Town of Fortville
Wastewater Master Plan 2017

I. PROJECT SUMMARY

A. General

This Master Plan has been prepared for the Town of Fortville. Its purpose is to provide the Town Council and citizens in the community's planning area with a plan for the orderly expansion of the wastewater system over the next 20 years. Associated information will be provided to allow the Town to determine the technical and economical adequacy of the recommended management plan.

B. Purpose and Scope of Master Plan

Currently there are approximately 25 linear miles of collection sewers and 7 lift stations that serve the populated areas of Town. The wastewater treatment plant is a Class II oxidation ditch that was expanded in 2012 to a design rating of 0.950 MGD. After the plant was upgraded the service area experienced a substantial increase in residential development. This caused the Town to re-evaluate the wastewater management system in order to accommodate the current and future needs of the community.

Improvements presented in this report are planned to benefit the future 20 year growth of the Town and surrounding service area whose population is expected to increase. Recommendations for system expansion were targeted to provide centralized treatment capabilities to accommodate the high population growth presently being experienced in the area.

C. Financial Analysis

Financing the recommended improvements and extension of the system could be cost prohibitive without planned funding avenues. The cost for improvements has been divided into projects which can be implemented to coincide with development. A general itemization of costs is presented on **Table 9**. Potential funding avenues are presented in Section IX.

II. EXISTING SERVICE AREA

A. Corporate Limits

The Town of Fortville is located approximately 12 miles northeast of Indianapolis in the northwest corner of Hancock County. The community was incorporated as the Town of Fortville in 1865 and sits between the Towns of Ingalls, Fishers, and McCordsville. After several annexations, the Town presently contains approximately 3 square miles.

B. Extended Service Area

The Town encompasses parts of Vernon Township in the northwest part of Hancock County, Indiana. The 20 year study area includes the corporate limits and future service areas. The Town is located in Sections 9 and 10 of Township 17 North, Range 6 East and is contained on the Ingalls Quadrangle map. The adjacent Towns are McCordsville to the west and Ingalls to the east along SR 67. The service area is generally bounded on the north by the Hamilton/Hancock County line, N 400 W on the west side, approximately W 650 N on the south side, and N 50 E on the east.

C. Population

1. Existing Population

The population based on the 2010 Census data is 3,929 which is an increase of 14% from the previous decade. According to the Census records there are 2.53 persons per household (pph) based on the population and an estimated 1,553 households. The current 2016 population is estimated at 3,998 persons.

2. Historical Population

A review of past, current and future population trends is necessary in order to determine and appropriately plan for future expansion of the system. **Table 1** provides a listing of past trends.

Vernon Township has a current population of 11,005 and contains 4,322 housing units. The 2010 census notes that the township has a total area of 31.33 square miles of which 31.26 square miles

(99.78%) is land and 0.07 square miles (0.22%) is water. The two largest Towns in the Township are McCordsville and Fortville. Together they make up 80% of the population.

TABLE 1
HISTORICAL POPULATION

	Fortville		Hancock County	
Census	Pop.	%±		
1870	387	—	15,123	18.1%
1880	634	63.8%	17,123	13.2%
1890	685	8.0%	17,829	4.1%
1900	1,006	46.9%	19,189	7.6%
1910	1,174	16.7%	19,030	-0.8%
1920	1,213	3.3%	17,210	-9.6%
1930	1,289	6.3%	16,605	-3.5%
1940	1,463	13.5%	17,302	4.2%
1950	1,786	22.1%	20,332	17.5%
1960	2,209	23.7%	26,665	31.1%
1970	2,460	11.4%	35,096	31.6%
1980	2,787	13.3%	43,939	25.2%
1990	2,690	-3.5%	45,527	3.6%
2000	3,444	28.0%	55,391	21.7%
2010	3,929	14.1%	70,002	26.4%
Est. 2016	3,998	1.8%	73,717	5.3%

3. Future Population

It should be noted that, in the past 14 decades the Town only experienced a decline between 1980 and 1990. Based on this historical trend it is expected that the Town will experience continued increases in population over the planning period.

Population projections are difficult to determine in some areas because the Town's service area limits do not coincide with a Township boundary. In order to derive the most likely projections the future population will be based on a combination of sources, factors and assumptions. *The Comprehensive Plan for the Town predicts that the population within the Town limits will be 4,720 by 2025 and 5,334 by 2035.*

Population projections in undeveloped areas outside of the Town limits were based on the acreage and a conservative building density of 2.5 single family residences (sfr) per acre. (The allowable building density from the Town's Construction Standards is 2.8 households per acre.) Future growth predictions can be attributed to both the economic expansion of the Indianapolis metropolitan area as well as the expansion of the nearby Cities of Fishers and Noblesville over the

past several years. Based on the present growth pattern, it can be estimated that 8,000 people could reside in the service area by the year 2030 and this could rise to over 13,000 by 2040.

If potential growth areas are developed in the next 20 years the population could increase as listed on **Table 2**.

TABLE 2
FUTURE POPULATION PROJECTIONS

Area		Acreage	Homes [1]	Population [2]
A1		54	135	338
A2		83	205	512
B		285	710	1,775
C		79	200	500
D		146	364	910
	Subtotal	*640*	*1,614*	4,035
E		167	415	1,038
F		58	145	360
G		50	125	310
H		33	80	200
I		10	25	63
J		43	108	270
K		395	988	2,470
L		49	45 Existing	110
	Subtotal	*805*	*1,931*	*4,821*
	TOTAL	*1,445*	*3,545*	*8,856*

[1] Derived using 2.5 sfr per acre

[2] Derived from Census data indicating 2.5 person per household in area

D. Economic Projections

Economic growth is expected to parallel the population growth which will be centered around the areas currently served and the major roadway corridors. Commercial and industrial users in the planning area account for a moderately healthy 15% of the existing customer accounts. These are mostly located in the business park, downtown corridor, and adjacent to SR 67. Based on this

background it is expected that unless a major industry or business is solicited commercial growth tendencies will continue to remain similar to the present.

Economic growth will occur by additional tax base resulting from increased development within the planning area. Based on the Comprehensive Plan and the proposed concepts for the TIF Districts, growth will be a mix of residential and commercial uses with a planned and measured ratio that includes green space and walking trails. It is the desire of the Town to limit commercial and industrial users to specific uses and targeted locations within the service area.

E. Customer Base

Most areas in Town are served by the wastewater system. Only a handful of properties are not served but these are primarily large lots that are not near an available sewer. With few exceptions most areas outside of the Town limits are not served. The present user base includes 1,587 residential, 278 commercial and multi-family, 10 industrial, and 27 government and institutional for a total of 1,902 customers. Based on projections from **Table 2** the population in the Town's service area could increase to nearly 13,000 by 2040 with full build-out of all developments.

F. Topography

The terrain within the service area is flat to gently rolling. Most areas in Town generally fall from southeast to northwest. Contour elevations range from a high of 880 feet above mean sea level (msl) in the south to a low of 840 feet in the north. Drainage basins in the service area include Fall Creek to the north, Sugar Creek to the east and southeast, and Buck Creek to the southwest.

