FILED
September 30, 2021
INDIANA UTILITY
REGULATORY COMMISSION

STATE OF INDIANA

INDIANA UTILITY REGULATORY COMMISSION

JOINT PETITION OF INDIANA-AMERICAN WATER COMPANY INC. ("INDIANA-AMERICAN") AND THE TOWN OF LOWELL, INDIANA ("LOWELL") FOR APPROVAL AND AUTHORIZATION OF: (A) THE ACQUISITION BY INDIANA-AMERICAN OF LOWELL'S WATER UTILITY PROPERTY (THE "LOWELL SYSTEM") IN LAKE COUNTY, INDIANA IN ACCORDANCE WITH A PURCHASE AGREEMENT THEREFOR; (B) APPROVAL OF ACCOUNTING AND RATE BASE TREATMENT; (C) APPROVAL OF THE RATES AND CHARGES FOR WATER SERVICE IN THE AREA SERVICED BY THE LOWELL OPERATION; (D) APPROVAL OF APPLICATION OF INDIANA-AMERICAN'S RULES AND REGULATION FOR WATER SERVICE TO THE LOWELL WATER SYSTEM; (E) APPLICATION OF INDIANA-AMERICAN'S DEPRECIATION ACCRUAL RATES TO SUCH ACQUIRED PROPERTIES; AND (F) THE SUBJECTION OF THE ACQUIRED PROPERTIES TO THE LIEN OF INDIANA-AMERICAN'S MORTGAGE INDENTURE.	)	**CAUSE NO. 45550**

PETITIONER'S RESPONSE TO DOCKET ENTRY REQUEST DATED SEPTEMBER 27, 2021

Indiana-American Water Company, Inc. ("Indiana American"), by counsel, hereby responds to the Commission's Docket Entry Request dated September 27, 2021 as follows:

Request No. 1: Gregory D. Shimansky. On Pages 14 and 15 of his Direct Testimony, Mr. Shimansky states "Customer communications regarding the Lowell acquisition are expected to be sent around the week of June 6, 2021. A copy of the notice will be late-filed as Attachment GDS-4." Please submit Attachment GDS-4.

Response: Attachment GDS-4 was late-filed on September 28, 2021.

Request No. 2: Gregory D. Shimansky. Indiana American's Attachment GDS-2, Line No. 13, identifies no planned investment over the next five years in the Town of Lowell. Please confirm that this is correct.

Response: The statement is accurate with explanation. Attachment GDS-2 was prepared for purposes of evaluating the following statutory elements:

IC 8-1-30.3-5(d)(7): "The rates charged by the utility company will not increase unreasonably in future general rate cases solely as a result of acquiring the utility property from the offered utility."

IC 8-1.5-2-6.1(e)(2): "If subdivision (1) does not apply and subject to subsection (h), the commission shall consider the extent to which the proposed terms and conditions of the proposed sale or disposition would require the existing utility customers of either the prospective purchaser or the municipality's municipally owned utility, as applicable, to pay rates that would subsidize utility service to the other party's existing customers."

As for the first element, capital improvements that might be made after the transaction are not included in the analysis because Mr. Shimansky's analysis is focused on rate increases that would result "solely as a result of" the acquisition. Future improvements are not "solely as a result of the acquisition." As for the second element, Indiana American does not yet know what capital improvements may be needed. As explained in the testimony of Witness Elmer at pp. 4-6, many of the immediate improvements are operational. As for capital, the initial effort will be implementation of an asset management strategy and plan, including prioritization, as well as development of a Comprehensive Planning Study. While Lowell has identified capital improvements that it believes are necessary if Lowell were to continue to own the system, Indiana American will need time operating the system before it can confirm agreement with the need and prioritization. Mr. Elmer also explains that hydrogeologists will help study the issues with Lowell's source of supply to determine what improvements are needed to address Lowell's Total Trihalomethanes issue. These improvements could be capital in nature. Until these studies, evaluations and prioritizations can be done after Indiana American has had the opportunity to operate the system, an effort to project future capital expenditures would be speculative. As such, Attachment GDS-2 identifies no capital improvements because, at this point, Indiana American cannot say what improvements will be needed.

Request No. 3: John Yelkich. Please provide a copy of the Town of Lowell's most recent Capital Improvement Plan. Please indicate which projects in that plan are complete, which will be, or are being completed in 2021 by Lowell, and which will remain incomplete after 2021, that Indiana American will consider completing. Please include the estimated cost for each project.

Response: See Town of Lowell's response.

Request No. 4: David Elmer. On page 3, line 11 of Mr. Elmer's Direct Testimony he references a water system evaluation report prepared by SEH in 2014. Please provide a copy of that report.

Response: See attached.

Request No. 5: Justin Schneider. Does a main extension agreement exist to extend service to Lake Prairie Elementary School as referenced on page 6 of Mr. Schneider's testimony and page 14 Section 7.0(iv) of the Asset Purchase Agreement (JS-2)?

A. If so, please provide a copy of that agreement.

B. If a main extension agreement has not been executed, which party will pay for the cost of the main extension? What is the estimated cost of the main extension?

Response: A main extension agreement has not been executed. The terms of the main extension will be negotiated with the school and other potential customers after closing and coordinated with Lowell's extension of sewer service. The main extension will be pursuant to the Commission's main extension rules, but it is not yet known what the initial "deposit" would be, whether the extension would qualify as a "special contract" pursuant to 170 IAC 6-1.5-40, or whether Indiana American could or would make an extension more favorable to the original depositor than that required by the Commission's main extension rules under 170 IAC 6-1.5-41. Lowell estimated the cost of the main extension to be $1,200,000. The estimate is included in the capital improvements identified in the plan provided in response to the question answered by Lowell.

Respectfully submitted,

Hillary J. Close

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Indiana-American Water Company, Inc.

CERTIFICATE OF SERVICE

The undersigned hereby certifies that a copy of the foregoing was served this 30th day of September, 2021, by electronic transmission to the following:

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DMS 21036036v1

Water System Evaluation

Town of Lowell, Indiana

SEH No. LOWELL 126268

November 2014

Lowell EST. 1852

SEH of Indiana

December 16, 2014

Re: Water Distribution System Master Planning
Town of Lowell, Indiana
SEH No. LOWELL 126268

Mr. Greg Shook
Director of Public Works
Town of Lowell
415 Main Street
Lowell, WI 54701

Dear Mr. Shook:

As requested, SEH of Indiana (SEH®) has completed the evaluation of the Town of Lowell's water distribution system. This report considers how population growth, daily water pumpage, and use have trended from 2004 to present. It also speculates the impacts that future growth west of the town limits will have on the Town's distribution system.

We appreciate the opportunity to be of service to you on this project. Please feel free to contact me with questions or concerns relating to this report or any other matter.

Sincerely,

Craig Hendrix, PE
Senior Project Manager

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Water System Evaluation

Prepared for:
Town of Lowell, Indiana

Prepared by:
SEH of Indiana
9200 Calumet Avenue, Suite N300
Munster, Indiana 46321
219.513.2500

Craig Hendrix, PE	PE19500326 PE Number	November 26, 2014 Date

Executive Summary

Growth throughout the Town of Lowell increased its population nearly 25 percent between 2000 and 2010. This growth has placed pressure on its utilities, specifically its potable water facilities. In recent years, the growth has slowed mainly due to economic factors. Lowell has been taking advantage of this lag in development to evaluate itself from a zoning, land use and utility perspective. With recent upticks in the economy, a renewed interest in development and the potential of the addition of the Illiana Highway; Lowell is positioning itself to be ready for what the future might hold.

Throughout 2013 Lowell, through its Plan Commission, reviewed and updated its Existing and Future Land Use, Zoning, and Thoroughfare Plans. These plans led to the development of an annexation strategy and annexation schedule. The potential construction of the Illiana Highway will certainly spur development and place pressure on the Town to provide services to these areas.

SEH of Indiana (SEH®) was charged with evaluating Lowell's existing water distribution system to determine its adequacy to supply potable water and fire protection not only to Lowell's existing territory, but to future areas west of town to US 41 and north of town to the proposed Illiana Highway. To accomplish our task, we utilized existing planning maps and documents, existing water atlases and interviewed planning and public works staff to gather an understanding of where Lowell has been and where it wants to be in the future. These efforts led to the creation of a hydraulic computer model of Lowell's existing water distribution system to aid in its analysis.

The computer model was utilized to evaluate the ability of the current system to meet the potable water and fire suppression needs of its customers and to model the effects of future needs caused by growth both within and outside Lowell. Chapter 1 discusses the purpose and scope of our work. Chapter 2 reviews Lowell's existing infrastructure. Chapter 3 evaluates and projects the level of anticipated growth both within Lowell's existing limits and in future service areas. Chapter 4 discusses Lowell's potential water needs. Chapter 5 evaluates the ability of the distribution system to meet Lowell's water needs today and in the future. Chapter 6 identifies improvements necessary for the distribution system to supply Lowell's water needs. Chapter 7 discusses servicing future areas. Chapter 8 lays out a Capital Improvements and Priority Plan for the Town's success.

Growth projections were determined using population projections, existing and proposed land use and zoning. These projections can be found in Chapter 3. These projections, together with historical water sales, are the basis for computing water needs. Total sales data was available beginning in 2004. By the end of 2012, Lowell had installed new meters to most if not all of its residential and commercial customers. Monthly meter data is collected via radio communication between the meter and a data collection center. Prior to 2013, monthly meter data was collected by Lowell staff and was prone to reporting error. The new reporting allows us to have a high level of confidence in customer sales data beginning in 2013. Monthly meter data from 2013 and the first quarter of 2014 was used exclusively in this report. Chapter 4 discusses at length historical customer usage and projects future customer usage. Tables 4-10, 4-12 and 4-15 summarize the Future Water Requirements within the Town Limits, Potential Water Requirements with Full Town Buildout and 2035 Pumpage Projections with Future Service Areas respectively. To seek concurrence, our methods and projections outlined in Chapter 4 were presented to the Lowell Plan Commission and to Lowell Planning and Public Works Staff on September 18, 2014. After much discussion, the Plan Commission recommended that we move forward with the system evaluation with the projections as presented.

The creation of the hydraulic model proved to be challenging. We discovered that Lowell's water atlases were not up to date and had not been revised when new mains were installed or existing mains were eliminated. A great deal of time and effort was spent reviewing mapping with Lowell's staff. In many instances, Lowell's staff had to verify in the field whether mains existed or not and if they did exist, what size they were. The outcome of this effort is Figure 2-3. Figure 2-3 represents the most comprehensive water distribution map of Lowell's existing water distribution system.

Executive Summary (Continued)

Model calibration also proved challenging. During calibration, fire hydrants are flow tested in the field to measure the amount of flow passing through the hydrant and the system pressure drop during the test. These measurements are then simulated in the computer model. The model is adjusted until the results of the model matches, as closely as possible, the field measurements. In several instances model results could not be adjusted to match field results. Many times this is the result of valves within the system unknowingly being closed or pipes not existing where they are thought to exist. Exhaustive field efforts by Town staff resulted in the identification of several unknown closed valves and missing or never installed water mains.

Additionally, it was always thought by Lowell's staff that both the East and West Storage Tanks were the same height. The fill valve on the West Tank had to be nearly completely closed to keep the tank from overflowing. The model indicated the tanks could not be at the same elevation. Field survey revealed that the West Tank was actually lower than the East Tank by nearly five feet. The model had proved to be useful in problem solving right from its inception!

With the model calibrated, we were able to simulate the effects of average day, maximum day, peak hour and fire demands on the system. Several areas of the town were discovered to have average day pressures as low as 35 psi, barely above acceptable levels as required by Indiana Code. Other areas have average day pressures of nearly 70 psi. Figure 5-2 represents a graphical depiction of static pressures on average day with the Town's current system. Figure 5-3 represents a graphical depiction of available fire flows with the Town's current system. It is apparent that available fire flows in too many areas of the Town fall far short of the flows recommended by the Insurance Service Office (ISO). Figure 5-4 calls attention to areas of deficient flows.

In Chapter 6, we identified a number of recommended system improvements. These improvements were prioritized into three stages. Stage 1 improvements are recommended to be completed immediately and include the construction of a new 1.0 MG elevated storage tank and raising the pressure gradient in Town by 10 psi and the addition of an additional supply well. Stage 2 improvements are recommended for fire protection and for interconnection. Stage 3 (lowest priority) are recommended for increased fire flow availability. Figure 6-3 depicts graphically the results of raising the pressure gradient in Town. Figure 6-4 through Figure 6-6 indicate the results of making piping improvements.

Servicing Future Service Areas to the west of Town are of great interest. Figure 7-1 introduces a second pressure zone. The Main Pressure Zone (with the system gradient raised) reaches as far west as US 41 and nearly 173rd Avenue to the north. The Second Pressure Zone will reside north of 173rd Avenue to the future Illiana Highway. An additional booster station and elevated tank will be required to serve this new pressure zone. The Town may consider constructing a new water treatment plant to serve this new pressure zone to decrease the demands at the existing treatment plant. An additional ground storage tank is recommended to provide storage for average day demand reliability.

Cost estimates and prioritizations of proposed improvements are provided in Chapter 8. Constructing a new elevated storage tank and increasing the supply of raw water to the water treatment plant are the top priorities.

Efficiently operating a potable water utility is not an easy task. Budgets do not typically allow for all desired improvements to be constructed in a timely manner. Evaluations like this are important planning documents that aid in assembling capital improvement plans and in long range budgeting. Computer models like the one created for this evaluation are useful beyond this document. The effects of future developments can be modeled to identify necessary upgrades required to serve the development or how to determine the amount of fire flow available. This evaluation should not be shelved and forgotten about. It should be reviewed and updated with new data at a minimum of every five years to ensure the results are still pertinent. The computer model should be updated annually by adding newly installed improvements. Water atlases and improvement records should also be updated as new improvements are added. SEH is pleased to submit this evaluation and remains ready to assist Lowell with future water distribution efforts.

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Water System Evaluation

Town of Lowell, Indiana

Prepared for the Town of Lowell

1.0 Introduction

The Town of Lowell is a growing community of approximately 9,400 residents located in northwestern Indiana in Lake County. The Town is divided by State Road 2 (Commercial Avenue) which travels east-west and Cedar Creek flowing south. The Town was incorporated in 1852 and has owned and operated a municipal water system since 1898.

The Lowell water system consists of seven active water supply wells, one water treatment plant, two elevated reservoirs, one booster station, and approximately 66 miles of transmission and distribution water mains, ranging in size from 4 inches up to 16 inches in diameter. The distribution system is divided into two separate pressure zones, including the Main pressure zone and the North pressure zones. The Main zone operates at a pressure plane of approximately 806.5 feet USGS. The North zone, however, does not have elevated storage and is pressurized directly by the North booster station.

Public water is supplied from eight wells (seven active) scattered over a 215-acre area in the south part of the Town. Wells 1 through 6 are generally 30 feet in depth and obtain water from the shallow sand and gravel aquifer. Wells 7 and 8 are around 300 feet deep and obtain water from the limestone aquifer beneath the clay confining unit just below the shallow sand and gravel aquifer.

The water from all of the wells is blended and treated by gravity filtration in gravity filters in a water treatment facility with a capacity of 1,040 gpm. Treatment consists of aeration, chlorine feed, lime feed, flocculation, rapid mix, sedimentation, CO_2 stabilization, gravity filtration, fluoride feed, sodium silicate feed, and residual chlorine feed.

Lowell's water utility customer base is mostly comprised of residential customers and includes a variety of commercial customers and a handful of industrial customers. With proper planning and coordination, the water system facilities can be better prepared for short-term as well as long-term community needs.

1.1 Purpose

This report utilizes the information provided by the Town and summarizes the results of the 2014 water system evaluation for the Water Utility. The primary purpose of the study is to evaluate the water distribution system needs and system expansion required to serve current and future Utility customers.

Past, present and future water needs of Lowell have been evaluated, and recommendations made concerning improvements necessary to maintain an adequate level of water service. This report will serve as a plan to guide future expansion of the water system.

1.2 Scope

The planning approach used for the study began with an evaluation of service area needs and characteristics. Current and future water needs were evaluated over a planning period extending to the year 2035.

Population, community growth, and water consumption projections serve as the foundation for evaluating and identifying recommended improvements to the water system. A review of existing facilities is summarized in Section 2.0. Section 3.0 discusses existing and expected future land uses and community growth. The assumptions and conclusions presented in Section 3.0 were used to develop projections of water requirements that are presented in Section 4.0. Section 5.0 summarizes the evaluation of the water system in the existing state and in Year 2035 with future development. A summary of recommended water system improvements is presented in Section 6.0. Section 7.0 discusses future service areas outside the town limits. Section 8.0 includes a proposed Water Utility capital improvements plan. Appendix A contains a Glossary of Terms and Appendix B contains a List of Abbreviations.

Municipal water system planning is a continuous function as needs change with time. Therefore, the longer term projections and improvements discussed in this report should be reviewed, re-evaluated, and modified as necessary to assure its adequacy for future planning efforts. Proper future planning will help assure that system expansion is coordinated and constructed in the most efficient manner.

2.0 Existing Water System Facilities

The water system facilities operated and maintained by the Lowell Water Utility include:

1. Seven active groundwater wells
2. One water treatment plant with high service pumping station
3. One booster station
4. Two Pressure Zones
5. Two elevated tanks
6. Water system controls located in the Water Treatment Plant
7. A network of transmission and distribution water mains

The general location and layout of the water system facilities is illustrated in Figure 2-1. A schematic of the water system is illustrated in Figure 2-2. All wells are directly pumped in the existing water treatment plant. This section presents a summary of the design and operating characteristics of the existing water system components.

2.1 Water Treatment Plant

The Town of Lowell water distribution system obtains 100 percent of its water from one well field and one water treatment plant. All seven active wells pump into one raw water main that leads to the water treatment plant. The sum of the rated capacity of the wells is approximately 2,230 gpm, but the wells when operating all together produce approximately 1,330 gpm. The water treatment plant has a maximum capacity of 1,040 gpm (1.5 mgd).

Treatment begins in the plant with aeration for sulfide removal and oxidation. Chlorine is injected and the influent enters a slid contact and flow equalization chamber, where the influent has at least 30 minutes of contact with chlorine. Next, the water enters the flash mixers and solids contact clarifiers and react with the chlorine and flocculants for 2.5 hours. The water stabilizes, the solids settle out, and pH adjustment is made. Next, the water passes through four gravity filters, each 144 ft^2 in cross sectional area, at a filtration rate of 1.8 gpm/ft^2. Next, the water enters the wet well and receives additional chlorine and fluoride. Finally, the water enters the clear well and high service pump basin to enter the distribution system through the high lift pumps. A schematic of the water treatment plant processes is attached to this report in Appendix F.

The water treatment plant capacity, arguably the most important consideration in a water master plan because future water needs, are directly limited by the water supply source, and the water supply must be altered to meet the future needs. If the plant does not keep up with needs, the unavailable water may discourage developers and industries from coming to Lowell.

2.2 Water Distribution System

The Town of Lowell currently serves approximately 2,600 acres with 66 miles of water main. The Town is divided into one main pressure zone and one small pressure zone. Figure 2-1 illustrates the existing water system service area and the existing pressure zones.

The existing water system contains one pumping station, two elevated storage reservoirs, and one ground storage reservoir in the water treatment plant. A schematic of the water system is illustrated in Figure 2-2. Figure 2-3 shows the existing water mains and the location of the pumping station and reservoirs.

The Town's water distribution system provides a means of transporting and distributing water from the supply sources to Utility customers and other points of usage. The distribution system must be capable of supplying adequate quantities of water at reasonable pressures throughout the service area under a range of operating conditions. Furthermore, the distribution system must be able to not only provide uniform distribution of water during normal and peak demand conditions, but it must also be capable of delivering adequate water supplies for fire protection purposes.

The Town of Lowell's water system is comprised of approximately 66 miles of water mains ranging in size up to 16 inches in diameter. The current water main size inventory is summarized in Table 2-1. Of the 66 miles of water main, 21 percent of the pipes are 10 inches or larger. The large diameter water mains represent the system's primary transmission facilities.

The current water main inventory based on pipe material is summarized in Table 2-2. Pipe materials include cast iron, ductile iron, and PVC.

The system contains a number of large transmission mains that are critical to the operation of the distribution system. These transmission mains connect remote areas of the system to the water treatment plant and provide the system with the ability to transmit water at high flow rates around the system. Figure 2-4 shows the transmission mains in the system that are 10 inches or larger in diameter. Figure 2-4 shows how the system does not have any large transmission mains that connect the east and west areas of the Town other than the 14-inch mains along Belshaw Road near the water treatment plant.

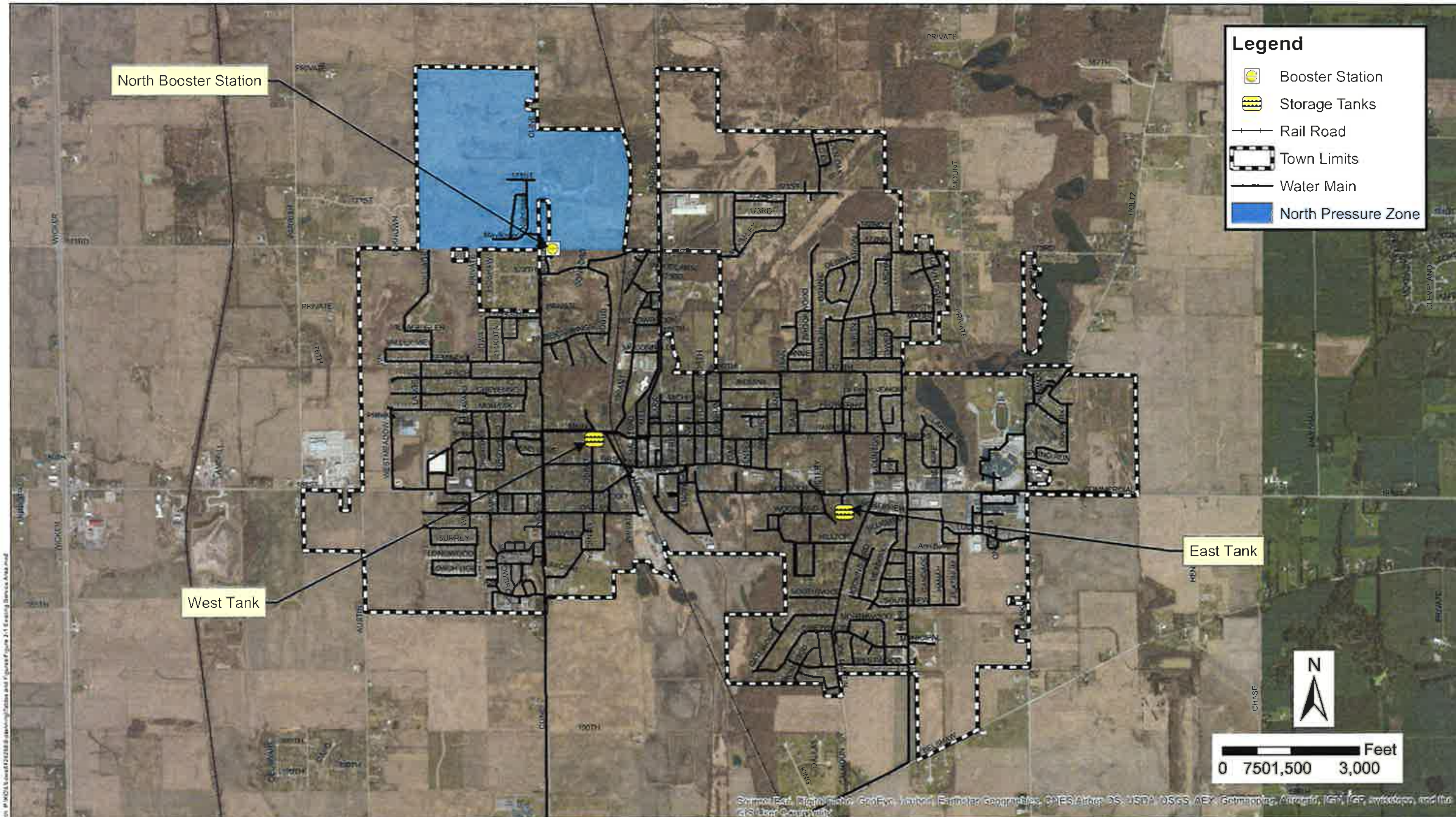
2.3 Existing Booster Pump Facilities

The distribution system is a two-pressure zone piping network. The system pressure in the main zone is maintained by the water level in the two reservoirs. A high service pump station at the water treatment plant moves water from the water treatment plant to the main pressure zone. A second booster station moves water from the main distribution system into a separate smaller pressure zone (North Pressure Zone). This section reviews the existing pumping stations in the distribution system.

2.3.1 Main Pressure Zone

The Main Pressure Zone serves all customers in the Town of Lowell and the North Pressure Zone. In 2013, the Town had approximately 3,550 water meters. The water treatment plant pumping station shares the same pressure zone as the two elevated storage tanks in the Main zone. This main pressure zone has backup power provided by a diesel engine generator. This station has one 700 gpm pump and two 1,040 gpm pumps. A summary of equipment and operational characteristics of this station can be found in Table 2-3.

One 16-inch main leaves the water treatment plant pumping station and goes north along Colfax Street. The 16-inch main splits into two 14-inch mains at Belshaw Road, going southwest and northeast to Calhoun Street and Cline Street, where each bends north towards the distribution system. One hundred percent of all water in the system originates from these water mains from the water treatment plant.



SEH of Indiana

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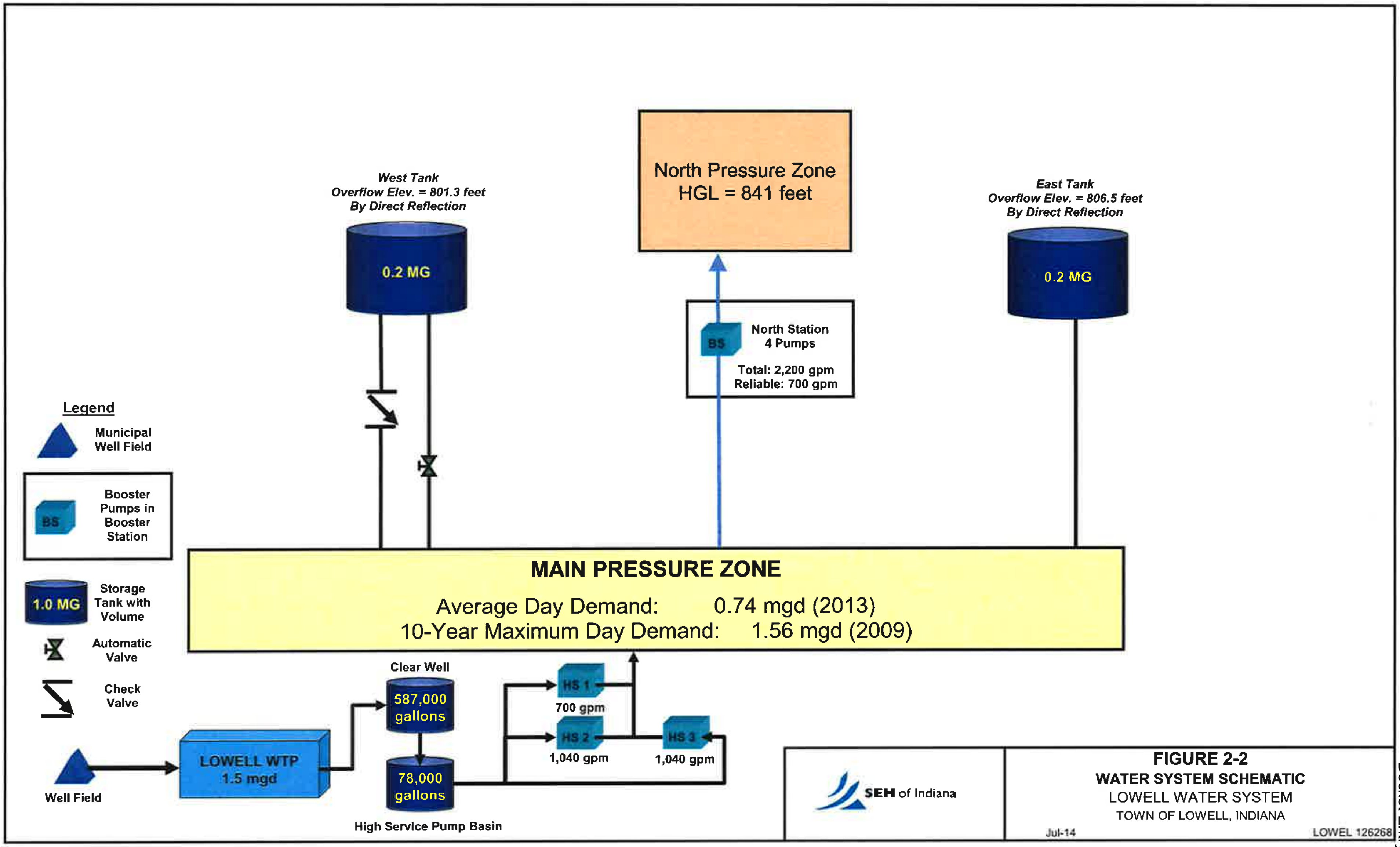
Project: LOWEL 126268
Print Date: 8/18/2014

Existing Service Area

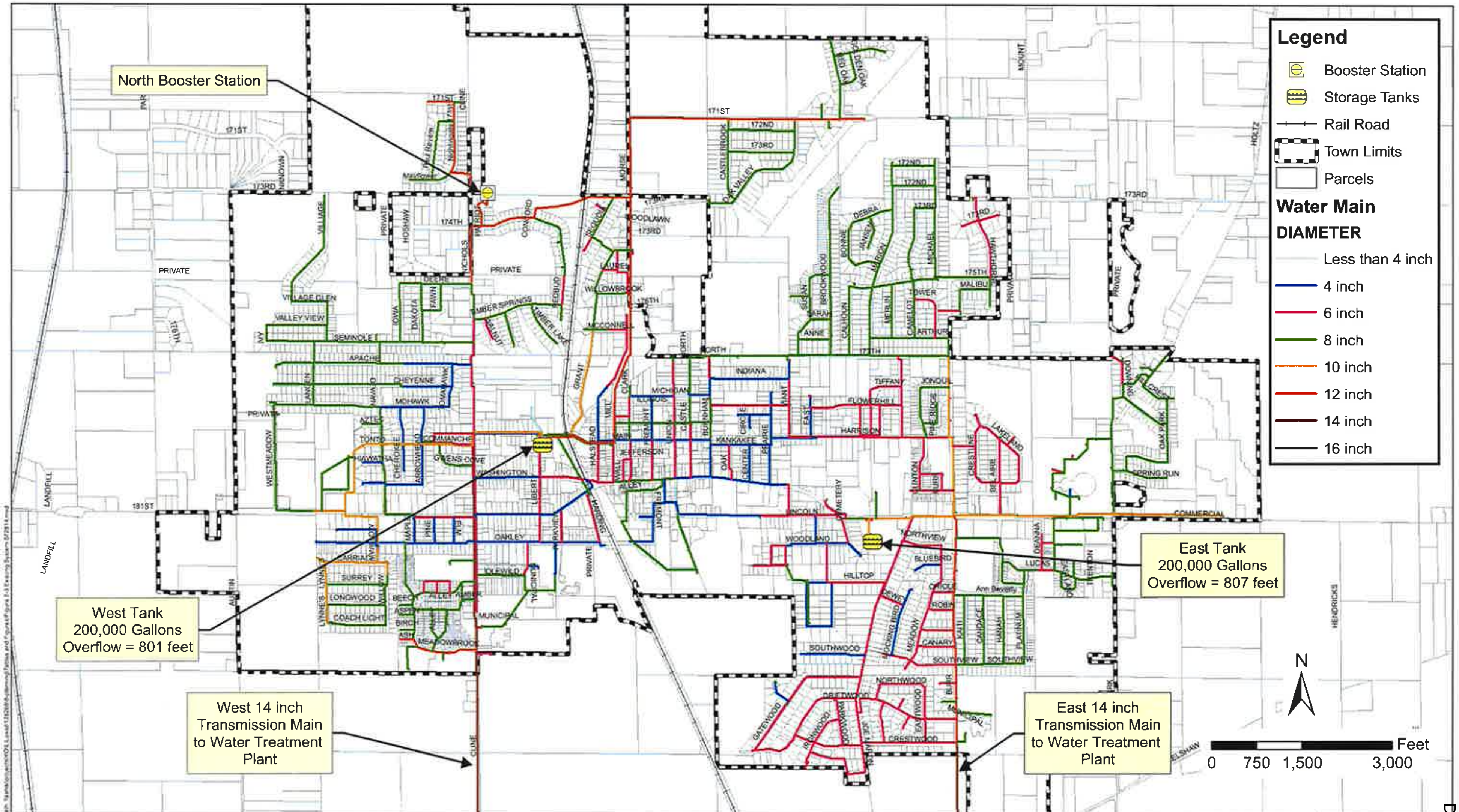
Lowell Water System Master Plan

Lowell, Indiana

Figure 2-1



\\sehlx\projects\KO\L\Lowell\126268\8-planning\Tables and Figures\[Figure 2-2 Schematic Drawing 072114.xlsx]Figure 4-2



