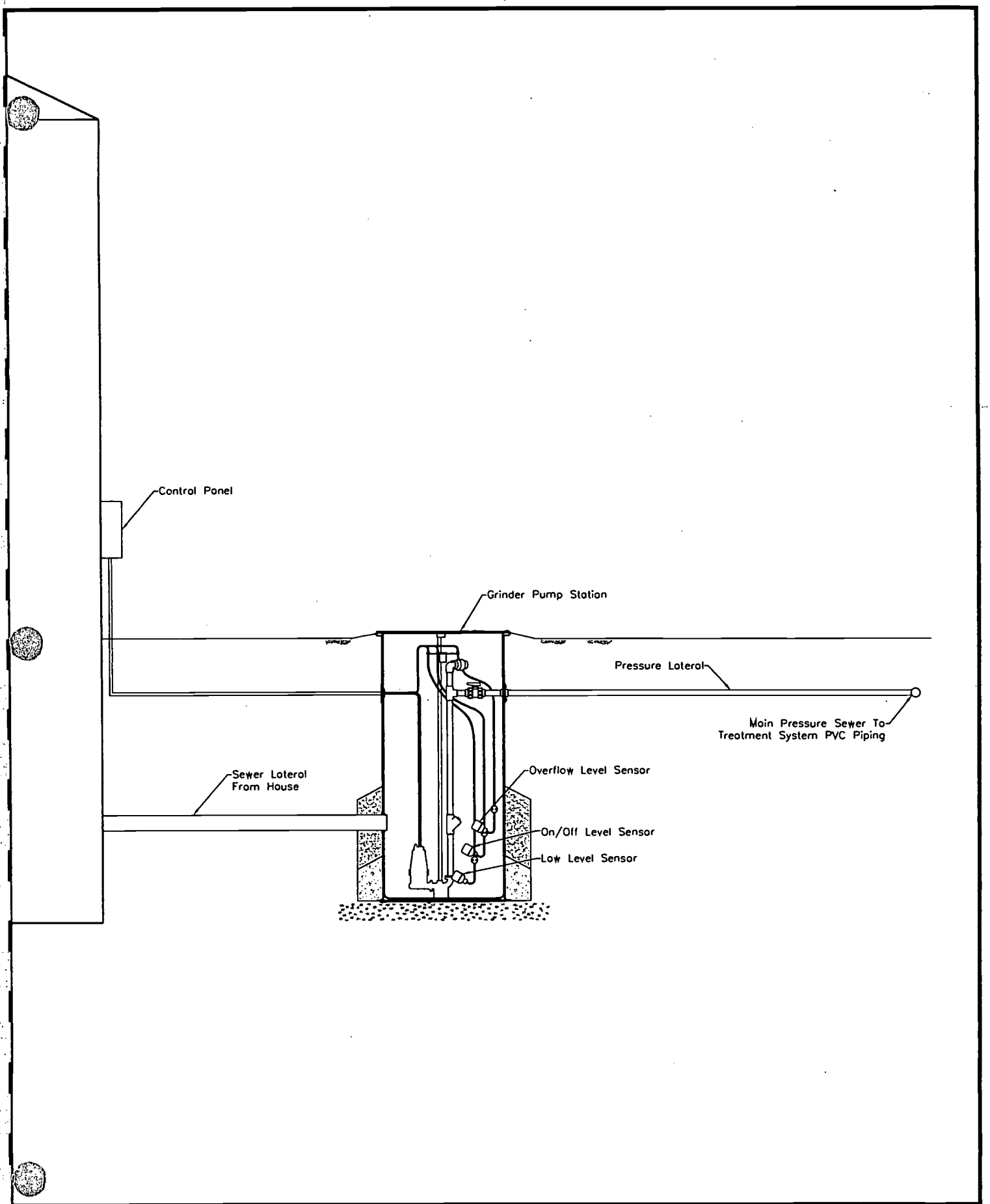

Figure 5-2
Grinder Pump Station

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Low pressure sewers with grinder pumps are well suited in areas with existing development and minimal future taps. They can be installed by using directional boring machines, which can bore a run up to 800'. Once the bore is complete, the low pressure sewer is pulled into the bore as the bit is being withdrawn. This significantly reduces the amount of surface disturbance and the number of joints. Disadvantages to this system include the number of mechanical parts and the required periodic maintenance of pumps and control panels. Construction cost estimates, short-lived assets and O&M costs for this collection alternative are given by **Table 5-2**, **Table 5-3** and **Table 5-4**, respectively.

Table 5-2: Low Pressure Sewers With Grinder Pumps – Construction Costs

Item:	Quantity	Unit	Unit Cost	Cost
1 1/2" Low Pressure Sewer	3,000	LF	$12	$36,000
2" Low Pressure Sewer	9,500	LF	$12	$114,000
3" Low Pressure Sewer	9,000	LF	$14	$126,000
1-1/4" Low Pres. Sewer Lateral	16,800	LF	$16	$268,800
Grinder Pump Assemblies (Simplex)	162	EA	$4,000	$648,000
Grinder Pump Assemblies (Duplex)	6	EA	$6,500	$39,000
4" PVC Sewer House Connection	3,360	LF	$20	$67,200
Abandon Existing Septic Tank	168	EA	$460	$77,280
Flushing Connections	20	EA	$700	$14,000
Isolation Valves	10	EA	$700	$7,000
Service Line Valves	168	EA	$300	$50,400
Air Release Valves	10	EA	$1,300	$13,000
Connection to Existing Electrical	168	Each	$250	$42,000
Pipe Railroad Jack and Bore	100	Feet	$150	$15,000
Stream Crossing	200	Feet	$30	$6,000
County Road Directional Drill	9	EA	$3,500	$31,500
State Road Jack and Bore	1	EA	$15,000	$15,000
Drive Repairs	1,400	LF	$20	$28,000
Erosion Control	1	LS	$35,000	$35,000
Final Grading & Seeding	1	LS	$40,000	$40,000
Traffic Control and Protection	1	Lump Sum	$15,000	$15,000
Mobilization/Demobilization (5%)	1	LS	$85,000	$85,000
			Total Construction Costs:	**$1,773,200**

Table 5-3: Low Pressure Sewers With Grinder Pumps - Short Lived Assets

Item	Quantity	Unit	Unit Cost	Total Cost
Grinder Pump Replacements[1]	672	EA	$1,000	$672,000
Isolation Valves[2]	10	EA	$700	$7,000
Service Line Valves[2]	168	EA	$300	$50,400
Air Release Valves[2]	10	EA	$1,300	$13,000
			TOTAL	**$742,400**

1. Assume each grinder pump replaced once per 10 years, on average.
2. Assume one replacement each, over the loan period.

Table 5-4: Low Pressure Sewers With Grinder Pumps - Annual O&M Costs

Item	Annual Cost
Power	$881
Labor for Inspection and Maintenance	$21,555
Total Annual O&M Costs	**$22,436**

5.1.2 Low Pressure Sewers With Grinder Pumps, Sharing Where Feasible

The low pressure sewers with grinder pumps collection system alternative was re-evaluated for a shared grinder pump approach, where feasible. With this alternative there are several locations where 2 homes are proposed to share a grinder pump station, from which domestic wastewater discharge would be pumped into the collection system mains in the same manner as it would be in the individual grinder pump station approach.

The main differences include that there would be less grinder pump stations to install and maintain. There would be less low pressure sewer lateral piping, however there would be additional gravity house connection sewer piping. Another main difference is that an electrical distribution system would need to be set up to provide power to these shared pump stations. Typically, when individual grinders are provided per individual home, these small grinder pump stations are often powered from each home. Alternatively, they are powered from a utility pole and service drop at the residential street, where underground circuits are run to each pump station. This would need to be the case for a shared approach due to difficulties associated with determining responsibility for power connection and usage costs, otherwise. Along with the added costs associated with the electrical distribution system, a monthly service charge would apply to each electrical utility drop.

Some of the savings that can be realized through the sharing of grinder pump stations are found in the costs to cover the replacement of short-lived assets and the requirements for operation and maintenance.

Construction cost estimates, short-lived assets and O&M costs for this collection alternative are given by **Table 5-5**, **Table 5-6** and **Table 5-7**, respectively.

Table 5-5: Low Pressure Sewers With Shared Grinder Pumps – Construction Costs

Item:	Quantity	Unit	Unit Cost	Cost
1 1/2" Low Pressure Sewer	3,000	LF	$12	$36,000
2" Low Pressure Sewer	9,500	LF	$12	$114,000
3" Low Pressure Sewer	9,000	LF	$14	$126,000
1-1/4" Low Pres. Sewer Lateral	9,900	LF	$16	$158,400
Grinder Pump Assemblies (Simplex)	24	EA	$4,000	$96,000
Grinder Pump Assemblies - Shared (Simplex)	69	EA	$4,500	$310,500
Grinder Pump Assemblies (Duplex)	6	EA	$6,500	$39,000
4" PVC Sewer House Connection	6,960	LF	$20	$139,200
Abandon Existing Septic Tank	168	EA	$460	$77,280
Electrical Service Drops	69	EA	$750	$51,750
10/3 UF Cable w/ Ground	32,200	LF	$1.07	$34,454
Labor for Pulling Cable (55 hr/1000')	1,771	HR	$63	$111,573
Boring for Cable	12,625	LF	$10	$126,250
Control Panel Wiring & Metering	18	EA	$2,450	$44,100
Flushing Connections	20	EA	$700	$14,000
Isolation Valves	10	EA	$700	$7,000
Service Line Valves	168	EA	$300	$50,400
Air Release Valves	10	EA	$1,300	$13,000
Connection to Existing Electrical	30	Each	$250	$7,500
Pipe Railroad Jack and Bore	100	Feet	$150	$15,000
Stream Crossing	200	Feet	$30	$6,000
County Road Directional Drill	9	EA	$3,500	$31,500
State Road Jack and Bore	1	EA	$15,000	$15,000
Drive Repairs	1,400	LF	$20	$28,000
Erosion Control	1	LS	$35,000	$35,000
Final Grading & Seeding	1	LS	$40,000	$40,000
Traffic Control and Protection	1	Lump Sum	$15,000	$15,000
Mobilization/Demobilization (5%)	1	LS	$88,000	$88,000
			Total Construction Costs:	**$1,830,000**

Table 5-6: Low Pressure Sewers With Shared Grinder Pumps - Short Lived Assets

Item	Quantity	Unit	Unit Cost	Total Cost
Grinder Pump Replacements[1]	396	EA	$1,000	$396,000
Electrical	1	LS	$47,857	$47,857
Isolation Valves[1]	10	EA	$700	$7,000
Service Line Valves[1]	168	EA	$300	$50,400
Air Release Valves[1]	10	EA	$1,300	$13,000
			TOTAL	**$514,257**

1. Assume each grinder pump replaced once per 10 years, on average.
2. Assume one replacement each, during the loan period.

Table 5-7: Low Pressure Sewers With Shared Grinder Pumps - Annual O&M Costs

Item	Annual Cost
Power and Monthly Utility Drop Fees[1]	$21,072
Labor for Inspection and Maintenance	$14,805
Total Annual O&M Costs	**$35,877**

1. Includes monthly service charge of $25/month per electrical utility service.

5.1.3 STEP Collection System

Septic Tank Effluent Pumping (STEP) systems are similar to a low-pressure grinder pump systems with the exception that the majority of solids in the waste stream would be removed in a septic tank, located at the individual home site, and prior to being discharged into the collection system. The elimination of solids in the collection system eliminates minimum velocity concerns and prevents solids build up, allowing greater flexibility in the piping design. However, an added maintenance requirement would be inspection of and removal of solids from the individual septic tanks and replacement of failed pumps. A STEP collection system also avoids many of the complications associated with the construction of gravity sewers due to shallow depths as well as route flexibility in both the horizontal and vertical directions.