G. Land Use

Land use in the service area is predominantly agricultural outside of the Town limits, although this is quickly changing. Residential land use is more concentrated within and west of the Town due to growth in the Fishers area. The County's long range planning efforts incorporates the land use plan developed by the Town.

H. Transportation

A high quality transportation system is essential for future development. The Town is located between the Towns of McCordsville and Ingalls on a smaller scale and between the Cities of Indianapolis and Pendleton on a larger scale. SR 67 passes through the Town east to west and

Southeastern Ave/Merrill Street north to south. These two major transportation networks allow for excellent access through the Town and provide a cross-connection to several larger municipalities nearby. Interstates 69 and 70 are nearby which will also impact development patterns.

I. Watershed/Drainage Basins

Development of a Master Plan typically includes a review of the watersheds based on drainage patterns. Wastewater and storm water improvements are often designed by watershed. However need, density, proximity to an available sewer, overall benefit, and cost are also factors to consider when developing and prioritizing projects.

III. WATERSHED AREA PLANNING

The northern part of Fortville lies within the White River Drainage Basin while the Southern part of the service area is contained within the East Fork of the White River Drainage Basin. There are several sub-watersheds throughout the area. The sub-basins include Lick Creek Manifold-McFadden Ditch to the north, Sugar Creek to the east, Buck Creek to the southwest, and Flatfork Creek to the west. Smaller drainage sheds include Stottlemeyer Ditch and Jackson Ditch. These drainage sheds dictate the layout for sewers and the need for lift stations in order to direct wastewater to the plant for treatment. The two main interceptors in the Town run along Stottlemeyer Ditch and Jackson Run prior to discharging to the WWTP.

IV. COLLECTION SYSTEM

A. Current Conditions

The existing collection system was installed in the 1920's with combined storm and sanitary sewers and 11 permitted combined sewer overflows (CSOs). To date, all outfalls have been removed or converted to dedicated storm water outfalls. The general condition of the collection lines range from good in the rehabbed and newer sewers to fair in some of the remaining areas.

Previous improvements consist of rehabilitation of the interceptors and installation of sanitary sewers to separate the combined system. The work was completed in phases over a 10 year period and the system is now 100% separated. The system contains approximately 25 miles of sanitary sewers that range in size from 8 to 18 inches in diameter. The older lines are VCP and the

newer sewers are PVC. There are two (2) interceptors. The Jackson Run Interceptor is 12" and the Stottlemeyer Ditch ranges from 15 to 18 inches in diameter. Both interceptors converge to a common 18" line that flows directly to the plant.

B. Unsewered Areas

A small number of residences and businesses are not connected to a sewer. Some of these are in outlying areas that cannot be easily and cost effectively served by the present system. Treatment for these properties is handled through on-site septic systems. The majority of these are characterized as conventional, consisting of a septic tank and a sub-surface gravity fed leach field. The age of these systems vary, with some being 20 years and older. Increased development in the service area will provide the opportunity to better serve these properties.

C. Lift Stations

The collection system contains seven (7) lift stations and approximately 2.6 miles of force main. **Table 3** lists the stations and sizes. The stations are in good condition and are sized adequately for the flow that is being received and transported at the present time. However, a few will require upgrading in order to meet the future needs of the areas as outlined in this report.

TABLE 3
LIFT STATIONS

Number	Location	Capacity	Hp/Volt/Ph	Force Main
3	Main/Timber Ridge	180 gpm	5 Hp/480 V/3ph	4"
6	200W Mt Vernon School	250 gpm	7.5Hp/208/3ph	6"
7	SR234 New Life Church	112 gpm	5Hp/480V/3ph	4"
4	SR67 Medical Building	85 gpm	2Hp/230V/1ph	1 1/4"
2	Ohio & Emerson	350 gpm	10Hp/230V/3ph	8"
1	Industrial/Commerce	190 gpm	5Hp/480/3ph	4"
5	200 W @ Church	250 gpm	5Hp/208V/3ph	6"

V. EXISTING WASTEWATER TREATMENT FACILITY

The Town operates a Class II, 0.950 MGD oxidation ditch treatment facility which consists of a fine screen, three (3) raw sewage pumps, a three-ring oxidation ditch, three (3) secondary clarifiers, chlorine gas and sulfur dioxide disinfection, step aeration, and an effluent flow meter. Solids handling includes an aerobic sludge digester and belt filter press. Final solids are disposed of in a landfill or hauled off-site using a contract hauler. The plant operates under permit no. IN0020958 and is not under any enforcement actions at this time.

The plant was originally built in the 1960s and is located at 500 West Church Street adjacent to the park. The facility was rebuilt in 1985 and upgraded and increased in 2011. Effluent is discharged to Flat Fork Creek which is tributary to Fall Creek and Geist Reservoir. The reservoir is located approximately 3.25 miles downstream of the plant. The $Q_{7,10}$ low flow of Flat Rock is 0.8 cfs. **Table 4** lists the unit operations.

TABLE 4
EXISTING TREATMENT PLANT COMPONENTS

Component	Size
Design Average Flow	0.950 MGD
Influent Lift Station	3 @ 1,200 gpm each
Fine Screen	2.86 MGD Peak
Oxidation Ditch	1 @ 0.622 MG
Secondary clarifiers	2 @ 30'-0" dia.; 1 @ 43’ dia.
RAS/WAS Pumps	3 @ 500 gpm;
Post Aeration	2’-6” w x 29’ Cascade Ladder
Phosphorus Removal (Alum)	2 @ 7.0 gph ea.
	5,000 gal chemical storage tank
	10,000 gal spill storage tank
Chlorine Disinfection	28,880 gallon tank
Aerobic Digester	1 @ 153,330 gal tank
Belt Filter Press	1 @ 1 meter, 500 #/hr

VI. WASTEWATER FLOWS AND LOADINGS

A. Existing Flows

Average daily flows are approximately 0.500 MGD which is 53% of the design capacity of 0.950 MGD. Monthly flows for the past year are tabulated on **Table 5**. As shown, the difference between the average daily flows and average peak wet weather volume is 0.773 MGD. The highest flow recorded was 2.453 MGD which occurred in February following a substantial snowmelt. The lowest flow was 0.225 MGD which occurred in June 2016.