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Print Date: 9/8/2014

Map by: jbohnert
Projection: Indiana West (feet)
Source: Town of Lowell

Existing Water System

Lowell Water System Master Plan

Lowell, Indiana

Figure 2-3

Cause No. 45550
Docket Entry Request No. 4
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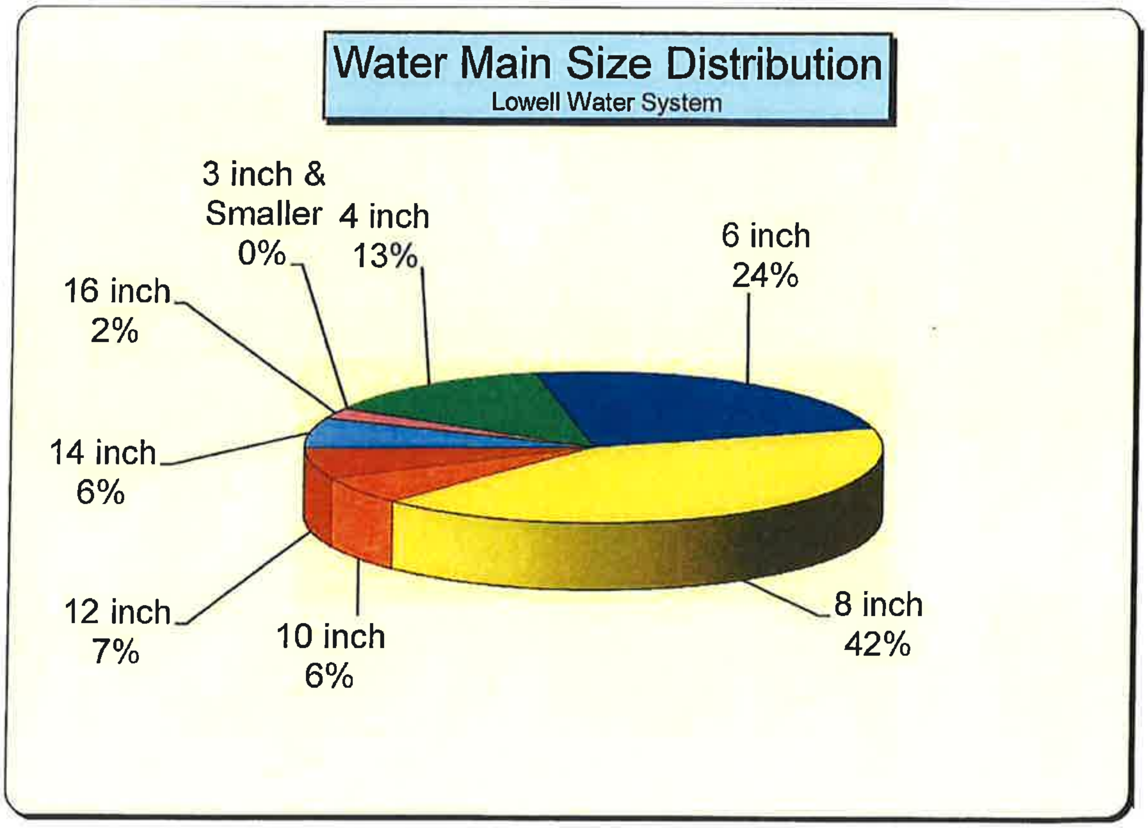
Table 2-1
Water Main Size Distribution
Lowell Public Works
Town of Lowell, Indiana

Diameter	Approximate Total Length[1] (feet)	Percentage of Total
3 inch & Smaller	1,111	0.3%
4 inch	45,216	13%
6 inch	82,713	24%
8 inch	142,870	41%
10 inch	20,013	6%
12 inch	23,120	7%
14 inch	21,999	6%
16 inch	7,775	2%
Total	**344,817**	**100.0%**

[1] Source: WaterCAD Model

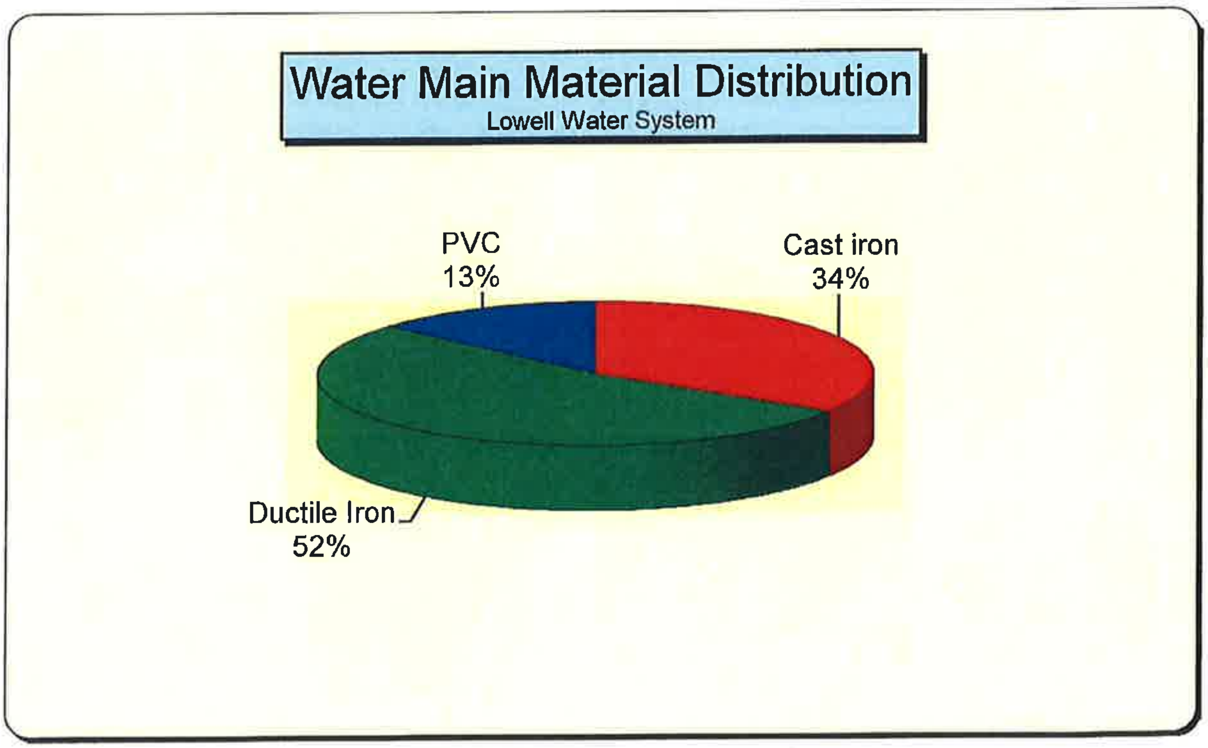


\\sehlx\projects\KO\L\Lowell\126268\8-planning\Tables and Figures\[Chapter 2.xlsm]Table 4-6

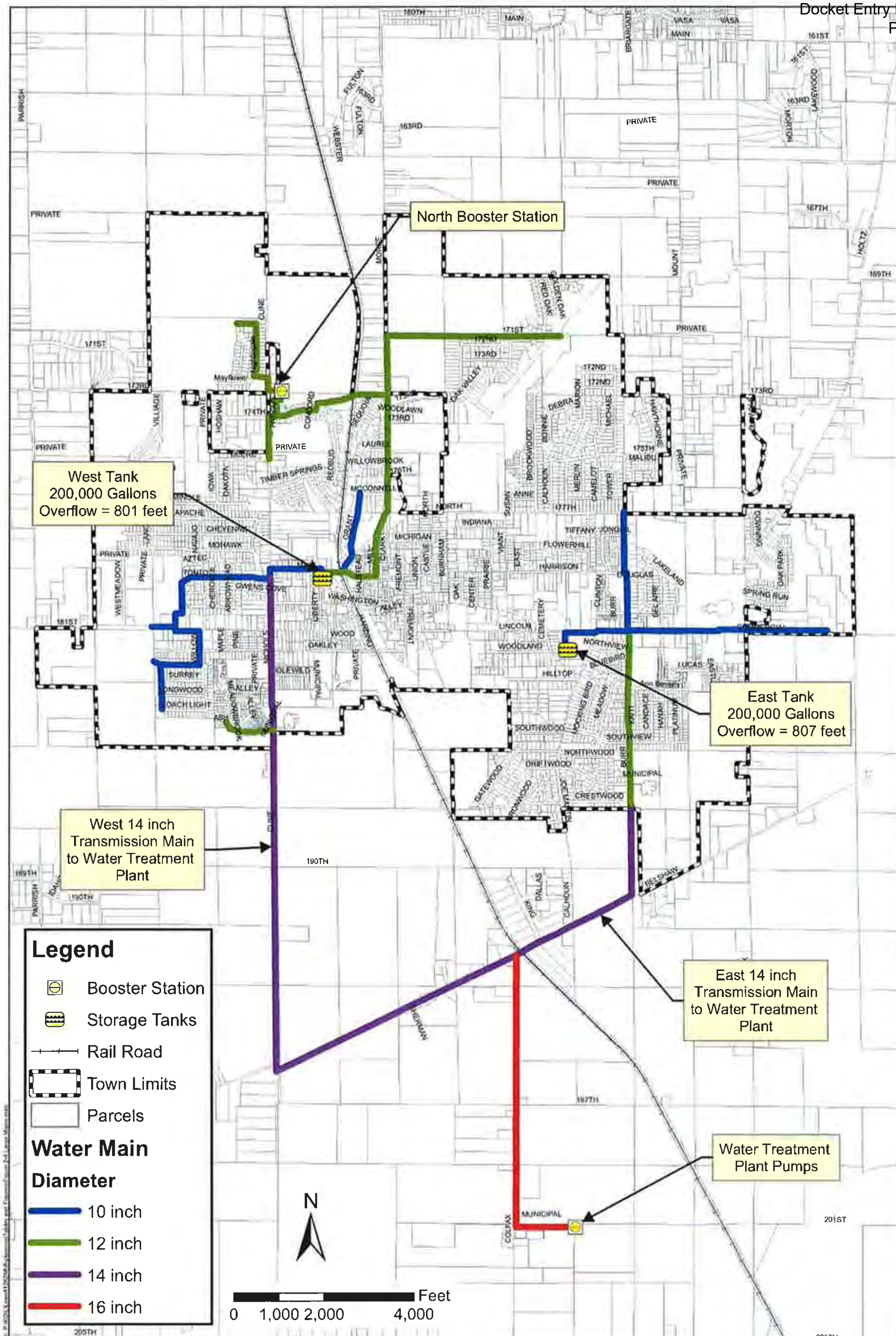
Table 2-2
Water Main Material Distribution
Lowell Public Works
Town of Lowell, Indiana

Pipe Material	Approximate Total Length[1] (feet)	Percentage of Total
Cast iron	118,073	34%
Ductile Iron	182,079	53%
PVC	46,272	13%
Total	**346,424**	**100.0%**

Notes:
[1] Source: WaterCAD model with Operator updates in 2014



\\sehlx\projects\KO\L\Lowell\126268\8-planning\Tables and Figures\[Chapter 2.xlsm]Table 4-7



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Project: LOWEL 126268
Print Date: 9/8/2014

Large Transmission Mains
Lowell Water System Master Plan
Lowell, Indiana

Figure
2-4

Table 2-3
High Lift Pump Data
Lowell Public Works
Town of Lowell, Indiana

	HS1	HS2	HS3
Year Constructed	1994		
Type	Vertical Turbine	Vertical Turbine	Vertical Turbine
Make	Peerless	Peerless	Peerless
Model	90663-A	90664-A	90664-B
Capacity (gpm)	700	1,040	1,040
Head (Feet)	185	200	200
RPM	1,800	1,760	1,760
Design Efficiency	77%	86%	86%
Number of Stages	7	4	4
Motor Manufacturer	U.S. Motors	U.S. Motors	U.S. Motors
Maximum Speed (rpm)	1,800	1,800	1,800
Motor Type	Electric - 460 Volt / 3 phase	Electric - 460 Volt / 3 phase	Electric - 460 Volt / 3 phase
Motor Power (HP)	50	75	75
Has VFD?	No	No	No
Rated Conditions			
Shutoff Head (ft)	345	275	275
Point 1 Flow (gpm)	700	1,040	1,040
Point 1 Head (ft)	182	200	200
Point 2 Flow (gpm)	800	1,380	1,380
Point 2 Head (ft)	108	123	123
Back up Power	Detroit 300 kW diesel generator with automatic transfer switch		
Chemical Treatment Capabilities	Chorine Gas		

\\sehlx\projects\KO\L\Lowell\126268\8-planning\Tables and Figures\[Chapter 2.xlsm]Table 4-4

2.3.1 North Pressure Zone Booster Station

The North pressure zone provides boosted pressure to approximately 72 parcels, of which 31 parcels have water meters. The North booster is on a closed system. A variable frequency drive (VFD) motor driven pump maintains the pressure in the North booster station at 60 psi. This station has one 100 gpm pump for normal operation, two 300 gpm pumps, and one 1,500 gpm fire protection pump. Backup power to this facility is provided by a natural gas generator. Table 2-4 summarizes the equipment and operational characteristics of this station.

2.4 Existing Storage Facilities

The Utility operates and maintains two elevated steel water storage tanks. One tank is located on the east side and one tank on the west side. The storage reservoir capacity in both tanks is 200,000 gallons. Both tanks serve the main pressure zone. Table 2-5 summarizes design characteristics of the Lowell elevated storage tanks.

2.4.1 East Reservoir

The East reservoir was constructed and placed into service in 1970. The East Reservoir is an elevated steel tank with an overflow elevation of 806.5 feet. The reservoir has a diameter of 36 feet and a depth of 30 feet. The tank has a total capacity of 0.2 MG and is normally operated within two feet of overflow. Figure 2-5 shows the East reservoir site and water mains.

The East reservoir has an overflow approximately five feet higher than the West reservoir. The central and eastern areas of the Town operate on the East reservoir. Many disconnected crossing pipes in the main zone cause a hydraulic separation between areas of the Main zone, but it is not entirely divided into two pressure zones. There is no altitude valve to keep the tank from overflowing under higher system pressures.

2.4.2 West Reservoir

The West reservoir was constructed and placed into service prior to 1970. The West Reservoir is an elevated steel tank with an overflow elevation of 801.3 feet. Prior to this evaluation, Town staff believed the East and West Tanks operated at the same elevation. The reservoir has a diameter of 36 feet and a depth of 31 feet. The tank has a total capacity of 0.2 MG and is normally operated full. Figure 2-6 shows the West reservoir site, valves, and water mains.

The West reservoir has an overflow approximately five feet lower than the East reservoir. The western areas of the Town also operate on the East reservoir. The West reservoir currently has a broken altitude valve and is currently operated with a manual gate valve and a check valve. The 6-inch influent line with the broken altitude valve has a gate valve that is only one-half turn open. The 10-inch effluent line has a check valve that only permits flow from the tank. The West tank currently has limited use with the broken altitude valve, mostly-closed gate valve, check valve, and the effluent line that directs flow almost entirely to one area of the town.

Table 2-4
North Booster Station Pump Data
Lowell Public Works
Town of Lowell, Indiana

	BS1	BS2	BS3	BS4
Year Constructed	2008			
Type	Centrifugal	Centrifugal	Centrifugal	Centrifugal
Make	Peerless	Peerless	Peerless	Berkeley
Model	C610A	C825A	C825A	B6JPBMS
Capacity (gpm)	100	300	300	1,500
Head (Feet)	100	100	100	125
RPM	3,500	3,500	3,500	1,750
Design Efficiency	65.8%	78.8%	78.8%	82.9%
Motor Type	Electric	Electric	Electric	Electric
Motor Power (HP)	5	15	15	75
Has VFD?	Yes			
VFD Setting	60 psi discharge pressure			
Rated Conditions				
Shutoff Head (ft)	125	130	130	160
Point 1 Flow (gpm)	100	303	303	1,500
Point 1 Head (ft)	102	103	103	124
Point 2 Flow (gpm)	140	400	400	2,000
Point 2 Head (ft)	70	75	75	80
Back up Power	Cummins 150 kW natural gas generator with automatic tranfer switch			
Chemical Treatment Capabilities	Room for chlorine gas, but currently no treatment			

\\sehlx\projects\KO\L\Lowell\126268\8-planning\Tables and Figures\[Chapter 2.xlsm]Table 4-4

Table 2-5
Existing Storage Reservoir Data
Lowell Public Works
Town of Lowell, Indiana

	West Tank	East Tank
City Location	Liberty Park	Evergreen Park
Year Constructed		
Type	Elevated Steel Legged Tank	Elevated Steel Legged Tank
Diameter (feet)	36	36
Overflow Elevation (feet MSL)	801.3	806.5
Depth (feet)	31.3	30.2
Reported Storage Volume (gal)	200,000	200,000
High Operating Elevation (feet)	801.3	806.5
Low Operating Elevation (feet)	797.3	802.5
Typical Operating Volume (gal)	30,500	30,500
Last Inspection		

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SEH of Indiana

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Project: LOWEL 126268
Print Date: 8/18/2014

Map by: jbohnert
Projection: Indiana West (feet)
Source: Town of Lowell

East Reservoir
Lowell Water System Master Plan
Lowell, Indiana

Figure 2-5

SEH of Indiana

SEH of Indiana, LLC
9200 Calumet Avenue, Suite N300
Munster, IN 46321
Phone: 219.513.2500
www.sehinc.com

Project: LOWEL 126268
Print Date: 6/18/2014

Map by: jbohnert
Projection: Indiana West (feet)
Source: Town of Lowell

West Reservoir

Lowell Water System Master Plan

Lowell, Indiana

Figure 2-6

2.4.3 Clear Well at Water Treatment Plant

The water treatment plant contains a 587,000 gallon (0.587 MG) ground storage tank that provides water to the high lift pumping station in the plant. This reservoir is ground storage and not elevated storage, and must be considered differently. This reservoir has the capacity to provide additional fire protection and supply to the system as long as the high lift pumping station is fully online. If a situation arose where the high service pumps or the 16-inch diameter main leaving the plan were offline, this reservoir could no longer be counted as storage in the distribution system.

2.5 Water System Controls

Table 2-6 summarizes the current high service pump operating control strategy. The water treatment plant is manually operated according to the level in the East Tank. The North Booster station maintains a discharge pressure of 60 psi. The West Tank floats with the East Tank, except the West Tank has an altitude valve and a check valve that prevents the West Tank from overflowing due to its lower overflow elevation.

2.6 Existing Wells

The Town operates seven groundwater wells located on the municipal well field south of the Town. The well yields are reported to range from approximately 185 gpm to as high as 600 gpm. The existing operating wells were constructed on or after 1994. The constructed depths of the wells range from 27 to 325 feet. Specific capacities range from approximately 29 to 323 gpm per foot of drawdown. Table 2-7 summarizes the system supply well data. Table 2-8 presents a summary of the pump and motor data for the Town's supply wells.

The shallow wells produce water high in iron. The deep wells produce water high in fluoride and sulfur. These constituents cause the need for constant and costly maintenance. The Town performs maintenance on their wells annually or as needed. The Town blends shallow well water with deep well water to control the levels of fluoride and sulfurs.

2.6.1 Well No. 1

Well No. 1 was constructed in 1994 to a total depth of 28.5 feet. The well contains a 12-inch diameter outer casing to a depth of 19 feet, and a 12-inch diameter inner casing to a depth of 23 feet. The well is grouted to a depth of 19 feet. A 12-inch screen is utilized to draw water from 23 feet to 28 feet of depth within the well.

Well No. 1's original static water level was reported to be 7 feet below the ground surface. The specific capacity of the well following its construction in 1994 was reported to be 16.6 gpm per foot of drawdown at a pumping rate of 199 gpm. Its current capacity according to the plant superintendent is approximately 30 gpm. Well maintenance is planned for late 2014. Post maintenance capacity is anticipated to be 160 to 200 gpm.

Table 2-6
Operating Control Strategy
Tank Levels

Tank Name	Storage Tank Water Elevations (feet)	
	Typical Conditions	
	Minimum	Maximum
East Tank	802.5	806.5
West Tank	797.3	801.3

This is an example for reference only. Actual settings can vary day to day between operators.

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2.6.2 Well No. 2

Well No. 2 was constructed in 1994 to a total depth of 27 feet. The well contains a 12-inch diameter outer casing to a depth of 14 feet, and a 12-inch diameter inner casing to a depth of 19 feet. The well is grouted to a depth of 14 feet. A 12-inch screen is utilized to draw water from 19 feet to 24 feet of depth within the well.

Well No. 2's original static water level was reported to be 5 feet below the ground surface. The specific capacity of the well following its construction in 1994 was reported to be 15.4 gpm per foot of drawdown at a pumping rate of 185 gpm. Its current capacity according to the plant superintendent is approximately 60 gpm. The well was recently cleaned by Lowell's staff.

2.6.3 Well No. 3

Well No. 3 was constructed in 1994 to a total depth of 34 feet. The well contains a 12-inch diameter outer casing to a depth of 19 feet, and a 12-inch diameter inner casing to a depth of 24 feet. The well is grouted to a depth of 19 feet. A 12-inch screen is utilized to draw water from 24 feet to 34 feet of depth within the well.

Well No. 3's original static water level was reported to be 6 feet below the ground surface. The specific capacity of the well following its construction in 1994 was reported to be 23.8 gpm per foot of drawdown at a pumping rate of 453 gpm. Its current capacity according to the plant superintendent is approximately 40 gpm. The well was recently cleaned by Lowell staff. Well No. 3 and Well No. 8 cannot operate at the same time due to electrical service and transformer deficiencies.

2.6.4 Well No. 4

Well No. 4 was constructed in 1994 to a total depth of 31 feet. The well contains a 12-inch diameter outer casing to a depth of 18 feet, and a 12-inch diameter inner casing to a depth of 23 feet. The well is grouted to a depth of 18 feet. A 12-inch screen is utilized to draw water from 23 feet to 31 feet of depth within the well.

Well No. 4's original static water level was reported to be 6 feet below the ground surface. The specific capacity of the well following its construction in 1994 was reported to be 20.8 gpm per foot of drawdown at a pumping rate of 396 gpm. Its current capacity according to the plant superintendent is approximately 50 gpm. The well was cleaned in April of 2013 and March of 2012 by outside contractors.

2.6.5 Well No. 5

Well No. 5 is not is service and is currently utilized as a monitoring well.

2.6.6 Well No. 6

Well No. 6 was constructed in 2000 to a total depth of 33 feet. The well contains a 12-inch diameter outer casing to a depth of 13 feet. A 12-inch screen is utilized to draw water from 25 feet to 31 feet of depth within the well.

Well No. 6's original static water level was reported to be 8.8 feet below the ground surface. The specific capacity of the well following its construction in 2000 was reported to be 55.8 gpm per foot of drawdown at a pumping rate of 225 gpm. Its current capacity according to the plant superintendent is approximately 100 gpm. The well was cleaned in August of this year by an outside contractor. The Superintendent believes the capacity could be increased to 130 to 140 gpm if it was cleaned again.

2.6.7 Well No. 7

Well No. 7 was constructed in 2002 to a total depth of 325 feet. The well contains a 10-inch diameter outer casing to a depth of 85 feet. The well is grouted to a depth of 85 feet. A 10-inch open borehole draws water from 85 feet to the bottom depth of the well at 325 feet.

Well No. 7's original static water level was reported to be 11.6 feet below the ground surface. The specific capacity of the well following its construction in 2002 was reported to be 8.0 gpm per foot of drawdown at a pumping rate of 600 gpm. Its current capacity according to the plant superintendent is approximately 270 gpm. The well was cleaned and repaired in October of 2013. The water produced is high in both fluoride and sulfur.

2.6.8 Well No. 8

Well No. 8 was constructed in 2004 to a total depth of 296 feet. The well contains a 16-inch diameter outer casing to a depth of 48 feet and a 15-inch diameter outer casing from 48 to 95 feet. A 12-inch open borehole draws water from 95 feet to the bottom depth of the well at 296 feet.

Well No. 8's original static water level was reported to be 15 feet below the ground surface. The specific capacity of the well following its construction in 2004 was reported to be 11.8 gpm per foot of drawdown at a pumping rate of 372 gpm. Its current capacity according to the plant superintendent is approximately 370 gpm. The water produced is high in both fluoride and sulfur which causes turbidity problems. The operators use this well as a supplement to the others during high demand times. They limit the run time to 4 to 6 hours due to its high fluoride, sulfurs and turbidity. Well No. 8 and Well No. 3 cannot run at the same time due to deficiencies in the electrical system and transformer.

Table 2-7
Existing Well Data
Lowell Public Works
Town of Lowell, Indiana

Well Data	Well 1	Well 2	Well 3	Well 4	Well 6	Well 7	Well 8
	Supply Wells						
Year Constructed	1994	1994	1994	1994	2000	2002	2004
Driller	John Blatz	John Blatz	John Blatz	John Blatz	John Blatz		Bruce McLeish
Depth (feet)	28.5	27	34	31	33	325	296
Borehole (inches)	30	30	30	30		16	20" (0' - 48') 15" (48' - 95') 11 7/8" (95' - 296')
Drilling Method	Cable Tool	Cable Tool	Cable Tool	Cable Tool	Cable Tool	Rotary	Rotary
Upper Grouted Depth (ft.)	0 - 17	0 - 12	0 - 16	0 - 16	0 - 13	0 - 85	0 - 48
Upper Grout Material	Neat Cement	Neat Cement	Neat Cement	Neat Cement	Benseal	Benseal	Bentonite with Neat Cement
Casing Material	12 inch Steel	12 inch Steel	12 inch Steel	12 inch Steel	12 inch Steel	10 inch Steel	16 inch Steel (0' - 48') 12 inch Steel (48' - 95')
Lower Grouted Depth (ft.)	17 - 19	12 - 14	16 - 19	16 - 18	None	None	
Lower Grout Material	Transition Pad	Transition Pad	Transition Pad	Transition Pad	None	None	Bentonite with Neat Cement
Gravel Pack Depth (feet)	19 - 23	14 - 19	19 - 24	18 - 23	13 - 25	None	48 - 95
Gravel Pack Material	#2 Silica	#2 Silica	#2 Silica	#2 Silica	#2 Silica	None	
Screen Depth (feet)	23 - 28	19 - 24	24 - 34	23 - 31	25 - 31	Open Borehole	
Screen Length (feet)	5	5	10	8	8	N/A	
Screen Diameter (inches)	12	12	12	12	12	N/A	
Screen Slot Size (inches)	0.06	0.06	0.05	0.06	0.05	N/A	
Last Rehab/Reconstruction	2012	1997	1999	2012	2012		
Original Construction:							
Static Water Level (ft.)	7	5	6	6	8.81	11.6	15
Specific Capacity (gpm/ft)	16.6	15.4	23.8	20.8	55.8	8.0	11.8
Rated Capacity (gpm)	199	185	453	396	225	800	700
2014 Conditions:							
Static Water Level (ft.)							
Pumping Water Level (ft.)							
Drawdown (ft.)							
Pumping Rate (gpm)							
Specific Capacity (gpm/ft)							
Reported Operating Capacity (gpm)	30	60	40	50	100	270	372

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Table 2-8
Existing Well Pump Data
Lowell Public Works
Town of Lowell, Indiana

	Supply Wells						
	Well 1	Well 2	Well 3	Well 4	Well 6	Well 7	Well 8
Pump Data							
Make	McDonald			Grundfos	Grundfos	Grundfos	Baker
Model	260G		9RCHC	230S100-3	230S75	475S200-2	7PS1214WBWE06T6E
Bowl Assembly Type		JK					
Type	Submersible	Vertical Turbine	Vertical Turbine	Submersible	Submersible	Submersible	Submersible
Year Installed	1994	1994	1994	1994	2000	2002	2004
Latest Inspection	2012		1999	2012	2012		
Serial Number	56-1661-00			15B70003	A-15BH0002-P2		
Pump Setting - Top of Bowls (feet)	24	20	25	24	20	100	109.5
Size (inches)	5	8	6	5.5	6	8	
Drop Pipe Diameter (inches)	3		6	3	4	6	7
Pump Length (feet)	2.5	3	3.25	2	1.67	1.67	2.5
No. of Stages	3	4	2	3	2	2	2
DNR Reported Capacity (gpm)	199	185	453	396	200	600	550
Operational Capacity (gpm)	200	210	500	400	200	250	350
Operational TDH (feet)	108			70	90	78	
Operational Efficiency				62%	74%	62%	
Rated Conditions:							
Flow Rate (gpm)	210			230	230	475	
Pressure (psi)	46			53	36	52	
TDH (feet)	105			122	82	120	
Efficiency				77%	77%	76%	
Motor Data							
Make	Franklin	U.S. Motor	U.S. Motor	Franklin	Franklin	Franklin	Franklin
Model		213TP	284TPA				
Year Installed	2002	1994	1994	2002	2000	2002	2004
Size (inches)	6		6	6	6	6	6
Serial Number	00A19-17-0123		383288	01K19-10-0074	99319-30-0132		
Horsepower	7.5	7.5	25	10	7.5	20	30
RPM	3450	1800	1760	3450	3450	3450	3450
Voltage	460	460	460	460	460	460	460
Amps	10.9			16.1	12.3	26.9	
Phase / Cycles	3	3	3	3	3	3	3
Standby Power:							
Type							
Pump Discharges to:	Water Treatment Plant						

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3.0 Population and Community Growth

This section summarizes the planning assumptions made regarding future service area characteristics for the Town of Lowell. To maintain consistency between individual planning efforts, the results of the Comprehensive Plan were reviewed. The input received from local officials and Utility staff members was also considered and incorporated.