Figure 5-3 shows a typical STEP system septic tank. Again, the collection system sewer main layout would be similar to that proposed for the grinder pump alternative and is shown **by Figure 5-1**. Construction cost estimates, short-lived assets and O&M costs for this collection alternative are given by **Table 5-8**, **Table 5-9** and **Table 5-10**, respectively.

5.1.4 STEP Collection System, Sharing Where Feasible

The STEP collection system was also re-evaluated for a shared septic tank approach, where feasible. With this alternative there are several locations where 2 homes are proposed to share a septic tank. Similar to the shared grinder pump station approach that was evaluated in *5.1.2*, the main differences include that there would be less septic tanks to install and maintain. There would be less low pressure sewer lateral piping, but there would be additional gravity house connection sewer piping.

Also similarly, an electrical distribution system would need to be set up in order to provide power to the shared septic tank pumps. Again, in addition to the capital costs associated with the electrical distribution system, a monthly service charge would apply to each electrical utility drop. However, savings are found in the reduced costs to cover the replacement of short-lived assets and the requirements for operation and maintenance.

Construction cost estimates, short-lived assets and O&M costs for this collection alternative are given by **Table 5-11**, **Table 5-12** and **Table 5-13**, respectively.

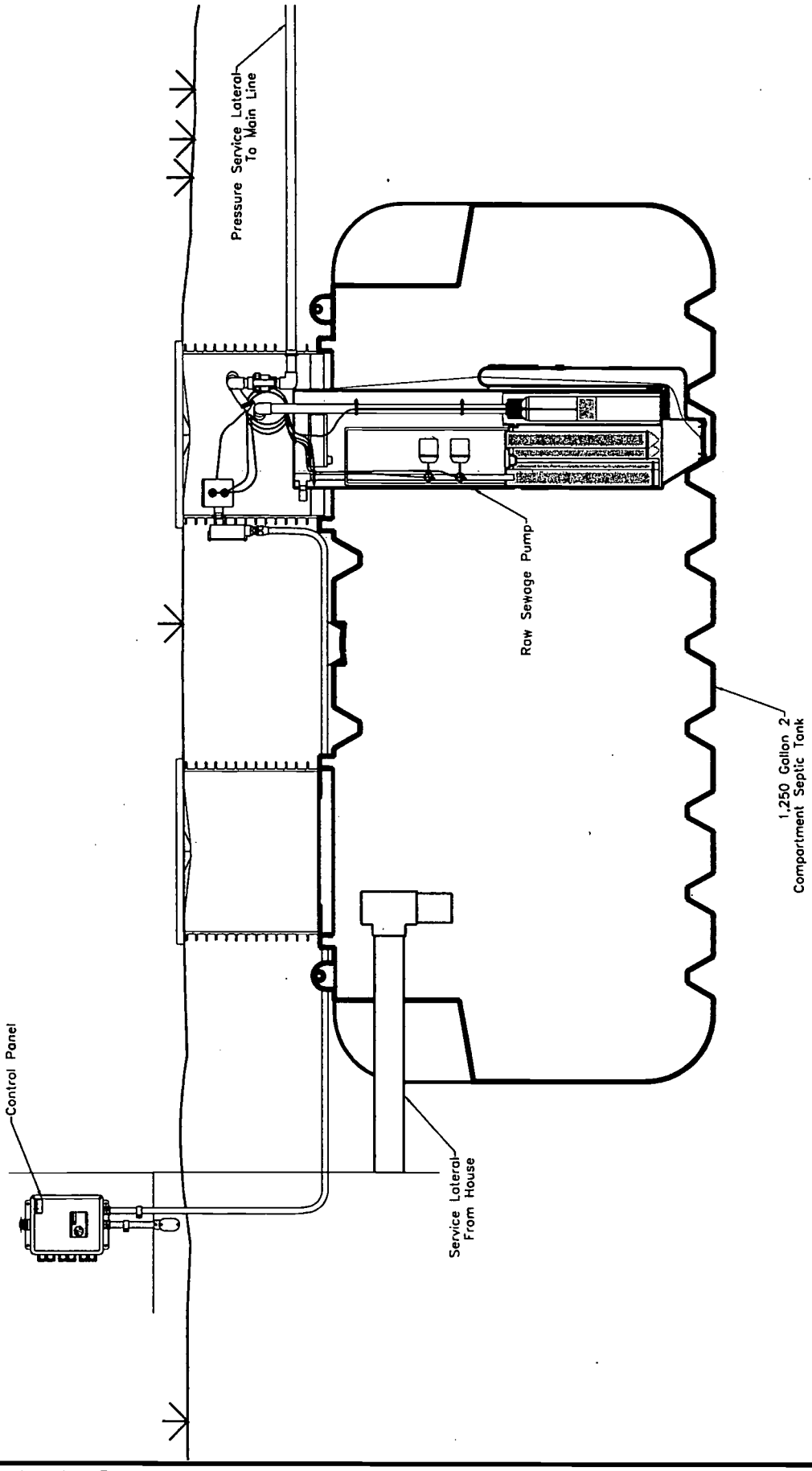

Figure 5–3
Typical Step System Septic Tank

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3502 Woodview Trace, Suite 150
Indianapolis, IN 46268
(317) 222-3880

Table 5-8: STEP Collection System – Construction Costs

Item:	Quantity	Unit	Unit Cost	Cost
1 1/2" Low Pressure Sewer	3,000	Feet	$12	$36,000
2" Low Pressure Sewer	9,500	Feet	$12	$114,000
3" Low Pressure Sewer	9,000	Feet	$14	$126,000
1-1/4" Low Pres. Sewer Lateral	16,800	Feet	$16	$268,800
4" PVC Sewer House Connection	3,360	Feet	$20	$67,200
Septic Tanks (1,250 gal. with PA-1)	162	Each	$5,500	$891,000
Septic Tanks (1,250 gal. Duplex)	5	Each	$6,500	$32,500
Septic Tanks (5,000 gal. Duplex)	1	Each	$15,000	$15,000
Abandon Existing Septic Tank	168	EA	$460	$77,280
Flushing Connections	20	Each	$700	$14,000
Isolation Valves	10	Each	$700	$7,000
Service Line Valves	168	Each	$300	$50,400
Air Release Valves	10	Each	$1,300	$13,000
Connection to Existing Electrical	168	Each	$250	$42,000
Pipe Road/RR Bore	100	Feet	$150	$15,000
Stream Crossing	200	Feet	$30	$6,000
County Road Jack and Bore	9	EA	$3,500	$31,500
State Road Jack and Bore	1	EA	$4,000	$4,000
Drive Repairs	1,400	LF	$20	$28,000
Erosion Control	1	LS	$35,000	$35,000
Final Grading & Seeding	1	LS	$40,000	$40,000
Traffic Control and Protection	1	Lump Sum	$15,000	$15,000
Mobilization/Demobilization (5%)	1	Lump Sum	$97,000	$97,000
Total Construction Costs:				**$2,025,700**

Table 5-9: STEP Collection System - Short Lived Assets

Item	Quantity	Unit	Unit Cost	Total Cost
STEP Pump Replacements[1]	448	EA	$500	$224,000
STEP Effluent Filter Replacements	672	EA	$70	$47,040
Isolation Valves[2]	10	EA	$700	$7,000
Service Line Valves[2]	168	EA	$300	$50,400
Air Release Valves[2]	10	EA	$1,300	$13,000
			TOTAL	**$341,440**

1. Assume each STEP pump replaced once per 15 years, on average.
2. Assume one replacement each, during the loan period.

Table 5-10: STEP Collection System - Annual O&M Costs

Item	Annual Cost
Pump Tanks[1]	$10,700
Power	$440
Labor for Inspection and Maintenance	$26,595
Total Annual O&M Costs	**$37,735**

1. Assume pump each tank once every three years, on average, for $190 each.

Table 5-11: STEP Collection With Shared Septic Tanks – Construction Costs

Item:	Quantity	Unit	Unit Cost	Cost
1 1/2" Low Pressure Sewer	3,000	Feet	$15	$45,000
2" Low Pressure Sewer	9,500	Feet	$12	$114,000
3" Low Pressure Sewer	9,000	Feet	$14	$126,000
1-1/4" Low Pres. Sewer Lateral	9,900	Feet	$16	$158,400
4" PVC Sewer House Connection	6,960	Feet	$20	$139,200
Septic Tanks (1,250 gal. with PA-1)	24	Each	$5,500	$132,000
Septic Tanks (2,000 gal. with PA-1)	69	Each	$7,000	$483,000
Septic Tanks (1,250 gal. Duplex)	5	Each	$6,500	$32,500
Septic Tanks (5,000 gal. Duplex)	1	Each	$15,000	$15,000
Abandon Existing Septic Tank	168	EA	$460	$77,280
Electrical Service Drops	69	EA	$750	$51,750
10/3 UF Cable w/ Ground	32,200	LF	$1.07	$34,454
Labor for Pulling Cable (55 hr/1000')	1,771	HR	$63	$111,573
Boring for Cable	12,625	LF	$10	$126,250
Control Panel Wiring & Metering	18	EA	$2,450	$44,100
Flushing Connections	20	Each	$700	$14,000
Isolation Valves	10	Each	$700	$7,000
Service Line Valves	168	Each	$600	$100,800
Air Release Valves	10	Each	$1,300	$13,000
Connection to Existing Electrical	30	Each	$250	$7,500
Pipe Railroad Jack and Bore	100	Feet	$150	$15,000
Stream Crossing	200	Feet	$30	$6,000
County Road Directional Drill	9	EA	$3,500	$31,500
State Road Jack and Bore	1	EA	$15,000	$15,000
Drive Repairs	1,400	LF	$20	$28,000
Erosion Control	1	LS	$35,000	$35,000
Final Grading & Seeding	1	Lump Sum	$40,000	$40,000
Traffic Control and Protection	1	Lump Sum	$15,000	$15,000
Mobilization	1	Lump Sum	$101,000	$101,000
Total Construction Costs:				**$2,119,400**

Table 5-12: STEP Collection With Shared Septic Tanks - Short Lived Assets

Item	Quantity	Unit	Unit Cost	Total Cost
STEP Pump Replacements[1]	264	EA	$500	$132,000
STEP Effluent Filter Replacements[1]	396	EA	$70	$27,720
Isolation Valves[2]	10	EA	$700	$7,000
Service Line Valves[2]	168	EA	$600	$100,800
Air Release Valves[2]	10	EA	$1,300	$13,000
			TOTAL	**$280,520**

1. Assume each STEP pump replaced once per 15 years, on average. Assume filters replaced once per 10 years.
2. Assume one replacement each, during the loan period.

Table 5-13: STEP Collection With Shared Septic Tanks - Annual O&M Costs

Item	Annual Cost
Pump 81 Tanks[1]	$6,300
Power and Monthly Utility Drop Fees[2]	$20,874
Labor for Inspection & Maintenance	$17,775
Total Annual O&M Costs	**$44,949**

1. Assume each septic tank pumped once every 3 years, $190 each.
2. Includes monthly service charge of $25/month per electrical utility service.