Based on the existing plant capacity and the recorded average flows approximately 450 MGD is available for future developments under the current conditions. *This would allow for an additional 1,450 single family residents (sfr) to be accommodated until an increase would be required.* (450,000 gpd / 310 gpd per household = 1,450 sfr)

TABLE 5
HISTORICAL PLANT FLOWS AND LOADINGS

Year 2016	**Avg Flow MGD**	**High Flow MGD**	**BOD Mg/l**	**TSS Mg/l**	**NH3-N Mg/l**
January 2016	0.572	1.167	94	105	19.2
February 2016	0.557	2.453	133	140	23.3
March 2016	0.571		93	121	17.9
April 2016	0.642	2.079	90	115	19.9
May 2016	0.448	0.629	114	177	23.2
June 2016	0.437	0.811	107	154	23.6
July 2016	0.465	1.041	110	140	22.4
August 2016	0.513	1.613	92	129	22.4
September 2016	0.556	1.351	89	87	20.4
October 2016	0.454	1.416	98	107	27.4
November 2016	0.411	1.029	145	129	29.2
December 2016	0.459	0.645	111	151	25.3
January 2017	0.768	2.038	98	99	17.7
February 2017	0. 378	0.496	137	134	27.9
Average	***0.517***	***1.290***	***108***	***128***	***22.8***

B. Future Flows

The maximum capacity of the collection system is 2.2 MGD based on the 18" influent interceptor. In accordance with Ten State Standards, peak hourly flows are calculated to be 2.5 times the average, or approximately 3,820 gpm. The maximum capacity of the treatment plant is 1.6 MGD. This capacity could be achieved by adding another cell/ring on the oxidation ditch, installing an additional clarifier, adding another digester, and increasing the sizes of the influent screen and chlorine contact tank. Due to setback requirements and ground availability, the plant cannot be sized to handle the theoretical volume of the sewer system so the maximum capacity of the plant at the existing site is limited to 1.6 MGD. (**See Table 7**)

There are several land parcels that are likely to be developed within the planning period. Many of these are on the market for sale while others have expressed an interest in developing. Preliminary calculations for developing these parcels were based on an assumed density using a rate of 2.5 single family residences (sfr) per acre, 2.5 persons per household (pph) rate (from census records), and an industry standard of 310 gpd per sfr (10 State Standards).

The likely areas to be developed are listed on **Table 2**. As shown, the population in the service area could increase by 8,856 over the next 20 to 40 years. Of course this would depend on the economic and political climate which could impact conditions with little or no warning. Regardless, having a plan in place is a good first step to being able to react quickly and provide services when needed. *Based on the chart, Areas A through D could be developed without any expansion of the treatment system. However, in order to prevent bottlenecks and overloading in the sewers, changes may be needed in the collection system in order to better direct these flows to the plant.*

C. Existing Permit Limits

The NPDES permit requires 85% removal of CBOD and TSS or a discharge concentration of 25 mg/l and 30 mg/l, whichever is more stringent. Effluent quality is consistently within the parameters of the existing NPDES discharge limits. The removal rate averages 98.1% for CBOD, 96.5% for TSS, and 99.7% for NH3-N. In the past, exceptions to parameter limits have primarily been the result of high wet weather flows. This is no longer an issue since the CSOs are closed and I/I has been reduced. The NPDES permit limitations are shown on **Table 6**.

TABLE 6
CURRENT NPDES PERMIT LIMITATIONS

		Monthly Average		Weekly Average	
CBOD5	(S)	79 lbs/day	10 mg/l	119 lbs/day	15 mg/l
	(W)	119 lbs/day	15 mg/l	182 lbs/day	23 mg/l
TSS	(S)	79 lbs/day	10 mg/l	119 lbs/day	15 mg/l
	(W)	119 lbs/day	15 mg/l	182 lbs/day	23 mg/l
Ammonia-Nitrogen (NH3-N)					
Summer		8.7 lbs/day	1.1 mg/l	13 lbs/day	1.6 mg/l
Winter		13 lbs/day	1.6 mg/l	19 lbs/day	2.4 mg/l
Phosphorus			1.0 mg/l		
D.O.	(S)	6.0 mg/l daily minimum			
	(W)	5.0 mg/l daily minimum			
pH		6.0 daily minimum		9.0 daily maximum	
E. Coli		235 count/100ml daily max		125 count/100ml mon avg	

D. Existing Wastewater Characteristics

Influent waste concentrations were analyzed from MROs to determine the wastewater pollutant characteristics. The results indicate an average raw wastewater of moderate strength. Carbonaceous biochemical oxygen demand (CBOD), total suspended solids (TSS) and ammonia-nitrogen (NH_3-N) average 106 mg/l, 127 mg/l and 22 mg/l respectively. Other pollutant characteristics such as pH and phosphorous were reviewed from the MROs with no exceptional concentrations noted.

Table 5 shows the typical influent loadings. Graphs of influent and effluent characteristics are provided in **Appendix A**. *As shown, the BOD and TSS loadings are well below what the plant could handle.*

E. Future Wasteloads

Future wasteload contributions to accommodate the expected growth in the service area must be calculated using design loadings from Ten State Standards. The design wasteloads would be calculated using the following loading rates:

BOD5	0.22 lbs/cap/day
TSS	0.25 lbs/cap/day
NH3N	18 mg/l

For purposes of this plan, it is assumed that loadings from projected growth will be domestic in nature with no significant industrial or special wasteload characteristics expected.

VII. PROPOSED WASTEWATER SYSTEM IMPROVEMENTS

A. Treatment Plant Improvements

1. Existing Plant

The WWTP was upgraded in 2012 at which time substantial modifications were made to improve operations and the capacity was increased to 0.950 MGD. The plant is well operated and well maintained. As such, no improvements are necessary at this time. Based on the existing plant capacity and the recorded average flows approximately 0.450 MGD is available for future developments under the current conditions. *This would allow an additional 1,450 single family residents to be accommodated until an increase in plant capacity would be required. (450,000 gpd / 310 gpd per household = 1,450 sfr)*

2. Future Plant Expansion

Due to setback requirements and ground availability the maximum expansion capability of the plant is 1.6 MGD at the current site. This increase would be achieved by adding another cell/ring on the oxidation ditch, installing an additional clarifier and digester, and increasing the influent screen and chlorine tank to handle the higher volume. The proposed digester would be constructed on Town owned property to the south. **Table 7** lists the proposed unit operations. *Additional land must be acquired if a capacity higher than 1.6 MGD is needed in the future. Preliminary steps should be taken to research available property to the south.*

TABLE 7
TREATMENT PLANT COMPONENTS
PROPOSED EXPANSION TO 1.6 MGD

Component	Existing	Proposed
Design Average Flow	0.950 MGD	**1.6 MGD**
Influent Lift Station	3 @ 1,200 gpm each	
Fine Screen	2.86 MGD Peak	**4.8 MGD Peak**
Oxidation Ditch	1 @ 0.622 MG	**1.32 MG**
Secondary clarifiers	2 @ 30'-0" dia.; 1 @ 43' dia.	**1 Addtnl @ 43' Dia.**
RAS/WAS Pumps	3 @ 500 gpm;	**3 @ 800 gpm**
Post Aeration (Cascade Ladder)	2'-6" w x 29' l	
Phosphorus Removal (Alum)	2 @ 7.0 gph ea.	
	5,000 gal chemical tank	
	10,000 gal spill tank	
Chlorine Disinfection	28,880 gallon tank	**50,000 gallon tank**
Aerobic Digester	1 @ 153,330 gal tank	**2 @ 40' x 80' x 12'**
Belt Filter Press	1 @ 1 meter, 500 #/hr	

Note: As the service area grows and the system is extended, personnel needs must also increase. It is projceted that an additional operator and laborer will be needed when construction for the plant expansion begins. Budget planning for the expansion should include provisions for additional staff.