3.1 Population

There is generally a close relationship between a community's population and total water consumption volumes. Future water sales can be expected to generally reflect future changes in service area population. Similarly, commercial, public, and industrial water consumption will also tend to vary proportionately with the growth of the community.

The Town of Lowell experienced a steady increase in population from 1960 to 2010. The Town's population according to 2010 Census Bureau data was 9,276 and the 2013 estimate was 9,381. Since 2010, Lowell's population grew an average of 0.4 percent per year. Table 3-1 summarizes past trends and projected future population of the Town. Future population estimates were based on projections provided by STATS Indiana and the United States Census Bureau. Table 3-2 summarizes population changes in Lake County communities between the 2000 and 2010 censuses.

Current projections by STATS Indiana indicate that the Utility's service area total population is expected to increase to approximately 12,400 by the year 2035 using a linear trend from the STATS Indiana historical data. For this study, it was assumed the total population served by the Utility by the year 2035 will be 12,400.

3.2 Existing Land Use

For this study, an existing Town land use zoning map was reviewed. The current land use map represents the nature and extent of development within the Town. The Town total area contains 3,494 acres.

To estimate current land use by acreage, the Town's GIS zoning data was reviewed. Figure 3-1 illustrates the existing land use within the Town. Aerial photos were used to estimate what portion of existing parcels are currently in residential, commercial, industrial, public, or undeveloped use. The total amount of zoned parcels with existing development within the Town is approximately 2,970 acres, which does not include streets, highways, floodways or water bodies (Table 3-3).

Land currently zoned and used for single-family use comprises 854 acres (29 percent of parcel area) and is spread around the Town. Land currently zoned and used for multi-family use comprises 276 acres (9 percent of parcel area) and is spread around the Town. Land zoned and used for business use comprises 133 acres (4.5 percent of parcel area) and exists mostly along Commercial Avenue. Land zoned and used for industrial use comprises 92 acres (3 percent of parcel area) and mostly exists on the western area of Town. Land zoned and used for public use comprises 143 acres (5 percent of parcel area). Approximately 49 percent is undeveloped.

Table 3-1
Population Trends and Projections
Lowell Public Works
Town of Lowell, Indiana

	STATS Indiana 2012 Projection[1,2]	
Year	**Total**	**Percent Change Per Year**
1960	2,270	--
1970	3,839	6.9%
1980	5,827	5.2%
1990	6,430	1.0%
2000	7,505	1.7%
2010	9,276	2.4%
2013	9,381	0.4%
2025	11,080	1.5%
2035	12,400	1.2%

Notes
1. Historical City population taken from STATS Indiana
2. Growth is a linear projection of STATS Indiana data

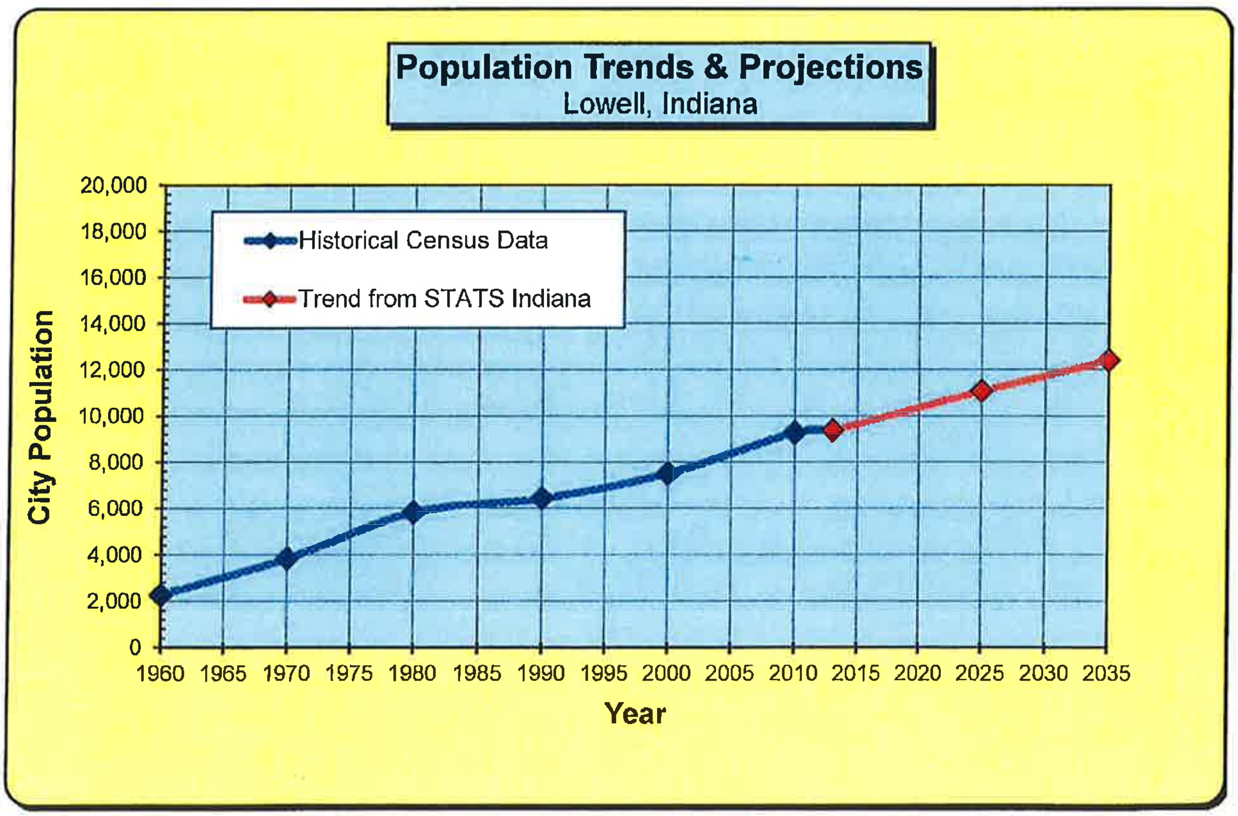

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Table 3-2
Surrounding Community Population Trends
Lowell Public Works
Town of Lowell, Indiana

Lowell Area Community	2000	2010	Increase	Percent Change
Town of Lowell	***7,505***	***9,276***	***1,771***	***23.6%***
Lake County Cities				
Crown Point	19,806	27,317	7,511	37.9%
East Chicago	32,414	29,698	-2,716	-8.4%
Gary	102,746	80,294	-22,452	-21.9%
Hammond	83,048	80,830	-2,218	-2.7%
Hobart	25,363	29,059	3,696	14.6%
Lake Station	13,948	12,572	-1,376	-9.9%
Whiting	5,137	4,997	-140	-2.7%
Lake County Towns				
Cedar Lake	9,279	11,560	2,281	24.6%
Dyer	13,895	16,390	2,495	18.0%
Griffith	17,334	16,893	-441	-2.5%
Highland	23,546	23,727	181	0.8%
Merrillville	30,560	35,246	4,686	15.3%
Munster	21,511	23,603	2,092	9.7%
New Chicago	2,063	2,035	-28	-1.4%
Schererville	24,851	29,243	4,392	17.7%
St. John	8,382	14,850	6,468	77.2%
Winfield	2,298	4,383	2,085	90.7%
Lake County Total	**484,564**	**496,005**	**11,441**	**2.4%**
Indiana Total	**6,080,424**	**6,483,802**	**403,378**	**6.6%**
Source: U.S. Census Bureau				

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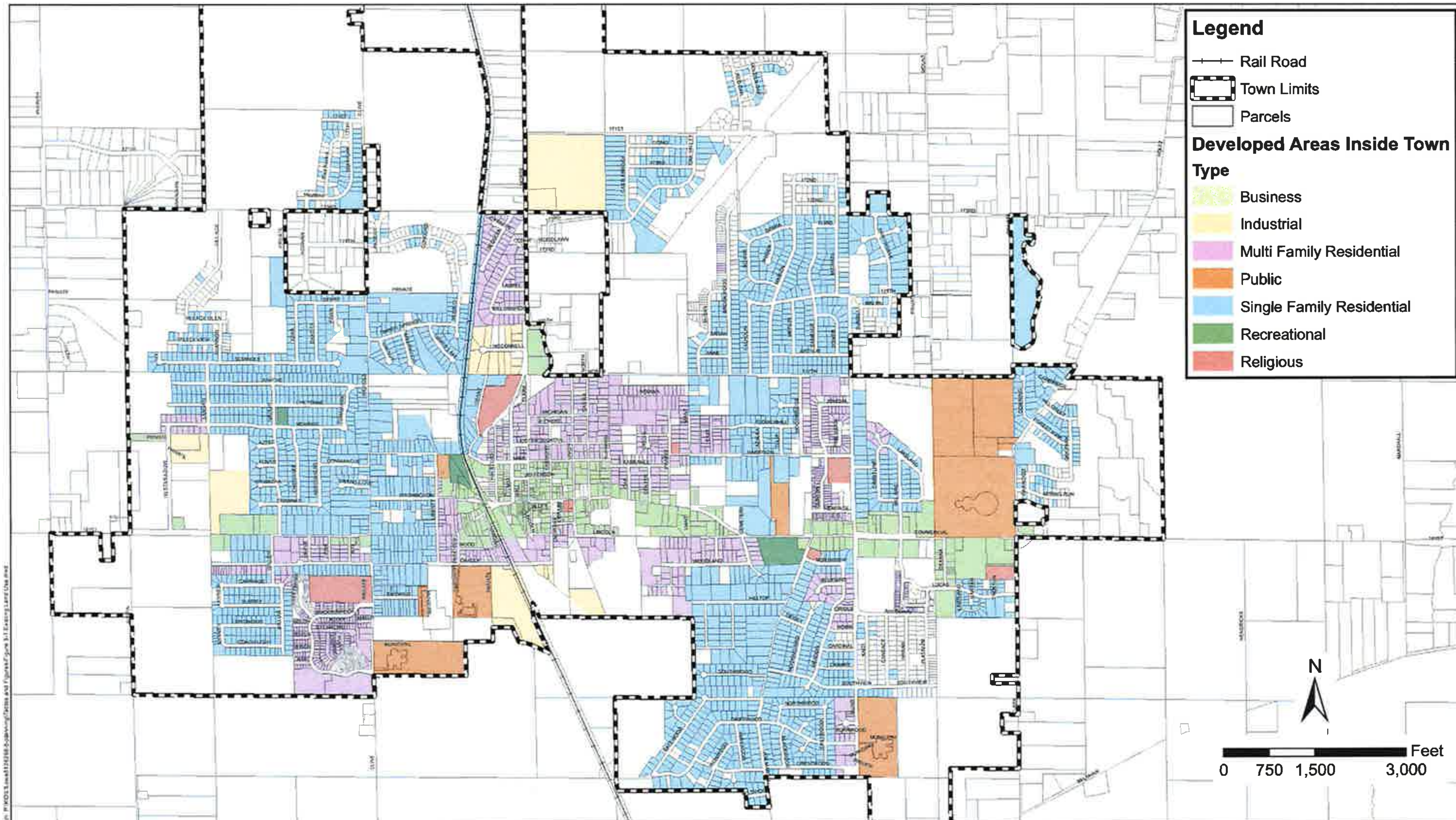

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Print Date: 9/25/2014

Map by: jbohnert
Projection: Indiana West (feet)
Source: Town of Lowell

Existing Development within Town Limits

Lowell Water System Master Plan

Lowell, Indiana

Figure
3-1

Table 3-3
Existing and Future Land Use within Town Limits
Lowell Public Works
Town of Lowell, Indiana

Land Use (Acres)[1]	2013	50 Percent Buildout	100 Percent Buildout
Town of Lowell			
Single Family Residential	*854*	*1,372*	*1,890*
Multi Family Residential	*276*	*319*	*361*
Business	*133*	*192*	*251*
Industrial	*92*	*149*	*206*
Public	*143*	*201*	*260*
Religious	*26*		
Recreational	*11*		
Undeveloped	*1,433*	*717*	*0*
Total	2,969	*2,969*	2,969
North Pressure Zone			
Single Family Residential	*20*	*142*	*263*
Multi Family Residential	*0*	*0*	*0*
Business	*0*	*0*	*0*
Industrial	*0*	*0*	*0*
Public	*0*	*57*	*115*
Undeveloped	*358*	*179*	*0*
Total	378	378	378
Main Pressure Zone			
Single Family Residential	*833*	*1,230*	*1,627*
Multi Family Residential	*276*	*319*	*361*
Business	*133*	*192*	*251*
Industrial	*92*	*149*	*206*
Public	*142*	*144*	*145*
Undeveloped	*1,075*	*538*	*0*
Total	*2,590*	*2,591*	*2,591*

1. Areas from 2014 GIS land use data provided by Town; does not include streets
2. "100 Percent Buildout" means that 100 percent of undeveloped lands are developed.
3. "50 Percent Buildout" means that 50 percent of undeveloped lands are developed.
4. North Pressure Zone was delineated to provide 35 psi to nearby undeveloped areas.
5. FIRM flood areas were not included in the areas in the table.

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3.3 Future Growth within Town Limits

To estimate future growth within Town limits, the total amount of undeveloped land currently zoned for residential, commercial, and industrial uses was identified. Two growth models were considered: the projected population growth and the total anticipated full buildout growth. The population projection growth model assumes the projection in Table 3-1 and that residential, business, and public sales all are directly related to population. The total anticipated full buildout growth model considers the total vacant land of each land use and applies a demand per acre to determine the maximum potential demands on the system with full buildout.

Figure 3-2 illustrates the planned zoning within the Town Limits. The majority of the planned zoning is single family residential. Industrial development in the Town is only expected to occur to the southwest. Business development is expected to occur along Highway 2 primarily.

Table 3-3 summarizes projected acreages by land use category for 2025 and 2035. Between 2014 and the time when full buildout occurs in the Town, the total amount of land within existing Town limits dedicated to single-family residential is expected to increase from 854 acres to 1,890 acres, multi-family land use is expected to increase from 276 acres to 361 acres, business land use is expected to increase from 133 acres to 251 acres, public land use is expected to increase from 143 to 260 acres, and industrial land use is expected to increase from 92 acres to 206 acres.

3.4 Future Growth outside Town Limits

Growth outside of the Town limits was determine using the Proposed Annexation Map Showing Proposed Land Usage. This map accounts for potential development along US 41 to the west, State Road 2 to the south and the future Illiana Highway on the north. Future areas north of Town and east of the Cedar Creek were not considered in this evaluation.

Interviews with Lowell Planning staff and the Lowell Plan Commission led to the creation of two future service areas – Service Area 1 and Service Area 2. These services areas were developed based upon a logical progression of development and annexation to US 41. The Lowell Plan Commission concurred with our assumptions in the development of the two service areas.

3.4.1 Service Area 1

Figure 3-3 illustrates the planned zoning within Service Area 1. Table 3-4 summarizes projected acreages by land use category for both service areas. Service Area 1 shows the progression of development along 173rd Avenue west to US 41 and along the southwestern corner of the Town. Business developments are anticipated to be gas stations, restaurants, and retail stores. Industrial developments are anticipated to be low water consumption industries such as warehousing and assemblies.

3.4.2 Service Area 2

Figure 3-4 illustrates the planned zoning within Service Area 2. Table 3-4 summarizes projected acreages by land use category for both service areas. Service Area 2 shows the progression of development along State Road 2 west to US 41. Service Area 2 is anticipated to occur simultaneously or after Service Area 1, but not before due to the difficulty of annexation. Development within Service Area 2 is expected to be similar in nature to those in Service Area 1 except that no single family residential development is proposed.

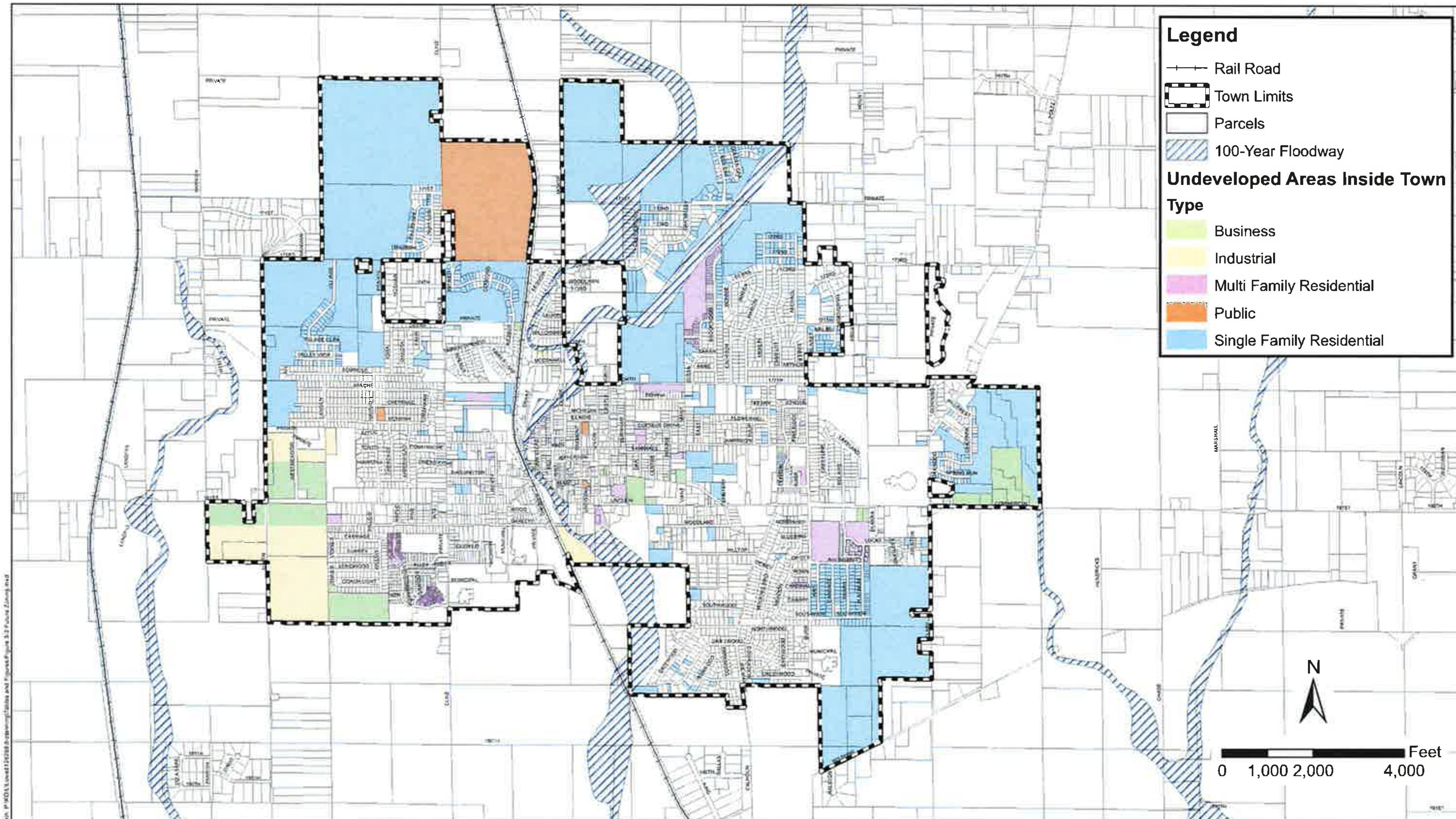
3.4.3 Service Areas 1 & 2

Figure 3-5 illustrates the planned zoning within Service Areas 1 and 2 combined. Table 3-4 summarizes projected acreages by land use category for both service areas. Service Areas 1 and 2 if fully developed are expected to contain 225 acres of single-family residential lands, 270 acres of multi-family residential lands, 540 acres of business lands, and 584 acres of industrial lands. In total, Service Area 1 & 2 are expected to add 1,619 acres to the Town.

3.5 Summary

This section summarized the primary assumptions regarding future growth of the Town of Lowell service area. The present and future needs and characteristics of the identified service area will have a direct impact on the need for expansion of water system facilities. Therefore, the conclusions discussed in this section were used as a primary basis for projecting future water needs, evaluating the adequacy of existing water system facilities, and identifying needs for future water system expansion.

For this study, the planning area boundary will define the limits to which existing water system facilities will reach and where new facilities will be required over the next 20 years. While the Town is obligated to serve water to all developments within the Town limits, the Town is not obligated to serve water outside the town limits. Service Areas 1 and 2 will be continuously considered by the Town as future development occurs.



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Print Date: 9/25/2014

Map by: jbohnert
Projection: Indiana West (feet)
Source: Town of Lowell

Future Development within Town Limits

Lowell Water System Master Plan
Lowell, Indiana

Figure 3-2

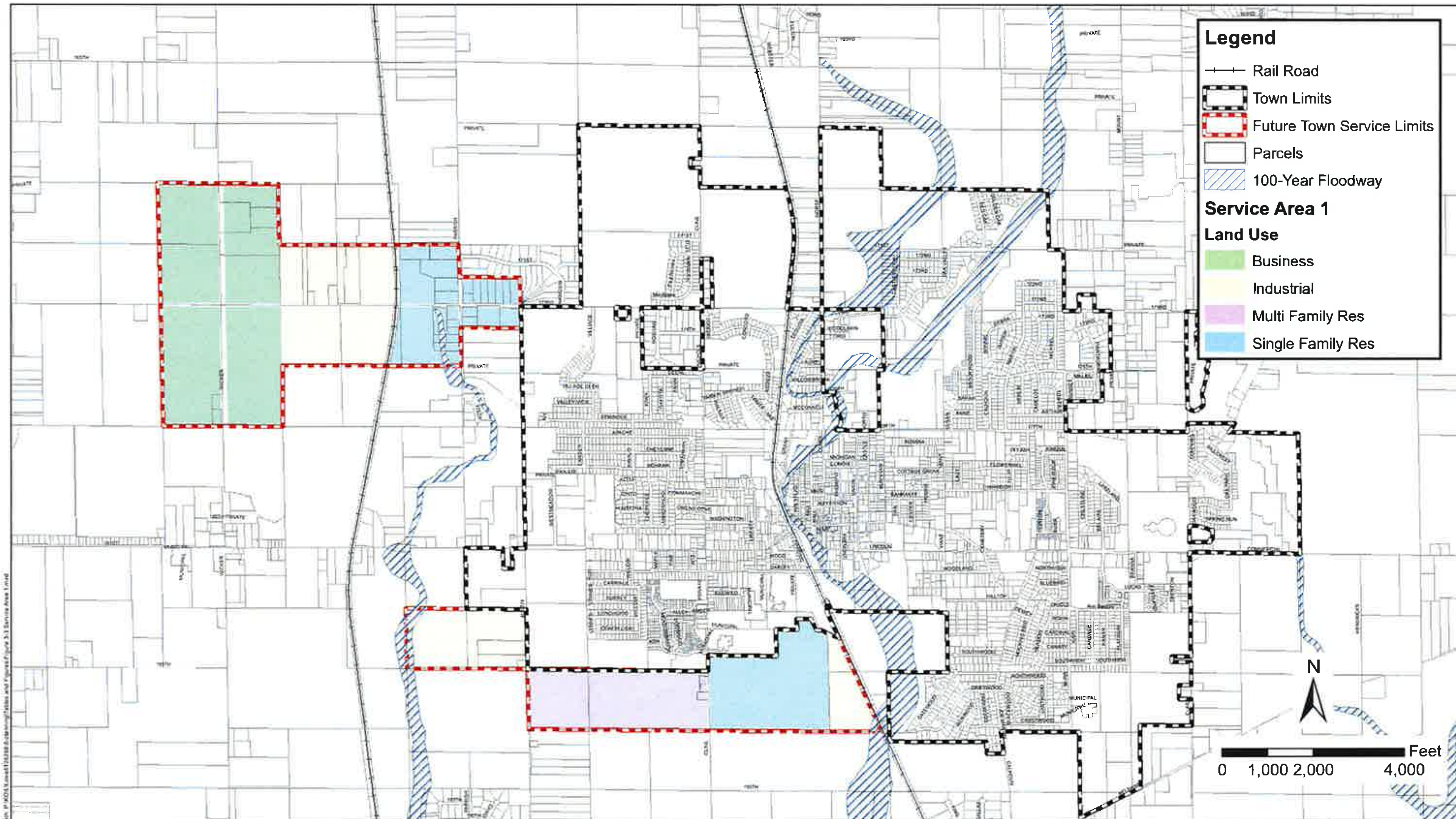
Cause No. 45550
Docket Entry Request No. 4
Page 41 of 181

Table 3-4
Future Service Area Outside Town Limits
Lowell Public Works
Town of Lowell, Indiana

Land Use (Acres)[1]	Service Area 1	Service Area 2	Service Areas 1 & 2
Future Service Area			
Single Family Residential	*225*	*0*	*225*
Multi Family Residential	*119*	*151*	*270*
Business	*303*	*237*	*540*
Industrial	*252*	*332*	*584*
Total	900	720	1,619

1. Areas from 2014 GIS land use data provided by Town
2. FIRM flood areas were not included in the table.

\\sehix\projects\KO\L\Lowell\126268\8-planning\Tables and Figures\[Chapter 3.xlsx]Table 2-4



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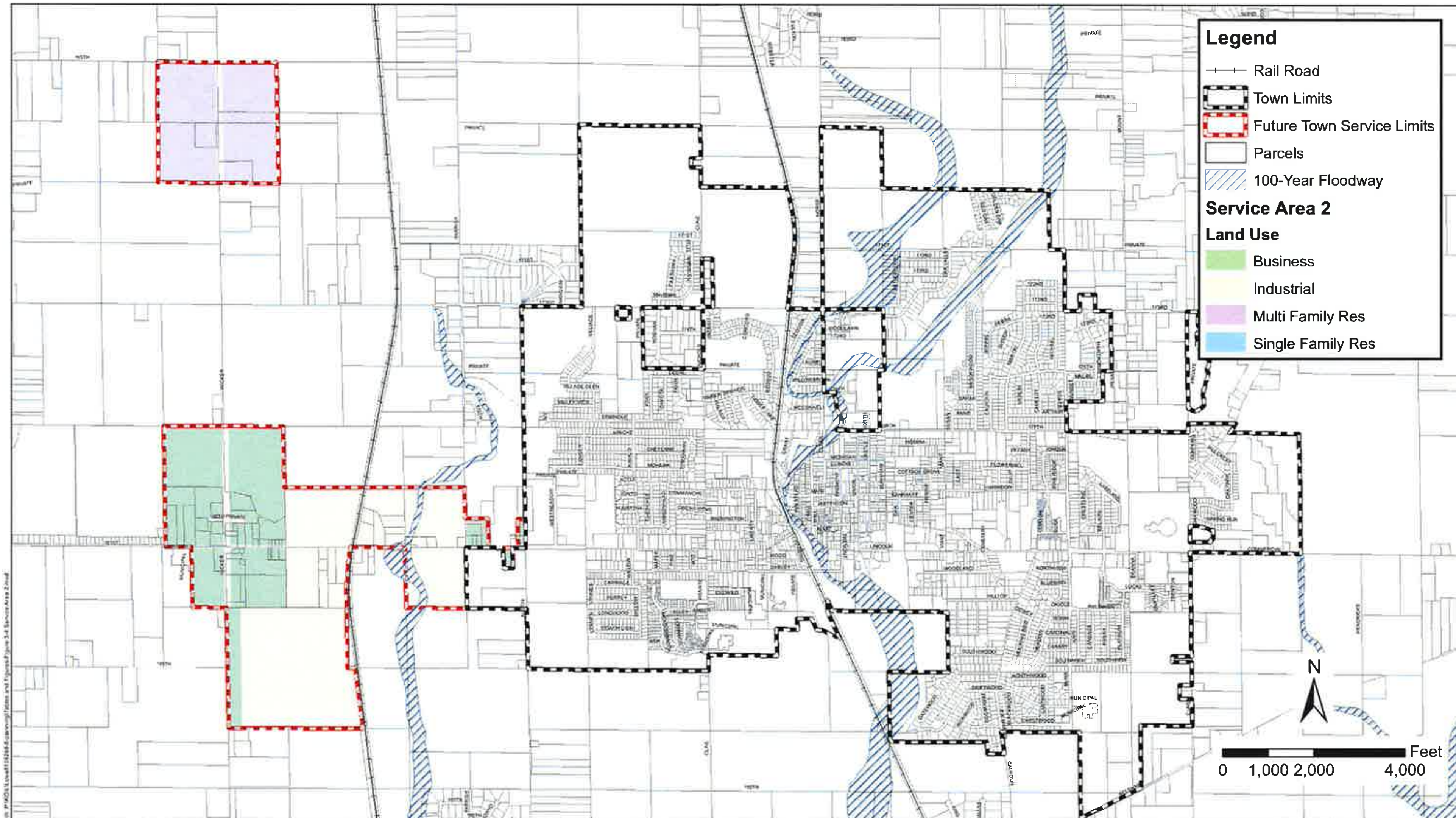
Source: Town of Lowell

Service Area 1

Lowell Water System Master Plan
Lowell, Indiana

Figure 3-3



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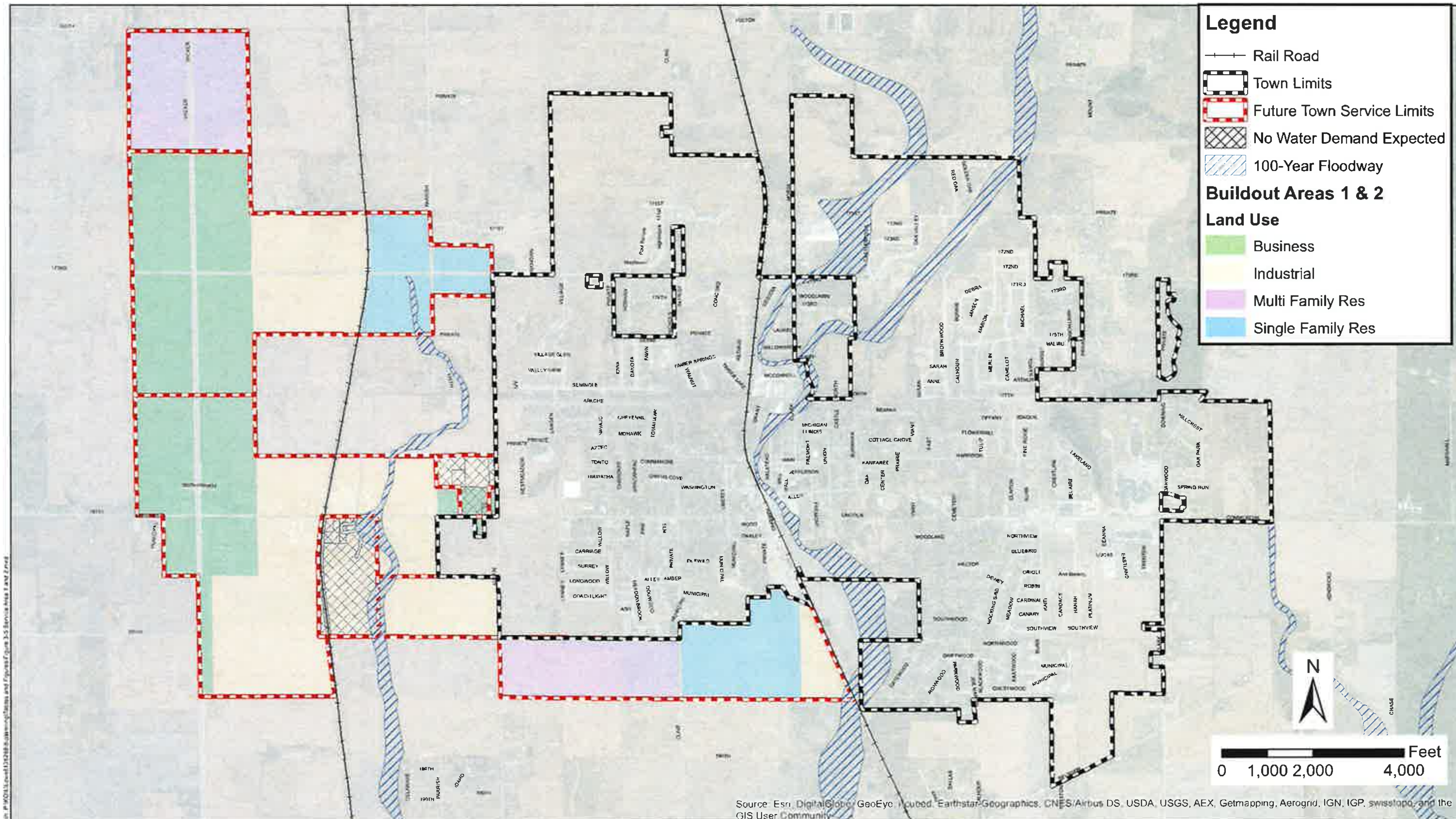
Service Area 2
Lowell Water System Master Plan
Lowell, Indiana

Figure
3-4



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Print Date: 9/8/2014

Map by: jbohnen
Projection: Indiana West (feet)
Source: Town of Lowell

Service Areas 1 & 2
Lowell Water System Master Plan
Lowell, Indiana

Figure 3-5

4.0 Water Requirements

Projections of customer demands serve as the basis for capital improvements planning. Several standard methods were used in this evaluation to project water supply and storage needs including historical sales and pumpage records, estimates of population, annual customer usage and future land use maps. This section summarizes the methodology used and the results of these projections.