5.2 Treatment System Alternatives

The second part of domestic wastewater management is treatment. This report evaluates four (4) treatment alternatives, as listed in **Table 5-14**:

Table 5-14: Treatment System Alternatives

Alternative #	Alternative Description
T1	New Biomechanical WWTP
T2	Force Main To Existing North Vernon Collection & Treatment System
T3	Recirculating Sand Filter
T4	Recirculating Vertical Flow Constructed Wetland

5.2.1 Extended Aeration Biomechanical WWTP

The extended aeration type activated sludge process is widely used for small communities where the organic loading is low. Aeration basins are designed to handle the flow with a hydraulic retention time between 18-24 hours. The solids retention time is 20 to 30 days. This system does not utilize primary clarifiers; however, the secondary clarifiers will be designed at lower hydraulic rates than a conventional activated sludge unit. This system will produce a well stabilized sludge. Operation and maintenance of the WWTP includes

power costs, equipment replacement, chemicals and other materials, cost for sludge disposal, routine maintenance and repairs, and the cost of a full-time certified operator. Refer to **Figure 5-4** for the proposed location of this WWTP. Construction cost estimates, short-lived assets and O&M costs for this collection alternative are given by **Table 5-15**, **Table 5-16** and **Table 5-17**, respectively.

Table 5-15: New Biomechanical WWTP – Construction Costs

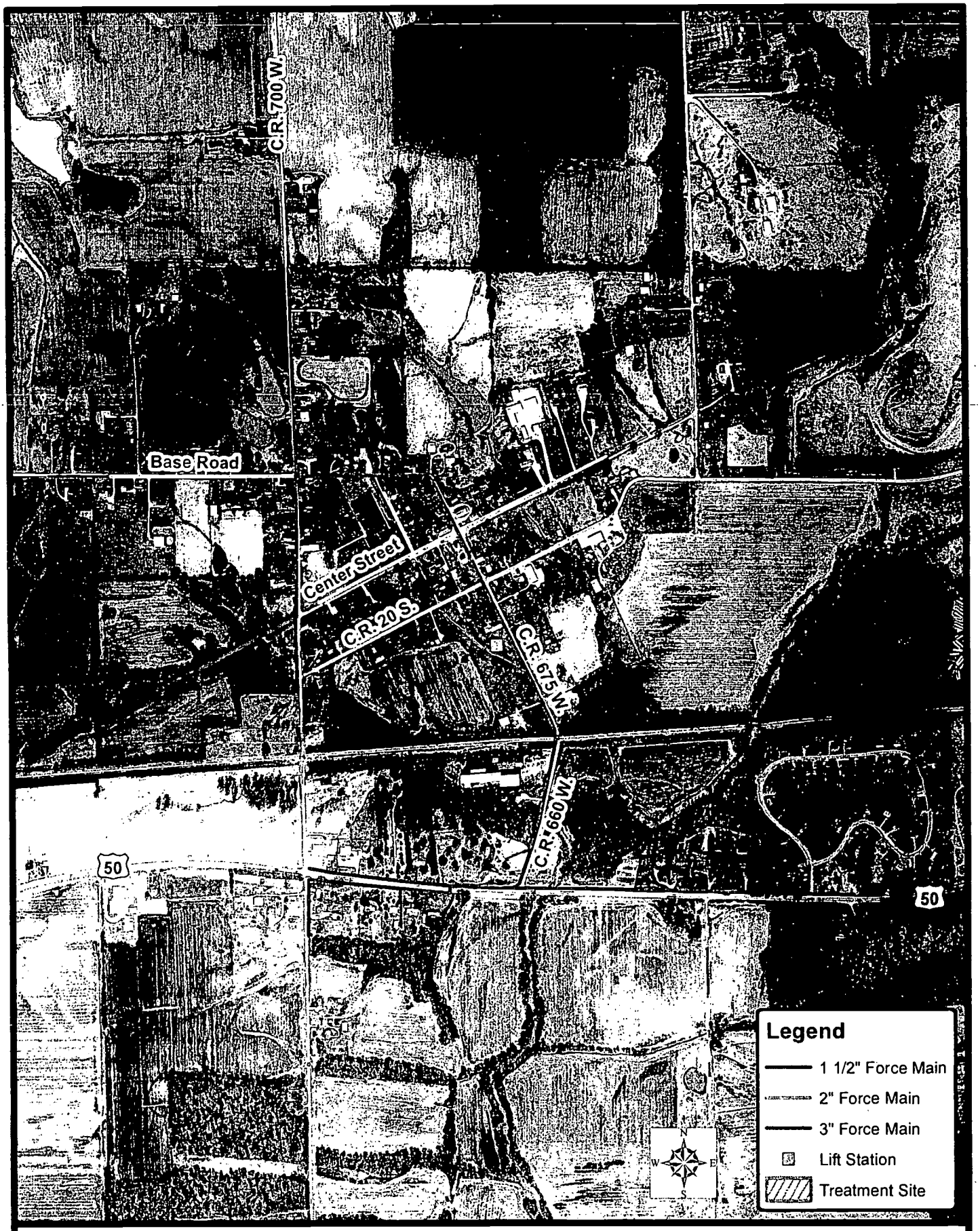
Item	Quantity	Unit	Unit Cost	Cost
Extended Aeration Unit	1	Each	$296,000	$296,000
Pump Station	1	Each	$50,000	$50,000
Force Main	500	LF	$15	$7,500
Influent structure - Screening & Metering	1	Each	$85,000	$85,000
Blower Enclosure & Equipment	1	Each	$42,500	$42,500
Sludge Digestion & Storage	1	Each	$130,000	$130,000
Ultraviolet Disinfection	1	Each	$45,000	$45,000
Control/Lab/Storage Building	1	Each	$100,000	$100,000
Yard Piping, Appurtenances & Structures	1	LS	$100,000	$100,000
Backup Generator	1	LS	$100,000	$100,000
Site fence with gates	1	LS	$10,000	$10,000
Land Purchase	1	LS	$10,000	$10,000
Mobilization/Demobilization (5%)	1	LS	$48,800	$48,800
Total Construction Costs:				**$1,024,800**

Table 5-16: New Biomechanical WWTP - Short Lived Assets

Item	Quantity	Unit	Unit Cost	Total Cost
General Treatment System Parts & Materials	1	LS	$127,000	$127,000
			TOTAL	**$127,000**

Table 5-17: New Biomechanical WWTP - Annual O&M Costs

Item	Annual Cost
Power	$15,000
Labor	$35,000
Materials, Supplies and Chemicals	$3,000
Replacement	$6,000
Repairs	$3,000
Sludge Disposal	$12,000
Total Annual O&M Costs	**$74,000**



Preliminary Engineering Report
Hayden, Indiana

0 400 800 1,600 Feet

Figure 5-4
Biomechanical WWTP Location
Hayden, Indiana

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Indianapolis, IN 46268
Phone: (317) 222-3880

5.2.2 Force Main to Existing North Vernon Collection & Treatment System

This alternative considers pumping the Hayden wastewater offsite to the City of North Vernon. North Vernon is approximately eight point six (8.6) miles east of Hayden. O&M costs for this alternative have been based on the North Vernon sewer rate charge of $4.91 per 1,000 gallons.

Refer to **Figure 5-5** for the proposed route of this force main. Construction cost estimates, short-lived assets and O&M costs for this collection alternative are given by **Table 5-18, Table 5-19** and **Table 5-20**, respectively.

Table 5-18: Force Main to North Vernon – Construction Costs

Item	Quantity	Unit	Unit Cost	Cost
Lift Stations and Backup Generator	1	LS	$220,000	$220,000
Force Main	45,000	LF	$16	$720,000
Air Release Valves	3	Each	$5,500	$16,500
Road/RR Bores	600	LF	$300	$180,000
Stream Crossings	2	Each	$12,000	$24,000
Mains	400	LF	$12	$4,800
Asphalt Paving	360	LF	$20	$7,200
Compacted Aggregate Base	1,260	LF	$10	$12,600
Driveway Repairs	900	LF	$20	$18,000
Erosion Control	22,800	SYD	$2	$34,200
Final Grading and Seeding	45,400	LF	$2	$90,800
Mobilization/Demobilization (5%)	1	LS	$66,405	$66,405
			Total Construction Costs:	**$1,395,000**

Table 5-19: Force Main to North Vernon - Short Lived Assets

Item	Quantity	Unit	Unit Cost	Total Cost
Air Release Valves	3	EA	$5,500	$16,500
General Treatment System Parts	1	LS	$173,000	$173,000
			TOTAL	**$189,500**

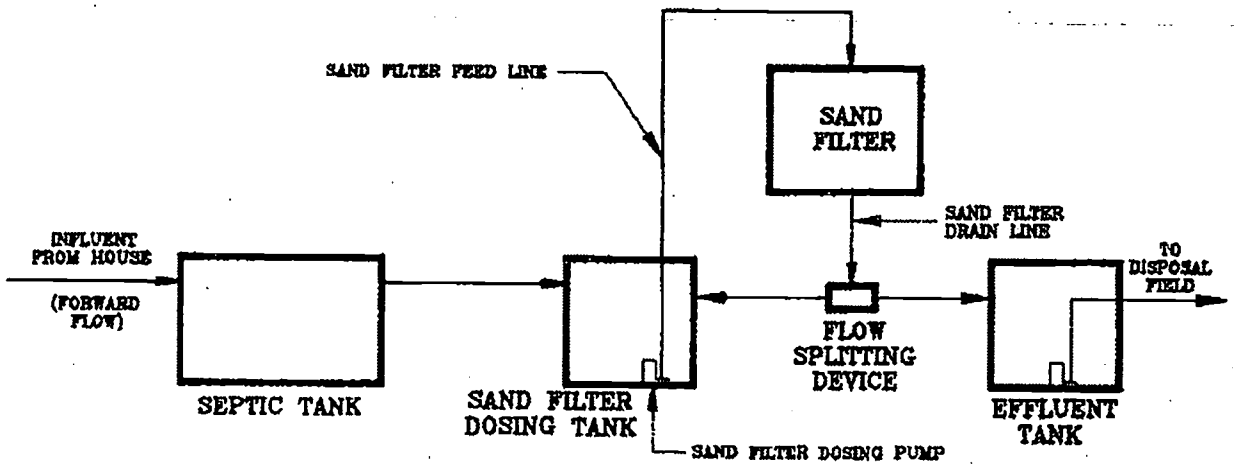
Table 5-20: Force Main to North Vernon - Annual O&M Costs

Item	Annual Cost
North Vernon Charge of $4.91/1,000 gallons	$89,800
Total Annual O&M Costs	**$89,800**

5.2.3 Recirculating Sand Filter

Recirculating sand filters (RSFs) are aerobic, fixed film bioreactors that use sand to provide secondary treatment of settled wastewater or septic tank effluent. Gravel or other media may also be used in place of sand. They consist of a structure or lined, excavated area that is filled with uniform washed sand and placed over an underdrain system. The wastewater is dosed onto the surface of the sand through a distribution network and allowed to percolate through the sand to the underdrain, which collects and recycles the filter effluent to the recirculation tank for further processing or discharge. **Figure 5-6** shows a typical RSF system.