B. Collection System Improvements

While the existing plant capacity is adequate for moderate growth in the service area, improvements are needed in the collection system in order to transport the flows. The system contains two (2) interceptors. One is located adjacent to Jackson Run and the other runs along Stottlemeyer Ditch. Both lines merge upstream of the plant where flows are combined and transported in an 18 inch sewer. In order to avoid overloading and surcharging, the flows from some existing areas and any newly developed areas need to be re-routed.

1. Current Issues

- The Stottlemeyer Interceptor is near capacity in some parts. Some of the flows need to be offloaded to the Jackson Run Interceptor or another route into the plant needs to be identified such as north and south along N 300 W.

- Due to the topography in the service area multiple lift stations will be needed to transport wastewater to the plant. Efforts should be made to increase the capacity of existing lift stations or to relocate them in order to avoid double pumping and minimize the number that needs to be installed if possible. In addition new developments that are not adjacent to existing facilities should be required to install lift stations and/or sewers along the perimeter of the proposed development, if practical.

- TIF Districts have been established in 3 parts of Town. The three are the Broadway Avenue, South Madison, and Industrial Business Park TIFs. These areas need to be evaluated to assure that service could be extended where needed as development occurs while preventing future overloading of lines throughout Town.

- Main lines should be extended by gravity wherever possible. Sewers should be installed at a depth and size that would accommodate the area that could be served.

- The plant is located in the northwest part of the service area. Wastewater would need to be transported many miles in some cases in order to provide service to the far southern part of the service area. Another plant to provide treatment service to developments in the southern part of the district may be practical at some point in the future.

2. Future Improvements and Expansion Areas

This plan provides recommended improvements for the collection system in order to serve the likely areas to be developed and the TIF Districts. Improvements were proposed as a means to reroute flows or extend lines where they are most practical. *It is recommended that gravity lines be extended as deep and as far as possible.* The following is a narrative that describes each area and the proposed plan to provide service. A summary is provided on **Table 8**.

- **Areas A1 and A2 (Northwest corner of Town)**

  Existing Conditions

  A2 has been platted but utilities have not been laid out. The northern half (A1) of this area naturally drains to the north and the southern part (A2) slopes towards the south.

  Proposed Plan

  Direct the northern flows to existing Lift Station 3 (Timber Ridge) which will need to be increased. Reroute the force main for LS 3 through A2 to a proposed gravity interceptor at N 300 W (proposed Northwest Interceptor) to redirect flows to the plant. The southern half of the area should be able to be served by gravity with the flows directed to the same proposed Northwest Interceptor.

- **Area B (285 Acres Southwest of Town)**

  Existing Conditions

  Area B is presently agricultural. Most of the ground slopes to the east and southest.

  Proposed Plan

  A lift station will be needed to transport flows to the proposed Southwest Interceptor to be installed south of the plant along N 300 W. It is recommended that a regional lift station be situated at N 300 W and W 850 N.

- **Area C (79 Acres Southwest of Town)**

  Existing Conditions

  Area C is presently agricultural but contains a home. Most of the ground slopes to the east and southeast.

  Proposed Plan

  A lift station will be needed to transport flows to either the proposed Southwest Interceptor or proposed regional lift station at N 300 W and W850 N.

- **Area D (146 Acres East of Town)**

  Existing Conditions

  Area D is presently agricultural. Most of the ground slopes to the west.

Proposed Plan

This area should be able to be served by gravity with the flow directed to an existing 10 inch line located on the north side of W 1050 N. The line presently discharges to existing Lift Station 2 (Ohio and Emerson) which has recently been increased. The discharge from LS #2 flows to a 12" line and eventually the Jackson Run Interceptor. These flows may be able to be diverted in the future to the proposed Southwest Interceptor which would offload some of the wastewater that flows through Town.

- **Area E (167 Acres South of Town)**

  Existing Conditions

  Area E is presently agricultural and straddles Fortville Pike. It is presently on the market for sale as one parcel. This parcel partially slopes north and east towards the Jackson Ditch Arm and partially slopes southwest towards the upper end of Jackson Ditch.

  Proposed Plan

  Due to the terrain, it is unlikely that wastewater could be transported to the plant for this entire parcel without the use of a lift station. Depending on the layout and type of development, flows for the southwest part may be able to be transported by installing a gravity line to existing Lift Station 6 (Mt. Vernon School). A portion of the ground in the northern part of the parcel may be able to be served by installing a gravity line north along Fortville Pike to an existing line at W 900 N and N 200 W. *Gravity lines should be extended as deep and as far as possible.* Due to the terrain, a lift station will be needed to serve the east end of the property.

- **Area F (58 Acres South of Town)**

  Existing Conditions

  Area F is located south of Town adjacent to Area E. The ground is presently agricultural and is on the market for sale. This parcel generally slopes south toward the upper end of Jackson Ditch and appears to be partially in a floodway.

Proposed Plan

Depending on the layout and type of development, flows may be able to be transported by installing a gravity line south along N 200 W to LS 6 (Mt Vernon School). This lift station presently discharge to LS 5 (200 W) but these flows could be diverted to the proposed Southwest Interceptor if it is constructed in the future.

- **Area G1, G2 (50 Acres South of Town)**

  Existing Conditions

  Areas G1 and G2 are 2 adjacent parcels that located in the far southern part of the service area. The land use is presently agricultural and both are currently on the market for sale as individual parcels. According to topo maps these parcels are on a high spot between Buck Creek and Sugar Creek.

  Proposed Plan

  A lift station would be needed to pump flows to existing LS 6 (Mt. Vernon). These parcels are many miles from the existing plant. Due to the distance and terrain, it may be more practical to construct a second plant to serve the southern part of the service area. This would depend upon the timing and level of development in the vicinity.

- **Area H (33 Acres South of Town)**

  Existing Conditions

  Area H is located in the far southern part of the service area. The land use is presently agricultural and the parcel is currently on the market for sale. According to topo maps this parcel slopes south to Cahill Shore Ditch which is tributary to Sugar Creek.

  Proposed Plan

  A lift station would be needed to pump flows to existing LS 6 (Mt. Vernon). This parcel is many miles from the existing plant. Due to the distance and terrain, it may be more practical to construct a second plant to serve the area in the southern part of the service area. This would depend upon the timing and level of development in the vicinity.

- **Area I (10 Acres Southeast of Town)**

  Existing Conditions

  Area I is located in the southern part of the service area on the north side of SR 234. The land is presently agricultural and the parcel is currently on the market. According to topo maps the parcel slopes slightly northwest toward the upper end of the Jackson Ditch Arm.

  Proposed Plan

  This parcel is located approximately one half mile east of Lift Station 7 (SR 234 New Life) which serves the church. The flows from this area may be able to be transported via a deep gravity line to the lift station which may require upgrading in order to handle what is developed. LS 7 discharges to LS 6 (Mt. Vernon) which transports the wastewater north to a gravity line and then to LS 5 (200 W) so the flows would be triple pumped. Future alternates would be to transport the wastewater to the proposed Southwest Interceptor or to a new southside WWTP if either is constructed.

- **Area J (43 Acres Southeast of Town)**

  Existing Conditions

  Area J is located in the southern part of the service area on the south side of SR 234. The land use is presently agricultural and the parcel is currently on the market. According to topo maps this parcel slopes north towards SR 234.