4.1 Water Consumption History

Past water consumption characteristics were analyzed by reviewing annual pumpage and water sales records for the period from 2004 to 2013 (with some data from 2014 included). 2013 customer usage data was used exclusively in establishing demands in the computer model because of the level of confidence in the data. Typically, averages of multiple years of customer data is utilized if there is confidence in the data. Average and maximum day water consumption during this period, together with the amount of water sold in each customer category, was analyzed. Projections of future water requirements are based on the results of the consumption analysis coupled with estimates of population and community growth discussed in Section 3.0.

A summary of historical water sales and pumpage is provided in Table 4-1. Approximately 57 percent of the total water consumption in 2013 is attributed to residential users, seven percent to business users, 0.4 percent to industrial users, and six percent to public users. In 2013, the Town's largest user was the Tri-Creek School Corporation. It should also be noted that two of Town's largest industrial customers, Rieter and Ashland, are no longer in business. Rieter's burned in August of 2011. Ashland closed in December of 2012. Approximately 28 percent is non-revenue water. Over the 11-year period summarized in the table, water sales varied from a low of 187 MGY in 2014 to a high of 234 million gallons per year (MGY) in 2005.

A summary of historical water consumption is provided in Table 4-2. Approximately 3.3 percent of the total water consumption in 2013 is attributed to treatment, 0.1 percent to other authorized uses such as flushing and fire protection, 72 percent to metered sales, and 19 percent to unknown and unaccounted uses. The un-accounted amount of 20.5 percent is a high number for a water utility, and SEH of Indiana recommends the Town implement a plan to reduce the amount of un-accounted for future water planning.

Average day water utility pumpage over the past 11 years has fluctuated with an average of 305 MGY or 0.83 million gallons per day (mgd). Lowell water sales and pumpage trends are graphically illustrated in Figure 4-1.

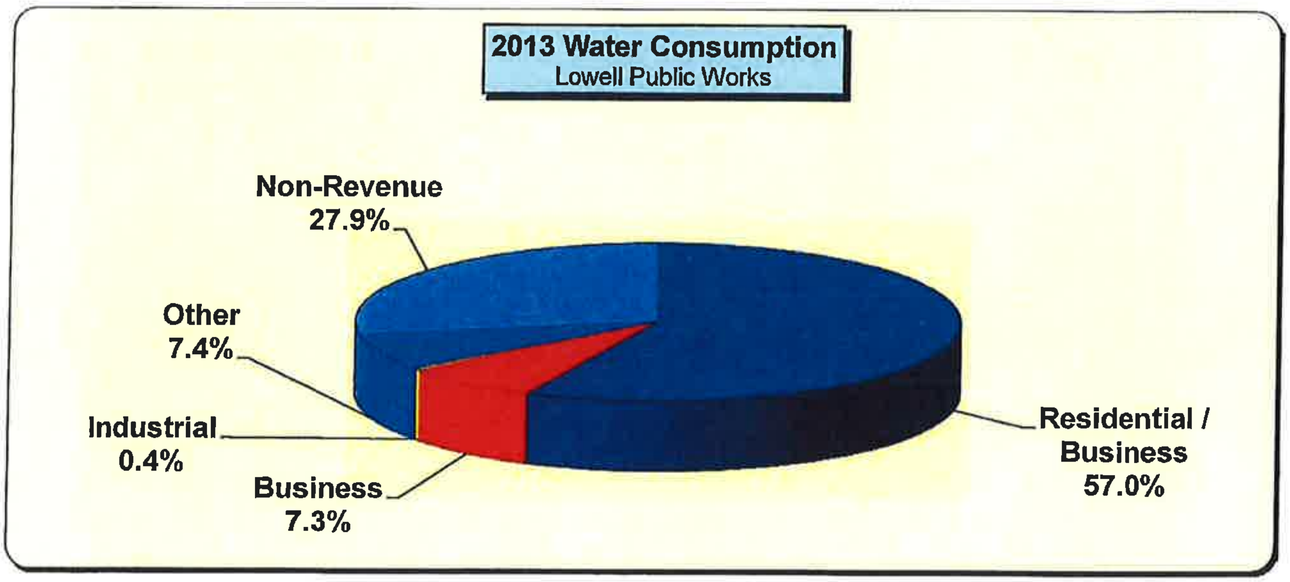
A historical summary of Utility customers served is provided in Table 4-3. In 2013, residential customers accounted for 93 percent of the Utility's customers, and 57 percent of the total pumpage. Business customers accounted for five percent of the Utility's customers and seven percent of total pumpage. Industrial customers accounted for 0.1 percent of the Utility's customers, but account for 0.4 percent of total pumpage. Public customers accounted for approximately 1.5 percent of total customers and 7 percent of total pumpage.

Table 4-1
Historical Water Sales
Lowell Public Works
Town of Lowell, Indiana

Year	Annual Water Sales (MGY)[1]				Total Sales (MGY)[2]	% Water Sold	Total Pumpage (MGY)
	Residential / Business	Business	Industrial	Other			
2004	Data Not Available				223	71.7%	311
2005					234	70.5%	332
2006					230	70.8%	325
2007					229	69.1%	331
2008					220	74.2%	297
2009					207	66.8%	309
2010					208	72.2%	288
2011					196	65.8%	297
2012	163	41	2.3	10	214	74.7%	287
2013[3]	156	20	1.0	18	194	71.8%	271
2014[4]	148	18	0.9	20	187	Data Not Available	

Maximum Value = (shaded cell)

10-year Average	305
10-year Maximum	332



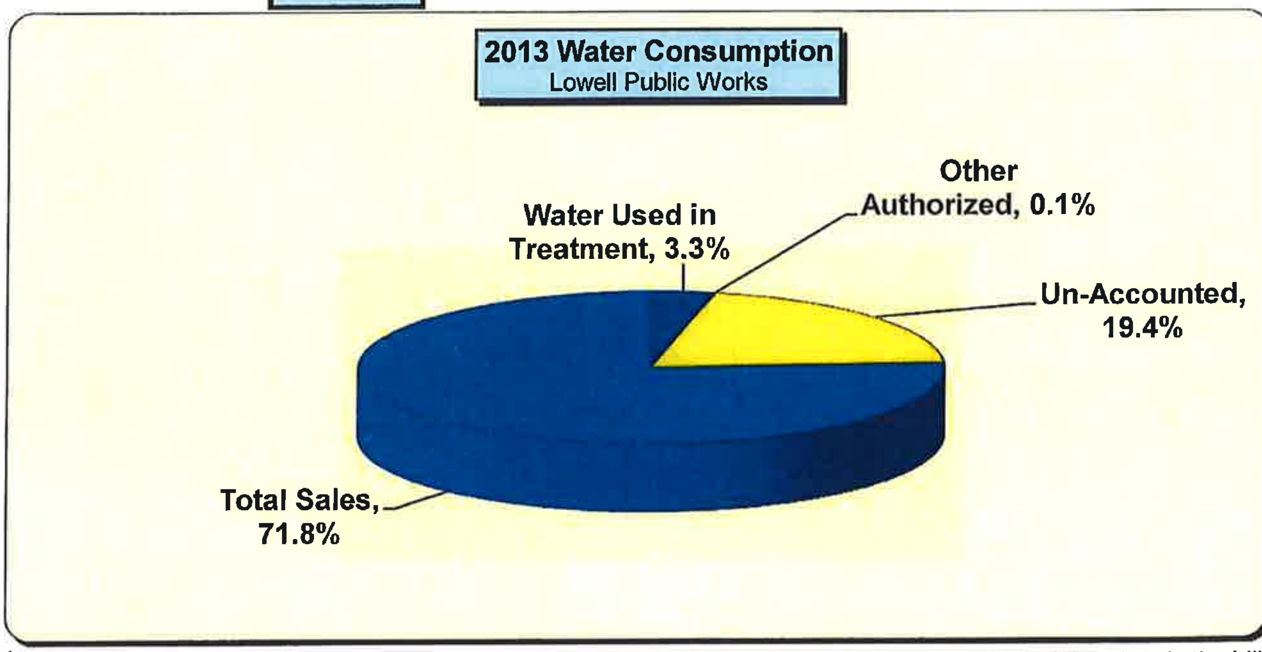
[1] Data on sales by customer type was received in July 2014. Total sales in this information was higher than in the billing
[2] Data obtained from monthly billing data spreasheets for each year from Town.
[3] 2013 Data contained January through October data.
[4] Data extrapolated from 5 months of data in 2014.
[5] Rieter burned down on August 20, 2011
[6] Ashland closed in December 2012
[7] 2004 to 2010 data taken from Unaccounted spreadsheets from Town; 2011 to 2013 data taken from IURC Reports.

\\sehlx\projects\KO\L\Lowell\126268\8-planning\Tables and Figures\[Chapter 4.xlsm]Table 4-1

Table 4-2
Water Consumption History
Lowell Public Works
Town of Lowell, Indiana

Year	Total Sales (MGY)	% Water Sold	Non-Revenue (MGY) Water Used in Treatment	Other Authorized	Un-Accounted	% Un-Accounted	Total Pumpage (MGY)	Total Pumpage (mgd)
2004	223	71.7%	Not Available	11	77	24.8%	311	0.85
2005	234	70.5%	5	Data Not Available	93	28.1%	332	0.91
2006	230	70.8%	6		89	27.4%	325	0.89
2007	229	69.1%	8		94	28.6%	331	0.91
2008	220	74.2%	5		72	24.1%	297	0.81
2009	207	66.8%	9		94	30.4%	309	0.85
2010	208	72.2%	2		78	27.2%	288	0.79
2011	196	65.8%	15		86	29.0%	297	0.81
2012	214	74.7%	9		78	27.3%	287	0.79
2013	194	71.8%	9	0.2	53	19.4%	271	0.74
2014	187	Data Not Available						

Maximum Value =



[1] Data on sales by customer type was received in July 2014. Total sales in this information was higher than in the billing
[2] Data obtained from monthly billing data spreasheets for each year from Town.
[3] 2013 Data contained January through October data.
[4] Data extrapolated from 5 months of data in 2014.
[5] Rieter burned down on August 20, 2011
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[7] 2004 to 2010 data taken from Unaccounted spreadsheets from Town; 2011 to 2013 data taken from IURC Reports.

\\sehix\projects\KO\L\Lowell\126268\8-planning\Tables and Figures\[Chapter 4.xlsm]Table 4-2

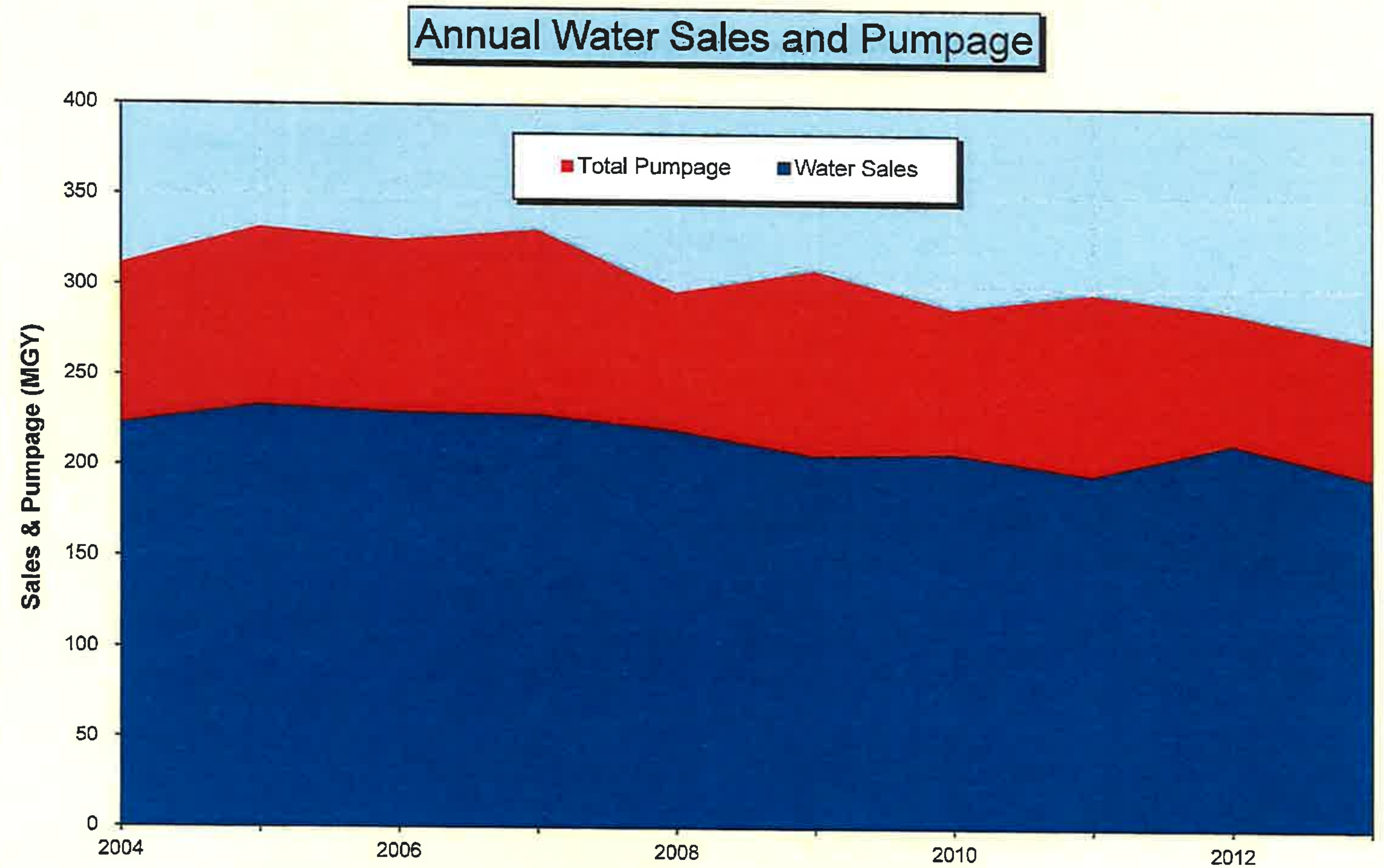

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FIGURE 4-1

SALES AND PUMPAGE HISTORY

Lowell Public Works

Town of Lowell, Indiana

July-14

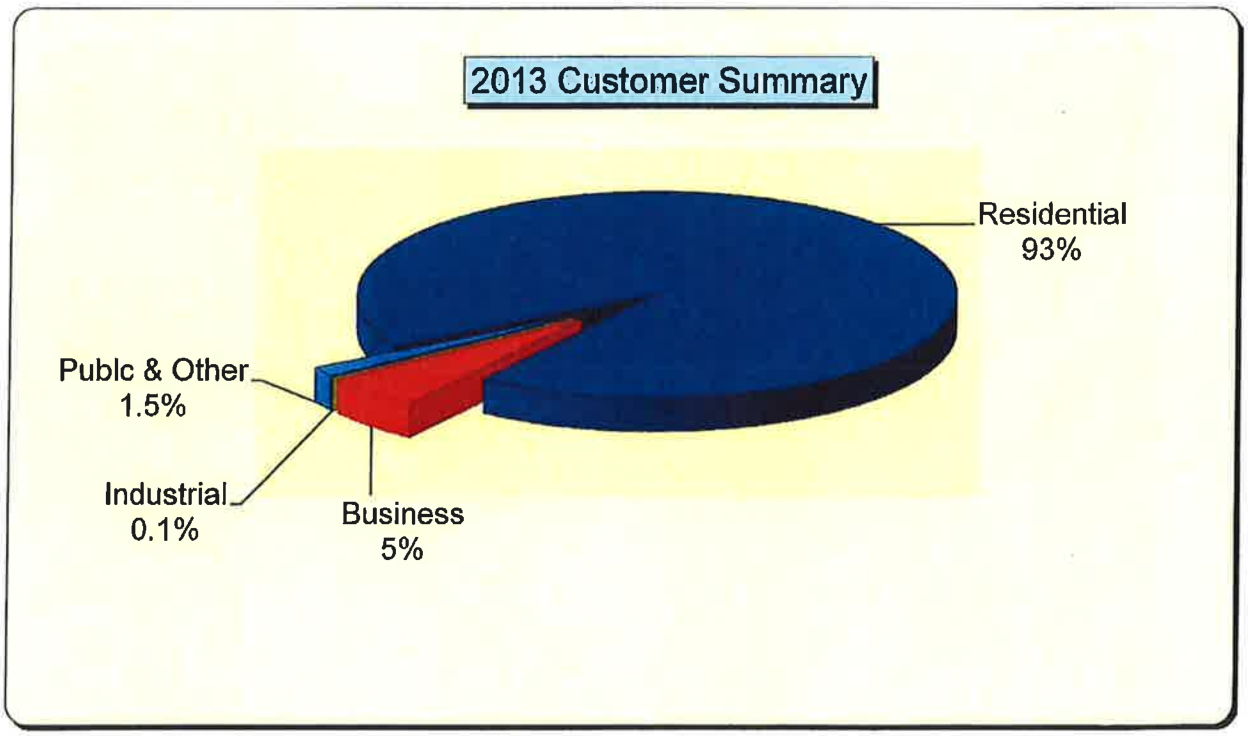
LOWEL 126268

\\sehbx\projects\KO\L\Lowel\126268\8-planning\Tables and Figures\[Chapter 4.xlsm]Figure 4-1

Table 4-3
Historical Customer Summary
Lowell Public Works
Town of Lowell, Indiana

Year	Number of Customers				
	Residential	Business	Industrial	Public & Other	Total
2004	Data Not Available				2,996
2005					3,109
2006					3,194
2007					3,276
2008	3,141	267	Data Not Available		3,316
2009	3,180	267			3,359
2010	3,126	304			3,421
2011	Data Not Available				3,436
2012	3,199	201	5	35	3,440
2013	3,259	186	3	54	3,502
2014	3,284	184	3	57	3,528

Maximum Value =



\\sehlx\projects\KO\L\Lowell\126266\8-planning\Tables and Figures\[Chapter 4.xlsm]Table 4-3

4.2 Per Capita Water Usage

Residential, commercial, and public water usage can be correlated to a community's population. An analysis of per capita water consumption for the Town of Lowell for each of these customer classifications was made from the available sales records and is summarized in Table 4-4.

The apparent trend in per capita residential water usage illustrated in Table 4-4 is consistent with observed results for other Indiana municipal water utilities. Although per capita residential water usage in the U.S. had consistently increased until the early 1970s, water usage statistics indicate that the increasing rate of per capita consumption has leveled off. This may be due in part to residential customers becoming more aware of water costs and water conservation measures becoming more common.

The average residential use in the past three years was 46 gpcd. To project future water needs, average daily water usage for residential customers in the Lowell Water Utility planning area was projected to be 46 gpcd throughout the 20-year planning period.

Over the previous 10 years, per capita business sales have seen a sharp decrease. Sales were on the order of 6 and 5 gpcd in 2013 and 2014. For this study, it was projected that future per capita commercial consumption will average approximately 6 gpcd.

Since 2012, per capita public sales ranged from 3 to 6 gpcd. For this study, it was projected that future per capita public consumption will be 5 gpcd.

4.3 Industrial Water Customers

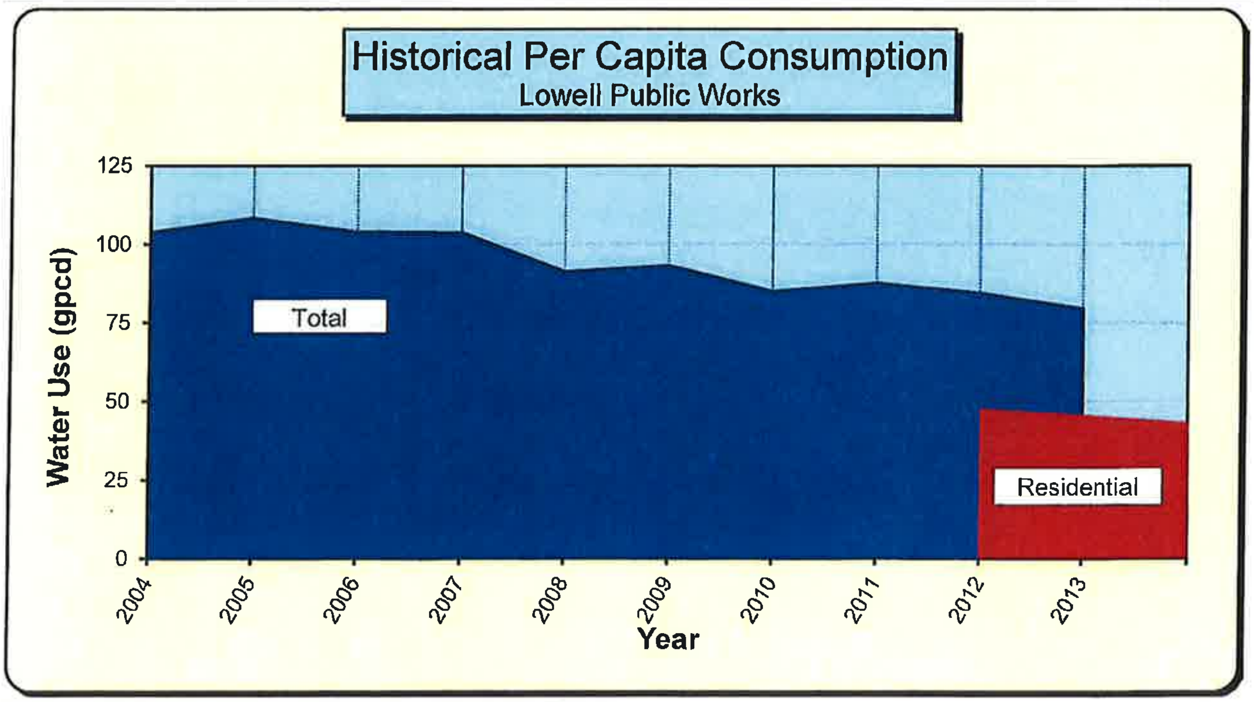
It is important to note that fluctuations in water consumption for industrial customers can be attributed to several factors, including:

1. Changes in production schedules or operational capacity
2. Changes in manufacturing processes
3. Changes in the number of persons employed
4. Addition or deletion of product lines
5. Seasonal variation in cooling requirements
6. Seasonal changes in business activity
7. Implementation of conservation measures

Industrial water consumption has played a major role in the Town's water sales over the last 30 years. Table 4-5 summarizes the Utility's customers purchasing the most amount of water over the past four years. The Utility's largest customers play a very minor role in the consumption of water. Approximately 0.5 percent of the average annual water sales can be attributed to these five largest customers. Reiter was not included in the computation of the design industrial unit demand of 110 gpd/acre because it was an atypical customer compared to the other four industrial customers. It should also be noted that the total used area for each industry was used in the calculation, not the total acreage owned.

Table 4-4
Historical Per Capita Usage
Lowell Public Works
Town of Lowell, Indiana

Year	Estimated Population	Gallons Per Capita Per Day					
		Residential	Business	Industrial	Public & Other	Total Metered	Total Pumpage
2004	8,213	Data Not Available				74	104
2005	8,391					76	108
2006	8,568					74	104
2007	8,745					72	104
2008	8,922					68	91
2009	9,099					62	93
2010	9,276					61	85
2011	9,292					58	88
2012	9,308	48	12	0.7	3	63	84
2013	9,324	46	6	0.3	5	57	79
2014	9,340	43	5	0.3	6	55	Not Available



\\sehix\projects\KO\L\Lowell\126268\8-planning\Tables and Figures\[Chapter 4.xlsm]Table 4-4

Table 4-5
Industrial Customers
Lowell Public Works
Town of Lowell, Indiana

Rank	Name	Address	Total Used Area (Acres)[3]	Structure Area (Acres)	Actual 2013 (gpd)	Actual 2012 (gpd)	Actual 2011 (gpd)	Estimated 2010 (gpd)	% of Total Metered Sales (2013)	Average Unit Demand (gpd/acre)
1	Saco Industries (both facilities)	17151 Morse St	27.1	4.2	1,559	1,576	2,370	1,800	0.3%	67
2	Avery Dennison Corporation	270 Westmeadow Pl	7.0	2.8	636	411	844	600	0.1%	89
3	Ashland Hardware Systems	790 W Commercial Ave	12.3	3.0	376	4,213	3,788	2,800	0.1%	228
4	Midwest Grinding	17211 Morse St	1.6	0.2	80	125	87	100	0.0%	60
5	Rieter Automotive	Oakley Avenue	12.9	2.5	0	0	4,084	29,505	0.0%	653
Totals for Industrial Customers			**60.9**	**12.7**	**2,651**	**6,325**	**11,172**	**34,805**	0.5%	226
Total Sales					**532,400**	**586,300**	**535,700**	**569,200**		
Average Sales to Industrial Customers from 2011 to 2013 (gpd), not inlcuding Rieters					5,354					
Total Land Area (Acres), not including Rieters					48					
Design Industrial Unit Demand (gpd/acre)					**110**					

Notes:
1. Industrial Sales were not available for anything other than Rieters in 2010.
2. The average from 2011 to 2013 was applied in 2010.
3. Only the portions of the properties that are used for industrial purposes is counted.

[1] Rieter burned down on August 20, 2011
[2] Ashland closed in December 2012

\\sehblprojects\KO\L\Lowell\126268\8-planning\Tables and Figures\[Chapter 4.xlsm]Table 4-5

4.3.2 Saco Industries

Saco Lowell is involved in the manufacturing and assembly of cabinetry. Since 2011, Saco purchased between 1,500 gpd and 2,400 gpd. Saco resides on a 34 acre lot with approximately 27 acres used for industrial purposes since the remaining acreage is in the flood plain. Since 2011, Saco has used approximately 54 gpd/acre of industrially used land. The only water use at Saco is domestic and restroom use.

4.3.3 Avery Dennison Corporation

Avery Dennison is a world leader in label and packaging supplies. The Town of Lowell is home to one of the many branches of this company. Since 2011, Avery purchased between 411 and 844 gpd. The company resides on a 7.0 acre parcel, which means that the plant consumes approximately 89 gpd/acre. Water use for Avery will be considered constant throughout the planning period.

4.3.4 Ashland Hardware Systems

Ashland Hardware Systems manufactured a wide variety of metal implements and devices before its closure in 2012. Ashland Hardware System will not be included in the future demands of the system, although its water sales history will assist the Town in future water planning.

Ashland operated on an 18 acre parcel, with approximately 12 acres actually used for industrial purposes. Ashland purchased around 4,000 gpd in 2011 and 2012, which amounts to around 228 gpd/acre.

4.3.5 Midwest Grinding

Midwest grinding manufacturer of rotary cutting tools, endmills, feedwheels, knurls, grippers, scoring blades, and other metal manufacturing equipment. Since 2011, Midwest Grinding has purchased between 80 gpd and 125 gpd. The company exists on a 4 acre parcel and uses approximately 1.6 acres for industrial purposes. Midwest Grinding has used approximately 24 gpd/acre. The only water use at Midwest Grinding is domestic and restroom use.

4.3.6 Rieters Automotive

Rieters Automotive manufactured automotive parts before a fire destroyed it on August 20, 2011 and caused its closure. While in operation, it was the Utility's largest customer. Rieters will not be included in the future demands of the system, although its water sales history will assist the Town in future water planning.

Rieters operated on a 13 acre parcel and historically purchased around 35,000 gpd in 2010, which amounts to around 653 gpd/acre.

4.4 Non-Revenue Water

There is generally a close relationship between the total gallons of water pumped and the gallons of water metered and sold to water utility customers. Total metered water sales are always less than the amount of pumpage due to several factors, including:

1. Unmetered water usage for maintenance purposes such as hydrant flushing and water main repairs
2. Water used in water treatment
3. Unmetered water usage for fire fighting
4. Inaccuracies in water metering devices

5. Unaccounted-for public water consumption
6. Leakage within the distribution system

Table 4-1 provides a historical summary of the percentage of total pumpage metered over the past 11 years. The percentage of total Lowell pumpage metered has been reported to be as low as 65.8 percent in 2011 and as high as 74.2 percent in 2008. This fraction of sold water is uncommon for water utilities, and SEH of Indiana recommends that the Town review its water metering and sales for future water planning. Typically, the percentage of total pumpage metered would be expected to decrease in years when unusual problems with leakage or meter stoppage occurred, or when unusually high water demands for fire protection occurred.

The difference between total pumpage and total water sales is termed "non-revenue" water. In Table 4-1, from 2004 to 2013, the average amount of non-revenue water was 30 percent of the total amount pumped. A portion of the non-revenue water was for water treatment and backwashing filters. Table 4-2 shows that approximately 5 to 15 MGY can be attributed to water treatment. For future planning, the average ratio from 2004 to 2013 of 25 percent non-revenue water to total water pumped will be used.

A portion of non-revenue water is due to authorized activity like hydrant flushing and firefighting. After the authorized unmetered uses are accounted for, the remaining portion of non-revenue water is termed "water losses." The amount of water loss is an indication of the condition of the water system and is usually expressed as a percentage. When a distribution system is very old or poorly maintained, the percentage of water loss often increases dramatically. Typical water losses might range between 8 and 10 percent.