Figure 5-6. Typical Recirculating Sand Filter System



This alternative is not proposed to discharge to a local stream, which requires an NPDES permit. This is because the average rate of total nitrogen removal for an RSF, typically around 50-60%, creates uncertainty that the RSF alternative will be reliable enough to meet the pollutant limits of an NPDES permit that requires 80-90% removal. Therefore, disposal of the RSF discharge is proposed to be provided by a drip irrigation system. The septic tank will be sized to provide 1½ days detention time in order to accomplish higher levels of total nitrogen removal. No NPDES permit will be required for this disposal method.

Operational requirements include periodic inspections of system components, including the septic tank, pump station wet wells and appurtenances, and drip field. Sludge accumulation will need to be removed on a regular basis from the septic tanks and the pump station wet wells. The sand filter will require periodic raking to prevent clogging. Sampling will also be required, per the land application permit.

Refer to **Figure 7-1** for the location of this treatment site. Construction cost estimates, short-lived assets and O&M costs for this collection alternative are given by **Table 5-21**, **Table 5-22** and **Table 5-23**, respectively.

Table 5-21: Recirculating Sand Filter – Construction Costs

Item	Quantity	Unit	Unit Cost	Cost
Septic Tanks w/ Appurtenances	2	EA	$49,500	$99,000
Excavation and Backfill	4,400	CYD	$16	$70,400
Liner	22,100	SF	$1	$22,100
Cell Media	2,500	CYD	$30	$75,000
Recirculating Pump Station	1	Each	$30,000	$30,000
Sand Filter Manifolds	500	LF	$3	$1,500
Sand Filter Distribution Laterals	16,400	LF	$1.50	$24,600
Force Main	400	LF	$20	$8,000
Drip Irrigation Dosing Pump Station	4	EA	$20,000	$80,000
Valve Boxes	4	EA	$1,600	$6,400
Fittings & Cleanouts	1	LS	$500	$500
Flow Meters	4	EA	$1,500	$6,000
Drip Irrigation Distribution Laterals	193,000	LF	$2	$386,000
Drip Irrigation Manifolds	2,000	LF	$6	$12,000
Supply & Return Piping	5,000	LF	$6	$30,000
Seeding & Mulching	11.2	AC	$1,000	$11,200
Land Purchase	1	LS	$40,000	$40,000
Mobilization/Demobilization (5%)	1	LS	$46,000	$46,000
			Total Construction Costs:	**$949,000**

Table 5-22: Recirculating Sand Filter - Short Lived Assets

Item	Quantity	Unit	Unit Cost	Total Cost
Pumps[1]	5	EA	$2,000	$10,000
Flow Meters[1]	4	EA	$1,500	$6,000
Solenoid Valves[1]	10	EA	$1,600	$16,000
General Treatment System Parts	1	LS	$104,000	$104,000
			TOTAL	**$136,000**

1. Assume one replacement each, over the duration of loan period.

Table 5-23: Recirculating Sand Filter - Annual O&M Costs

Item	Annual Cost
Sample Collection Testing	$2,970
Pump Tanks	$2,533
Power	$174
Labor for Inspection, Maintenance & Sampling	$11,520
Total Annual O&M Costs	**$17,197**

5.2.4 Recirculating Vertical Flow Constructed Wetland

A recirculating vertical flow (RVF) constructed wetland consists of three primary components: a subsurface flow constructed wetland; a vegetated recirculating gravel filter which lies on top of the wetland, and a soil absorption system.

Prior to the wastewater reaching the wetland, it receives primary treatment through the septic tank, allowing most of the solids to settle out. A septic tank effluent filter, which is incorporated into the pump assembly located in each septic tank, provides additional filtering of organic matter and suspended solids prior to being pumped to the wetland.

Once the wastewater reaches the treatment site, the wetland provides secondary treatment to reduce organic wastes. A subsurface-flow constructed wetland is a man-made gravel bed with a synthetic liner planted with wetland plant species. Wastewater flows through the constructed wetland and is recirculated back to the vertical-flow gravel filter which further reduces the pollutants. The water passing through the filter returns back to the constructed wetland. These facilities recreate the complex biological pollutant removal processes which occur in natural wetlands and are relatively simple and inexpensive to construct and operate. Constructed wetlands can provide treatment of wastewater with little or no energy usage, no chemical and very few operational and maintenance requirements.

Some major benefits of a RVF constructed wetland include:

- Allows for evapotranspiration, which results in significant reduction of effluent discharged to the subsurface drip irrigation system during warm weather months.
- Root systems that help to prevent plugging of media and detain the recycled water, which dramatically increases the detention/treatment time within the aerobic portion of the vertical wetland.
- An anoxic zone with a continuous input of carbon to drive denitrification.
- Requires only pumping for recirculation of the wastewater within the wetland.
- Maximizes total nitrogen removal.

This alternative has the ability to accomplish higher levels of total nitrogen removal than the RSF due to the presence of the large anoxic zone under the gravel bed. Therefore, the required detention time is much shorter and a smaller septic tank can be utilized. Disposal of the RVF constructed wetland discharge can be provided by a drip irrigation system.

Operational requirements include periodic inspections of system components, including the septic tank, pump station wet wells and appurtenances, and drip field. Sludge accumulation will need to be removed on a regular basis from the septic tanks and the pump station wet wells. Regular wetlands maintenance will include periodic inspection of plantings for plant disease and pests. Invasive weedy plant species should be removed from the wetland annually and plants should be replaced, if necessary. Sampling will also be required, per the land application permit.

Figure 5-7 shows a rendering of a typical RVF constructed wetland. Construction cost estimates, short-lived assets and O&M costs for this collection alternative are given by **Table 5-24**, **Table 5-25** and **Table 5-26**, respectively.

Table 5-24: Recirculating Vertical Flow Constructed Wetland – Construction Costs

Item	Quantity	Unit	Unit Cost	Cost
Septic Tanks w/ Appurtenances	1	EA	$74,250	$74,250
Excavation and Backfill	4,300	CYD	$15	$64,500
Liner	30,000	SF	$1	$30,000
Cell Media	2,700	CYD	$30	$81,000
Plants	3,000	SF	$2.50	$7,500
Recirculating Pump Station	1	EA	$30,000	$30,000
Drip Irrigation Dosing Pump Station	4	EA	$20,000	$80,000
Force Main	400	LF	$6	$2,400
Wetland Distribution Laterals	25,000	LF	$1.50	$37,500
Drip Irrigation Distribution Laterals	193,000	LF	$2	$386,000
Wetland Manifolds	440	LF	$3	$1,320
Drip Irrigation Manifolds	2,000	LF	$6	$12,000
Supply & Return Piping	5,000	LF	$6	$30,000
Valve Boxes	4	EA	$1,600	$6,400
Fittings & Cleanouts	1	LS	$500	$500
Flow Meters	4	EA	$1,500	$6,000
Seeding & Mulching	11.2	AC	$1,000	$11,200
Land Purchase	1	LS	$40,000	$40,000
Mobilization/Demobilization (5%)	1	LS	$46,000	$46,000
			Total Construction Costs:	**$947,000**

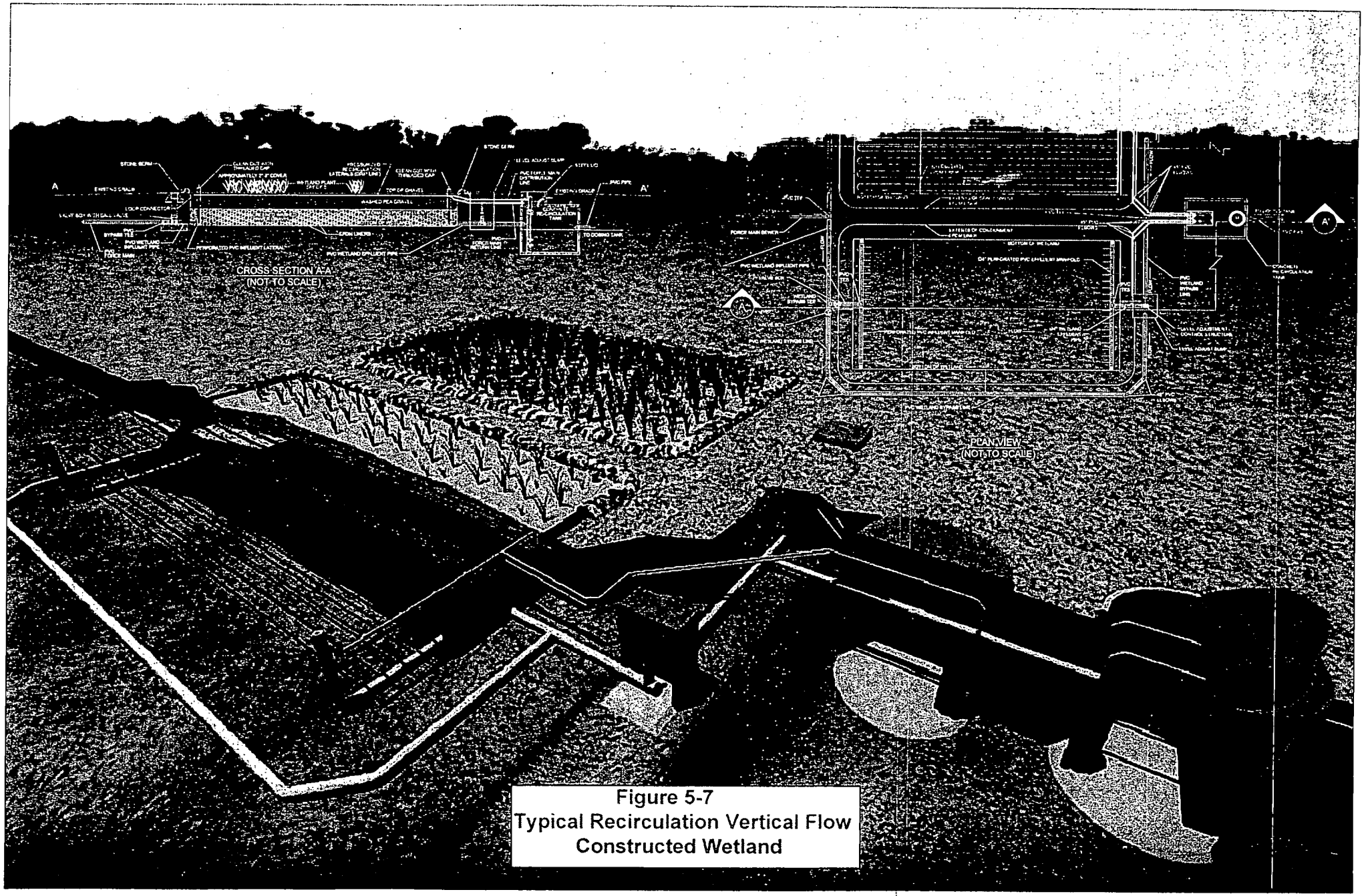


Figure 5-7
Typical Recirculation Vertical Flow
Constructed Wetland

Table 5-25: Recirculating Vertical Flow Constructed Wetland - Short Lived Assets

Item	Quantity	Unit	Unit Cost	Total Cost
Pumps	5	EA	$2,000	$10,000
Flow Meters	4	EA	$1,500	$6,000
Solenoid Valves	10	EA	$1,600	$16,000
General Treatment System Parts	1	LS	$104,000	$104,000
			TOTAL	**$136,000**

Table 5-26: Recirculating Vertical Flow Constructed Wetland - Annual O&M Costs

Item	Annual Cost
Sample Collection Testing	$2,970
Pump Tanks	$1,667
Power	$174
Labor for Inspection, Maintenance & Sampling	$11,520
Harvesting Crops in Drip Field	$0
Total Annual O&M Costs	**$16,331**

1. Assumes local farmer will harvest field at no cost.

5.3 Land Requirements

The project will require a general easement from each home owner, business or municipality. These easements will provide access from the R/W to the grinder pumps for both construction and post-construction maintenance. The community is currently obtaining easements from the property owners for the purpose of this project. Secondly, approximately eleven (**11**) acres of ground will need to be purchased for construction of the treatment system and the drip field. The land purchase agreement between the Hayden Wastewater Utility Board and the land owner is provided in **Appendix C**.