  Proposed Plan

  This parcel is located directly south of existing Lift Station 7 (SR 234 New Life) which serves the church. The terrain should allow gravity service from this area to the lift station which may require upgrading in order to accommodate what is developed. The line should be installed as deep as possible in order to better serve future extensions.

  LS 7 discharges to LS 6 (Mt. Vernon) which transports the wastewater north to a gravity line and then to LS 5 (200 W) so the flows would be triple pumped. Future alternates would be to transport the wastewater to the proposed Southwest Interceptor or to a new southside WWTP if either is constructed.

- **Area K (Existing 49 Lot Development Southeast of Town)**

  Existing Conditions

  Area K is located in the southern part of the service area on the northwest corner of SR 234 and Fortville Pike. The parcel is developed and contains 49 homes that presently use on-site septic systems. Reportedly, some of these homes have tied into the force main for LS 7. Topo maps indicate that this parcel slopes north toward the upper end of Jackson Ditch.

  Proposed Plan

  This parcel is located directly east of existing Lift Station 7 (SR 234 New Life) which serves the church. The terrain may allow gravity service from this area to the lift station which may require upgrading. If gravity is not feasible, small diameter sewers with grinder stations could be installed to transport the wastewater to the lift station or to the force main as some properties have already done. LS 7 discharges to LS 6 (Mt. Vernon) which transports the wastewater north to a gravity line and then to LS 5 (200 W) so the flows would be triple pumped. Future alternates would be to transport the wastewater to the proposed Southwest Interceptor or to a new southside WWTP if either is constructed.

- **Area L (395 Acres Southwest of Town)**

  Existing Conditions

  Area L is a large plot that is presently agricultural but contains a few homes. Most of the ground slopes to the east and southeast.

  Proposed Plan

  A lift station will be needed to transport flows to either the proposed Southwest Interceptor or proposed regional lift station at N 300 W and W 850 N.

TABLE 8
Summary of Future Development Areas

AREA	Location	Acres	SFR	Served by Gravity?	Proposed Plan
A1, A2	Northwest Corner of Town	135	340	Southern part	Direct A1 flows to LS 3 Gravity flow for southern part
B	SW of Town N300W & W850N	285	710	Partially	Proposed LS 9 at N300W & W850N Gravity to plant via SW Int from W925N
C	SW of Town N400W & W900N	79	200	No	Proposed LS; Gravity to plant from W925N via SW Interceptor
D	East of Town; N of W1050N	146	364	Yes	Gravity to existing 10" line to west, north side of W1050N
E	Southeast of Town; Fortville Pike & W850N	167	415	Partially	Gravity to LS 6; Gravity to line @ W900N & N200W
F	Southeast of Town;W of Area E	58	145	Partially	Gravity to LS 6
G1, G2	Southeast of Town N200W & W700N	50	125	No	Proposed LS to LS 6; or Gravity to New South WWTP
H	Far Southeast of Twn 650 N & Fortville Pike	33	80	No	Proposed LS to LS 6; or Gravity to New South WWTP
I	Southeast of Town SR234 E of Fort. Pike	10	25	Partially	Gravity to existing LS 7 to LS 6
J	Southeast of Town SR234 SW of Fortville Pike	43	108	Partially	Gravity to existing LS 7 to LS 6
K	Southeast of Town; Fort. Pike & SR 234	45	49 Existing	No	Existing development on septic; Proposed gravity or small diameter to LS 7 to LS 6
L	Southwest of Town SR234 & N400W	395	988	Partially	Part gravity to proposed LS @ W850N & N300W; Gravity to plant from W925N

C. TIF District Development

One of the goals identified in the Town's Comprehensive Plan is to establish additional TIF Districts or Economic Improvement Districts (EIDs) in selected areas of Town. Each TIF District has a potential plan for development. Growth in these areas will require improvements and changes in the collection system in order to reroute flows or extend lines where they are most practical. The following are narratives describing the areas and proposed plans to optimize service.

1. South Madison TIF District

This area consists of 186 acres of land that extends southeast to SR 234 from the southern borders of the Business District and the Broadway Consolidated TIFs. At the present time the area is primarily agricultural with a few rural homes. The TIF District is "envisioned to accommodate the industrial and commercial growth to the south and will form a new door to the community". A Master Plan has been developed for the area which includes extending Madison Avenue to Fortville Pike. The density for residential users will range from 2 to 10 units per acre. The Master Plan included the following land uses and assumptions:

Residential	30.45 acres	465+ gpd/acre
Commercial/Retail	13.08 acres	750 gpd/acre
Mixed Use Residential	26.10 acres	465+ gpd/acre
Warehouse/Manufacturing/Light Ind	85.98 acres	930-1440 gpd/acre
Parks/Open Space	15.95 acres	80 gpd/acre

At the present time there are no sanitary sewers within the area other than a 12" gravity line that is located in N 200 W and Fortville Pike along the western border of the TIF. The preliminary Master Plan for the area proposed a 10" gravity line in Fortville Pike along a new roadway that would be built from Broadway to Fortville Pike. The sewer was sized to carry all flow from the South Madison TIF study area. One lift station was proposed at the intersection of the new roadway and W 1000 N. The force main would discharge to the nearest adjacent sewer which is a 12" line located at W 1000 N and Fortville Pike.

It should be noted that the assumptions for flow rates listed above are less than current design standards. In addition, the plan routes all flows to the plant through the existing sewer network and the Jackson Run Interceptor. This would add an estimated 0.39 MGD to this system at full build-out of the area which would overtax the existing and downstream sewers. Another option is to install a new interceptor (proposed Southwest Interceptor) that would serve as an alternate route into the plant. This would provide a better avenue for developments to the south and also allow some of the existing flows to be offloaded. The proposed Southwest Interceptor would be installed along N 300 W and would bring future flows from the south directly into the plant.

2. Fortville Business District TIF

This district was established in 2003 and is the oldest of the TIF Districts. The area consists of 45 acres located at the east end of the Town south of SR 67. The tenants in the business park are primarily light industrial. Sewers have been extended along the main streets in the district and all flows discharge to LS 1 which is located at Industrial Drive and Commerce Parkway. The 4" force main connects to the 8" force main from LS 2 which transports flows to a 12" sewer that serves as a main trunk line for the south side of Town before discharging to the 18" Jackson Run Interceptor. *No changes are recommended for this area.* While the park is not fully built out, it is not likely that the sewers can be expanded beyond what is needed to serve the business district. At this time the volume is also not great enough to cause downstream overloading.

3. Broadway Consolidated District

This district was established in 2016 and was formed to encourage reinvestment and development within the older parts of Town. The area contains approximately 250 acres that encompass historic Main Street and the area adjacent to SR 67 from the east to west outskirts of the corporate limits. Design standards have been established for new non-residential and multi-family proposals in this area. The Town Council and Fortville Plan Commission are in the process of adopting zoning ordinances and standards to guide the future growth and development for the Broadway corridor. Included will be an evaluation of the water system and other infrastructure to ensure they are adequate for the projected growth.