4.5 Seasonal Variations in Customer Demands and Pumpage

Seasonal fluctuations in water usage are important factors in the design and sizing of water supply and storage facilities. The seasonal nature of water consumption in the Town of Lowell can be demonstrated by an analysis of monthly pumpage variations. The Utility's monthly sales variations in 2013 are presented in Table 4-6. In 2013, the maximum monthly pumpage occurred in August, while the minimum monthly pumpage occurred in March.

4.6 Maximum Day Demand

Maximum daily water demands usually occur during the summer months on hot days when additional water is used for watering lawns, gardening, bathing, and industrial cooling. The maximum day demand is defined as the amount of water pumped during a single day of the year with the highest water usage, and is often expressed as a ratio of the annual average day pumpage. The maximum day pumpage is of particular importance to water system planning, because water supply facilities are sized to meet this demand.

Table 4-7 shows the maximum volumes of water pumped in a single day for Years 2005 through 2013. The highest volume pumped in a single day for any of the past ten years was 1.56 million gallons in July of 2009. A measurement of 1.71 million gallons was noted in June of 2005 but this was due to a recording error. The lowest maximum day was 1.05 mgd in May 2012.

Indiana code 327 IAC 8 outlines requirements for the design of water systems and the maximum day design flow. Table 4-8 performs the analysis required by 327 IAC 8 to determine the design maximum day demand factor. To evaluate future water supply and storage needs, a maximum day pumpage ratio of 1.9 was used for this study.

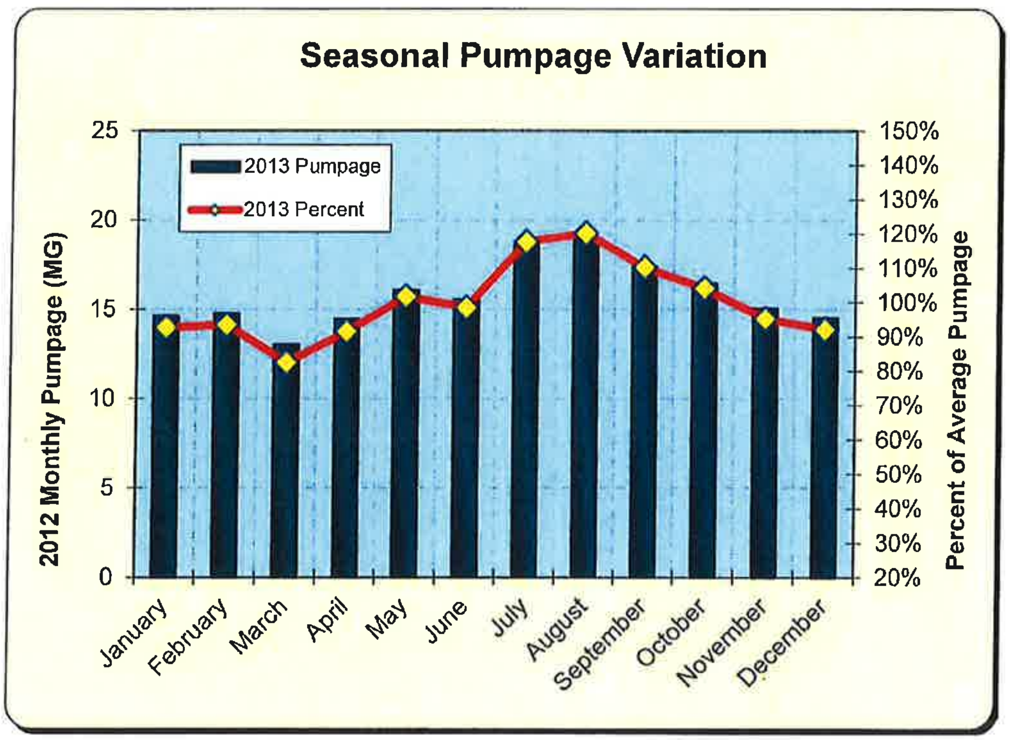
4.7 Hourly Demand Fluctuations

The hour-to-hour variation of customer demands is also an important characteristic used to evaluate water supply and storage requirements. As with maximum day demands, peak hour demand is often expressed as a ratio of average day demand for the year. The peak hour demand is simply the hour of maximum demand that occurs on the maximum day.

The peak hourly rate for Lowell was estimated to be approximately 160 percent of the maximum day rate, stated in Table 4-8. This estimate is the AWWA peaking factor which provides a good estimate across a wide population of residential communities. This ratio combined with the maximum day to average day ratio would indicate a design peak hour demand to average day pumpage ratio of approximately 3.3.

Table 4-6
Seasonal Variations in Sales
Lowell Public Works
Town of Lowell, Indiana

Month	2013 Monthly Sales (MG)	Percentage of Total Pumpage	Percentage of Average Pumpage
January	14.6	7.7%	92.6%
February	14.8	7.8%	93.6%
March	13.0	6.9%	82.5%
April	14.5	7.6%	91.5%
May	16.1	8.5%	101.7%
June	15.5	8.2%	98.5%
July	18.6	9.8%	117.7%
August	19.0	10.0%	120.2%
September	17.4	9.2%	110.2%
October	16.4	8.7%	104.2%
November	15.0	7.9%	95.3%
December	14.5	7.7%	92.0%
Total	**189.4**	**100.0%**	**100.0%**



\\sehlx\projects\KO\L\Lowell\126268\8-planning\Tables and Figures\[Chapter 4.xlsm]Table 4-6

Table 4-7
Historical Maximum Day Demands
Lowell Public Works
Town of Lowell, Indiana

Year	Avg. Day Pumpage (MGD)	Max. Day Pumpage (MGD)	Ratio of Max. to Avg. Day
2004	0.85	Not Available	
2005	0.91	1.30	1.43
2006	0.89	1.18	1.33
2007	0.91	1.33	1.47
2008	0.81	1.08	1.33
2009	0.85	1.56	1.84
2010	0.79	1.17	1.48
2011	0.81	1.42	1.74
2012	0.79	1.05	1.34
2013	0.74	1.25	1.69
2014	0.00	Not Available	

Maximum Value =

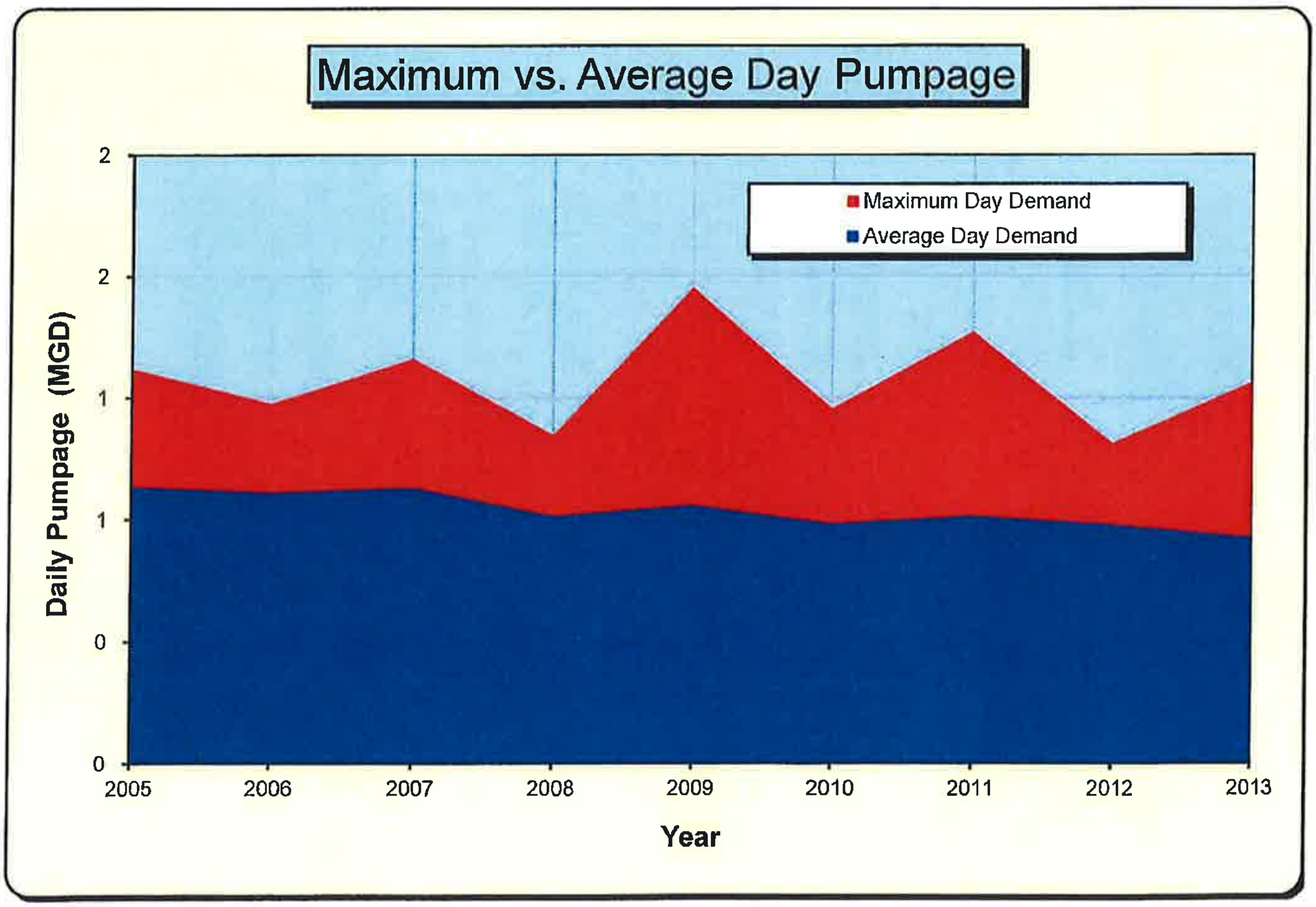


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Table 4-8
327 IAC 8 Maximum Day Calculation
Lowell Public Works
Town of Lowell, Indiana

	Value	Description
ADCD = (Max Average) × PRSC	1,512,575	Average daily consumer demand in gallons per residential service connection per day.
PDCD = (ADCD × PF) + FF	5,472	Peak daily consumer demand in gallons per minute (with fire flow occurring)
Max Average = (ADCD10) ÷ (SC10)	349	Maximum average daily consumer demand in gallons per service connection.
ADCD10 =	1,045,574	The highest average daily demand as reported on the MROs over the previous ten (10) year period.
SC10 =	2,996	The number of service connections at ADCD10.
PRSC =	4,334	Proposed number of residential service connections.
MDD10 =	1,563,400	The maximum single day demand as reported on the MROs over the previous ten (10) year period.
10YADD =	832,819	The ten (10) year average daily demand as calculated from the previous ten (10) year period.
FF =	3,500	Fire flow demand value equal to the fire protection flowrate provided by the public water system.
PF = MDD10 ÷ 10YADD	**1.9**	**Maximum Day demand factor**
AWWA Residential Peak Hour	**1.6**	**Peak Hour demand factor**

Notes:
1. Maximum monthly demand occurred in May 2007
2. Maximum daily demand occurred in June 2005
3. 2035 proposed service connection determined by 2035 population with housing density of 2.9 persons per unit
4. Fire Flow (FF) = 3,500 gpm for 3 hours = 630,000 gallons

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4.9 Water Consumption and Pumpage Projections to 2035

Future sales and pumpage projections are based on assumptions of water demand, coupled with estimates of future population and community growth. It is often useful to review projections at 10 year (2025) and 20 year (2035) planning horizons. A detailed summary of the individual components of projected water sales and pumpage requirements for years 2025 and 2035 is provided in Table 4-9. Table 4-10 summarizes the information on Table 4-9 and shows the projected maximum day demand and peak hour demand.

4.9.1 Residential Sales

Residential sales were projected based on current trends and assumptions regarding future population to be served and per capita water consumption. By the year 2035, it is estimated that the residential consumption rate will remain approximately 46 gpcd, resulting in total residential sales of 566,000 gpd. The projected 2035 residential consumption will be about 74 percent of total annual sales.

4.9.2 Public Sales

Future per capita sales to public customers were projected to remain 5 gpcd throughout the planning period. By the year 2035, it is estimated that public sales will be approximately 57,000 gpd, about 7 percent of total annual sales.

4.9.3 Business Sales

Future per capita consumption by business customers was projected to be approximately 6 gpcd over the planning period. By the year 2035, it is estimated that business sales will be approximately 73,000 gpd, about 10 percent of total annual sales.

4.9.4 Industrial Sales

The Town's GIS data (summarized in Table 4-5) indicates that there are currently 92 acres of land developed for industrial use with 48 acres actually being utilized. The remaining acreage is underutilized or unusable do to floodplain. To project future industrial customer water needs, an average industrial water consumption of 110 gpd/acre was used. It was projected that future growth will occur with land development and an additional 114 acres of land would be developed for industrial use. By the year 2035, it is estimated that industrial sales will be approximately 15,000 gpd, about 2 percent of total annual sales.

4.10 Summary of Total Demands and Pumpage Requirements

The total annual metered sales projections previously summarized in Table 4-10 are based on a summation of sales projections for each major customer classification. An allowance was also made for non-revenue water to arrive at total pumpage projections.

Table 4-10 summarizes projections of future water needs. Future average day sales are projected to increase from 0.53 mgd in 2013 to 0.71 mgd in 2035. Total average day pumpage is expected increase to from 0.74 mgd in 2013 to 0.95 mgd by the year 2035.

Estimates of daily demand fluctuations have also been made based on projections of future average day sales. By the year 2035, the maximum day pumpage is projected to increase to 1.8 mgd. Future projections of maximum day pumpage are based on a ratio of maximum day to average day of 1.9 as discussed in Table 4-8.

Peak hour demand was projected by assuming a ratio of peak hour demand to maximum day pumpage of 1.6. Peak hour demand is projected to increase to a rate of approximately 2,000 gpm by the year 2035.

4.11 Potential Future Sales and Pumping Requirements with Full Buildout

Full Town Buildout sales and pumpage projections are based on assumptions of residential unit density coupled with total future zoned residential and industrial areas. Reviewing projections at full Town buildout is important because the Town is obligated to plan and serve demands within its Town limits. Plans and efforts must be made to meet the needs of these demands. According to population projections, full Town buildout occurs sometime after 2035. A detailed summary of the individual components of projected maximum water sales and pumpage requirements is provided in Table 4-11. Table 4-12 summarizes the information on Table 4-11 and shows the projected maximum day demand and peak hour demand.

4.11.1 Potential Single Family Residential Sales

Residential sales were projected based on existing undeveloped lands zoned for single family residential development. Assuming 3 units per acre and 2.9 persons per unit, an additional 9,000 people could potentially reside in the undeveloped single-family areas comprising 1,037 acres within the Town limits. With 100 percent buildout of single family areas, it is estimated that sales will be approximately 404,000 gpd

4.11.2 Potential Multi Family Residential Sales

Residential sales were projected based on existing undeveloped lands zoned for single family residential development. Assuming eunits per acre and 2.9 persons per unit, an additional 1,970 people could potentially reside in the undeveloped multi-family areas comprising 85 acres within the Town limits. With 100 percent buildout of multi-family areas, it is estimated that sales will be approximately 88,000 gpd

4.11.3 Potential Public Sales

Future per capita consumption by public customers was projected to be approximately 5 gpcd over the planning period. With 100 percent buildout of residential areas, it is estimated that public sales will be approximately 93,000 gpd.

4.11.4 Potential Business Sales

Future consumption by business customers was projected to be approximately 410 gpd/acre. With 100 percent buildout of residential areas, it is estimated that business sales will be approximately 122,000 gpd.

Table 4-9
Water Sales and Pumpage Projections within Town Limits
Lowell Public Works
Town of Lowell, Indiana

Customer Classification	Actual 2013	Projected 2025	Projected 2035
Town Population	9,324	11,080	12,400
Residential Sales			
Per Capita Sales (gpcd)	46	46	46
Average Day Sales (gpd)	**426,800**	**506,000**	**566,000**
Public and Other Sales			
Per Capita Sales (gpcd)	5	5	5
Average Day Sales (gpd)	**48,000**	**51,000**	**57,000**
2013 Acreage Sales (gpd/acre)	340		
Business Sales			
Per Capita Sales (gpcd)	6	6	6
Average Day Sales (gpd)	**54,800**	**65,000**	**73,000**
2013 Acreage Sales (gpd/acre)	410		
Industrial Sales			
Developed Industrial Area within Town Limits (Acres)	92	149	206
Vacant / Waterless Industrial Area within Town Limits (Acres)	114	57	0
Acreage Sales (gpd/Acre)	110	110	110
Average Day Sales (gpd)	**2,800**	**9,000**	**15,000**
AVERAGE DAY SALES (gpd)	**532,400**	**631,000**	**711,000**
Non-Revenue Water - 25 % (gpd)	208,700	209,000	239,000
AVERAGE DAY PUMPAGE (gpd)	***741,100***	***840,000***	***950,000***

Notes:
1. Projections assume no significant changes in consumption patterns of largest Utility customers.
2. Residential, Other, and Commercial sales assume per capita average from 2013.
3. Industrial Sales projected from per acre sales in 2013. Area projections from GIS data. Industrial sales assumes all future customers are dry industries. Assumes all industrial lands inside Town are developed.
4. Future residential, public, and business demands are based on population growth.
5. Future industrial sales assume 110 gpd per acre for the future areas to be developed and the existing 2,800 gpd remains constant. The existing 92 industrial acres are total acres, not used acres compared to Table 4-5.
6. Non-Revenue Water was projected at 25% of total pumpage for future years from 10 year average (2004 - 2013). Non Revenue water includes losses, authorized non-revenue, and water used in treatment, such as backwashing.

\\sehlx\projects\KO\L\Lowell\126266\8-planning\Tables and Figures\[Chapter 4.xlsm]Table 4-9

Table 4-10
Future Water Requirements within Town Limits
Lowell Public Works
Town of Lowell, Indiana

	Actual 2013	Projected 2025	Projected 2035
Average Day Sales (mgd)	0.53	0.63	0.71
Average Day Pumpage (mgd)	0.74	0.84	0.95
Maximum Day Pumpage (mgd)	1.3	1.6	1.8
Design Peak Hour Demand (gpm)	1,400	1,800	2,000

Notes:
1. Design maximum day pumpage projections were estimated using a ratio of maximum to average day pumpage of 190 percent.
2. Design peak hour demand projections were estimated using a ratio of peak hour demand to maximum day pumpage of 160 percent.

\\sehlx\projects\KO\L\Lowell\126268\8-planning\Tables and Figures\[Chapter 4.xlsm]Table 4-10

Table 4-11
Comparison of Average Day Flows for Projection and Full Buildout within Town
Lowell Public Works
Town of Lowell, Indiana

Customer Classification	2035 Town Projection	50 Percent Buildout	100 Percent Buildout
Projected Population	9,324	9,324	9,324
Full Buildout Population	0	5,420	10,840
Total Population	**9,324**	**14,744**	**20,164**
Residental Sales			
Per Capita Sales (gpcd)	46	46	46
Average Day Sales (gpd)	**566,000**	**673,000**	**920,000**
Single Family Residential Sales	Not Separated Out		
Per Capita Sales (gpcd)		46	46
Housing Density (persons/unit)		2.9	2.9
Unit Density (units/acre)		3.0	3
Acreage Sales (gpd/Acre)		390	390
Acquired Single Family Acres		518	1,037
Average Day Sales (gpd)		**202,000**	**404,000**
Multi Family Residential Sales			
Per Capita Sales (gpcd)		46	46
Housing Density (persons/unit)		3	2.9
Unit Density (units/acre)		8	8
Acreage Sales (gpd/Acre)		1,040	1,040
Acquired Multi Family Acres		42	85
Average Day Sales (gpd)		44,000	**88,000**
Public and Other Sales			
Per Capita Sales (gpcd)	5	5	5
Average Day Sales (gpd)	**57,000**	**25,000**	**93,000**
Business Sales			
Per Capita Sales (gpcd)	6		
Acquired Business Acres		59	119
2013 Acreage Sales (gpd/acre)		410	410
Average Day Sales (gpd)	**73,000**	**97,000**	**122,000**
Industrial Sales			
Average Day Sales (gpd)	**15,000**	**15,000**	**15,000**
AVERAGE SALES (gpd)	**711,000**	**810,000**	**1,150,000**
Non-Revenue Water - 25 % (gpd)	239,000	270,000	380,000
TOTAL AVERAGE DAY PUMPAGE (gpd)	***950,000***	***1,080,000***	***1,530,000***

Notes:
1. Projections assume no significant changes in consumption patterns of largest Utility customers.
2. Residential, Other, and Commercial sales assume per capita average from past 10 years.
3. Industrial Sales projected from per acre sales in 2013. Area projections from GIS data. Industrial sales assumes all future customers are dry industries. Assumes all industrial lands inside Town are developed for all three scenarios above according to Table 4-9.
4. The 2035 projection assumes residential, public and business demands are related to population while industrial demands are based on land area. The full buildout projection assumes residential and public demands are related demands are related to population while business and industrial demands are related to land area.
5. Per acre business sales was calculated from th 2013 business sales and business land use in GIS.
6. Non-Revnue water was projected at 25% of total pumpage for future years from 10 year average (2004 - 2013).

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Table 4-12
Potential Water Requirements with Full Town Buildout
Lowell Public Works
Town of Lowell, Indiana

	Projected 2035	50 Percent Buildout	100 Percent Buildout
Average Day Sales (mgd)	0.71	0.93	1.2
Average Day Pumpage (mgd)	0.95	1.2	1.5
Maximum Day Pumpage (mgd)	1.8	2.3	2.9
Design Peak Hour Demand (gpm)	2,000	2,600	3,200

Notes:

1. Design maximum day pumpage projections were estimated using a ratio of maximum to average day pumpage of 190 percent.
2. Design peak hour demand projections were estimated using a ratio of peak hour demand to maximum day pumpage of 160 percent.

\\sehlx\projects\KO\L\Lowell\126268\8-planning\Tables and Figures\[Chapter 4.xlsm]Table 4-12

4.11.5 Potential Industrial Sales

To project future industrial customer water needs, an average industrial water consumption of 110 gpd/acre was used. It was projected that future growth will occur with land development and an additional 114 acres of land would be developed for industrial use. Similar to the 2035 projection, it is estimated that industrial sales will be approximately 15,000 gpd with 100 percent buildout.

4.11.6 Potential Maximum Day Demand with Full Buildout

Table 4-12 shows the same information as Table 4-10 except that Table 4-12 shows the total average day and maximum day demand if all residential areas were developed according to the assumptions made in this section. The average day demand could be as high as 1.5 mgd and the maximum day demand could be as high as 2.9 mgd. The peak hour could be as high as 3,200 gpm.

The maximum day demand in Table 4-12 is the potential water treatment plant capacity the Town may eventually be obligated to meet. The estimates in Table 4-11 and Table 4-12 are not expected to occur by year 2035, but at some unknown point in the future.

4.12 Future Service Areas Outside of Town Limits

While the Town of Lowell is obligated to provide water to all development within the Town limits, the Town is not limited to the existing Town boundaries and is anticipating growth outside the existing Town boundaries in the next 20 years. Any growth outside the existing Town limits would obligate the Town to provide adequate water supply and fire protection to the new areas. Section 3.0 discussed the two future service areas the Town has plans to serve: Service Area 1 and Service Area 2. The two future service areas are shown in Figure 3-3, Figure 3-4, and Figure 3-5. The following sections discuss potential water needs in both service areas.

4.12.1 Service Area 1

Maximum future sales and pumpage projections in Service Area 1 are based on assumptions of residential unit density coupled with total future zoned residential and industrial areas. A detailed summary of the individual components of projected maximum water sales and pumpage requirements is provided in Table 4-13. Table 4-14 combines the information on Table 4-13 with the 2035 projected demands from Table 4-9. Table 4-15 summarizes the information on Table 4-14 and shows the projected maximum day demand and peak hour demand.

4.12.1.1 Potential Single Family Residential Sales

Residential sales were projected based on existing undeveloped lands zoned for single family residential development. Assuming 3 units per acre as suggested by the Town's Planner and 2.9 persons per unit, approximately 1,900 people could reside in the undeveloped single-family areas comprising 225 acres within Service Area 1.

4.12.1.2 Potential Multi Family Residential Sales

Residential sales were projected based on existing undeveloped lands zoned for single family residential development. In Table 4-13, Assuming 8 units per acre as suggested by the Town's Planner and 2.9 persons per unit, an additional 2,700 people could potentially reside in the undeveloped multi-family areas comprising 119 acres within the Service Area 1.

4.12.1.3 Potential Public Sales

Future per capita consumption by public customers was projected to be approximately 5 gpcd over the planning period. In Table 4-13, with 100 percent buildout of residential areas in Service Area 1, it is estimated that additional public sales in Service Area 1 will be approximately 22,000 gpd.

4.12.1.4 Potential Business Sales

Future consumption by commercial customers was projected to be approximately 410 gpd/acre. In Table 4-13, with 100 percent buildout of residential areas, it is estimated that additional business sales in Service Area 1 will be approximately 124,000 gpd.

4.12.1.5 Potential Industrial Sales

To project future industrial customer water needs, an average industrial water consumption of 110 gpd/acre was used. It was projected that future growth will occur with land development and an additional 252 acres of land would be developed for industrial use. In Table 4-13, it is estimated that additional industrial sales in Service Area 1 will be approximately 28,000 gpd with 100 percent buildout.

4.12.1.6 Potential Maximum Day Demand

Table 4-14 combines Service Area 1 projections from Table 4-13 with the 2035 projected demands with the Town's existing borders (Table 4-9). Table 4-15 summarizes the information on Table 4-14 and shows the projected maximum day demand and peak hour demand. For Service Area 1 with the 2035 projected Town water requirements, the average day demand could be as high as 1.4 mgd and the maximum day demand could be as high as 2.5 mgd. The peak hour could be as high as 2,800 gpm.

4.12.2 Service Area 2

Maximum future sales and pumpage projections in Service Area 2 are based on assumptions of residential unit density coupled with total future zoned residential and industrial areas. A detailed summary of the individual components of projected maximum water sales and pumpage requirements is provided in Table 4-13. Table 4-14 combines the information on Table 4-13 with the 2035 projected demands from Table 4-9. Table 4-15 summarizes the information on Table 4-14 and shows the projected maximum day demand and peak hour demand.

4.12.2.1 Potential Single Family Residential Sales

No single-family sales are expected in Service Area 2.

4.12.2.2 Potential Multi Family Residential Sales

Residential sales were projected based on existing undeveloped lands zoned for single family residential development. In Table 4-13, Assuming 8 units per acre and 2.9 persons per unit, an additional 3,450 people could potentially reside in the undeveloped multi-family areas comprising 151 acres within the Service Area 2. With 100 percent buildout of multi-family areas in Service Area 2, it is estimated that sales will be approximately 157,000 gpd.

4.12.2.3 Potential Public Sales

Future per capita consumption by public customers was projected to be approximately 5 gpcd over the planning period. In Table 4-13, with 100 percent buildout of public areas, it is estimated that additional public sales in Service Area 2 will be approximately 16,000 gpd.

4.12.2.4 Potential Business Sales

Future consumption by business customers was projected to be approximately 410 gpd/acre. In Table 4-13, with 100 percent buildout of business areas, it is estimated that additional business sales in Service Area 2 will be approximately 97,000 gpd.

4.12.2.5 Potential Industrial Sales

To project future industrial customer water needs, an average industrial water consumption of 110 gpd/acre was used. It was projected that future growth will occur with land development and an additional 393 acres of land would be developed for industrial use. In Table 4-13, it is estimated that additional industrial sales in Service Area 2 will be approximately 37,000 gpd with 100 percent buildout.

4.12.2.6 Potential Maximum Day Demand

Table 4-14 combines the information on Table 4-13 with the 2035 projected demands from Table 4-9. Table 4-15 summarizes the information on Table 4-14 and shows the projected maximum day demand and peak hour demand. For Service Area 2 with the 2035 projected Town water requirements, the average day demand could be as high as 1.4 mgd and the maximum day demand could be as high as 2.6 mgd. The peak hour could be as high as 2,900 gpm.

4.12.3 Service Areas 1 & 2 Combined with 2035

The information for Service Area 1 and Service Area 2 are combined into final quantities in Table 4-13, Table 4-14, and Table 4-15. Summing the information above, the 2035 projected water requirements of the Town plus 100 percent buildout of both future service areas yields a potential average day demand of 1.4 mgd and a maximum day demand of 3.5 mgd.

The maximum day demand in Table 4-15 is the potential water treatment plant capacity the Town may eventually be obligated to meet if the future service areas are brought into the Town. The estimates in Table 4-14 and Table 4-15 are not expected to occur by year 2035, but at some unknown point in the future.

Table 4-13
Future Water Sales and Pumpage Projections Outside Town Limits
Lowell Public Works
Town of Lowell, Indiana

Customer Classification	Service Area 1 Only	Service Area 2 Only	Service Areas 1 & 2
Additional Population	4,660	3,450	8,110
Single Family Residential Sales			
Per Capita Sales (gpcd)	46	46	46
Housing Density (persons/unit)	2.9	2.9	2.9
Unit Density (units/acre)	3	3	3
Acreage Sales (gpd/Acre)	390	390	390
Acquired Single Family Acres	225	0	225
Average Day Sales (gpd)	**88,000**	**0**	**88,000**
Multi Family Residential Sales			
Per Capita Sales (gpcd)	46	46	46
Housing Density (persons/unit)	2.9	2.9	2.9
Unit Density (units/acre)	8	8	8
Acreage Sales (gpd/Acre)	1,040	1,040	1,040
Acquired Multi Family Acres	119	151	270
Average Day Sales (gpd)	**124,000**	**157,000**	**281,000**
Public and Other Sales			
Per Capita Sales (gpcd)	5	5	5
Average Day Sales (gpd)	**22,000**	**16,000**	**37,000**
Business Sales			
Acquired Businessl Acres	303	237	540
2013 Acreage Sales (gpd/acre)	410	410	410
Average Day Sales (gpd)	**124,000**	**97,000**	**221,000**
Industrial Sales			
Acquired Industrial Acres	252	332	584
Acreage Sales (gpd/Acre)	110	110	110
Average Day Sales (gpd)	**28,000**	**37,000**	**64,000**
AVERAGE SALES (gpd)	**386,000**	**307,000**	**691,000**
Non-Revenue Water - 25 % (gpd)	124,000	103,000	229,000
TOTAL AVERAGE DAY PUMPAGE (gpd)	*510,000*	***410,000***	***920,000***

Notes:
1. Projections assume no significant changes in consumption patterns of largest Utility customers.
2. Residential, Other, and Commercial sales assume per capita average from past 10 years.
3. Industrial Sales projected from per acre sales in 2013. Area projections from GIS data. Industrial sales assumes all future customers are dry industries. Assumes all industrial lands inside Town are developed.
3. Non-Revnue water was projected at 25% of total pumpage for future years from 10 year average (2004 - 2013).