5.4 Construction Problems

Construction problems are possible with any projects. It is potential that all property owners will not sign an easement. This would cause rerouting of the main line and increase the cost of the project. Weather condition could cause a delay in the project schedule, but this does not propose a great project risk. Traffic within the area is mostly residential. The pipe should be bored under the roadway to avoid traffic problems.

6.0 Selection Of An Alternative

6.1 Present Worth Cost Analysis of Collection System Alternatives

Table 6-1 provides a present worth cost analysis of the four previously discussed collection system alternatives. The analysis is based on a 40-year loan period with a 3.0% interest rate.

Table 6-1: Present Worth Analysis of Collection System Alternatives

Alternative	C1	C2	C3	C4
Collection System Costs	$1,773,200	$1,830,000	$2,025,700	$2,119,400
Sitework	$17,732	$18,300	$20,257	$21,194
Total Construction Costs	$1,791,000	$1,848,300	$2,046,000	$2,140,600
Design & Construction Admin (9.5%)	$170,200	$175,600	$194,400	$203,400
Total Project Costs	**$1,962,000**	**$2,024,000**	**$2,241,000**	**$2,344,000**
Years	40	40	40	40
Interest Rate	3.0%	3.0%	3.0%	3.0%
Present Worth Factor	23.115	23.115	23.115	23.115
O&M Costs	22,436	35,877	37,735	44,949
Present Worth O&M Costs	518,700	829,300	872,300	1,039,100
Short-Lived Assets	742,400	514,257	341,440	280,520
Alternative Costs	1,962,000	2,024,000	2,241,000	2,344,000
Total Life Cycle Costs	**$3,223,100**	**$3,367,557**	**$3,454,740**	**$3,663,620**

C1: Low Pressure Sewers with Grinder Pumps

C2: Low Pressure Sewers with Grinder Pumps, Sharing Where Feasible

C3: STEP Collection System

C4: STEP Collection System, Sharing Where Feasible

The above analysis indicates that over the life-cycle of the project loan, Alternative C1: Low Pressure Sewers with Grinder Pumps is the least expensive collection treatment alternative.

6.2 Present Worth Cost Analysis of Treatment System Alternatives

Table 6-2 provides a present worth cost analysis of the four previously discussed treatment system alternatives. The analysis is based on a 40-year loan period with a 3.0% interest rate.

Table 6-2: Present Worth Analysis of Treatment System Alternatives

Alternative	T1	T2	T3	T4
Treatment System Costs	$1,024,800	$1,395,000	$949,000	$947,000
Sitework	$51,240	$20,925	$28,470	$28,410
Electrical	$204,960	$69,750	$75,920	$75,760
Total Construction Costs	$1,281,000	$1,485,700	$1,087,800	$1,051,200
Design & Construction Admin (9.5%)	$121,700	$141,200	$103,400	$99,900
Total Project Costs	**$1,403,000**	**$1,627,000**	**$1,154,000**	**$1,152,000**
Years	40	40	40	40
Interest Rate	3.0%	3.0%	3.0%	3.0%
Present Worth Factor	23.115	23.115	23.115	23.115
O&M Costs	74,000	89,800	17,197	16,331
Present Worth O&M Costs	1,710,600	2,075,800	397,600	377,500
Short-Lived Assets	127,000	189,500	136,000	136,000
Alternative Costs	1,403,000	1,627,000	1,154,000	1,152,000
Total Life Cycle Costs	**$3,240,600**	**$3,892,300**	**$1,687,600**	**$1,665,500**

T1: New Biomechanical WWTP

T2: Force Main to Existing North Vernon Collection & Treatment System

T3: Recirculating Sand Filter

T4: Recirculating Vertical Flow Constructed Wetland

The above analysis indicates that over the life-cycle of the project loan, Alternative **T4**: Recirculating Vertical Flow (RVF) Constructed Wetland is the least expensive collection treatment alternative. However due to the current "innovative" status of the system, and due to another more well-established alternative being similar in degree of cost, the treatment system that will be proposed is Alternative **T3**: Recirculating Sand Filter.

7.0 Recommended Alternative

7.1 Project Design

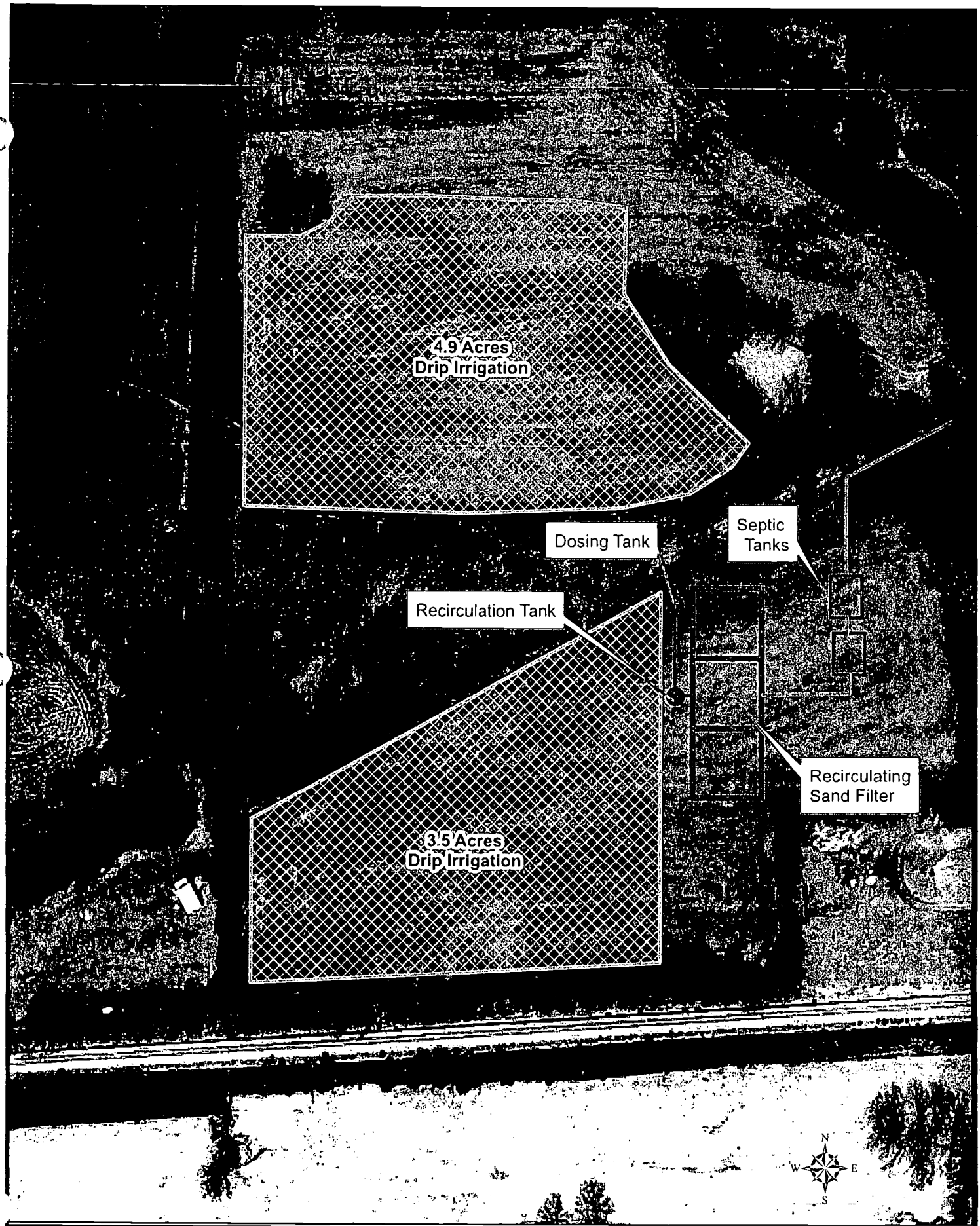
As a result of the present worth cost analysis, along with other non-cost decision factors, the recommended wastewater collection and treatment system alternatives for the community of Hayden are low pressure sewer with grinder pumps for collection (C1) and a recirculating sand filter for treatment (T3).

This collection system would consist of approximately 21,500 feet of low-pressure collection and transmission sewers ranging in size from 1.5 inches to 3 inches. A map showing the layout of this system was provided in Figure 5-1. The collection system shown provides collection for each of the current parcels within the Hayden community with room for future expansion.

The point of termination is at the preferred treatment site, located along the west side of CR 700W south of Base Road, along with the drip irrigation field as shown in **Figure 7-1**. This site was chosen because of its close proximity to the project area. Of note is that this proposed site is near an existing cemetery. Because of this, a second site located northwest of the intersection of CR 700W with US 50 was investigated as a potential treatment location. However, the owner was unwilling to sell this property. Therefore, it is the intent of the project to have at least 100 feet of separation distance from the cemetery, to comply with the Indiana Code with regards to historic preservation and archaeology. The Hayden Cemetery Association, which is the owner of the cemetery, has been contacted with project details and has indicated it is in support of the treatment facility as it is currently proposed. The Hayden Elementary School, which has used the project area for outdoor classroom activities, has also been contacted about the project and is in support of the treatment facility as it is currently proposed. This correspondence is found in **Appendix D**.

Disposal of the RSF discharge will be provided by a drip irrigation system and the septic tank will be sized to provide 1½ days detention time in order to accomplish higher levels of total nitrogen removal. It is not proposed to discharge to surface waters because of the preliminary effluent limits received from IDEM (**Appendix F**). Since there will be no surface water discharge, an NPDES permit will not be required for this disposal method. Transfer switches will be included for the pumps so that a portable generator can be brought in for backup power in the event of a power outage.

The selected plan will be a completely new installation. Phasing of the project will not be cost effective for the recommended plan.