D. Proposed Satellite Treatment Plant (WWTP No. 2)

After the existing plant is at capacity, if development warrants in the future, the Town may want to evaluate the benefit of installing another plant in the southern part of the service area. Ideally the plant would be centrally located to allow easy access from developments. Installing a new treatment plant requires evaluation of potential sites for the facility. Approximately 5 acres would be needed. Site evaluation is typically based on the following criteria:

- Allowable setback requirements
- Proximity to the existing service area, populated areas and future developments
- Availability of land sized for the proposed plant and future expansion
- Proximity to an acceptable discharge stream
- Effluent limits for the receiving stream
- Willingness of owner to sell or lease the property

Initially, the plant should be designed to accommodate the flows from a new development with the ability to expand on-site. The project can be funded by pre-paid capacity fees that are paid by the developer. A potential site for a satellite plant is at W 700 N and Meridian near the landfill but additional evaluation would be needed to fully determine its suitability.

VIII. PHASED IMPROVEMENTS PLAN

Implementing a wastewater management system throughout the service area requires a significant capital outlay. Extension of main interceptors would be cost prohibitive if all work was to be done at one time. A more feasible approach is to establish preliminary phases for extensions and expansions that would reflect planned or likely development in the service area. Phased construction is easier to finance and can be completed within shorter time frames.

The typical time horizon for a preliminary plan is twenty years with reviews and updates made every two (2) years at a minimum. Included would be an evaluation of available funding mechanism to provide for the orderly expansion of services over time as the need arises. Potential funding avenues are generally discussed in Section IX. A more detailed study will be needed to identify and evaluate the full range of available funding avenues once a project is planned and the scope has been narrowed.

A. Existing Budget

The Town has an annual budget of approximately $8.5 million dollars. The annual operating expense for the Wastewater Department, not including stormwater, is $1.33 million dollars. There is no specific capital improvements fund for wastewater so large scale projects need to be financed. At this time there are five outstanding bond issues that are funded through revenue receipts from raised user rates. Two of these will be retired in 2020 and two will be paid off in 2023. The wastewater budget requirements can be broken down as follows:

Operations and Maintenance	$743,000	56%
Debt Service, Bond and Interest	$590,000	44%

B. Existing Rate Structure

A separate rate structure has been established for users within the corporate limits and those outside of the limits. The structure for metered customers includes a base rate plus a volume charge per thousand gallons. Unmetered customers are charged a flat rate. New customers are subject to a sewer capacity fee that is based on an Equivalent Dwelling Unit (EDU) with a usage of 310 gpd. The current Schedule of Charges Ordinance is provided in **Appendix B**.

C. Project Priorities

For planning purposes, capital improvements can be separated into those that are needed immediately, those that are needed within 1 to 5 years, 5-10 years, 10-15 years and 15 to 20 years. Immediate and short term needs are usually apparent, while needs over 5 years are more dynamic and unpredictable. Priorities are typically established based on existing problems, current and planned developments, population, and overall impact and benefit of the improvements. Areas with historical problems, high development potential and those that would derive the greatest benefit should be classified as higher priorities.

D. Personnel

As the service area grows and the system is extended, personnel needs must also increase. It is projected that an additional operator and laborer will be needed about the same time as the plant is expanded. Budget planning for the expansion should include provisions for additional staff.

E. Potential Future Needs

1. Reduce Flows to the Stottlemeyer Interceptor

The existing Stottlemeyer Interceptor does not have adequate capacity to handle additional flows from the service area. The interceptor has been increased and rehabbed. However, the line is often near capacity due to the volume discharged during and after rain events. An aggressive I/I program would reduce the volume but probably not enough to make a significant difference. Due to the cost, land requirements, and downstream impacts, a parallel interceptor is not practical. A more feasible approach is to redirect future and some existing flows in order to avoid overloading this main line.

2. Install Another Interceptor to Provide an Alternate Route into the WWTP

The two interceptors intersect and combine flows in an 18" influent line for final transport to the WWTP. During wet weather surcharging is likely. These lines are not sized to handle the entire service area. Sewers could be extended north and south along N 300 W and these lines could serve as additional interceptors (proposed Northwest and Southwest Interceptors) to transport future flows directly into the plant. At the plant influent, this new line should be installed as a parallel relief sewer in order to avoid a bottleneck in the existing 18" line.

A 12" line has already been installed along N 300 W from W 1000 N to the plant and a bore has been installed across the railroad and SR 67. The 12" line should be extended as far south as gravity would allow which appears to be at or just north of W 925 N. Easements may be needed where there is no right of way or Town owned property. In the future, if growth in the west exceeds the line's capacity, a parallel sewer could be installed or the existing line could be replaced and increased by pipebursting.

3. Flow Metering

The system still experiences a significant amount of infiltration and inflow (I/I) after rain events even though it has been completely separated. It is recommended that the system be separated into drainage basins and flow metering be conducted on each subsystem. This will allow problem areas to be isolated. Enforcement and rehabilitation efforts can then be more cost effectively directed to targeted areas.

4. Construct an Additional WWTP

A second WWTP could be located in the southern part of the service area. The plant should be designed to accommodate an initial flow as dictated by likely or proposed development with the ability to be easily expanded in the future. Flows from areas that are presently served can also be rerouted to the new plant which will free up capacity at the existing facility. Expansion of the existing plant beyond 1.6 MGD would require additional land. This may be difficult due to existing site conditions. Expanding to the south would require waivers from any residence within 500 feet of the plant. Expansion to the west is not possible because the area is developed and in another county. Expansion to the north and east would entail construction in a floodway and elimination of the ballpark and/or woods.

5. Provide Developer Assistance to Expand the System

Financial assistance to developers to install larger lift stations and oversized sewer mains would assure that future systems are installed at capacities appropriate for the area that could be served. The Town could contribute to the initial cost and then be reimbursed through future capacity and connection fees. Another option is to have a developer install larger facilities and be reimbursed by future developers who want to connect. This would be done under a 15-Year Law Agreement which is carried out under the provisions of Indiana Code 36-9-22. An excerpt is provided in **Appendix C**. In addition new developments that are not adjacent to existing facilities should be required to install lift stations and/or sewers along the perimeter of the proposed development, if practical.

6. Increase the Capacity Fees

The capacity fees in the current rate structure are $1,700 per connection within the Town limits and $2,500 per connection outside the corporate limits. These rates have been in effect since 2011. It is recommended that these fees be increased both for new connections in Town and for those outside of the Town limits. This would require a modification of the existing ordinance and a study to justify the increase.