\\sehlx\projects\KO\L\Lowell\126268\8-planning\Tables and Figures\[Chapter 4.xlsm]Table 4-13

Table 4-14
2035 Projected Sales and Pumpage with Future Service Areas
Lowell Public Works
Town of Lowell, Indiana

Customer Classification	Town with Service Area 1	Town with Service Area 2	Town with Service Areas 1 & 2
2035 Town Population	12,400	12,400	12,400
Additional Population	3,450	4,660	8,110
Total Population	**15,850**	**17,060**	**20,510**
Residential Sales			
Sales Inside Town Limits (gpd)	566,000	566,000	566,000
Sales in Acquired Areas (gpd)	212,000	157,000	369,000
Total Residential Sales (gpd)	**778,000**	**723,000**	**935,000**
Public and Other Sales			
Sales Inside Town Limits (gpd)	57,000	57,000	57,000
Sales in Acquired Areas (gpd)	22,000	15,000	37,000
Total Other Sales (gpd)	**79,000**	**72,000**	**94,000**
Commercial Sales			
Sales Inside Town Limits (gpd)	73,000	73,000	73,000
Sales in Acquired Areas (gpd)	97,000	124,000	221,000
Total Commercial Sales (gpd)	**124,000**	**197,000**	**294,000**
Industrial Sales			
Sales Inside Town Limits (gpd)	15,000	15,000	15,000
Sales in Acquired Areas (gpd)	37,000	27,000	64,000
Total Industrial Sales (gpd)	**28,000**	**42,000**	**79,000**
AVERAGE SALES (gpd)	**1,010,000**	**1,030,000**	**1,402,000**
Non-Revenue Water - 25 % (gpd)	341,000	**346,000**	468,000
TOTAL AVERAGE DAY PUMPAGE (gpd)	***1,350,000***	**1,380,000**	***1,870,000***

Notes:
1. Projections assume no significant changes in consumption patterns of largest Utility customers.
2. Residential, Other, and Commercial sales assume per capita average from past 10 years.
3. Industrial Sales projected from per acre sales in 2013. Area projections from GIS data. Industrial sales assumes all future customers are dry industries. Assumes all industrial lands are developed.
4. Non-Revenue Water was projected at 25% of total pumpage for future years from 10 year average (2004 - 2013).

\\sehlx\projects\KO\L\Lowell\126268\6-planning\Tables and Figures\[Chapter 4.xlsm]Table 4-14

Table 4-15
2035 Pumpage Projections with Future Service Areas
Lowell Public Works
Town of Lowell, Indiana

	Town with Service Area 1	Town with Service Area 2	Town with Service Areas 1 & 2
Average Day Sales (mgd)	1.01	1.03	1.4
Average Day Pumpage (mgd)	1.4	1.4	1.9
Maximum Day Pumpage (mgd)	2.5	2.6	3.5
Design Peak Hour Demand (gpm)	2,800	2,900	3,900

Notes:
1. Design maximum day pumpage projections were estimated using a ratio of maximum to average day pumpage of 190 percent.
2. Design peak hour demand projections were estimated using a ratio of peak hour demand to maximum day pumpage of 160 percent.

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5.0 Water System Evaluation

An important component of this water distribution system evaluation was the evaluation of the existing water system and performing a deficiency analysis. This section summarizes the process and findings from the system evaluation.

5.1 Existing System Deficiency Analysis

Water distribution systems are analyzed, planned, and designed primarily through the application of basic hydraulic principles. Some important factors that must be considered when performing this analysis include:

1. The location and capacity of supply facilities
2. The location, sizing, and design of storage facilities
3. The location, magnitude, and variability of customer demands
4. Water distribution system geometry and geographic topography
5. Minimum and maximum pressure requirements
6. Land use characteristics with respect to fire protection needs
7. Other operational criteria which define the manner in which the system can most efficiently be operated

For this study, an evaluation of the Lowell water distribution system was performed to determine the adequacy of the system to supply existing and future water needs and to supply water for fire protection purposes.

The system was evaluated based on the following criteria:

1. Pressure
2. Flow Capacity
3. Reliability
4. Supply
5. Storage

The water distribution system evaluation was based on compliance with Indiana State code requirements and standard water industry engineering practice.

5.2 Water System Computer Model

The 2014 computer model was generated to match, as closely as possible, the Town's current water distribution system using 2014 GIS information. The Lowell system was modeled using WaterCAD®, a pipe network program developed by Bentley®. Pipe roughness coefficients were estimated based on the diameter, age and types of pipe materials. The age of pipes were provided by the Town. Results indicated that roughness coefficients were low compared to industry standards. Some areas of the system are relatively new and achieved predictable values, while other areas are old and may have tuberculation (sediment buildup on the inside edges of the pipe).

The Lowell water distribution system model was calibrated using results of field flow testing performed in summer 2014. During the model calibration process, pumping rates, customer demands, and tower water levels were set to the field conditions and pipe roughness coefficients were adjusted until the calibrated system model adequately simulated field test data. A summary of the flow test data is in Table 5-1 and the flow test locations are shown in Figure 5-1.

5.3 Water System Pressures

The Lowell water distribution system model was used to evaluate existing water distribution system characteristics and identify deficiencies with respect to pressures and flow capacities. Water system pressure will vary around the service area based on differences in topographic elevations as well as supply rates and customer demands. In general, as customer demands increase pressures will decrease. Areas higher in topographic elevation will also tend to exhibit lower water system pressures.

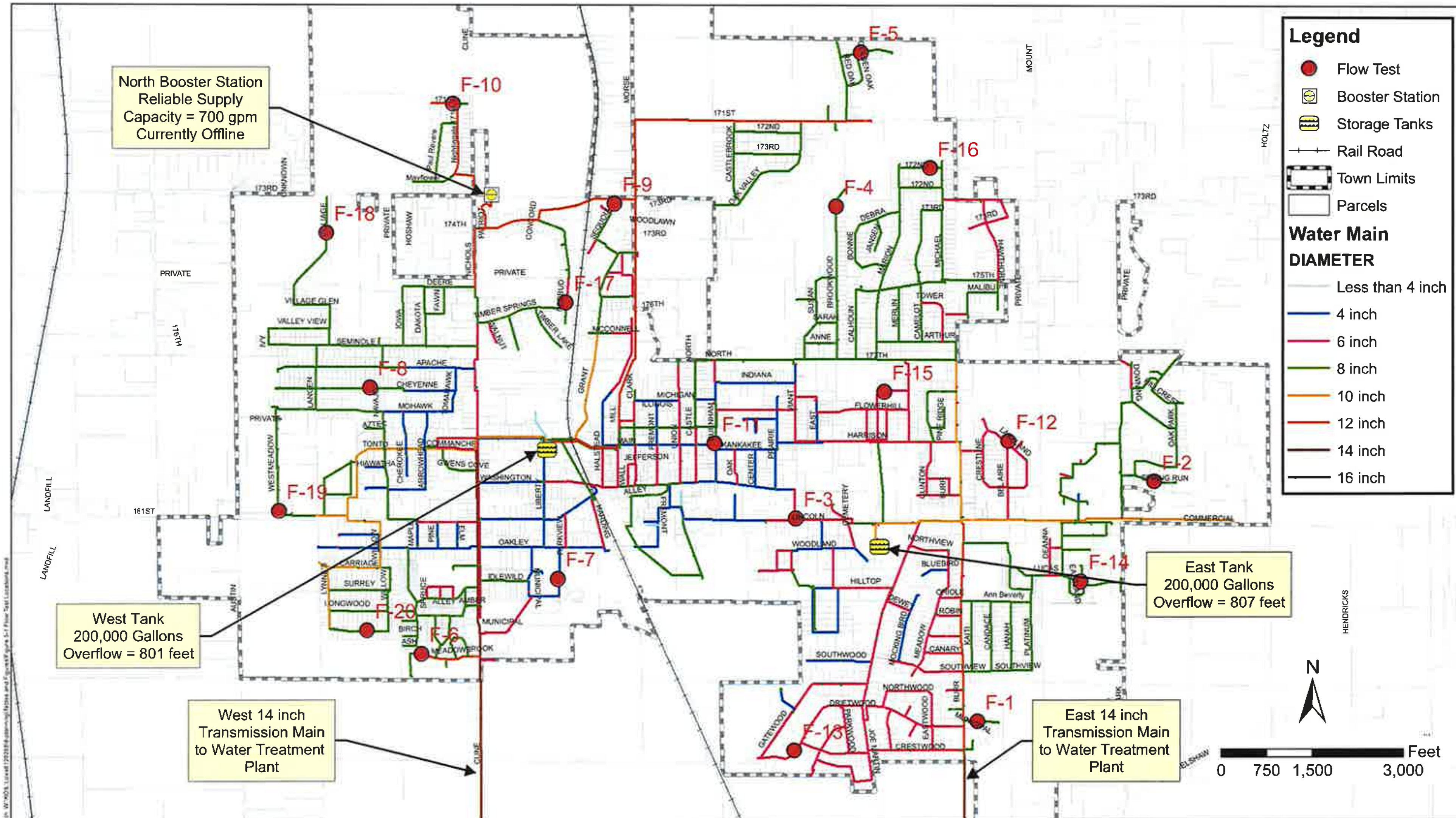
A water distribution system must be designed to provide pressures within a range of minimum and maximum allowable conditions. When system pressure is too low customers may complain of inadequate water supply, customer meters may tend to record inaccurately, and fire protection will be limited. Pressures that are too high can cause problems with system operation and maintenance and will tend to cause higher consumption rates by customers. High water system pressures can also increase the amount of water loss, as leakage rates will increase with increases in system pressure.

The Indiana Administrative Code requires that municipal water systems be designed with a minimum pressure of 35 psi under average daily demands. The Ten States Standards recommends that typical pressures in the service area under normal operating conditions be between 60 psi and 80 psi. Furthermore, Indiana State Code requires the minimum pressure in all service areas of the distribution system not fall below 20 psi during fire flows events during maximum day demands. For the purposes of this study, 80 psi is assumed to be the maximum recommended pressure.

Steady state system pressures under 2013 average day demand are shown in Figure 5-2 for the entire distribution system. Lowest system pressure were just over 35 psi and occurred in high elevation areas, such as near the intersection of North Nichols Street and West 174th Avenue. Highest system pressures were just under 70 psi and occurred in low elevation areas or on the discharge side of pumping stations, such as the discharge of the high lift pumps at the water treatment plant. As stated above, the Ten States Standards recommends pressures to be between 60 and 80 psi, but this range is not a requirement. The Lowell water system meets the minimum requirements for static pressure under average daily demands, as discussed in 327 IAC-8.

Table 5-1
Summary of Flow and Pressure Tests
Lowell Water Utility
Town of Lowell, Indiana

Test No.	Model Results		Field Results													
	Static Pressure Error	Pressure Drop Error	Flowing Hydrant 1	Pitot 1 (psi)	Flow 1 (gpm)	Residual Hydrant 1	Static Pressure (psi)	Residual Pressure (psi)	Residual Hydrant 2	Static Pressure (psi)	Residual Pressure (psi)	East Tower Level (feet)	West Tower Level (feet)	Pressure at WTP (psi)	WTP Flow (GPM)
1	-1.4%	-3.9%	H-589	30	920	H-590	44.5	34	H-130	37	32	26.4	23	55.5	off
2	-1.4%	16.2%	H-544	32	950	H-543	52	40	H-545	52	43	26	22.8	67.7	1022
3	8.3%	N/A	H-218	NA	NA	H-219	58	44	H-091	Not Measured	0	26.4	23.8	73.7	972
4	2.9%	0.8%	H-332	22	800	H-331	51	21.5	H-333	55	35.5	26.9	24.3	68	1002
5	1.9%	35.7%	H-18	37	1050	H-17	57	43	H-19	Not Measured	0	27.2	24.8	69.7	978
6	-6.1%	5.5%	H-136	32	950	H-701	42	31	H-139	41.5	29	27	21.5	60.5	off
7	-6.5%	-0.5%	H-313	25	840	H-312	51	32	H-062	Not Measured	0	26.3	20.8	57.8	off
8	1.6%	5.1%	H-013	27	900	H-012	46	33	H-014	44.5	30	26.3	22.6	69.7	1067
9	-8.0%	-63.3%	H-262	45	1130	H-264	52.5	45	H-1	61	50.5	27.6	21.1	62.7	off
10	-24.5%	-29.8%	H-508	27	900	H-509	52	28	H-517	58	37	26.8	23	69.7	1054
11	-5.7%	6.3%	H-110	<5	<360	H-086	58	41	H-109	51	43	26.69	22.77	59.1	off
12	-2.2%	-9.0%	H-204	16	660	H-203	50	36	H-205	48	32	26.69	22.77	58.1	off
13	0.7%	5.0%	H-146	15	640	H-145	58	48	H-147	Not Measured	0	26.69	22.77	57.8	off
14	-17.1%	-78.8%	H-186	5.5	400	H-185	58	46	H-333	57	45	27.1	19.9	58.7	0
15	-8.1%	-3.5%	H-277	15	650	H-326	38	16	H-276	48	24	27.7	20.8	61.5	0
16	1.8%	-5.1%	H-363	25	840	H-361	43	19	H-362	51	28	27.6	22.3	69	1100
17	-50.7%	12.5%	H-369	40	1060	H-326	49	40	H-320	50	47	27.9	23.8	78.6	1089
18	-7.9%	0.3%	H-60	20	750	H-59	38	25	H-61	38	19	27.4	20.5	59	0
19	-5.2%	-3.1%	H-104	37.5	1030	H-103	47	37	H-40	49	43	27.4375	21.0125	64	0
20	-8.1%	5.0%	H-127	25	840	H-128	39	22	H-126	40	31	27.6	20.7	61.5	0
21	2.2%	56.7%	H-592	45.5	1130	H-593	56	53	H-591	64	55	27.2	21.3	67.7	1095
22	-11.8%	-18.9%	H-592	36	1000	H-593	56	43	H-591	59	45	27	18.8	56	0
Average	-6.6%	-3.2%													



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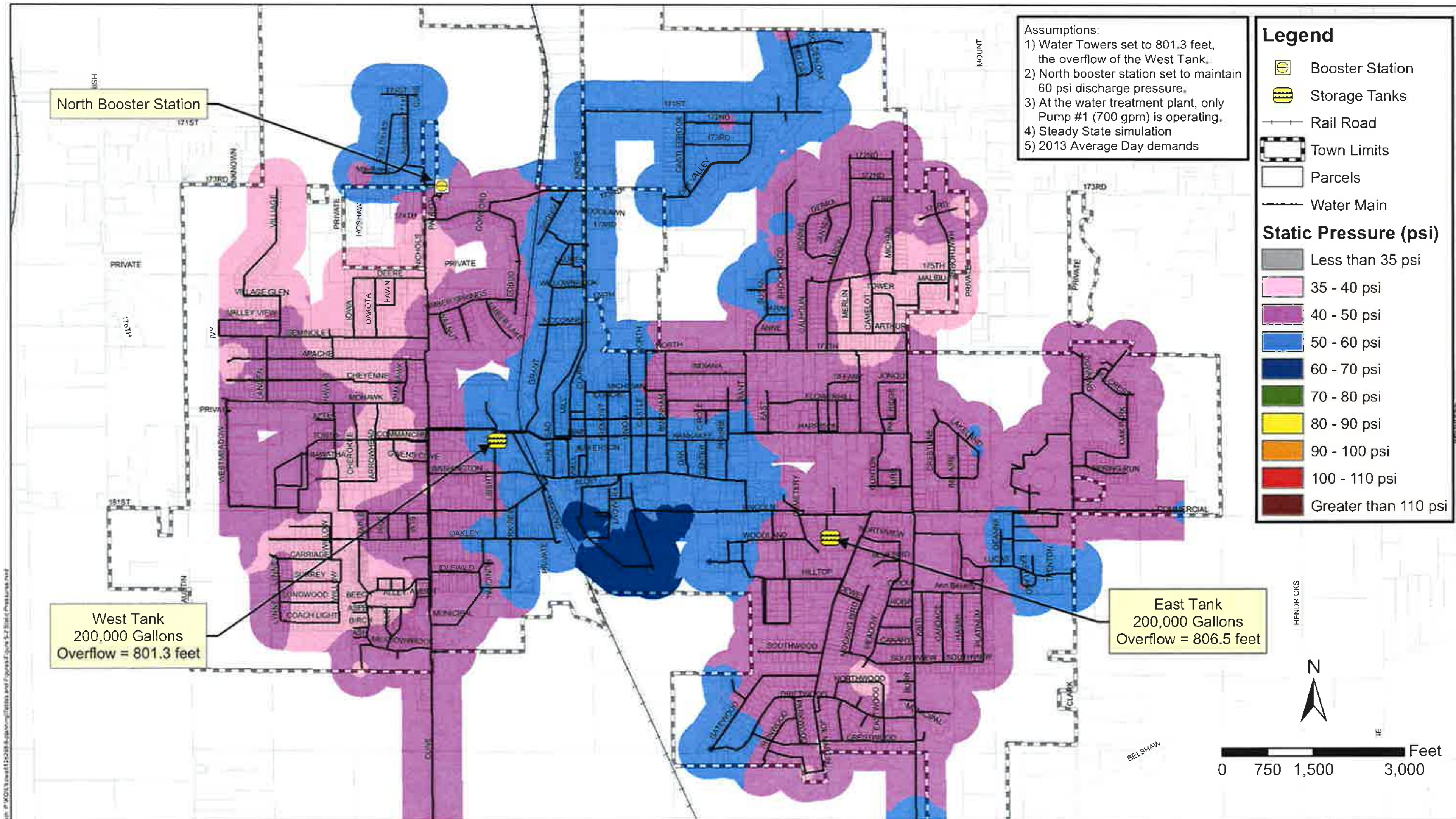
Print Date: 10/24/2014

Map by: jbohnert
Projection: Indiana West (feet)
Source: Town of Lowell

Flow Test Locations
Lowell Water System Master Plan
Lowell, Indiana

Figure
5-1



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Static Pressures under 2013 Average Day Demands

Lowell Water System Master Plan

Lowell, Indiana

Figure 5-2

Cause No. 45550
Docket Entry Request No. 4
Page 76 of 181

5.4 Water Needs for Fire Protection

In addition to the water supply requirements for residential, public, commercial, and industrial consumption, water system planning for fire protection needs is an important consideration. In most instances, water main sizes are designed specifically to supply needed fire flow requirements.

Benefits of providing adequate fire protection for the Town of Lowell include the reduction of insurance rates for residential homes and commercial business in the community. In the United States, guidelines for determining fire flow requirements are developed based on recommendations offered by the Insurance Services Office (ISO), which is responsible for evaluating and classifying municipalities for fire insurance rating purposes.

When a community evaluation is conducted by ISO, the water system is evaluated for its capacity to provide needed fire flow at a specific location and will depend on land use characteristics and the types of properties to be protected. The ISO has developed a method for design and evaluation of a municipal system which will indicate the Needed Fire Flow (NFF). For residential buildings the NFF is determined by the distance between structures as shown below:

Distance between Structures (ft)	*Fire Flow (gpm)*
More than 100	500
31-100	750
11-30	1,000
Less than 11	1,500

However, in high value districts containing commercial and industrial buildings, fire flow requirements of up to 3,500 gpm or more can be expected. These values can be reduced if existing buildings have sprinklers. Below is a formula that has been established for determining the NFF for commercial and industrial structures and is documented in the *Fire Protection Rating System* (1998) and AWWA M-31 (1998):

$$NFF = 18\,F\,A^{0.5}\,[O\,(X+P)]$$

Where
- NFF = needed fire flow (gpm)
- F = class of construction coefficient
- A = effective area (ft²)
- O = occupancy factor
- X = exposure factor
- P = communication factor

Based on current insurance classification guidelines, basic fire flow requirements are not expected to change over the planning period.

Table 5-2 shows ISO fire flow guidelines for various land uses. These requirements were used as a basis for evaluating the Lowell water system. The requirements shown in the table are only intended as a general guideline. The actual needed fire flow for a specific building can vary considerably, as discussed above. However, a minimum of 500 gpm of available fire flow at 20 psi is the absolute minimum recommended flow for any circumstance under ISO guidelines.

Table 5-2
Minimum Fire Flows According to ISO Guidelines
Lowell Water Utility
Town of Lowell, Indiana

Land Use	Range of Needed Fire Flows (gpm)
Single & Two-Family:	
Over 100 feet Building Separation	500
31 to 100 feet Building Separation	750
11 to 30 feet Building Separation	1000
10 feet or Less Building Separation	1500
Multiple Family Residential Complexes	2,000 to 3,000+
Average Density Commercial	1,500 to 2,500+
High Value Commercial	2,500 to 3,500+
Light Industrial	2,000 to 3,500
Heavy Industrial	2,500 to 3,500+
Other Commercial, Industrial & Public Buildings	Up to 12,000

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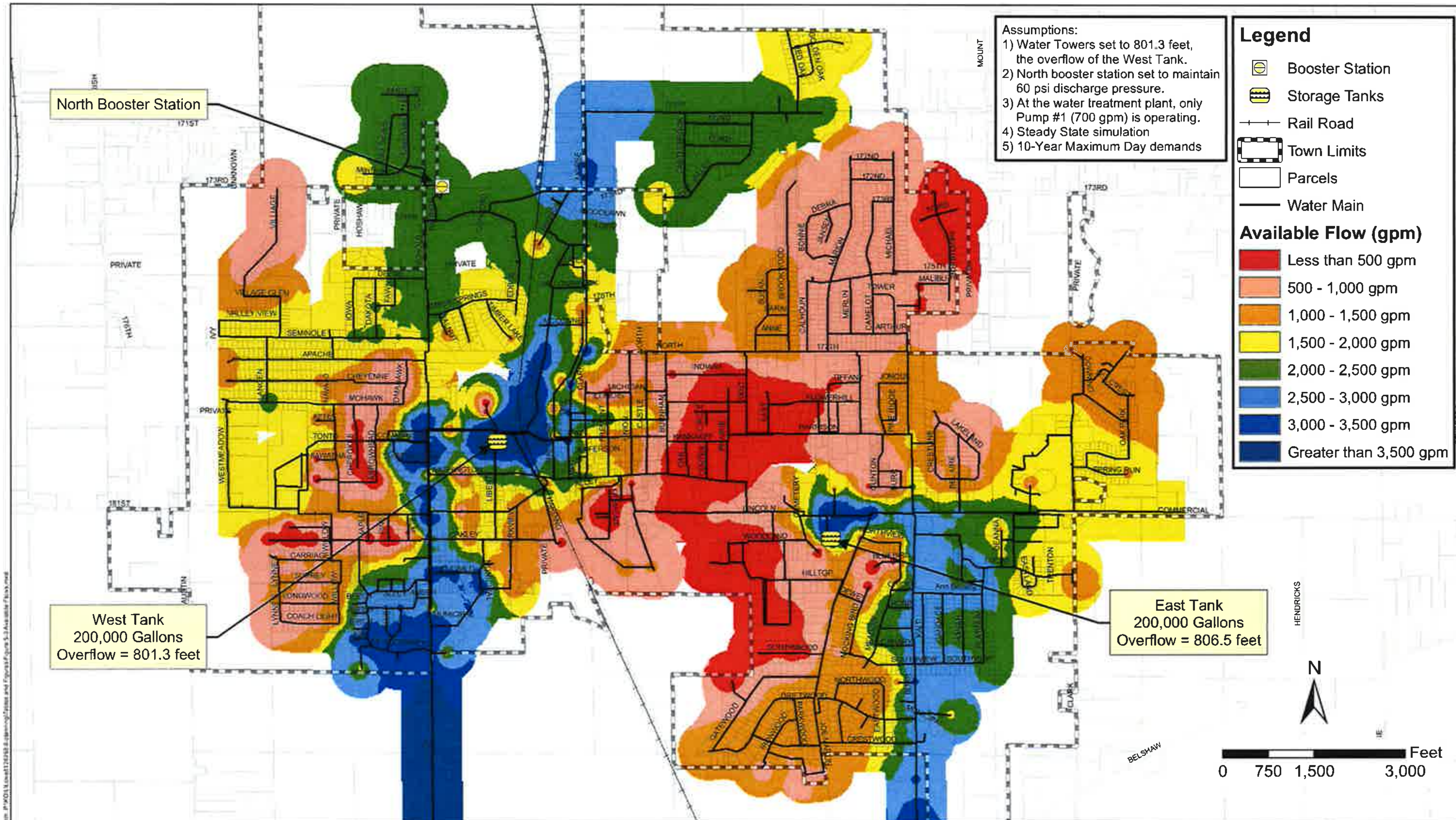
5.5 Fire Flow Capacities

Water system planning for fire protection is an important consideration. In most instances, water main sizes are designed specifically to supply desired fire flows. Guidelines for determining fire flow requirements are provided by the ISO. The ISO is the Insurance Service Organization responsible for evaluating and classifying municipalities for fire insurance rating purposes.

Fire protection needs vary with the physical characteristics of each building that is to be protected. For example, needed fire flows for a specific building can vary from 500 gpm to as high as 12,000 gpm, depending on habitual classifications, separation distances between buildings, height, materials of construction, size of the building, and the presence or absence of building sprinklers. Municipal fire insurance ratings are partially based on the Town's ability to provide needed fire flows up to 3,500 gpm. If a specific building has a needed fire flow greater than this amount, the community's fire insurance rating will only be based on the water system's ability to provide 3,500 gpm.

Figure 5-3 illustrates the estimated available fire flow under the 10-year design maximum day design demand while maintaining a residual pressure of 20 psi throughout the system. Areas with lower available flows are primarily located on the far extremities of the system, are served by dead end mains, or are in places where the distribution network is composed of older, smaller diameter water mains. In the case for Lowell, the Town consists of approximately 9 miles (13 percent) of water main 4-inches in diameter or smaller and 25 miles (24 percent) of water main 6 inches in diameter. The areas in Figure 5-3 with less than 500 gpm available flow at 20 psi are in areas dense with these smaller water mains particularly in the residential areas around Harrison Street, Flower Hill Drive, and Cottage Grove Avenue.



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Map by: jbohnert
Projection: Indiana West (feet)
Source: Town of Lowell

Available Flows at 20 psi under 10-year Maximum Day Demands

Lowell Water System Master Plan

Lowell, Indiana

Figure 5-3

5.6 Fire Flow Deficiencies According to Zoning

Figure 5-4 overlays the available fire flow in the system with recommended fire flows based on land zoning from Chapter 3. All areas in the system that serve a hydrant must meet 500 gpm with the pressure at all hydrants and service connections remaining at least 20 psi. Looking at Table 5-2, the recommended range of fire protection for commercial areas is 1,500 to 3,500 gpm and is 2,000 gpm and up for industrial areas. For the purposes of this evaluation, commercial areas will require a minimum of 1,500 gpm and industrial areas a minimum of 2,500 gpm. Residential and public areas will assume a minimum requirement of 1,000 gpm do to the proximity of one home to another.

Figure 5-4 shows a number of areas that do not meet the minimum recommended fire protection of 1,000 gpm at 20 psi from the ISO. In addition, the Town has a number of business (violet circles) and industrial customers (black pentagons) in Figure 5-4 that may not have the fire protection recommended by the ISO. Nine parcels labeled as "Industrial" in the Town's GIS information do not meet the minimum recommended fire protection of 2,500 gpm typically provided for industrial customers, and 98 parcels labeled as "Business" in the Town's GIS information do not meet the minimum recommended fire protection of 1,500 gpm typically provided for business customers.

SEH recommends these potential deficiencies be considered on a case-by-case basis by the Town, as not all industrial customers actually need a full 2,500 gpm and likewise some business customers may desire more fire protection. To facilitate in economic growth, adequate fire protection is a priority for businesses and industries, as higher fire protection means lower insurance costs and higher profitability.

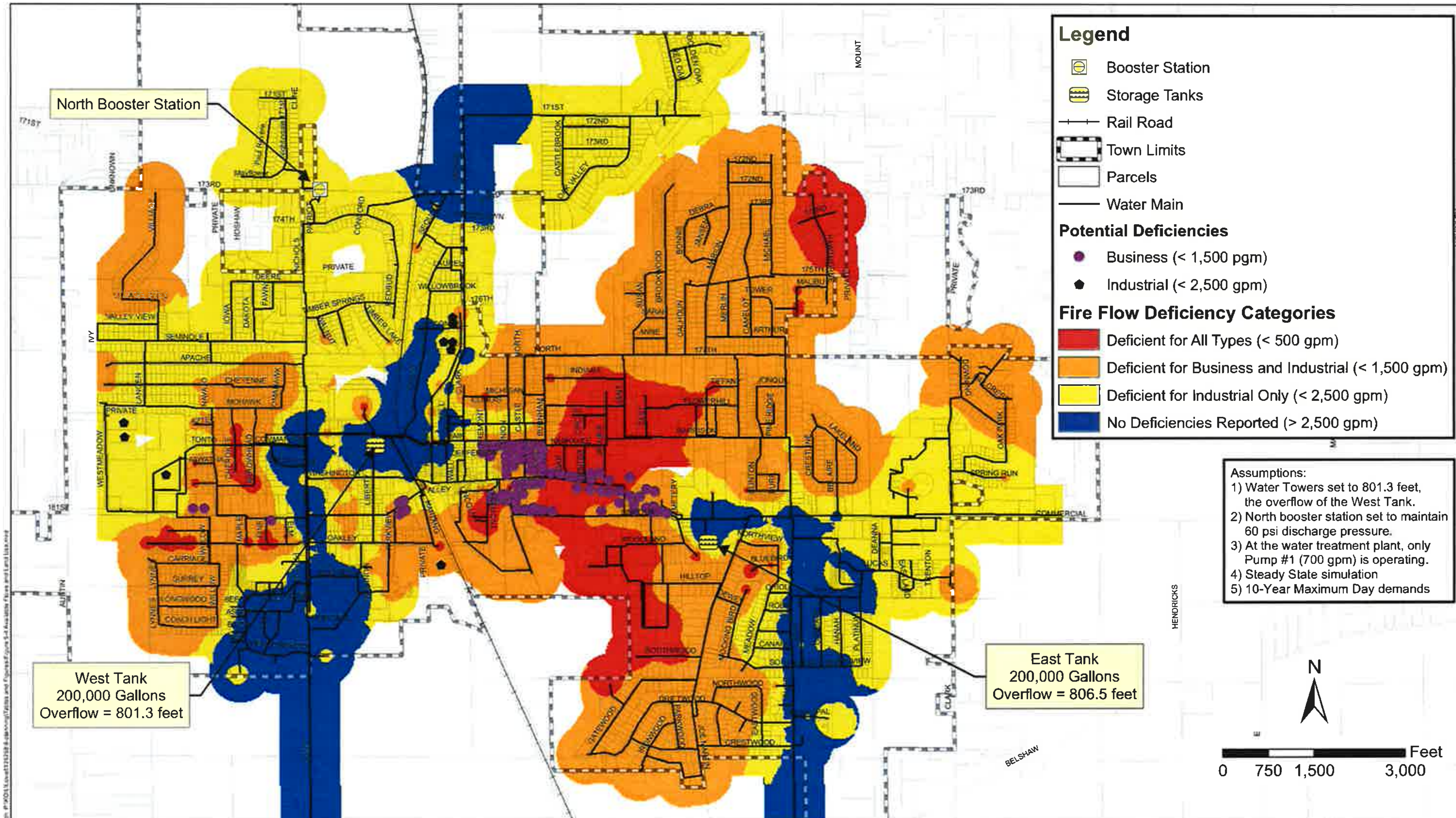
Section 6.0 will describe the recommended water main improvements to the Town, which will make it a priority to increase system capacity. In short, four inch mains should be replaced with 8-inch and larger mains.