Preliminary Engineering Report
Hayden, Indiana

Figure 7-1
Preliminary Selected Alternative Layout
Hayden, Indiana

0 75 150 300 Feet

BERNARDIN LOCHMUELLER & ASSOCIATES, INC.
3502 Woodview Trace, Suite 150
Indianapolis, IN 46268
Phone: (317) 222-3880

7.2 Total Project Cost Estimate

Project costs are summarized in **Table 7-1** for a total estimated cost of **$3,310,000.**

Table 7-1 – Selected Alternatives Total Construction Costs

Item:	Quantity	Unit	Unit Cost	Cost
1 1/2" Low Pressure Sewer	3,000	LF	$12	$36,000
2" Low Pressure Sewer	9,500	LF	$12	$114,000
3" Low Pressure Sewer	9,000	LF	$14	$126,000
1-1/4" Low Pres. Sewer Lateral	16,800	LF	$16	$268,800
Grinder Pump Assemblies (Simplex)	162	EA	$4,000	$648,000
Grinder Pump Assemblies (Duplex)	6	EA	$6,500	$39,000
4" PVC Sewer House Connection	3,360	LF	$20	$67,200
Abandon Existing Septic Tank	168	EA	$460	$77,280
Flushing Connections	20	EA	$700	$14,000
Isolation Valves	10	EA	$700	$7,000
Service Line Valves	168	EA	$300	$50,400
Air Release Valves	10	EA	$1,300	$13,000
Connection to Existing Electrical	168	Each	$250	$42,000
Pipe Railroad Jack and Bore	100	Feet	$150	$15,000
Stream Crossing	200	Feet	$30	$6,000
County Road Directional Drill	9	EA	$3,500	$31,500
State Road Jack and Bore	1	EA	$15,000	$15,000
Drive Repairs	1,400	LF	$20	$28,000
Septic Tanks w/ Appurtenances	2	EA	$49,500	$99,000
Excavation and Backfill	4,400	CYD	$16	$70,400
Liner	22,100	SF	$1	$22,100
Cell Media	2,500	CYD	$30	$75,000
Recirculating Pump Station	1	Each	$30,000	$30,000
Sand Filter Manifolds	500	LF	$3	$1,500
Sand Filter Distribution Laterals	16,400	LF	$1.50	$24,600
Force Main	400	LF	$20	$8,000
Drip Irrigation Dosing Pump Station	4	EA	$20,000	$80,000
Valve Boxes	4	EA	$1,600	$6,400
Fittings & Cleanouts	1	LS	$500	$500
Flow Meters	4	EA	$1,500	$6,000
Drip Irrigation Distribution Laterals	193,000	LF	$2	$386,000
Drip Irrigation Manifolds	2,000	LF	$6	$12,000
Supply & Return Piping	5,000	LF	$6	$30,000
Land Purchase	1	LS	$40,000	$40,000
Erosion Control	1	LS	$35,000	$35,000
Final Grading & Seeding	1	LS	$51,200	$51,200
Traffic Control and Protection	1	Lump Sum	$15,000	$15,000
Mobilization	1	LS	$130,000	$130,000
			Total Construction Costs:	**$2,720,900**
			Non-Construction Costs	$584,000
			Total Project Costs:	**$3,310,000**

1. Non-construction costs include $247,800 (9.0%) for Design & Construction Administration, $192,800 (7.0%) for Resident Project Representation, $25,000 for PER preparation, $20,000 for the IURC CTA Petitioning Process, $48,000 for Grant Administration, $40,000 for Bond Counsel, and $10,000 for Financial. Total Project Cost rounded up to nearest $10,000.

7.3 Annual Operating Budget

7.3.1 Income

A Rate and Financing Analysis has been conducted for this project. Refer to **Appendix E**.

7.3.2 Operation & Maintenance Costs

A certified operator will be required for the submission of monthly and annual reports to IDEM and provide supervision of the wastewater treatment system. A general maintenance person will be able to diagnose and correct problems identified when alarms are tripped at the onsite grinder pump assemblies. Additional tasks will be inspection and maintenance of collection and treatment system components, as well as sample collection and shipment to a laboratory for testing. Descriptions of O&M activities and costs were presented in *5: Alternatives Considered*. The utility operator will be responsible for the O&M of pumps at individual home sites. General easements have already been obtained for this purpose.

A summary of the annual O&M costs, as described previously, is provided by **Table 7-2**.

Table 7-2: Proposed Alternatives Summary of O&M Costs

Item	Annual Cost
Power	$1,019
Sample Collection Testing	$2,970
Pump Treatment Site Septic Tanks	$2,533
Annual Financial Audit	$5,000
Labor for Inspection and Maintenance	$33,075
Total Annual O&M Costs	**$44,598**

7.3.3 Short-Lived Asset Reserve

Short lived assets are the small equipment items which may need to be replaced over the life cycle of the project. Short lived assets in a grinder pump collection system are almost entirely attributable to individual, onsite pumps. Breaks in or leaks from collection mains and laterals are rare and inexpensive to repair and are typically considered insignificant in cost. The short lived asset reserves analysis will assumes that each of the onsite grinder pumps will be replaced once over the 40 year loan period. Additionally, it is assumed all valves in the collection system will be replaced once.

Short lived assets for the RSF and drip irrigation system include the replacement of pumps, valves and flow meters. The short lived asset analysis assumes that all valves and all pumps will require one replacement during the 40-year loan period. It is also assumed that all flow meters will have one replacement during this period. Descriptions of short lived assets and costs were presented in *5: Alternatives Considered*. They are also summarized by **Table 7-3**:

Table 7-3: Short-Lived Assets (40-Year Evaluation)

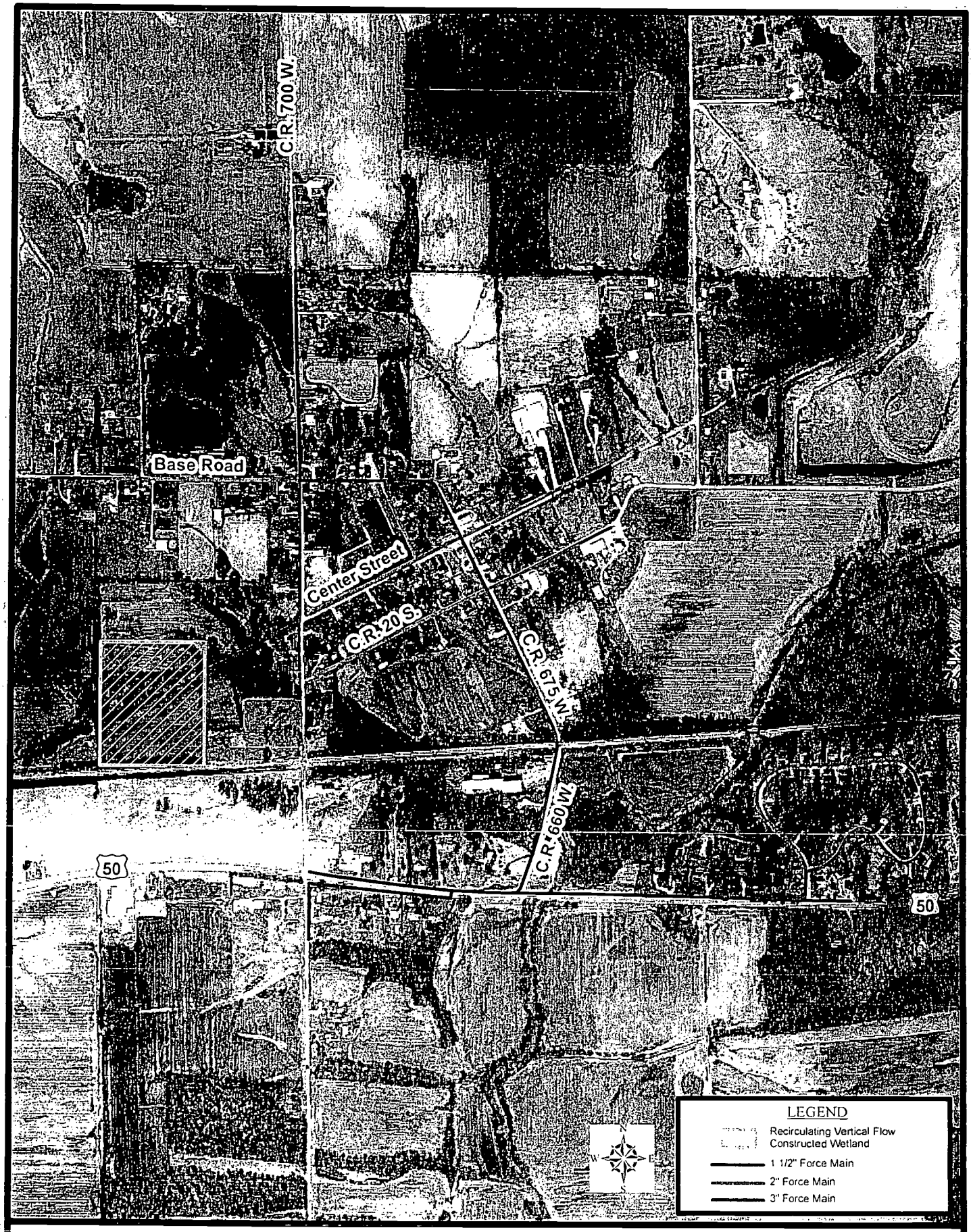
Item	Quantity	Unit	Unit Cost	Total Cost
Grinder Pump Replacements	672	EA	$1,000	$672,000
Isolation Valves	10	EA	$700	$7,000
Service Line Valves	168	EA	$300	$50,400
Air Release Valves	10	EA	$1,300	$13,000
Pumps	5	EA	$2,000	$10,000
Flow Meters	4	EA	$1,500	$6,000
Solenoid Valves	10	EA	$1,600	$16,000
General Treatment System Parts	1	LS	$104,000	$104,000
			TOTAL	**$878,400**

8.0 Conclusions and Recommendations

Residents and businesses within the Community of Hayden currently collect and treat wastewater with septic tanks, while the school disposes of its wastewater through an elevated sand mound. The area has and continues to experience multiple septic system failures. This health concern must be eliminated.

A recirculating sand filter provides a more affordable solution to provide wastewater collection and treatment than a mechanical plant or long distance pumping. Only positive environmental consequences are expected after construction of the proposed alternative.

Therefore, it is recommended that Hayden pursue financial assistance for design, construction and operation of a low pressure sewer collection system with grinder pumps and a recirculating sand filter treatment system to safely manage the wastewater within this community.



Preliminary Engineering Report
Hayden, Indiana

0 400 800 1,600 Feet

Exhibit A

Hayden, Indiana

BERNARDIN LOCHMUELLER & ASSOCIATES, INC.
3502 Woodview Trace, Suite 150
Indianapolis, IN 46268
Phone: (317) 222-3880

The proposed service area shall begin at a point on W Base Road located approximately 1,717 feet west of the intersection of W Base Road with N County Road 700 W; commencing to a point approximately 567 feet due north; continuing due east to Private Road 720; continuing approximately 195 feet due south along Private Road 720; continuing approximately 1010 feet due east to N County Road 700 W; continuing to a point approximately 1138 feet due north along N County Road 700 W; continuing to a point approximately 1889 feet due east, continuing to a point approximately 1050 feet due south; continuing to a point approximately 1,329 feet in a northeasterly direction; continuing to a point approximately 543 feet in a southeasterly direction to W Center Street; continuing to a point approximately 160 feet southwesterly along W Center Street; continuing to a point approximately 583 feet in a southeasterly direction; continuing to a point approximately 363 feet in a southwesterly direction; continuing to a point approximately 443 feet in a southwesterly direction; continuing to a point approximately 802 feet in a southeasterly direction to the south side of the railroad tracks; continuing to a point approximately 2,256 feet in a northeasterly direction along the south side of the railroad tracks; continuing to a point approximately 1,407 feet due south; continuing to a point approximately 4,199 feet due west to S County Road 700 W; continuing to a point approximately 1,187 feet due north along S County Road 700 W to the north side of the railroad tracks; continuing to a point approximately 1,291 feet in a southwesterly direction along the north side of the railroad tracks; continuing to a point approximately 1,550 feet due north; continuing to a point approximately 475 feet due west; and ending approximately 315 feet due north at the start point, located at a point on W Base Road approximately 1,717 feet west of the intersection of W Base Road with N County Road 700 W.

