

Prepared for:

The Village of Wayne Lakes

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ABBREVIATIONS

EDU	Equivalent Daily Units
OEPA	Ohio Environmental Protection Agency
GPD	Gallons Per Day
STEP	Septic Tank Effluent Pump
Mg/L	Milligrams Per Liter
MGD	Million Gallons Per Day
BOD	Biochemical Oxygen Demand
CBOD ₅	Five Day Carbonaceous Biochemical Oxygen Demand
MVRPC	Miami Valley Regional Planning Commission
D.O.	Dissolved Oxygen
WWTP	Wastewater Treatment Plant
R/D	Recirculation/Dilution
FPA	Facility Planning Area
O,M&R	Operation, Maintenance, and Repair
HSTS	Household Sewage Treatment Systems
GHD	General Health District

Purpose of Study

The purpose of this study is to identify, evaluate, and present information pertaining to the existing and future wastewater system within the Village of Wayne Lakes. This study will also gain a sense of the potential growth expected in the area, and present options of different wastewater collection and treatment systems. In addition, the study develops cost-effective alternatives for wastewater service in the area. This study will be used by the Miami Valley Regional Planning Commission (MVRPC) and the Village of Wayne Lakes for the purpose of future planning needs. The Village of Wayne Lakes was selected for this study because of the inability to stay within the health regulations when replacing failing septic tanks.

Alternatives Considered

The existing and future wastewater needs were analyzed to help determine different collection and treatment options. These options include:

Wastewater Collection System Alternatives considered the following:

- Gravity Sewer System
- Septic Tank Effluent Pumping (STEP) System
- Grinder Pump Sewer System
- Vacuum Sewer System

Wastewater Treatment System Alternatives considered the following:

- Construct new Wastewater Treatment Plant (WWTP) to serve the Village of Wayne Lakes, involving the following treatment alternatives:
 - o Extended Aeration
 - o Lagoon
 - o Packed Bed Media Filter
- Regionalize with an adjacent treatment system includes:
 - o Transport Wastewater to the City of Greenville WWTP
 - Transport Wastewater to the proposed Palestine/Hollansburg WWTP
 - o Transport Wastewater to the Village of New Madison WWTP

Conclusion

All of the different collection and treatment alternatives listed above were analyzed into many different scenarios. Each scenario looked at the cost of the project, O,M&R, and different environmental factors. All of these factors helped determine the most cost-effective best case scenario for the Village of Wayne Lakes.

Recommendation

After considering the economic cost-effective analysis and the environmental conditions, the following regional solutions are recommended:

The Village of Wayne Lakes should install a Grinder Pump collection system with necessary force mains to a new Mechanical Treatment Plant (Extended Aeration) facility stationed just outside of the Village of Wayne Lakes.

In order to design and construct a regional Grinder Pump sewer collection system and an Extended Aeration treatment system, the following table was developed summarizing the project costs with realistic funding plans for the project. The bottom line of each option shows the typical average cost per month for each of the 319 customers.

		Option #1 Using OWDA Loan	Option #2 Using Ohio EPA Loan	Option #3 Using RD Grant/Loan	
CUSTOMERS/EDUs		319	319	319	
PROJECT COST- Collection System		\$5,530,818	\$5,530,818	\$5,530,818	
PROJECT COST- Treatment System		\$1,816,320	\$1,816,320	\$1,816,320	
TOTAL PROJECT COST			\$7,347,138	\$7,347,138	\$7,347,138
ANNUAL O,M&R			\$91,000	\$91,000	\$91,000
FINANCING					
CDBG Formula Grant			\$50,000	\$50,000	\$50,000
Residential Public Infrastructure Grant	Residential Public Infrastructure Grant		\$480,000	\$480,000	\$480,000
OPWC Grant		\$400,000	\$400,000	\$400,000	
Unsewered Area Assistance Program		\$250,000	\$250,000	\$250,000	
Local Funds - Capacity Fee \$3,000/Customer		\$957,000	\$957,000	\$957,000	
Rural Development Grant (up to 35% of Project Cost)		\$ -	\$ -	\$2,571,498	
OPWC Loan	30	0.00%	\$800,000	\$800,000	\$800,000
OWDA Loan	30	2.00%	\$4,410,138	\$ -	\$ -
OEPA WPCLF Loan	30	0.00%	\$ -	\$4,410,138	\$ -
Rural Development Loan	40	2.75%	\$ -	\$ -	\$1,838,640
Total Financing		\$7,347,138	\$7,347,138	\$7,347,138	
ANNUAL DEBT					
Annual OPWC Payment		\$26,667	\$26,667	\$26,667	
Annual OWDA Payment			\$196,912	\$ -	\$ -
Annual OEPA WPCLF Payment		\$ -	\$147,005	\$ -	
Annual Rural Development Payment		\$ -	\$ -	\$ 76,361	
ANNUAL DEBT PAYMENT		\$223,579	\$173,671	\$103,028	
DEBT PAYMENT PER MONTH PER EDU		\$58.41	\$45.37	\$ 26.91	
O,M&R PAYMENT PER MONTH PER EDU			\$23.77	\$ 23.77	\$23.77
TOTAL PAYMENT PER MONTH PER EDU			\$82.18	\$ 69.14	\$50.69