E. Cost Estimates

Future improvements include extending the Town's collection system and expanding the treatment capabilities. Estimates were prepared for each project and are itemized on **Table 9.**

TABLE 9

Cost Estimate for Future Wastewater Improvements

	Exhibit	Quantity	Unit	Unit Cost	Ext. Cost
Southwest Interceptor (SW Int) along N300W					
12" Sewer Line (south of plant)	11B	4,000	lf	$85	$340,000
Manholes		5	ea	$4,000	$20,000
Easement South		800	lf	$10	$8,000
				Subtotal	$368,000
Northwest Interceptor (NW Int) along N300W					
12" Gravity Sewer (north of plant)	11A	800	lf	$85	$68,000
Manholes		2	ea	$4,000	$8,000
Easement North		750	lf	$10	$7,500
				Subtotal	$83,500
Re-route LS 6 Force Main to W925N to N300W					
8" Force Main	11F	6,480	lf	$65	$421,200
Relief Valve		3	ea	$800	$2,400
				Subtotal	$423,600
Regional LS at W850N & N300W					
Lift Station (300 gpm)	11C	1	ea	$150,000	$150,000
Force Main		4000	lf	$65	$260,000
Relief Valves		3	ea	$800	$2,400
Easement		1	ls	$2,000	$2,000
				Subtotal	$414,400
Eliminate LS 5; Re-route to Prop. Madison St.					
12" Gravity Sewer	11G	1,440	lf	$85	$122,400
Manholes		4	ea	$4,000	$16,000
Highway Bore		100	lf	$250	$25,000
				Subtotal	$163,400
Re-route LS 2 to Prop. Madison St Gravity					
8" Force Main	11G	800	lf	$65	$52,000
Relief Valves		1	ea	$4,000	$4,000
Disconnect from Manhole		1	ls	$5,000	$5,000
				Subtotal	$61,000
MadisonSt Grav & LS; FM to W925N FM to SW Int					
12" Gravity Sewer	11G	2,500	lf	$85	$212,500
Manholes		5	ea	$4,000	$20,000
Lift Station		1	ea	$150,000	$150,000
Force Main to W925N		2600	lf	$55	$143,000
Highway Bore		100	lf	$250	$25,000
				Subtotal	$550,500
Line Ext along W1050N for Develop. to East					
10" Gravity Sewer	11D	3,200	lf	$75	$240,000
Manholes		9	ea	$4,000	$36,000
				Subtotal	$276,000
Line Ext along SR234 for Develop. to South					
10" Gravity Sewer	11H	2,800	lf	$75	$210,000
Manholes		7	ea	$4,000	$28,000
				Subtotal	$238,000
Gravity from Areas E & F south to LS 6; Gravity from Area E north to Gravity @W900N & N200W					
12" Gravity Sewer South	11E	5,200	lf	$85	$442,000
12" Gravity Sewer North		3,200	lf	$85	$272,000
Manholes		21	ea	$4,000	$84,000
Highway Bore		100	lf	$250	$25,000
				Subtotal	$823,000
WWTP Expansion to 1.6 MGD					
Fine Screen, Ditch Exp, Clarifier, RAS/WAS Disinfection Exp, Aerobic Digester		1	ls	$3,000,000	$3,000,000
				Subtotal	$3,000,000

IX. FUNDING OPTIONS

One of the primary obstacles to an effective utility management plan is instability of funding. A properly organized capital financing program provides for an orderly and long term implementation of proposed projects. Financing must consider both the capital improvements and annual operating costs to maintain the system in order to assure that it continually functions as intended. Ideally, funding sources should be consistent, stable and publicly acceptable. This allows long range activities and projects to be properly planned and assures that installed systems are continually maintained. Funding for the Town's wastewater activities are currently built into the existing rates and budgets. There is no funding mechanism in place that is directly dedicated to system expansion.

There are a number of funding avenues available to finance desired projects and system expansion. Primary funding sources typically take the form of a user fee or assessment against those that directly benefit from the service. Other sources include developer funding with future reimbursement from additional users. Possible funding sources include the State Revolving Fund (SRF) loan program, the Rural Development (RD) grant/loan program, Developer Assistance, or the Indiana Bond Bank. The debt service is then repaid using service fees from the users who benefit from the improvements.

A. State Revolving Fund

The State Revolving Fund (SRF) is a below market rate loan program administered by the Indiana Finance Authority (IFA) to fund public wastewater and waterworks projects. A combination of State and Federal funds (20/80) leverages the issuance of bonds by the State which in turn are loaned to eligible communities with terms extending up to 20 years. Interest rates are tiered with rates ranging from 2.0% to 3.1% depending on the median household income and existing utility rates. Requirements include an approved loan application, Preliminary Engineering Report, construction plans and specifications, an Environmental Assessment, and Finding of No Significant Impact. SRF funds can be used as a supplement or to finance the entire project.

B. Rural Development Loan/Grant Program

Rural Development administers a water, waste disposal, and community facility grant/loan program to construct, enlarge, extend or otherwise improve community facilities providing essential services to financially needy rural areas and towns with a population of 10,000 or less. The funds are available to public entities, such as municipalities, counties, special-purpose districts, Indiana tribes, and certain locally affiliated not for profit corporations.

Grants are also available to reduce water and waste disposal costs to a reasonable level for rural users. Applicants must be unable to finance the proposed project from their own resources or through commercial credit at reasonable rates and terms. Grants are used to reduce water and waste disposal costs to a reasonable level and may not exceed 75% of eligible project costs. Grants are usually made in conjunction with a loan. Interest rates for loans are based on the mean household income and range from 3.15% to 5.5%. Partnering of other loan and grant programs is encouraged. Projects must be designed to assure adequate capacity to serve the present population to the extent feasible and reasonable foreseeable growth needs of the area. All facilities financed must be for public use and must be modest in size, design, and cost. Loan repayment can be up 40 years but not beyond the useful life of a facility. Due to limited funds and a more stringent application process, approval under this program is typically lengthy and can take years.

C. Indiana Bond Bank

The Indiana Bond Bank is an alternative funding source for infrastructure development. Their major function is to issue tax-exempt revenue bonds in its own name and use the proceeds from the bond sales to purchase pools of local government bond issues. This gives local governments an opportunity to realize substantial savings on fees associated with bond issues, such as marketing, insurance, and interest costs. Requirements for participation include a detailed application to the review board, which includes a completed rate study with rates sufficient to satisfy all associated costs. Bonds are sold at a rate slightly higher than face value. The Bond Bank requires assurance that adequate coverage is in place to meet annual debt service (approximately 125% of the annual payment). Typical terms are less than 20 years and the loan amount is capped at $2 million dollars. The current interest rate is estimated at 3.0%.

D. Developer Assistance

Developers usually pay for internal wastewater systems and main extensions to proposed developments. They could also be required to fund or share in the cost to avoid or correct adverse impacts caused by the development. This could include increasing line sizes to accommodate future development or eliminating downstream impacts. Developer costs to install oversized systems built in anticipation of future growth could also be repaid by charging subsequent users who connect to the system a fee. All or a part of this fee would then be returned to the original developer. This type of arrangement would be established in an agreement in accordance with Indiana Code 36-9-22 whereas the developer, after dedicating the system to the municipality, would receive fees collected from any connections made over a 15 year period. While this does not reflect a direct funding source for the Town, it does provide a means to install sewer extensions that are sized appropriately for the area. See **Appendix C**.

E. TIF

Tax increment financing (TIF) is a public financing method that is used to subsidize redevelopment, infrastructure, and other community-improvements projects. Establishing TIF Districts provides an avenue where municipalities can divert future property tax revenue increases from a defined area or district toward an economic development project or public improvement project in the community. While subsidies to TIF districts are not directly appropriated from a municipality's budget, a loss is incurred through lost tax revenue. There are three TIF Districts within the Town's service area. In accordance with the associated TIF ordinances, revenues from any development go to the Town. Revenues can only be used to retire bonds from improvements that would directly benefit the TIF District which can assist with the extension of infrastructure to and within these areas.