Petitioner's Exhibit No. E-1

Hayden Wastewater Utility, Inc.
Hayden, Indiana

Rate and Financing Analysis
IURC Cause No. 44143

March 7, 2012

LWG | LONDON WITTE GROUP

Hayden Wastewater Utility, Inc.

Hayden, Indiana

TABLE OF CONTENTS

Exhibit A	Summary of Revenue Requirements
Schedule A	Calculation of Equivalent Residential Customers
Exhibit B	Calculation of Annual Operation & Maintenance and Working Capital Revenue Requirements
Exhibit C	2012 USDA - RD Bonds Amortization Schedule
Schedule C	Estimated Sources and Uses of Funds
Exhibit D	Calculation of Annual Depreciation and Short Lived Asset Replacements
Exhibit E	Verification of Revenues to be Collected
Exhibit F	Net Margin & 5-Year Cash Flow Projections using Short Lived Asset Replacement for Rate Calculation (Monthly Rate Scenario Two)
Exhibit F-1	Net Margin & 5-Year Cash Flow Projections using 100% Depreciation for Rate Calculation (Monthly Rate Scenario One)

EXHIBIT A

Hayden Wastewater Utility, Inc.
Hayden, Indiana

Summary of Revenue Requirements

Line No.		Reference	Monthly Charge Scenarios: Scenario One Depreciation Requirement	Monthly Charge Scenarios: **Scenario Two Short Lived Asset Requirement**
1	Operation and Maintenance	Exh B	$44,523	**$44,523**
2	Working Capital	Exh B	5,438	**5,438**
3	Debt Service - Maximum Annual	Exh C	32,667	**32,667**
4	Debt Service Reserve	Exh C	3,267	**3,267**
5	Depreciation/Short Lived Asset Replacement	Exh D	68,823	**22,035**
6	Annual Revenue Requirement		$154,717	**$107,930**
7	Utilities Receipts Tax		2,197	**1,532**
8	Net Annual Revenue Requirement		156,914	**109,462**
9	Estimated Number of Equivalent Customers	Sch A	191	**191**
10	Monthly Billing Rate Per Equivalent Customer* ((Line 10 / Line 11)/ 12 months)		$68.46	**$47.77**
11	Monthly Billing Rate - Commercial Customers** (Line 12 X 3.125)		$213.94	**$149.28**
12	Monthly Billing Rate - School & Church Customers** (Line 12 X 16.25)		$1,112.48	**$776.26**
13	Debt Coverage Ratio (USDA-RD Required = 1.1)		3.37	**1.94**

* Equivalent Customer equates to a Residential Customer

** Commercial and School & Church Customers are stated in terms of Residential Customers based on Engineer's estimated flows.

Hayden Wastewater Utility, Inc.

Hayden, Indiana

Calculation of Equivalent Residential Customers*

Line No.			
1	EDU's per School and Church	16.25	
2	Times: # of customers	2.00	
3	School and Church in terms of Residential Customer		32.50
4	EDU's per Business Customer	3.125	
5	Times: # of Customers	4.00	
6	Commercial Customers in terms of Residential Customers		12.50
7	Residential Customers		146.00
8	Total Customers for Monthly Rate Calculation		191.00

*Per Engineer's Estimates

Hayden Wastewater Utility, Inc.

Hayden, Indiana

Calculation of Annual Operation & Maintenance and Working Capital Revenue Requirements

Line No.			
	Annual Operation and Maintenance:		
1	* Inspection, *Maintenance, **Office (Clerical/Billing) Expense	$35,500	
2	* Sample Collection Testing	2,970	
3	* Pump Treatment Site Septic Tanks	2,533	
4	* Amortized Portion of Sludge Removal Expense	2,500	
5	*Purchased Power Expense	1,020	
6	Annual Operation and Maintenance Revenue Requirement		$44,523
	Annual Working Capital:		
7	* Labor for Inspection and Maintenance	$35,500	
8	* Sample Collection Testing	$2,970	
9	* Pump Treatment Site Septic Tanks	$2,533	
10	Expenses Subject to Working Capital Calculation	43,503	
11	Divide by: 45 Day Factor	8	
12	Annual Working Capital Revenue Requirement		$5,438

* Per Engineer's Estimates

** Per Hayden Water Estimates and LWG Annual Audit Estimate as required by USDA

Hayden Wastewater Utility, Inc.
Hayden, Indiana

2012 USDA Rural Development Bonds - Amortization Schedule

Bond Amount	$ 753,000		Term (Years)	40	
Interest Rate	3.00%		Original Issue Date	9/15/2012	

Line No..		Principal	Interest	Total Period	Fiscal Period
1	2/1/2013	$ -	$ 8,534.03	$ 8,534.03	$ 8,534.03
2	8/1/2013	5,038.00	11,295.23	16,333.23	
3	2/1/2014	5,113.00	11,219.66	16,332.66	32,665.89
4	8/1/2014	5,190.00	11,142.96	16,332.96	
5	2/1/2015	5,268.00	11,065.11	16,333.11	32,666.07
6	8/1/2015	5,347.00	10,986.09	16,333.09	
7	2/1/2016	5,427.00	10,905.88	16,332.88	32,665.97
8	8/1/2016	5,509.00	10,824.47	16,333.47	
9	2/1/2017	5,591.00	10,741.83	16,332.83	32,666.30
10	8/1/2017	5,675.00	10,657.96	16,332.96	
11	2/1/2018	5,760.00	10,572.83	16,332.83	32,665.79
12	8/1/2018	5,847.00	10,486.43	16,333.43	
13	2/1/2019	5,934.00	10,398.72	16,332.72	32,666.15
14	8/1/2019	6,023.00	10,309.71	16,332.71	
15	2/1/2020	6,114.00	10,219.36	16,333.36	32,666.07
16	8/1/2020	6,205.00	10,127.65	16,332.65	
17	2/1/2021	6,299.00	10,034.57	16,333.57	32,666.22
18	8/1/2021	6,393.00	9,940.08	16,333.08	
19	2/1/2022	6,489.00	9,844.18	16,333.18	32,666.26
20	8/1/2022	6,586.00	9,746.84	16,332.84	
21	2/1/2023	6,685.00	9,648.05	16,333.05	32,665.89
22	8/1/2023	6,785.00	9,547.77	16,332.77	
23	2/1/2024	6,887.00	9,445.99	16,332.99	32,665.76
24	8/1/2024	6,990.00	9,342.68	16,332.68	
25	2/1/2025	7,095.00	9,237.83	16,332.83	32,665.51
26	8/1/2025	7,202.00	9,131.40	16,333.40	
27	2/1/2026	7,310.00	9,023.37	16,333.37	32,666.77
28	8/1/2026	7,419.00	8,913.72	16,332.72	
29	2/1/2027	7,531.00	8,802.43	16,333.43	32,666.15
30	8/1/2027	7,644.00	8,689.46	16,333.46	
31	2/1/2028	7,758.00	8,574.80	16,332.80	32,666.26
32	8/1/2028	7,875.00	8,458.43	16,333.43	
33	2/1/2029	7,993.00	8,340.30	16,333.30	32,666.73
34	8/1/2029	8,113.00	8,220.40	16,333.40	
35	2/1/2030	8,234.00	8,098.70	16,332.70	32,666.10
36	8/1/2030	8,358.00	7,975.19	16,333.19	
37	2/1/2031	8,483.00	7,849.82	16,332.82	32,666.01
38	8/1/2031	8,610.00	7,722.57	16,332.57	
39	2/1/2032	8,740.00	7,593.42	16,333.42	32,665.99
40	8/1/2032	8,871.00	7,462.32	16,333.32	
41	2/1/2033	9,004.00	7,329.25	16,333.25	32,666.57
42	8/1/2033	9,139.00	7,194.19	16,333.19	
43	2/1/2034	9,276.00	7,057.10	16,333.10	32,666.29
44	8/1/2034	9,415.00	6,917.96	16,332.96	
45	2/1/2035	9,556.00	6,776.73	16,332.73	32,665.69
46	8/1/2035	9,700.00	6,633.39	16,333.39	
47	2/1/2036	9,845.00	6,487.89	16,332.89	32,666.28

Hayden Wastewater Utility, Inc.
Hayden, Indiana

2012 USDA Rural Development Bonds - Amortization Schedule

	Bond Amount	$ 753,000		Term (Years)	40
	Interest Rate	3.00%		Original Issue Date	9/15/2012
Line No..		Principal	Interest	Total Period	Fiscal Period
48	8/1/2036	9,993.00	6,340.21	16,333.21	
49	2/1/2037	10,143.00	6,190.31	16,333.31	32,666.52
50	8/1/2037	10,295.00	6,038.16	16,333.16	
51	2/1/2038	10,449.00	5,883.73	16,332.73	32,665.89
52	8/1/2038	10,606.00	5,726.99	16,332.99	
53	2/1/2039	10,765.00	5,567.90	16,332.90	32,665.89
54	8/1/2039	10,927.00	5,406.42	16,333.42	
55	2/1/2040	11,090.00	5,242.51	16,332.51	32,665.93
56	8/1/2040	11,257.00	5,076.16	16,333.16	
57	2/1/2041	11,426.00	4,907.30	16,333.30	32,666.46
58	8/1/2041	11,597.00	4,735.91	16,332.91	
59	2/1/2042	11,771.00	4,561.95	16,332.95	32,665.86
60	8/1/2042	11,948.00	4,385.38	16,333.38	
61	2/1/2043	12,127.00	4,206.16	16,333.16	32,666.54
62	8/1/2043	12,309.00	4,024.25	16,333.25	
63	2/1/2044	12,493.00	3,839.61	16,332.61	32,665.86
64	8/1/2044	12,681.00	3,652.21	16,333.21	
65	2/1/2045	12,871.00	3,461.99	16,332.99	32,666.20
66	8/1/2045	13,064.00	3,268.92	16,332.92	
67	2/1/2046	13,260.00	3,072.96	16,332.96	32,665.88
68	8/1/2046	13,459.00	2,874.06	16,333.06	
69	2/1/2047	13,660.00	2,672.17	16,332.17	32,665.23
70	8/1/2047	13,865.00	2,467.27	16,332.27	
71	2/1/2048	14,073.00	2,259.29	16,332.29	32,664.56
72	8/1/2048	14,284.00	2,048.19	16,332.19	
73	2/1/2049	14,498.00	1,833.93	16,331.93	32,664.12
74	8/1/2049	14,716.00	1,616.46	16,332.46	
75	2/1/2050	14,936.00	1,395.72	16,331.72	32,664.18
76	8/1/2050	15,160.00	1,171.68	16,331.68	
77	2/1/2051	15,388.00	944.28	16,332.28	32,663.96
78	8/1/2051	15,619.00	713.46	16,332.46	
79	2/1/2052	15,853.00	479.17	16,332.17	32,664.63
80	8/1/2052	16,091.00	241.37	16,332.37	16,332.37
81		$ 753,000.00	$ 545,834.83	$ 1,298,834.83	$ 1,298,834.83

82	Maximum Annual Debt Service (Reserve Fund Requirement)	$ 32,667
83	Divide by: Funding Period	10
84	Debt Reserve Annual Funding Requirement	$ 3,267

Hayden Wastewater Utility, Inc.