Table 1-1: Funding Summary

Three potential scenarios are presented above based on the recommended grinder collection system and extended aeration treatment facility. The upper portion is constant between all three options showing the total number of customers, construction cost, and annual O,M&R costs.

Under the Financing and Annual Debt sections, we show the maximum available grants and loans through CDBG and OPWC assuming eligibility thresholds are met as described on the previous pages. This also includes an assumed \$3,000 Capacity Fee per customer. This capacity fee can be adjusted as the Village sees fit or eliminated altogether with the understanding that monthly rates will adjust accordingly. Option #1 and Option #2 are very similar with the only difference being the remaining loan balance after all grants are maximized being from different sources. Option #1 shows OWDA loan at a 2-percent rate where Option #2 shows a 0-percent rate through Ohio EPA funding. These rate differences affect the annual debt payment shared between each customer as shown on the Debt Payment per Month per EDU line.

Option #3 is the most optimistic scenario utilizing a Rural Development grant/loan combination. It is time consuming and requires a commitment from the community in order to secure, but can also significantly lower the average monthly cost per customer.

In most communities, sewer rates are based on metered water consumption to each customer. Since Wayne Lakes currently does not operate a public water system, water meters can be installed on each private well or a flat rate billing system established. Each of these scenarios above reflect a flat rate that each customer would need to be charged in order to operate and maintain the system based on 319 total customers.

Background

In accordance with the Water Pollution Control Act amendments of 1972, the Miami Valley Regional Planning Commission (MVRPC) serves as the Designated Water Quality Planning Agency for the 5-county Miami Valley Region. In this role, MVRPC prepared and continually maintains an Areawide Water Quality Management Plan (AWQMP), also known as the 208 Plan. Also, under Section 208 of the EPA's Clean Water Act, MVRPC has the responsibility for reviewing and approving individual Wastewater Treatment Facility Plans and their associated Facility Planning Areas. Within the AWQMP for Darke County, the Village of Wayne Lakes, among other communities, was designated as a localized area of concern as noted by the Darke County Combined Health District, Wayne Lakes County Soil and Water Conservation District and Ohio EPA as a result of failing septic systems

In 2014, MVRPC received a grant sponsored by Ohio EPA to evaluate and provide wastewater collection and treatment alternatives for several communities within the 5-county region agreeing to take part in the study. The Village of Wayne Lakes elected to become one of the study participants. This report is the result of that commitment.

Objective

The objective of this study is to provide a cost-effective and environmentally sound wastewater collection and treatment system for the Village of Wayne Lakes planning area. The design of the system will take the growth and development of the area into consideration. The new system will meet the requirements established by the Ohio Environmental Protection Agency.

Planning Area

The Village of Wayne Lakes is a small incorporated village located in the middle of Darke County. Wayne Lakes is approximately 6 miles south of the City of Greenville and 6 miles northeast of the Village of New Madison.