5.7 Pipe Velocities, Head Loss, and Flow Carrying Capacity

Pipe flow velocities within the distribution system are typically below two feet per second (fps) under average demand conditions. Even during the peak hour demand on the maximum day, flow velocities do not exceed five fps anywhere in the system according to the water model.

Water main pipe segments with the highest head losses are also typically found in areas served by the oldest and smallest water main piping. Because of the limited hydraulic capacity of water mains in these areas, the higher flow velocities equate to higher head losses, reducing system pressures in these affected areas.

The water system contains large transmission mains that play a central role in the performance of the distribution system (see Chapter 2). These large water mains connect storage tanks, booster stations, and the water treatment plant. In the case that flow in one of these mains is interrupted, the Town would need to be prepared for weaker performance in the distribution system.



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Map by: jbohnen
Projection: Indiana West (feet)
Source: Town of Lowell

Potential Fire Flow Deficiencies

Lowell Water System Master Plan
Lowell, Indiana

Figure 5-4

5.8 Standby Power for Pumping Facilities

For any water utility to serve its customers and protect the public welfare, water system facilities, equipment, and distribution systems must be reliable under all operating conditions. Reliability of utility service comprises a large part of the Water Utility's investment in the plant and equipment.

Indiana Administrative Code requires all pumping stations to be served by a power supply from at least two independent electrical substations or from a standby, auxiliary power source dedicated to water pumping use. As a general rule, the Utility should be able to reliably pump average day customer demands and maintain adequate fire protection using auxiliary power sources in every booster station.

5.9 Reliable Pumping Capacity

A critical step in long-range planning for the Lowell water distribution system was identifying the future needs of the service area coupled with an assessment of water supply and storage requirements. Water supply and storage needs are closely related. The primary criteria used in determining required supply rates and storage volumes include maximum and peak demands, operational characteristics, and fire protection needs.

It is frequently necessary to take a pump out of service for periods of several days to several weeks for maintenance. Therefore, the reliable pumping capacity of a water system is the total available delivery rate with the largest pumping unit out of service. For example, under average day operating conditions, the existing pumps at the water treatment plant have a combined total capacity of approximately 2,240 gpm, or 3.0 mgd, as shown in Table 5-3. However, the reliable capacity of the pumps is approximately 16,900 gpm, or 24.3 mgd, with one of the largest units (Pump #2 or #3) out of service. Table 5-4 provides a similar analysis for the North booster station.

For evaluating a municipal water system, reliable pumping capacity should at least equal maximum day pumpage requirements, assuming adequate storage is available. If this criterion is met, pumping facilities will have adequate capacity to replenish storage during off peak hours, while depletion of available storage occurs during peak demand hours. Using this criteria, and projections of future water pumping needs, Table 5-5 summarizes minimum future pumping needs according to population projections.

Lowell's current reliable pumping capacity (2.5 mgd) is adequate to meet the 2013 maximum day pumpage of 1.25 mgd. As projected over the next 20 years, no additional reliable pumping capacity is necessary; although, the water treatment plant capacity is exceeded.

Figure 5-5 compares the reliable pumping capacity of the entire system with projected maximum day pumpage requirements within the zone. As illustrated in Figure 5-5, the system does not require additional pumping capacity to meet current needs and projected future needs through year 2035 when only considering the current population growth of the Town with no future service areas; although, the capacity of the water treatment plant is exceeded.

Table 5-6 provides an estimate for the future water needs if the Town were to completely develop all undeveloped areas according to the current zoning plan. With 100 percent development of the Town, up to 260 gpm of additional reliable pumping capacity in the water treatment plant could be expected.

Table 5-3
Reliable Pumping Capacity of High Lift Station
Lowell Water Utility
Town of Lowell, Indiana

	Current Pumping Capacities	
Water Treatment Plant	**(gpm)**	**(MGD)**
Pump # 1	700	1.0
Pump # 2	1,040	1.5
Pump # 3	1,040	1.5
Total Pumping Capacity	2,780	4.0
Total Capacity under System Pressure	2,240	3.2
Less: Largest Supply Unit	1,040	1.5
Reliable Pumping Capacity Under System Pressure	**1,730**	**2.5**

Note:
1. Pumping rates based on original design capacity.

\\sehlx\projects\KO\L\Lowell\126268\8-planning\Tables and Figures\[Chapter 5 Storage tables.xlsm]TABLE 6-3

Table 5-4
Reliable Pumping Capacity of North Booster Station
Lowell Water Utility
Town of Lowell, Indiana

	Current Capacities	
North Booster Station	**(gpm)**	**(MGD)**
Pump # 1	100	0.1
Pump # 2	300	0.4
Pump # 3	300	0.4
Pump # 4	1,500	2.2
Total Pumping Capacity	2,200	3.2
Maximum Flow Limited by Suction Pressure	1,180	1.7
Less: Largest Supply Unit	1,500	2.2
Reliable Rated Pumping Capacity	**700**	**1.0**

Note:
1. Pumping rates based on original design capacity.

\\sehlx\projects\KO\L\Lowell\126286\8-planning\Tables and Figures\[Chapter 5 Storage tables.xlsm]TABLE 5-4

Table 5-5
Reliable Pumping and Plant Capacity Needs
According to Population Projections
Lowell Water Utility
Town of Lowell, Indiana

	Actual 2013	**Projected 2025**	**Projected 2035**
Average Day Sales (gpd)	532,400	631,000	711,000
Average Day Pumpage (gpd)	741,100	840,000	950,000
Design Maximum Day Pumpage (mgd)	1.25	1.6	1.8
Existing Water Plant Capacity (mgd)	1.5	1.5	1.5
Existing Reliable Pumping Capacity (mgd)	2.5	2.5	2.5
Additional Plant Capacity Required (mgd)	**None**	**0.1**	**0.3**
Additional Pumping Capacity Required (gpm)	**None**	**None**	**None**

Notes:
1. Design maximum day pumpage requirements were estimated based on 190% of average day pumpage.
2. The above figures are based on the pumps running 24 hours per day.

\\sehlx\projects\KO\L\Lowell\126268\8-planning\Tables and Figures\[Chapter 5 Storage tables.xlsm]TABLE 6-5

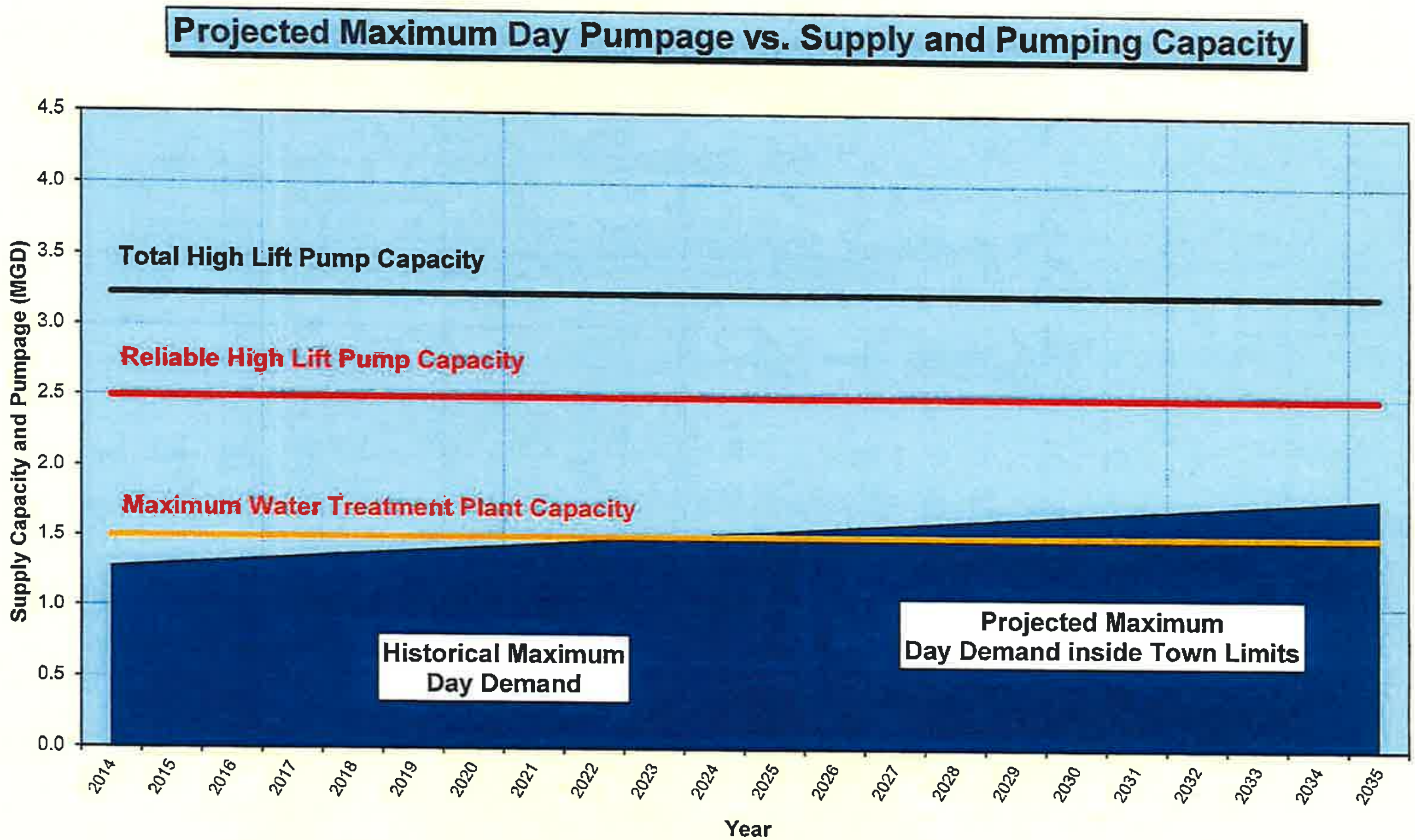

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FIGURE 5-5

Historical & Projected
Maximum Day Pumpage vs. Pumping Capacity

Lowell Public Works

Town of Lowell, Indiana

Oct-14

LOWEL 126268

\\sehlx\projects\KO\L\Lowel\126268\8-planning\Tables and Figures\[Chapter 5 reliable supply graphs.xlsx]FIGURE 6-4

Table 5-6
Reliable Pumping and Plant Capacity Needs with Full Town Buildout
Lowell Water Utility
Town of Lowell, Indiana

	2035 Town Projection	50 Percent Buildout	100 Percent Buildout
Average Day Sales (gpd)	711,000	810,000	1,150,000
Average Day Pumpage (gpd)	950,000	1,080,000	1,530,000
Design Maximum Day Pumpage (mgd)	1.8	2.3	2.9
Existing Water Plant Capacity (mgd)	1.5	1.5	1.5
Existing Reliable Pumping Capacity (mgd)	2.5	2.5	2.5
Additional Plant Capacity Required (mgd)	**0.3**	**0.8**	**1.4**
Additional Pumping Capacity Required (gpm)	**None**	**None**	**260**

Notes:
1. Design maximum day pumpage requirements were estimated based on 190% of average day pumpage.
2. The above figures are based on the pumps running 24 hours per day.

\\sehlx\projects\KO\L\Lowell\126268\8-planning\Tables and Figures\[Chapter 5 Storage tables.xlsm]TABLE 5-6

5.10 General Water Storage Needs

In addition to providing water for fire protection, system storage is used as a "cushion" to equalize fluctuations in customer demands, establish and maintain water system pressures, provide operational flexibility for water pumping facilities, and improve water pumping reliability. The primary criteria used in this study for evaluating storage volume needs includes average and peak demands, water pumping capacities, and fire protection needs.

In general, storage facilities should be adequately sized to provide sufficient quantities of water for fire protection on days of maximum customer demands. Although storage requirements for fire protection are not anticipated to change over the planning period of this study, peak hour demands and reliable pumping capacities will change as the Town grows and improvements are implemented.

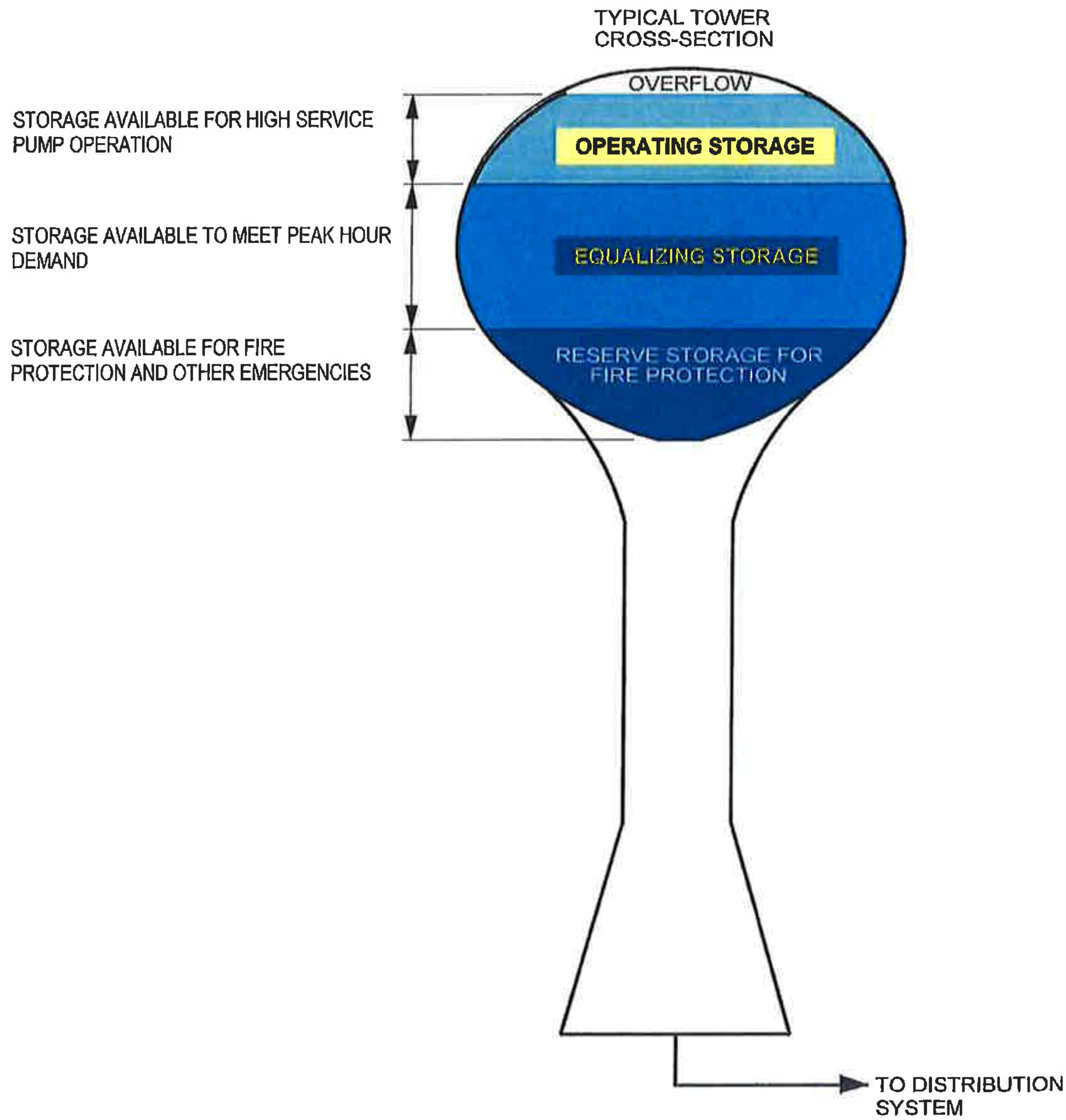
Figure 5-6 illustrates general categories of system storage. As customer demands exceed pumping capacities during peak hour conditions, these excess demands must be met by depleting available storage. The amount of storage depleted is referred to as equalizing storage for peak hour requirements. Storage should also be available for fire protection purposes. To assure a reliable pumping capacity for fire protection, this reserve storage should not be utilized to meet peak hour requirements.

In some instances, it may be desirable to provide additional reserve storage for other purposes. Reserve storage may be needed as a safety factor in emergencies or where customer demands are unpredictable and fluctuate widely. Additional storage may also be desired where the Utility wishes to take advantage of off peak electrical rates for pumping. Additional reserve storage of approximately 10 to 15 percent is usually provided to allow an operating range for well and booster pump operation.

Three primary criteria were used to develop a relationship between pumping capacities and optimum storage volumes for the Town of Lowell:

1. Reliable pumping capacity should at least equal projected maximum day pumpage requirements.
2. Total available storage should be capable of meeting fire protection needs, assuming reliable pumping capacity is just adequate to meet maximum day requirements. A base fire flow of 2,500 gpm for three hours was used for areas containing industrial areas and/or high value commercial properties.
3. Reliable pumping capacity, plus available storage volume, should equal or exceed fire flow requirements plus maximum day requirements.
4. Storage facilities should be able to provide one full day of water supply with the water treatment plant offline.

The concept of Figure 5-6 was applied to each of the reservoirs in the Town, and the results are in Table 5-7. The minimum operating storage level was determined using the minimum average day pressure. The minimum fire protection elevation simply provides 20 psi minimum static head. With the large number of 4-inch water mains, the fire protection delivery issue is more related to the distribution system that the elevated storage, but the total volume for fire protection is shown in Table 5-7.



SEH of Indiana 9200 Calumet Avenue, Suite N300 Munster, IN 46321-2885	**FIGURE 5-6** **Ssytem Storage Requirements** Lowell Water Utility Town of Lowell, Indiana 11/6/2014 LOWEL 126268

\\sehlx\projects\KO\L\Lowell\126268\8-planning\Tables and Figures\[Fig 5-6 from pat.xls]Table 5-7

Table 5-7
Effective Storage Volumes Applied to Lowell's Reservoirs
Lowell Water Utility
Town of Lowell, Indiana

	West Tank	East Tank
Diameter (feet)	36	36
Overflow Elevation (feet MSL)	801.3	806.5
Depth (feet)	30	30
Reported Storage Volume (gal)	200,000	200,000
High Operating Elevation (feet)	801.3	806.5
Low Operating Elevation (feet)	801.3	802.5
Minimum Equalization Storage Elevation (feet)	801.3	801.3
Fire Protection Storage Elevation (feet)	776.5	776.5
Operating and Equalization Storage Volume (gallons)	0	35,000
Fire Protection Storage Volume (gallons)	165,000	165,000
Dead Storage Volume (gallons)	**35,000**	**0**

Notes:

1. Operating Storage is the the storage with the water level at the elevation such that the minimum pressure pressure at any water service is 35 psi during peak hour demands.

2. Fire Protection Storage is the the storage with the water level at the elevation such that the minimum pressure pressure at any water service is 20 psi with a flow of 500 gpm during maximum day demands, minus problem areas with 3 inch or less water mains

3. Dead Storage is the storage that is not useable to the system other than for maintaining pressure in the storage tank

\\sehlx\projects\KO\L\Lowell\126266\8-planning\Tables and Figures\[Chapter 5 Storage tables.xlsm]TABLE 6-5

5.11 Projected Storage Requirements

A critical step in long range planning for the Lowell water distribution system was identifying the future needs of the service area coupled with an assessment of water supply and storage requirements. Water supply and storage needs are closely related. The primary criteria used in determining required supply rates and storage volumes include maximum and peak demands, operational characteristics, and fire protection needs.

Table 5-8 shows the existing and projected storage needs of the system. The existing system contains 365,000 gallons of useful elevated storage plus up to 587,000 gallons of ground storage in the water treatment plant. The West tank, however, is not useful for typical operating pressures, as shown in Table 5-7. The overflow elevation of the West tank, as measured by SEH, is about 801 feet, which was approximately the minimum elevation required to maintain 35 psi in the system. Storage in the clear well in the water treatment plant is available to the system, but is no longer available to the system if the water treatment plant pumping station is not online.

Future storage needs based on population projections are shown in Table 5-8. A major assumption of Table 5-8 for projections in 2025 and 2035 is the East and West Tanks are no longer in service. In order to equalize future projected demands on the maximum day, to provide 2,500 gpm for three hours of fire protection, and to provide one average day supply of water in elevated storage, approximately 950,000 gallons of additional storage is recommended by year 2035, according to population projections.

Future potential storage needs based on Town buildout is shown in Table 5-9. The same information for year 2035 from Table 5-8 is shown together with projections based on 50 percent and 100 percent buildout. Using the same assumptions as Table 5-8, up to approximately 1,530,000 gallons of additional storage may be recommended by year 2035 with 100 percent Town buildout.

Table 5-8
Projected Storage Needs
According to Population Projections
Lowell Water Utility
Town of Lowell, Indiana

Storage Requirements	Actual 2013	Projected 2025	Projected 2035
Storage for One Average Day	**740,000**	**840,000**	**950,000**
Peak Hour Equalizing Requirements (gallons)	160,000	200,000	230,000
Fire Protection Needs (gallons)	450,000	450,000	450,000
Industrial: 2,500 gpm for 3 hours			
Operating Storage (gallons; 15% of Total)	90,000	100,000	100,000
Total Optimum Storage Requirements (gallons)	**700,000**	**750,000**	**780,000**
Greater between Average Day and Optimum	**740,000**	**840,000**	**950,000**
Total Elevated Storage Capacity (gallons):			
West Tank	165,000	0	0
East Tank	200,000	0	0
Total Elevated Storage	**365,000**	**0**	**0**
Additional Recommended Elevated Capacity (gallons) if One Average Day is Desired in Storage	**375,000**	**840,000**	**950,000**

Notes:
1. Peak hour storage is storage required to meet demands which exceed the reliable supply capacity. Future peak hour equalizing storage requirements were calculated assuming the vailable supply is equal to the maximum day demand rate.
2. Projected storage requirements assume the Town pumps into the system at the maximum day rate
3. Projected storage needs assume AWWA Residential diurnal curve with peaking factor of 1.6
4. Both existing tanks are assumed to be removed from service.
5. Reserve storage is storage required to provide a start/stop range for well pump operation and an emergency reserve storage supply.

\\sehlx\projects\KO\L\Lowell\126268\8-planning\Tables and Figures\[Chapter 5 Storage tables.xlsm]TABLE 6-9

Table 5-9
Projected Storage Needs with Full Town Buildout

Lowell Water Utility
Town of Lowell, Indiana

Storage Requirements	**Projected 2035**	**50 Percent Buildout**	**100 Percent Buildout**
Storage for One Average Day	**950,000**	**1,240,000**	**1,530,000**
Peak Hour Equalizing Requirements (gallons)	230,000	300,000	370,000
Fire Protection Needs (gallons)	450,000	450,000	450,000
Industrial: 2,500 gpm for 3 hours			
Operating Storage (gallons; 15% of Total)	100,000	110,000	120,000
Total Optimum Storage Requirements (gallons)	**780,000**	**860,000**	**940,000**
Greater between Average Day and Optimum	**950,000**	**1,240,000**	**1,530,000**
Total Elevated Storage Capacity (gallons):			
West Tank	0	0	0
East Tank	0	0	0
Total Elevated Storage	**0**	**0**	**0**
Additional Recommended Elevated Capacity (gallons) if One Average Day is Desired in Storage	**950,000**	**1,240,000**	**1,530,000**

Notes:

1. Peak hour storage is storage required to meet demands which exceed the reliable supply capacity. Future peak hour equalizing storage requirements were calculated assuming the vailable supply is equal to the maximum day demand rate.
2. Projected storage requirements assume the Town pumps into the system at the maximum day rate
3. Projected storage needs assume AWWA Residential diurnal curve with peaking factor of 1.6
4. Both existing tanks are assumed to be removed from service.
5. Reserve storage is storage required to provide a start/stop range for well pump operation and an emergency reserve storage supply.

\\sehlx\projects\KO\L\Lowell\126268\8-planning\Tables and Figures\[Chapter 5 Storage tables.xlsm]TABLE 6-10

5.12 Summary

This section summarized the findings from an evaluation of the Lowell water system. Major findings from this evaluation include the following:

1. The water model and field calibration indicated that the system does not contain areas with static pressures less than 35 psi or greater than 80 psi, as shown in Figure 5-2.
2. The water model and field calibration indicated that the system contains several areas deficient in fire protection, as shown in Figure 5-3 and Figure 5-4.
3. No additional pumping capacity is recommended at the high lift pumping station at the water treatment plant; although, additional water treatment plant capacity is needed.
4. The hydraulics of the system permit the North booster station to pump up to 1,730 gpm before dropping the suction pressure below 35 psi under typical operating conditions. The system also permits the North booster station to operate at capacity and maintain 20 psi suction pressure during a fire flow event.
5. The lower elevation of the West tank limits the tank's usefulness to the system. The existing valve arrange of the West tank also limits its usefulness.
6. Approximately 950,000 gallons of additional storage is recommended by year 2035 according to population projections with both the West tank and East Tank removed from service, if the overflow elevation of the system is intended to be raised 10 psi (23 feet).

6.0 Recommended Water System Improvements

This section summarizes recommended water system improvements. The following categories of improvements are discussed:

1. Water Treatment Plant Capacity
2. Well Capacity
3. Water System Storage
4. High Lift Pump Improvements
5. Distribution System Improvements
6. System Automation
7. Emergency Backup Power
8. Water Meters
9. Record Keeping
10. Plan Updates

Due to the projected growth planned for the Lowell service area over the planning period, the water distribution system will require improvements to accommodate future service needs and address existing system deficiencies. The remainder of this section discusses the recommended system improvements. Section 7.0 will discuss service outside the Town limits. Section 8.0 will provide a capital improvements plan with cost estimates.

6.1 Water Treatment Plant and Well Capacity

The existing capacity of the water treatment plant is 1.5 mgd. The previous sections indicated the projected maximum day water needs are expected to exceed the capacity of the plant. Table 5-5 indicated that and additional 300,000 gpd (0.3 mgd) plant capacity may be required by 2035 with population projections. Table 5-6 indicated an additional 1.4 mgd may be required with full Town buildout.

While the rated capacity of the existing wells and well pumps are sufficient to meet Lowell's needs, the actual capacities are of concern. According to Lowell staff, the reported capacities of the wells fall short of meeting Lowell's immediate needs. Previous hydrogeologic studies by Hydrophase, Inc. (May 8, 2013) and piezometers installed by Earth Exploration for Lowell indicate that groundwater is available. Subject to further investigation, Lowell should consider installing an additional well(s) to meet its current needs. Because of the cost of maintaining the wells, Lowell should investigate surface water options (local quarries) for supply water. These surface water options may be able to produce water in sufficient quantities and quality to meet Lowell's current and future needs.

6.2 Water Storage Facilities and Static Pressures

SEH recommends constructing a new elevated tank of minimum 1,000,000 gallons and to remove the existing East and West Tanks from service (See Section 5.0). Two locations were considered as potential sites: the south side of Freedom Park near the existing North booster station and a vacant lot at the west end of Apache Lane. SEH recommends Freedom Park as the site for the proposed tank, due to the existing 12-inch main along Cline Avenue and the close proximity of the existing North Pressure Zone booster station.

Figure 5-2 previously showed static pressures in the distribution system under average day demands. In Figure 5-2, several areas in the Town had pressures below 40 psi. Raising the overflow of the system by 23 feet would increase the static pressures of the system by approximately 10 psi across the Town. The proposed static pressures are shown in Figure 6-3 with both existing tanks out of service and a new 1.0 MG elevated tank at Freedom Park (Option 1b below).

6.2.1 Option 1: New 1.0 MG Elevated Tank at Freedom Park

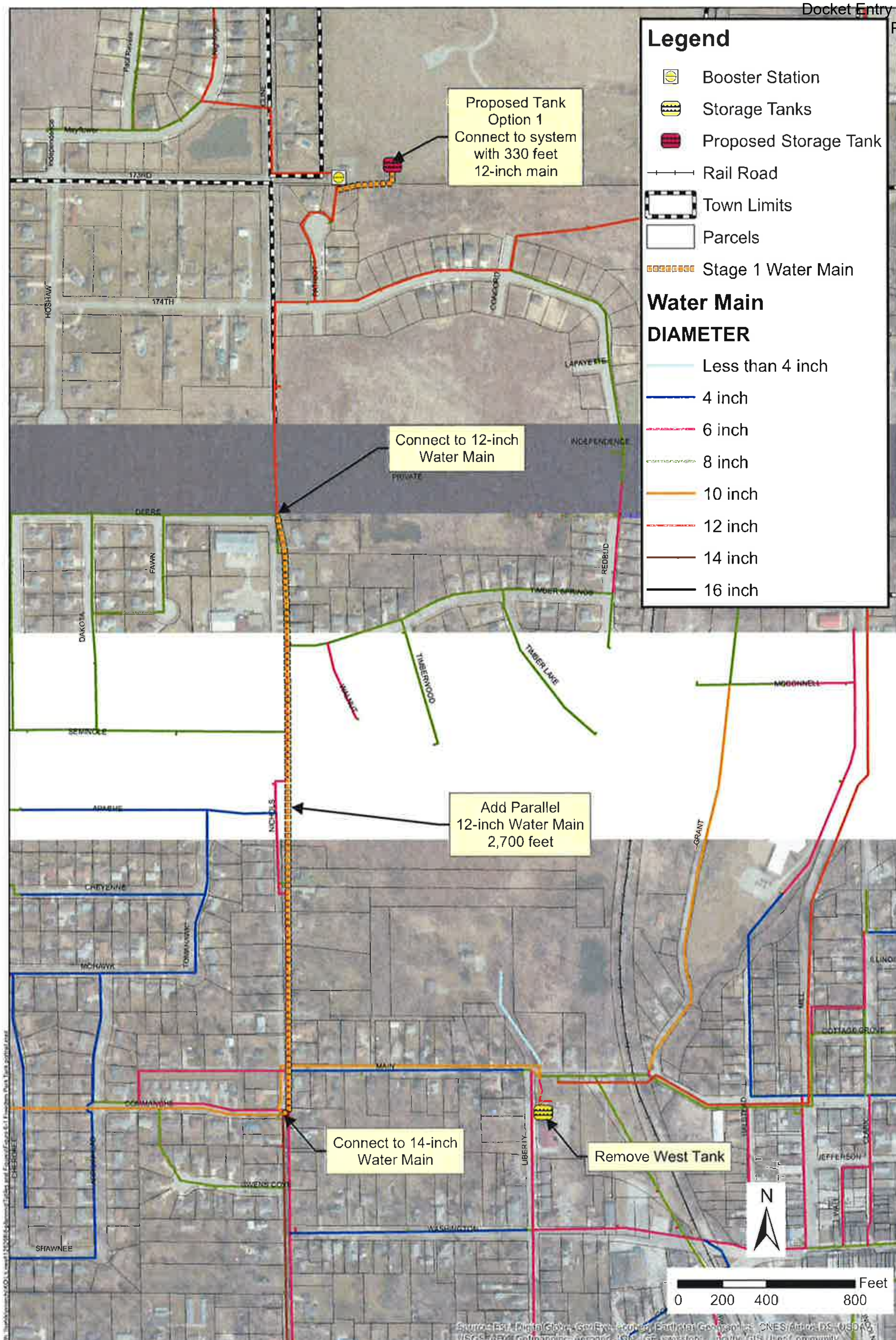
Figure 6-1 shows the proposed 1,000,000 tank at Freedom Park with the proposed water main changes to the system particular to this site. The overflow elevation is raised to 830 feet to increase the static pressure 10 psi throughout the Town. Both the East and West Tanks would also be removed from service. Figure 6-3 shows the new static pressures throughout the Town with the addition of the raised.