Hayden, Indiana

Estimated Sources and Uses of Funds

Line No.			
	Estimated Sources of Funds:		
1	USDA - RD Grant		$2,088,333
2	OCRA Grant		500,000
3	USDA - RD Loan		753,000
4	Total Sources of Funds		$3,341,333
	Estimated Uses of Funds:		
5	Construction Costs	$2,752,900	
6	Design and Construction Administration	247,800	
7	Total Construction Costs		$3,000,700
8	Resident Project Representation		192,703
9	Preliminary Engineering Report		25,000
10	IURC CTA Petitioning Process		20,000
11	Bond Counsel		40,000
12	Financial		10,000
13	Grant Administration		40,000
14	Labor Standards		5,000
15	Environmental Review		3,000
16	Miscellaneous		4,930
17	Total Uses of Funds		$3,341,333

Hayden Wastewater Utility, Inc.

Hayden, Indiana

Calculation of Annual Depreciation and Short Lived Assets Replacement

Line No.			
	Depreciation		
1	Utility Plant In Service		$2,752,900
2	IURC Composite Depreciation Rate		2.50%
3	Annual Depreciation		$68,823
	Short Lived Assets Replacement (40 Year Evaluation)		
4	Grinder Pump Replacements	$ 672,000	
5	Isolation Valves	7,000	
6	Service Line Valves	50,400	
7	Air Release Valves	13,000	
8	Pumps	10,000	
9	Flow Meters	6,000	
10	Solenoid Valves	16,000	
11	General Treatment System Parts	107,000	
12	Total Short Term Replacement Costs	$ 881,400	
13	Divide By: Years	40	
14	Annual Replacement Funding Component		$ 22,035

EXHIBIT E

Hayden Wastewater Utility, Inc.

Hayden, Indiana

Verification of Revenues to be Collected

Line No.		
	Monthly Charge	
1	Residential Customers - Equivalent Monthly Bills	146
2	Other Customers - Equivalent Monthly Bills	45
3	Total Equivalent Bills Per Month	191
4	Times: Annualize	12
5	Total Annual Number of Equivalent Bills	2,292
6	Times: Base Charge per equivalent monthly bill	$47.77
7	Total Annual Revenues from Base Charge	$109,489
8	Annual Base Revenue Requirement	(109,462)
9	Over/(Under) Collection	$27

Hayden Wastewater Utility, Inc.

Hayden, Indiana

Net Margin & 5-Year Cash Flow Projections using Short Lived Asset Replacement for Rate Calculation (Monthly Rate Scenario Two)

Assumptions:

GROWTH %	0.00%
EXPENSE INC. %	2.59%
INTEREST RATE. %	0.25%

Line No.	DESCRIPTION	BASE YEAR	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
1	Sewer Revenues	$ 109,462	$ 109,462	$ 109,462	$ 109,462	$ 109,462	$ 109,462
	Operating Expenses:						
2	Operating Expenses	44,523	45,547	46,597	47,674	48,779	49,913
3	Short Lived Assets Replacements	22,035	22,035	22,035	22,035	22,035	22,035
4	Taxes	1,532	1,532	1,532	1,532	1,532	1,532
5	Total Operating Expenses	68,090	69,114	70,164	71,241	72,346	73,480
6	Operating Margin	41,372	40,348	39,298	38,221	37,116	35,982
7	Short Lived Assets Replacements	22,035	22,035	22,035	22,035	22,035	22,035
8	Interest Income	0	77	151	223	293	360
	LESS:						
9	Debt Service - Principal	(32,667)	(32,667)	(32,667)	(32,667)	(32,667)	(32,667)
10	Debt Service - Interest	0	0	0	0	0	0
11	Amount Available	$ 30,740	$ 29,793	$ 28,817	$ 27,812	$ 26,777	$ 25,710
12	Assets Replacement Funding	22,035	22,035	22,035	22,035	22,035	22,035
13	Annual Debt Service Reserve						
14	funding requirement	3,267	3,267	3,267	3,267	3,267	3,267
15	Cash Flow	$ 5,438	$ 4,491	$ 3,515	$ 2,510	$ 1,475	$ 408
16	Cash Beginning Balance	0	5,438	9,929	13,444	15,954	17,429
17	Cash Balance Ending	$ 5,438	$ 9,929	$ 13,444	$ 15,954	$ 17,429	$ 17,837
18	Required Debt Service Coverage	1.10	1.10	1.10	1.10	1.10	1.10
19	Actual Debt Service Coverage	1.94	1.91	1.88	1.85	1.82	1.79
20	# of Customers	152	152	152	152	152	152
	Restricted Assets						
21	(After Current Contribution)						
22	Debt Service Reserve Balance	$ 3,267	$ 6,534	$ 9,801	$ 13,068	$ 16,335	$ 19,602
23	Short Lived Asset Replacement Reserve	22,035	44,070	66,105	88,140	110,175	132,210
24	Total Restricted Funds	$ 25,302	$ 50,604	$ 75,906	$ 101,208	$ 126,510	$ 151,812

Hayden Wastewater Utility, Inc.

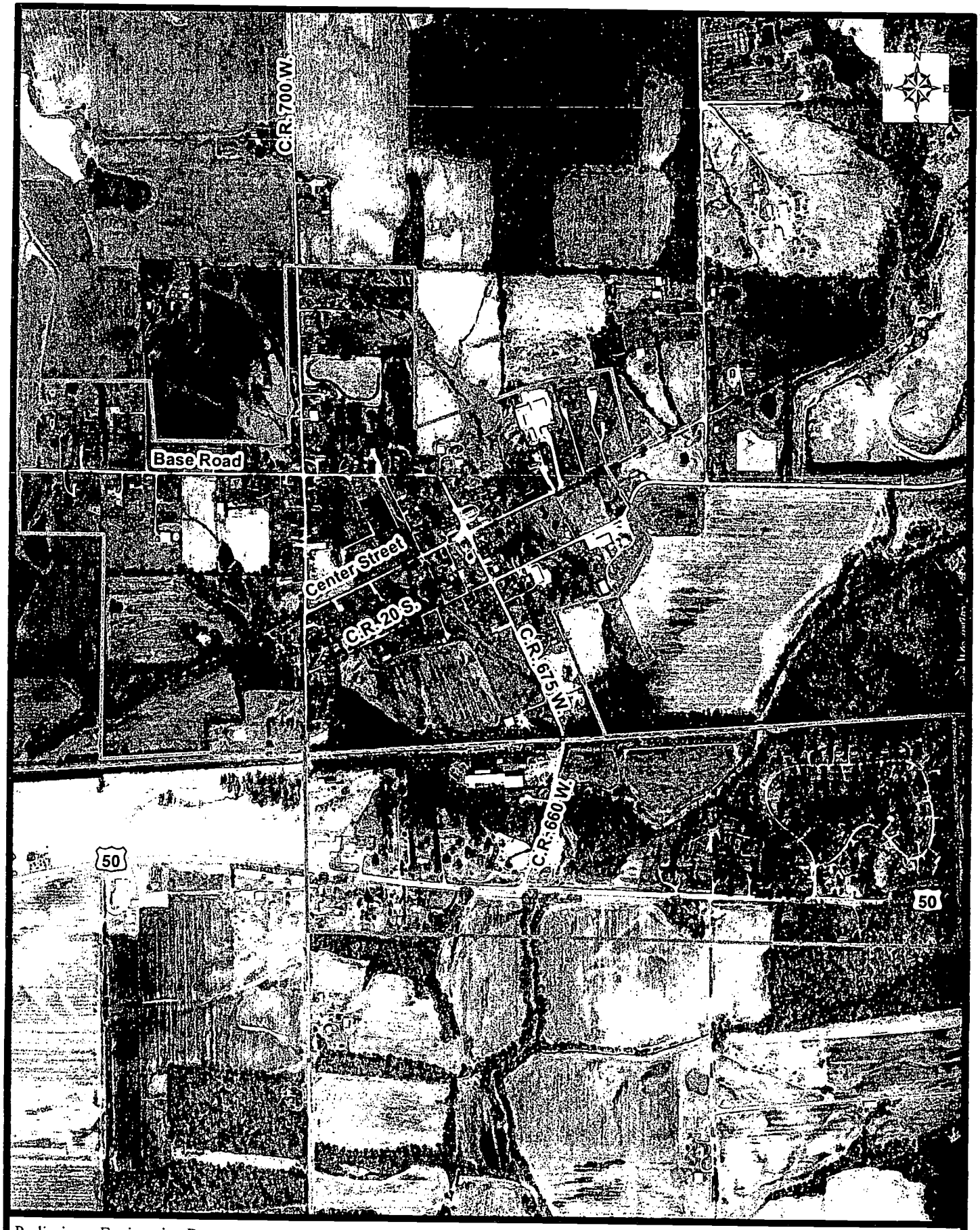
Hayden, Indiana

Net Margin & 5-Year Cash Flow Projections using 100% Depreciation for Rate Calculation
(Monthly Rate Scenario One)

Assumptions:

GROWTH %	**0.00%**
EXPENSE INC. %	**2.59%**
INTEREST RATE. %	**0.25%**

Line No.	DESCRIPTION	BASE YEAR	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
1	Sewer Revenues	$ 156,914	$ 156,914	$ 156,914	$ 156,914	$ 156,914	$ 156,914
	Operating Expenses:						
2	Operating Expenses	44,523	45,547	46,597	47,674	48,779	49,913
3	Depreciation	68,823	68,823	68,823	68,823	68,823	68,823
4	Taxes	2,197	2,197	2,197	2,197	2,197	2,197
5	Total Operating Expenses	115,542	116,566	117,616	118,693	119,798	120,932
6	Operating Margin	41,372	40,348	39,298	38,221	37,116	35,982
7	Depreciation	68,823	68,823	68,823	68,823	68,823	68,823
8	Interest Income	0	194	386	575	763	948
	LESS:						
9	Debt Service - Principal	(32,667)	(32,667)	(32,667)	(32,667)	(32,667)	(32,667)
10	Debt Service - Interest	0	0	0	0	0	0
11	Amount Available	$ 77,527	$ 76,697	$ 75,839	$ 74,952	$ 74,034	$ 73,085
12	Annual Replacements Funding	22,035	22,035	22,035	22,035	22,035	22,035
13	Annual Debt Service Reserve						
14	funding requirement	3,267	3,267	3,267	3,267	3,267	3,267
15	Cash Flow	$ 52,225	$ 51,395	$ 50,537	$ 49,650	$ 48,732	$ 47,783
16	Cash Beginning Balance	0	52,225	103,621	154,158	203,807	252,539
17	Cash Balance Ending	$ 52,225	$ 103,621	$ 154,158	$ 203,807	$ 252,539	$ 300,322
18	Required Debt Service Coverage	1.10	1.10	1.10	1.10	1.10	1.10
19	Actual Debt Service Coverage	3.37	3.35	3.32	3.29	3.27	3.24
20	# of Customers	152	152	152	152	152	152
	Restricted Assets						
21	(After Current Contribution)						
22	Debt Service Reserve Balance	$ 3,267	$ 6,534	$ 9,801	$ 13,068	$ 16,335	$ 19,602
23	Short Lived Asset Replacement Rese	22,035	44,070	66,105	88,140	110,175	132,210
24	Total Restricted Funds	$ 25,302	$ 50,604	$ 75,906	$ 101,208	$ 126,510	$ 151,812



Preliminary Engineering Report
Hayden, Indiana

0 400 800 1,600 Feet

Figure 2-2
Project Planning Area
Hayden, Indiana

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"EXHIBIT C"