As noted in MVRPC's Area Wide Water Quality Management Plan, the planning area for Wayne Lakes also includes the unicorporated community of Fort Jefferson, in Neave Township. Fort Jefferson is a small unswered area located just out side of the Village of Wayne lakes on the east side. Including this area in the planning area for Wayne Lakes will help lower the cost per customer. All property within the corporation limits of Wayne Lakes as well as adjacent residential properties located just outside of the Village limits cover an area of approximately 0.94 square miles. There are currently 283 homes within the Village of Wayne Lakes boundaries and an additional 36 homes in the Fort Jefferson area. Figure 2-1 illustrates the outline of the planning area.

Scope of Study

A brief summary of the scope of this study is presented below. The planning period for this study is 25 years or through the year 2040.

<u>Data Collection and Review</u> - Data relevant to the Planning Area was collected, reviewed and analyzed. This data included previous studies concerning wastewater needs of the area.

<u>Develop Population & Sewer Needs Forecasts</u> – Based on historical and existing population data, the projected future wastewater needs for the designated study area over a 25-year planning period was developed.

Factors such as cost, environmental impacts, regulatory and permitting requirements must be taken into consideration when evaluating wastewater collection and treatment alternatives.

<u>Develop and Evaluate Alternatives</u>- In establishing the criteria for the design of wastewater systems, several factors were considered. These included the length of time the facilities should serve before replacement or expansion is necessary, the population to be served, the type of customers to be served (i.e. residential, commercial, industrial, etc.) and the projected wastewater flows (both average daily and peak hourly flows) over the span of the planning period.

<u>Draft Report</u>- Based on the work generated in the above tasks, a Draft Report summarizing the findings and recommendations is to be prepared. The draft report will be reviewed with the Village and other stakeholders and comments/ feedback will be incorporated into the Final Report.

<u>Final Report</u>- After review of the draft report and revisions made pursuant to comments received, a final report will be prepared and delivered to the Village, MVRPC, and the Ohio EPA.

Methodology

Brief descriptions of the methods used in the preparation of this study are shown below.

<u>Study Area Boundary</u>- The general study area was determined by MVRPC and was refined during the first progress meeting.

<u>Projections of Sewer Needs for the Study Area -</u> The following calculations were used to determine the average daily flow and the peak hourly flow.

<u>Wastewater Systems</u> Average Daily Flow = Population x 100 gallons/day/person Peak Hourly Flow = Average Daily Flow x 4.0 peaking factor



Chapter 3 - Existing Conditions

Existing Water Systems

The existing source of drinking water for both residences and commercial establishments in the Village of Wayne Lakes is private wells. There is a potential for contamination with the onsite septic systems failing. The installation of a centralized wastewater system will preserve the drinking water in the area.

Existing Wastewater Systems

A centralized collection and treatment system does not exist within the Village of Wayne Lakes. Each residence and business is responsible for its own on-site treatment system. Many of these on-site systems are comprised of aeration tanks with subsurface drainage. Many of these on-lot treatment systems are failing and discharging raw or partially treated sewage to drainage swales which finds its way into the water table and adjacent streams. These systems do not meet Ohio EPA discharge standards.

There have been 324 HSTS (household sewage treatment system) permits issued to the Village of Wayne Lakes by the Darke County GHD. As Wayne Lakes was once a gravel pit, the effluent from the current sewer systems passes through the soil too quickly for adequate treatment and leaches to the lakes. The systems which are failing and do not meet Ohio EPA standards are subsurface sand filters, tank to tile systems, aerators and drywells. These current systems discharge approximately 54,400 gallons of untreated sewage per day. This was based on an estimate of 400 GPD for 136 homes that are not meeting the discharge standards. This has caused the water quality in the lakes to diminish. Most of the homes in the area are located on very small lots that do not have adequate space for septic system installation or replacement.

Environmental Conditions

The environmental conditions in Darke County and the study area are important factors in determining the wastewater collection and treatment alternatives that are viable for the study area. The environmental conditions are analyzed in the following sections.

Soils

The majority of the study area is located within two soil classifications; the soils within the Village of Wayne Lakes generate the Udorthents and Miamian associations. The following information is generated from the United States Department of Agriculture National Resource Conservation Service. Figure 3-1 shows all the soil associations within the Wayne Lakes planning area and an outline of the Village boundary.

The Udorthents soil series is the dominant soil series coving approximately 70 percent of the planning area. Most of the soil has a slope of 0-12 percent, with some of the soil sloping from 15-25 percent near the edges of the lakes. For the soil further away from the

lakes, the depth to the water table is approximately 80 inches. There is also little to no flooding or ponding for the soil further from the lakes.