X. STANDARDS, POLICIES, AND REGULATORY PRACTICES

It is essential that the impact of private development on the Town's facilities be monitored and controlled through policies, codes and regulatory practices. This is accomplished through on-site inspections, plan review, construction and development standards, controlling ordinances, and administrative regulations.

A. Administrative Rules and Regulations

Analysis of historical wastewater flows showed that I/I is still being contributed to the sewers. Plant flows increase substantially and quickly after a rain event which would indicate an inflow problem. Further review is needed to identify specific I/I sources. Most likely many structures have downspouts, perimeter drains, sump pumps and area drains tied to the sewer system.

Where practical, these private, clear water sources should be removed with the flows diverted to the storm water system. Some sources, such as perimeter drains, may not be possible or practical to disconnect. However, a program could be developed to systematically eliminate the clear water discharges from downspouts, sump pumps and area drains. Enforcement would require smoke testing, dye testing, house to house inspections etc. It is especially critical that potential discharges from sump pumps, parking lots, shopping centers, businesses, and schools be periodically inspected to assure there are no storm water connections to the wastewater system. Fines should be imposed for noncompliance.

B. Controlling Ordinances

The Town's Sewer Use Ordinance (SUO) contains language that prohibits clear water discharges to the sanitary system. This includes storm drains, downspouts, perimeter drains, area drains, sump pumps, cooling water, street drainage and subsurface drainage. Inflow is usually controlled by regulatory activities such as a sewer or storm water use ordinance. Infiltration is controlled by establishing proper design standards, inspections and testing of new construction. In older construction that is already in place I/I is controlled by enforcement, testing, inspection, and taking corrective actions to repair or replace broken pipes and seal cracks and joints.

C. Construction and Design Standards

System problems could occur if there are inadequate controls related to new development. Installing wastewater systems for individual subdivisions and private developments are typically the responsibility of the developer. Construction standards are currently in place to address issues such as materials, installation, testing and workmanship. The standards should be provided to private developers and engineering firms when new developments are proposed. The document needs to be periodically reviewed and revised to assure that it is kept up to date with current industry practices. The last update was in 2016.

D. Plan Review and Construction Inspection

Reviewing sewer plans and inspecting the work during construction will assure that designs are consistent and projects are completed in accordance with the Town's standards and specifications for materials, sizing, installation and workmanship. Plans for new developments should also be reviewed for surrounding and downstream impacts. This will assure that installed systems have adequate capacity for future developments.

Correction of adverse impacts caused by new developments should be required prior to approval of the project. Corrective work could be completed by the developer, or a joint endeavor could be undertaken, with the Town sharing in the cost to increase lines or eliminate problems in affected areas. Areas with existing problems should be identified and red-tagged to restrict or prevent additional discharges until improvements have been made to alleviate the issues to assure that no new problems will develop. In addition new developments that are not adjacent to existing facilities should be required to install lift stations and/or sewers along the perimeter of the proposed development, if practical.

E. Facilities Management System

The sewers have been digitized and incorporated into the Town's GIS mapping system. This provided an interface to property names and addresses which will ease the implementation of a GIS based facilities management (FM) program if one is pursued in the future. A computerized FM program will assist with filing, recording, and tracking new construction, maintenance, work orders, and customer complaints. This will allow problem areas to be easily identified so long term projects could be planned and prioritized. The cost for an integrated FM system will depend on the extent and capabilities of the program.

Record drawings for new sewer installations should be input on the map as soon as possible after acceptance in order to maintain an accurate and up to date inventory of the system. Ideally, the record drawings should be provided in a computerized format according to the Town's standards. This will assure consistency of drawings and facilitate updating the basemap.

XI. GENERAL CONCLUSIONS AND RECOMMENDATIONS

Improvements presented in this report are planned to benefit the future 20 year population growth of the Town and surrounding service area whose population is expected to increase. Extensions of the collection system by the Town have made wastewater service accessible to a number of neighborhoods and homes that were previously on septic systems. The wastewater treatment plant and extended sewers have adequate capacity to serve the existing population and many of the areas that are likely to be developed. Future service extensions can be achieved with a combination of gravity sewers and lift stations.

This Master Plan was prepared as a planning tool to guide future design efforts. It is not intended to, nor will it result in, complete expansion of the system. Installation of new lines for wastewater collection were proposed where necessary to serve existing developed areas or areas likely to be developed in the near future. Preliminary design of the system expansion was based on the best available information, as obtained from existing sewer maps, aerial photography and field work.

The basic purpose of a Master Plan is to develop a blueprint that will reasonably correct and eliminate existing problems, as well as plan for future development and expansion of the system. Uncontrolled development has an adverse effect on the citizens, property, neighborhoods, and utility operations. Installation of a wastewater management system to serve the entire service area represents a significant capital investment. Completion of a Master Plan represents a critical step to guide future improvements. After approving the Master Plan, the next course of action is to agree on an overall plan for phasing improvements. This would allow a financing strategy and associated funding mechanisms to be established and implemented.

Expansion of the wastewater management system to serve the unsewered areas and future 20 year projected growth in the Town will consist of installing a combination of conventional gravity collection sewers, pressure sewers, grinder pumps and lift stations. Connection of the proposed subsystems to the existing system will be accomplished via lift stations and force mains. In addition, several modifications are proposed to reroute and reduce the volume being transported to the WWTP from the main interceptors.

Other recommendations to assure an effective management program are as follows:

1. Review the design and development standards, specifications, and plan review procedures to confirm that controls are in place to assure that new developments have adequate capacity and will not adversely affect the downstream system. This document should be reviewed at least every three (3) years.

2. Periodically review administrative regulations and the Sewer User Ordinance (SUO) to assure that the needed authority and controls are in place to adequately enforce the SUO through inspections and other measures. The review should include an evaluation of fines related to non-compliance.

3. Develop specific work plans, management objectives, annual goals and associated budgets for completing projects. Compile a list of existing problem areas to assist in setting priorities, and prepare schedules for projects within the funding limits set by the Council.

4. Implement an ongoing program to inspect, disconnect, and eliminate private clear water sources to the system. This should be coupled with a public education program to inform customers of the costs and damages associated with clear water connections to the wastewater collection system.

5. Evaluate available facilities management software that can be interfaced to the Town's digital map. The program should include complaint tracking, work order scheduling, maintenance, and system inventory.

6. Periodically review the Master Plan to determine if revisions to the plan or priorities are needed due to changing conditions. This should be done every 5 years at a minimum.

7. Locations of recorded easements where sewers have been installed outside of the rights of way should also be input on the map. Establishing digital standards for submittal of plans will allow files to be directly entered into the GIS database.

8. The Infiltration/inflow (I/I) program needs to continue in order to remove or reduce the volume of clear water being discharged to the system. This should include private sources such as downspouts, sump pumps, and yard drains.