The second leading soil in the planning area is Miamian silt loam. Roughly 10 percent of the soil in the area is Miamian silt loam. The soil slope has a range of slope of 2-6 percent. In the areas where the slope has a steeper incline, the soil series has a well-drained drainage classification. This soil class also has little to no flooding or ponding. Another element for a soil with a steeper slope is having low available water storage. This soil is able to retain approximately 6 inches. The depth to the water table for this soil class is approximately 24-36 inches deep.

Topography

The topography is relatively hilly and consists of around 18 small lakes. The land around most of the lakes has a steep hill going from the top of land down to the water. The highest elevation in the study area is 1070 feet and the lowest elevation is 1030 feet .The topography of the land generally slopes from the south down to the north end of the study area. As such, there is a general 0.38 percent slope across the planning area.

The bedrock in the area is at an average elevation of 1000 feet. The lowest elevation of the bed rock is 965 feet, which is located in the northern part of the Village. The highest bedrock elevation of 1043 is also located at the northern end of the village. The average depth to the bedrock is 30 feet. Figure 3-2 indicates the bedrock in the area on the Area Bedrock Topography map.

Surface Water

There are 18 small lakes within the Village of Wayne Lakes. These lakes are spread throughout the Village and are currently used for swimming, fishing, and various activities. Mud Creek borders Wayne Lakes to the east and Prairie Outlet borders Wayne Lakes to the west. Prairie Outlet enters Mud Creek and Mud Creek enters Greenville Creek near the City of Greenville. Mud Creek and Prairie Outlet are designated as Warm Water Habitat with Greenville Creek being designated as an Exceptional Warm Water Habitat. Both Mud Creek and Prairie Creek will be considered as discharge points for a future wastewater treatment facility further in this study. Pertinent portions of the Biological and Water Quality Study of the Stillwater River Watershed for Darke, Miami, and Montgomery Counties dated November 6, 2001 are included within the Appendix of this report.

Wetlands

There are a few wetlands identified by the National Wetlands Inventory Program in the area. These wetlands are mainly the lakes located within the Village, but there are a few freshwater areas with forest and shrubs near them. The collection and treatment systems will be designed around these arrangements. The location of these wetlands can be found in Figure 3-3.

Flood Hazard Area (100 yr. flood plain)

Flood plains are formed by the periodic overflow of the stream and its resulting sediment deposition and realignment of the stream course. They are characteristically flat and fertile, and can extend over large areas of land.

Although flood plains are often perceived as desirable development sites, they are potentially hazardous in terms of loss of life, property, and land. The 100-year flood reoccurrence interval is most commonly accepted as a reasonable measure of flood-prone areas. Figures 3-4 and 3-5 show the aerial extent of the 100-year flood of the lakes within the Village, Mud Creek and its tributaries, as identified on the Federal Emergency Management Agency (FEMA) map.

Land Use

The planning area has three different land categories. The three different categories for this study are residential, commercial, and vacant/agriculture. Figure: 3-6 and 3-7 show the locations of each of the land categories.

The residential category, which is the largest, is comprised of single-family dwellings, multi-family dwellings, and vacant residences with a potential of human habitation. The primary residential area lies within the corporation limits of the Village of Wayne Lakes with additional residential areas just outside of the corporation limits. Residential land use in the planning area is comprised of approximately 520 acres, which is 87 percent of the total area.

Commercial land comprises the second largest percentage of acres in the planning area. Commercial land consists of the parks and local business in the area. Commercial land use makes up approximately 12 percent of the planning area and contains approximately 70 acres.

The third largest land use category, vacant/agriculture, is composed of 10 acres and is approximately 2 percent of the planning area.

LAND USE TYPE	ACREAGE	PERCENTAGE
Residential	520	86
Commercial	70	12
Vacant/Agriculture	10	2
Total	600	100

Table3-1: Existing Land Use





FIGURE 3-3: WETLANDS

User Remarks:

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

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Other

Lakes Village of Wayne

NISH & WILDLINE

U.S. Fish and Wildlife Service

Mar 3, 2015

Wetlands