A 2,700-foot long 12-inch diameter water main would need to be installed along North Nichols Street between Deere Way and Commanche Drive. This new 12-inch main would provide the proposed tank an adequate transmission main to receive water from the treatment plant and to provide water to the system. If and when the Town decides to move forward with the construction of the 12-inch crossing between West 171st Avenue and West 172nd Avenue, the proposed tank at Freedom Park would have additional transmission capacity from the east side of Town as well.

6.2.2 Option 2: New 1.0 MG Elevated Tank at End of Apache Lane

Figure 6-2 shows the proposed 1,000,000 tank at the end of Apache Lane with the proposed water main changes to the system particular to this site. The overflow elevation is raised to 830 feet to increase the static pressure 10 psi throughout the Town. Both the East and West Tanks would also be removed from service. Figure 6-3 shows the new static pressures throughout the Town with the addition of the raised.

The proposed tank would be connected to the system using a 12-inch water main, which would connect to four 8-inch water mains along Seminole, Apache Lane, Cheyenne Drive, and Tomahawk Trail. In addition to connecting the tank to the system, various segments of 4-inch water main is recommended to be replaced with 8-inch or 12-inch water main, as shown in Figure 6-2. The upgrades in Figure 6-2 would provide the tank with a reliable transmission route from the water treatment plant and to the system, using four 8-inch mains in parallel.



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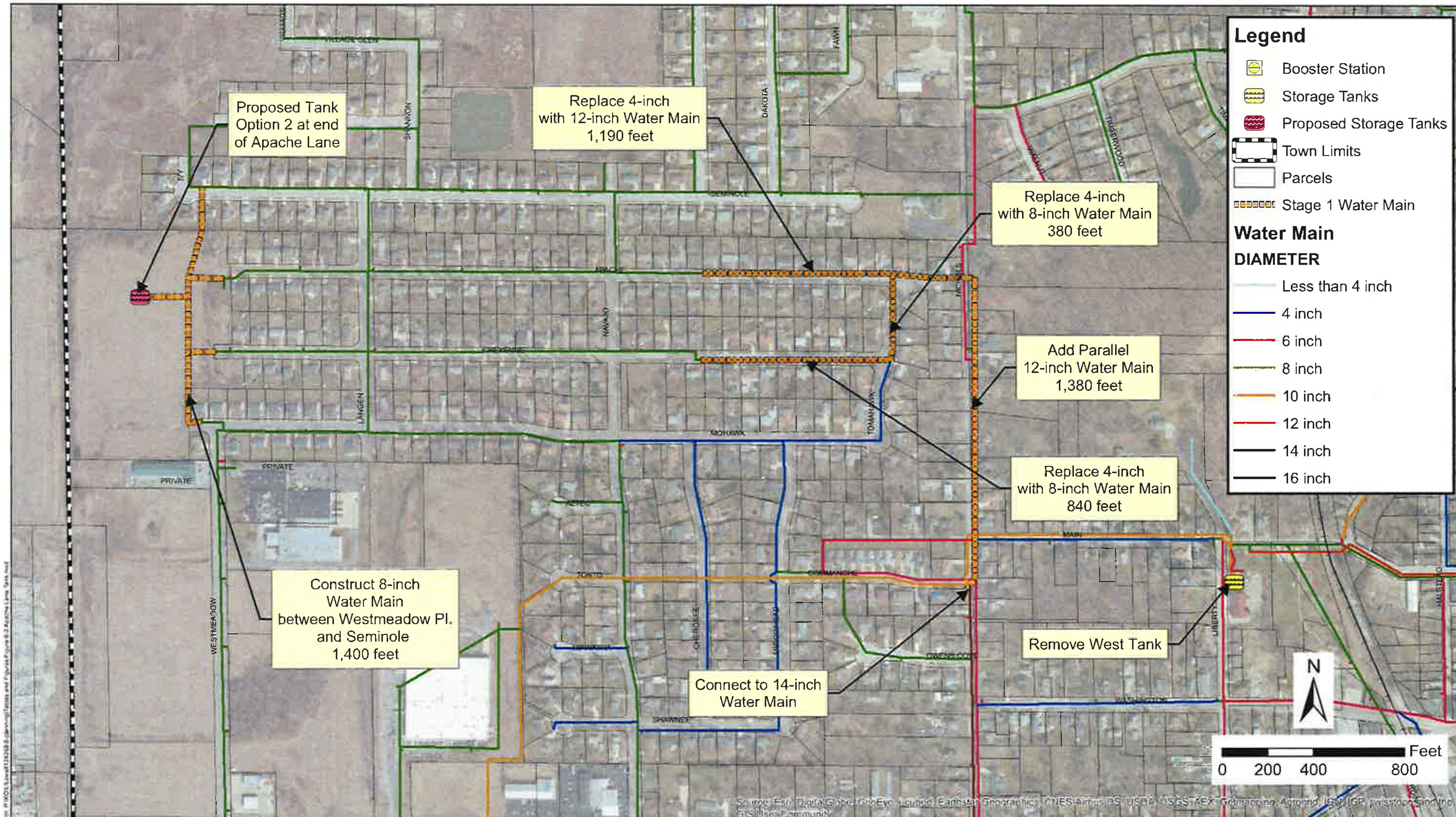
Project: LOWEL 126268
Print Date: 11/6/2014

Map by: jbehnert
Projection: Indiana West (feet)
Source: Town of Lowell

Proposed Water Storage Tank at Freedom Park
Lowell, Indiana

Figure 6-1



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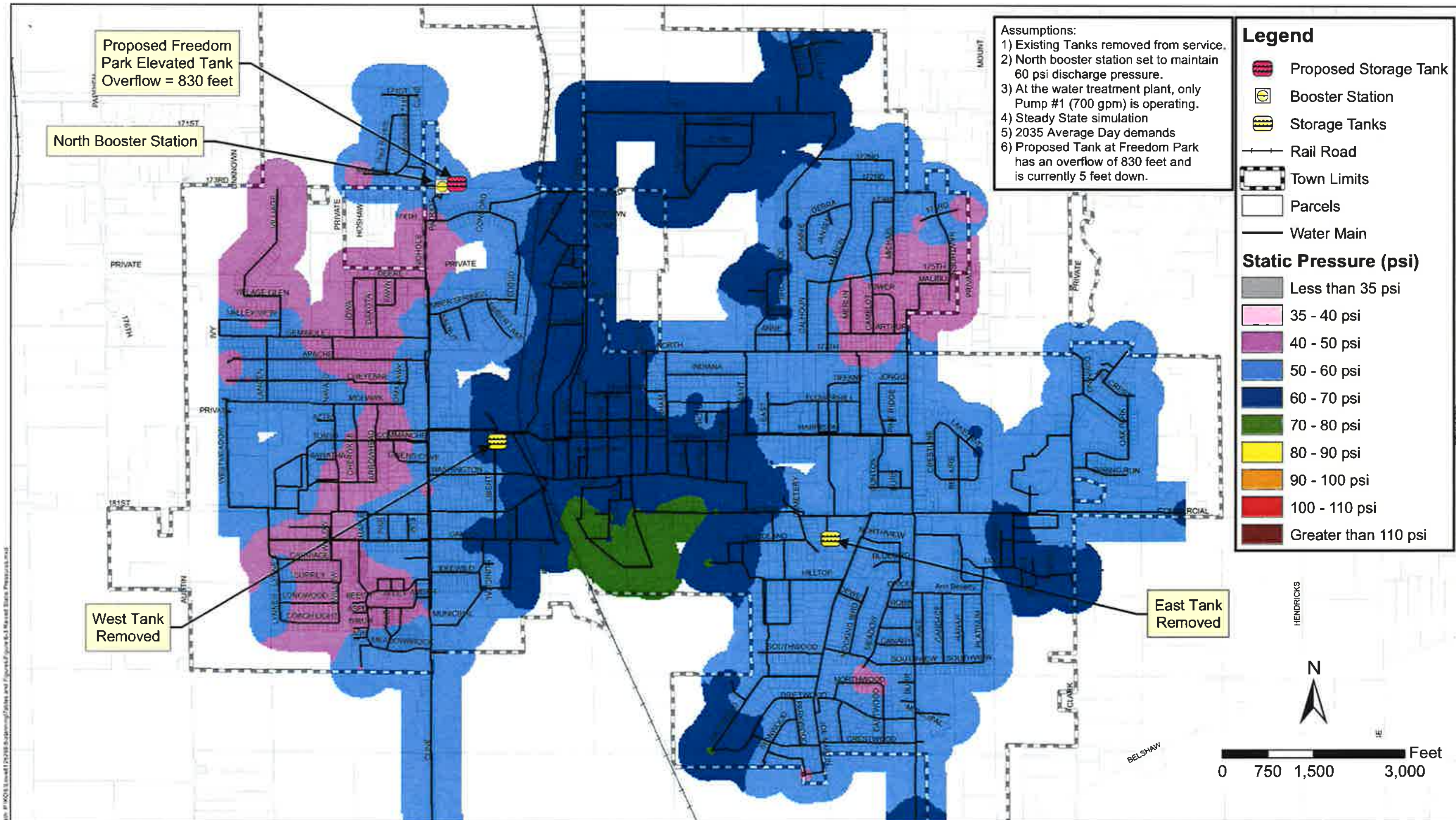
Map by: jbohnert
Projection: Indiana West (feet)
Source: Town of Lowell

Proposed Water Storage Tank at End of Apache Lane
Lowell Water System Master Plan
Lowell, Indiana

Figure 6-2



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Map by: jbohnert
Projection: Indiana West (feet)
Source: Town of Lowell

Static Pressures under 2035 Average Day Demands with Raised Overflow

Lowell Water System Master Plan

Lowell, Indiana

Figure 6-3

6.2.3 Basis of Design: Freedom Park Tank Option 1

SEH recommends Tank Option 1 at Freedom Park. Option 1 provides the tank with an immediate connection to a 12-inch main and provides the opportunity to quickly connect to the east side of Town with the 12-inch crossing between 171st Avenue and 172nd Avenue. The existing booster station at Freedom Park would have access to a nearby storage tank providing high flow capacity with negligible suction pressure losses. Option 1 would, however, require immediate construction of an additional 1,320 feet of 12-inch water along North Nicholas Street between Deere Way and Commanche Drive, besides the 1,380 feet of 12-inch main that both options require.

While Option 2 is worth consideration and could also benefit the system, Option 2 has the disadvantage of being connected to the system through a residential area with only 8-inch mains and having an immediate need to replace 4-inch mains along Apache Lane, Tomahawk Trail, and Cheyenne Drive. The replacement of these 4-inch mains, however, would provide additional fire protection to these areas, and SEH recommends the improvements along Apache Land, Tomahawk Trail, and Cheyenne Drive as part of the general recommendation to replace all 4-inch water mains in the system with 8-inch or larger water mains.

The North Pressure Zone booster station would experience higher suction pressure loss drawing water from Apache Lane than from Freedom Park. At Freedom Park, the water flowing to the booster station would only need to travel one or two hundred feet to the station versus a few thousand feet, and pressure loss is directly proportional to travel distance.

Referring back to the potential 12-inch crossing between 171st Avenue and 172nd Avenue, Tank Option 1 at Freedom Park would have the immediate ability to provide fire protection through a 12-inch main along 171st Avenue and then directly into the northeast part of the town. Tank Option 2 on Apache Lane would have no immediate means to efficiently deliver water to the east side of Town except through a large quantity of 4-inch mains in the central portion of Town.

6.3 Stage 1 Pumping Facility Improvements

The elevated Freedom Park tank was recommended to have an overflow elevation of 830 feet, approximately 24 feet higher than the existing overflow elevation of the system. With the higher overflow and the changes in system hydraulics, the water treatment plant high service pumps would experience a new system head curve and operate differently. The existing pumps would operate at a lower flow rate while overcoming a larger pressure differential. SEH of Indiana recommends the Town improve the pumps to match the proposed system hydraulics. Depending on the pump recommended by vendors, the pump motor may or may not need to be replaced.

6.4 Distribution System Improvements

Lowell's water distribution system needs improvements to address deficiencies in static system pressures and fire flow capacity. Increasing the static pressures can be solved by installing a new, higher elevation storage tank. Increasing fire flow capacities needs to be solved with the addition/replacement of piping. Figure 5-3 previously showed available flows in the distribution system while maintaining 20 psi throughout the distribution system. Replacing selected small diameter mains and connecting or "looping" existing mains will be increase the available fire flow capacities in areas where the improvements are made.

SEH of Indiana recommends distribution system improvements in three stages. Stage 1 comprises the proposed elevated storage tank at Freedom Park and the new 12-inch main along North Nichols Street (Figure 6-1). Stage 2 improvements target key mains in the system that, by replacing, can increase the fire protection in the Town without replacing every small water main (Figure E-1 through E-7 in Appendix E). Stage 3 improvements target the remaining fire flow deficient areas and replace the small water mains with larger mains. SEH of Indiana recommends Stage 1 improvements first, Stage 2 improvements second, and Stage 3 improvements third.

Stage 1 improvements alone will only solve the low static pressures but not the fire flow deficiencies. Stage 2 is recommended soon after Stage 1 to increase fire protection to utilize the tank more effectively. Off the Stage 2 improvements, SEH of Indiana recommends a new 12-inch main along East Main Street, Kankakee Street, and Harrison Street first (Figure E-3).

6.4.1 Increase Fire Protection Along Hawthorn Drive & Michael Drive

Figure 5-3 showed areas around Marion Drive and Hawthorn Drive have weak or deficient fire protection. Immediately to the north of this area (see Figure 5-3) 171st Street has a high amount of available fire protection due to the 12-inch main along 171st Street. Certain water main improvements can significantly increase the fire protection in these areas.

SEH recommends the Town connect this 12-inch main to West 172nd Avenue and Brookwood Drive. SEH also recommends the Town provide an 8-inch loop from the north end of Hawthorn Drive to Michael Drive and a second 8-inch loop from the south end of Sunset Drive to Burr Street. See Figure E-1 and Table E-1 in Appendix E for a map and a cost estimate.

6.4.2 Increase Fire Protection Along W Oakley Avenue & Coach Light Lane

Figure 5-3 showed the areas in the southwest of the Town have weak and deficient fire protection. Available flows in the areas around West Oakley Avenue is limited due to the 4-inch water main along Oakley Avenue and the fact that a single 5,880-foot long 10-inch diameter water main feeds the residential area from the West tank.

SEH recommends the Town replace the existing 4-inch water main with a 12-inch water main along West Oakley Street from Nichols Street to the west dead end. In addition, a new 12-inch water main is recommended to connect the west dead end of Oakley Avenue to Commercial Avenue to the north. A 160-foot long 8-inch diameter water main is recommended to connect the 10-inch main to the 8-inch main along Commercial Avenue. See Figure E-2 and Table E-2 in Appendix E for a map and a cost estimate.

6.4.3 Increase Fire Protection Along Kankakee Street & Harrison Street

Figure 5-3 showed the areas in the central portion of the Town have weak and deficient fire protection. Available flows in the areas around Kankakee and Harrison Streets are limited due to the large quantity of 4-inch and 6-inch water mains in the surrounding streets.

SEH recommends the Town replace the existing 4-inch water mains along East Main Street and Kankakee Street between Mill Street and East Street with 12-inch main; the existing 4-inch and 6-inch mains along Viant Street between Harrison Street and West 177th Avenue with 12-inch main; construct a new parallel 12-inch main along Harrison Street between East Street and Burr Street and remove any remaining 4-inch mains; and construct a new 12-inch main past the public library. A total of 4,920 feet of small water mains would be removed, and a total 8,140 feet water 12-inch water main would be installed. See Figure E-3 and Table E-3 in Appendix E for a map and a cost estimate.

A new 12-inch water main along East Main, Kankakee and Harrison Streets, as shown in Figure E-3, would provide the Town with a reliable transmission main connecting large mains on the west and east sides of Town. Reliable transmission mains increase the performance of the system by connecting water sources and storage tanks to operate with less pressure loss and by increasing the available flow capacity of areas otherwise only connected by smaller service mains.

6.4.4 Increase Fire Protection Along Cherokee Drive & Arrowhead Drive

Figure 5-3 showed the areas in the west-central portion of the Town have weak and deficient fire protection. Available flows in the areas around Cherokee and Arrowhead Drives are limited due to the 4-inch and 6-inch water mains along these streets.

SEH recommends the Town replace the existing 4-inch water mains along Arrowhead Drive between Mohawk Drive and Shawnee Drive with 8-inch main; extend the 4-inch main along Cherokee Drive to Shawnee Drive with 8-inch main; and construct a new parallel 8-inch main along Shawnee Court from the 10-inch main near the old Ashland building to the Navajo Trail. See Figure E-4 and Table E-4 in Appendix E for a map and a cost estimate.

6.4.5 Increase Fire Protection Along Hilltop Court & Southwood Drive

Figure 5-3 showed the areas in the southern-central portion of the Town have weak and deficient fire protection. Available flows in the areas around Hilltop Court and Southwood Drive are limited due to the large quantity of 4-inch and 6-inch water mains in this area of Town.

SEH recommends the Town construct a new 8-inch water main between Gatewood Drive, Southwood Drive, and Hilltop Court to serve as a loop for these streets. See Figure E-5 and Table E-5 in Appendix E for a map and a cost estimate.

6.4.6 Increase Fire Protection Along South Union Street & Lincoln Avenue

Figure 5-3 showed the areas in the south-central portion of the Town have weak and deficient fire protection. Available flows in the areas around Union Street and Lincoln Avenue are limited due to the large quantity of 4-inch and 6-inch water mains in this area of Town.

SEH recommends the Town construct new 8-inch water mains along Union Street and Lincoln Avenue to serve as a loop for these areas. See Figure E-6 and Table E-6 in Appendix E for a map and a cost estimate.

6.4.7 Increase Fire Protection Along Apache Lane

Figure 5-3 showed the areas in the west-central portion of the Town have weak and deficient fire protection. Available flows in the areas around Apache Lane are limited due to the large quantity of 4-inch and 6-inch water mains in this area of Town.

SEH recommends the Town construct new 8-inch and 12-inch water mains along Apache Lane and Cheyenne Drive to provide higher fire flow capacity to these areas. See Figure E-7 and Exhibit E-7 in Appendix E for a map and a cost estimate.

6.5 Stage 3 Distribution System Improvements

Additional improvements are proposed in Appendix E-8 through E-16. These improvements are to increase the fire flow capacity of the system in their general areas. Because these improvements do not play a central role in the performance of the system as a whole, these improvements are considered Stage 3 improvements and should be considered not before Stage 1 and Stage 2 improvements, unless special circumstances deem otherwise. If street repair occurs in any of the areas shown in Appendix E-8 through E-16, then the Town should also perform the related improvements shown in Appendix E-8 through E-16.

6.6 Stage 1 Proposed Available Flows

Figure 6-5 shows the proposed available flows in the system at a minimum pressure of 20 psi with the addition of all proposed Stage 1 distribution system improvements and a new tank at Freedom Park (raised to increase static pressures 10 psi) with its related system improvements. In Figure 6-4, fire flows are weak around the Town due to the small water mains and the removal of central elevated storage tanks. SEH recommends Stage 2 water mains be installed soon after Stage 1 is complete to provide reliable fire protection around the Town.

6.7 Stage 2 Proposed Available Flows

Figure 6-5 shows the proposed available flows in the system at a minimum pressure of 20 psi with the addition of all proposed Stage 1 and Stage 2 distribution system improvements and a new tank at Freedom Park (raised to increase static pressures 10 psi) with its related system improvements. Between Figure 6-4 and Figure 6-5, fire flows increase from Stage 1 to Stage 2.

6.8 Stage 3 Proposed Available Flows

Figure 6-6 shows the proposed available flows in the system at a minimum pressure of 20 psi with the addition of all proposed Stage 1, Stage 2, and Stage 3 distribution system improvements and a new tank at Freedom Park (raised to increase static pressures 10 psi) with its related system improvements. Between Figure 6-5 and Figure 6-6, fire flows increase from Stage 2 to Stage 3.

6.9 Automation of High Lift Pumping Station

The existing water treatment plant high lift pumping station currently operates on a manual controlled basis, based on the operators' reading of the water level in the East Tank. SEH recommends that improvements be made to the high lift pumping station in the water treatment plant so that it can operated automatically according to the water level in the East Tank. Such automation generally consists of a water level transducer for the tank, a panel, electrical service, a radio to the plant, programmable logic controller (PLC) with programming, and a computer operated motor control center (MCC).

SEH recommends variable frequency drive (VFD) motor controller to be installed on the high service pump motors. The VFD motors, along with automated tank monitoring and control, would increase the versatility and reliability of the high service pumping station, as fewer manual controls would be necessary. The VFDs would allow the pumps to operate at various flow rates, rather than the flow rate due to the system pressure alone.

6.10 Automation of Water Treatment Plant

The existing water treatment plant does not have the ability to operate automatically. SEH recommends the Town install equipment to operate the water treatment plant automatically and from a computer. A computer controlled plant has the ability to maintain the plant within set operating parameters and allow the plant to be monitored and operated by the operators remotely over the internet.

6.11 Emergency Power

Emergency power to the water treatment plant is provided by a diesel powered, 300kW generator with an automatic transfer switch that engages the generator when a power interruption is detected. The generator currently does not control backwash room, backwash pumps, or the offices. SEH recommends the backup power generator be connected to these elements of the water treatment plant. In the case of power failure, the backwash pumps would not operate, putting the plant at risk or inoperability.

6.12 Water Treatment Plant Water Meters

SEH recommends the effluent water meter in the water treatment plant be replaced, repaired or recalibrated. The meter itself may be causing some of the unusually high real and apparent losses in the distribution system. The water meter may be reporting water that never existed and be inflating the apparent water needs of the system. Water meters have an important role in a water system, as meters indicate the actual needs of the system. Projections made in this report were based on available information, but SEH believes there is a chance some of the projections (especially unaccounted for water) may be inflated due the inaccurate effluent meter.

6.13 Record Keeping

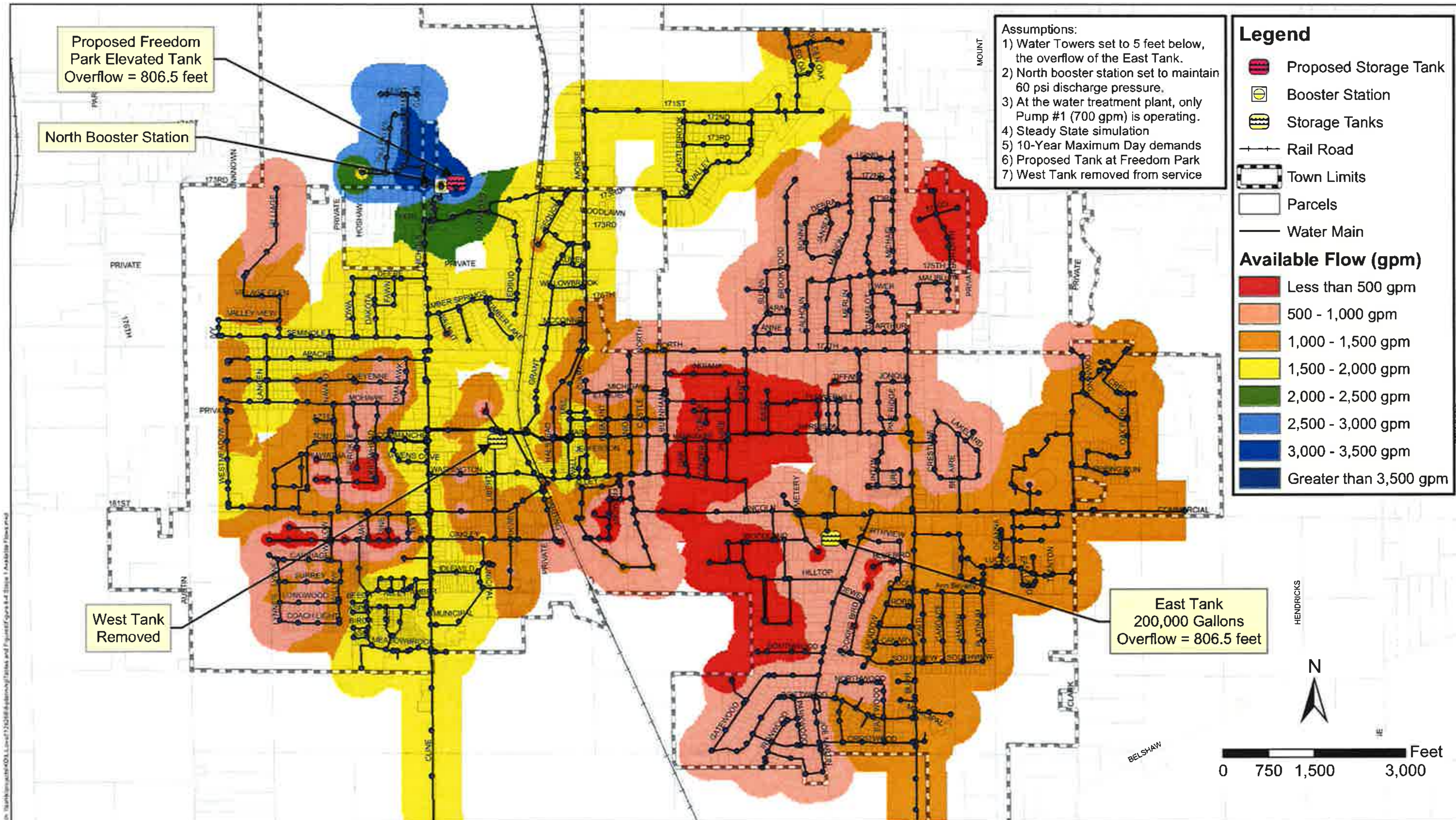
The data gathering portion of this study found that historical data was not readily accessible and sometimes unreliable for use. SEH recommends the Town examine its record keeping of the water plant and water distribution system and decide for itself how the Town could maintain readily accessible and reliable historical data from its system. SEH believes that hand written notes can provide similar benefits as automated computer logged data as long as the hand written notes are well filed and clearly written on standard forms. Hand written notes have the drawback of requiring the labor time to manually read meters, gages, and valves, but have the benefit of a less complicated historical data system.

Accurate historical data is crucial for water planning, as historical data is the basis for future projected needs. Accurate historical data provides the benefit of increasing the confidence in decision making, especially for large, expensive projects like water treatment plant improvements and water storage tanks.

SEH recommends the Town utilize GPS / GIS system for documenting open and closed valves in the system. Some utilities have a GPS unit in the operator's vehicle that the operator use to locate valves and record the status of the valves. This GPS / GIS information could be brought directly into modern GIS programs to quickly update water models and facilitate in trouble shooting the distribution system.

6.14 Plan Updates

This planning document contains the results using best available information as of November 2014. As growth occurs and needs change in the system, the actual needs of the system will certainly deviate from the projections in this plan. As more historical flow and customer data is obtained, the Town will need to review the projections in this plan and revise the projections, if necessary, to prevent the construction of unnecessary, undersized, or oversized facilities and infrastructure. Routine plan updates will help the Town use its limited money efficiently on infrastructure changes.



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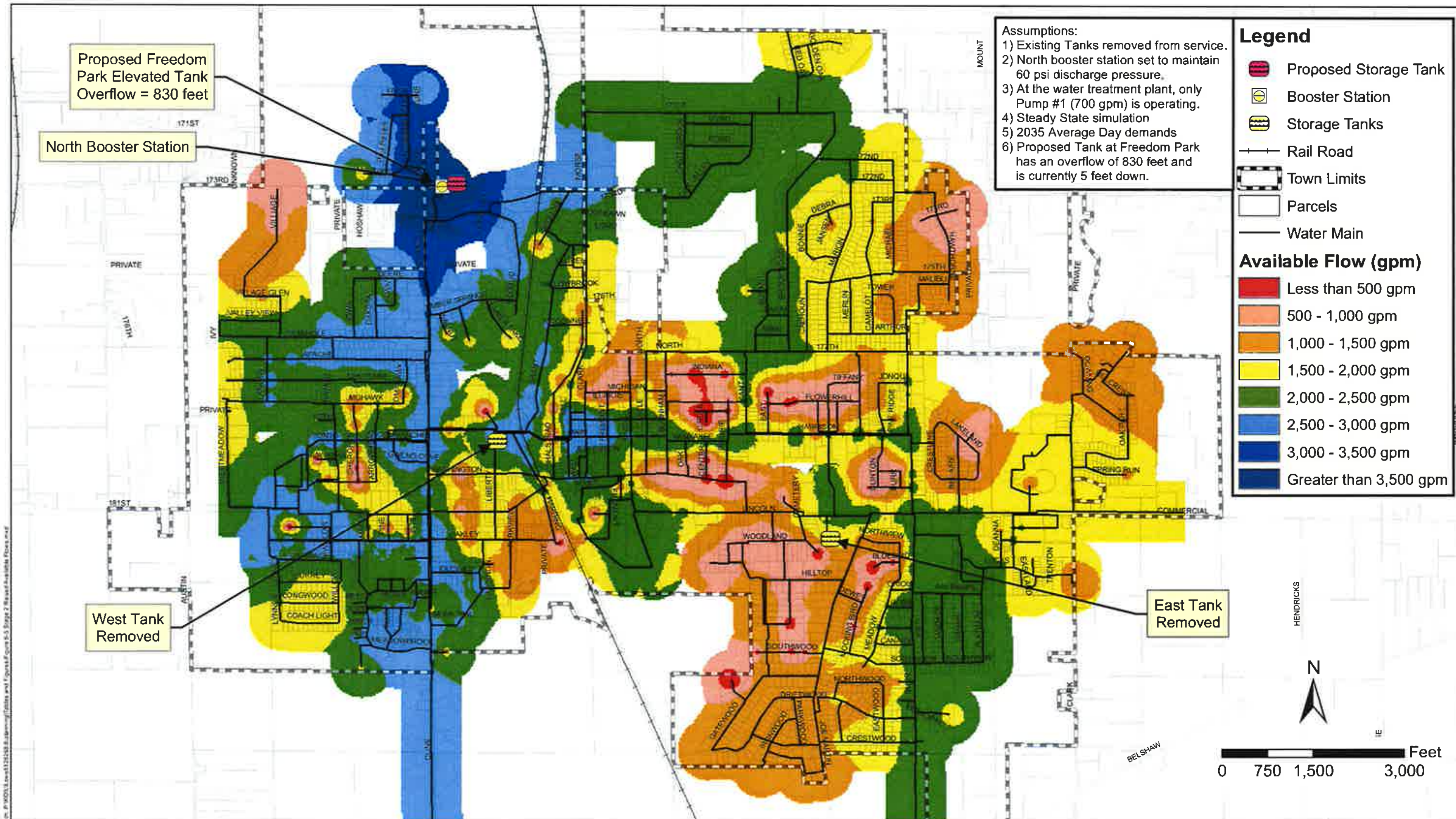
Map by: jbohner
Projection: Indiana West (feet)
Source: Town of Lowell

Stage 1 Available Flows at 20 psi under 2035 Maximum Day Demands

Lowell Water System Master Plan
Lowell, Indiana

Figure 6-4



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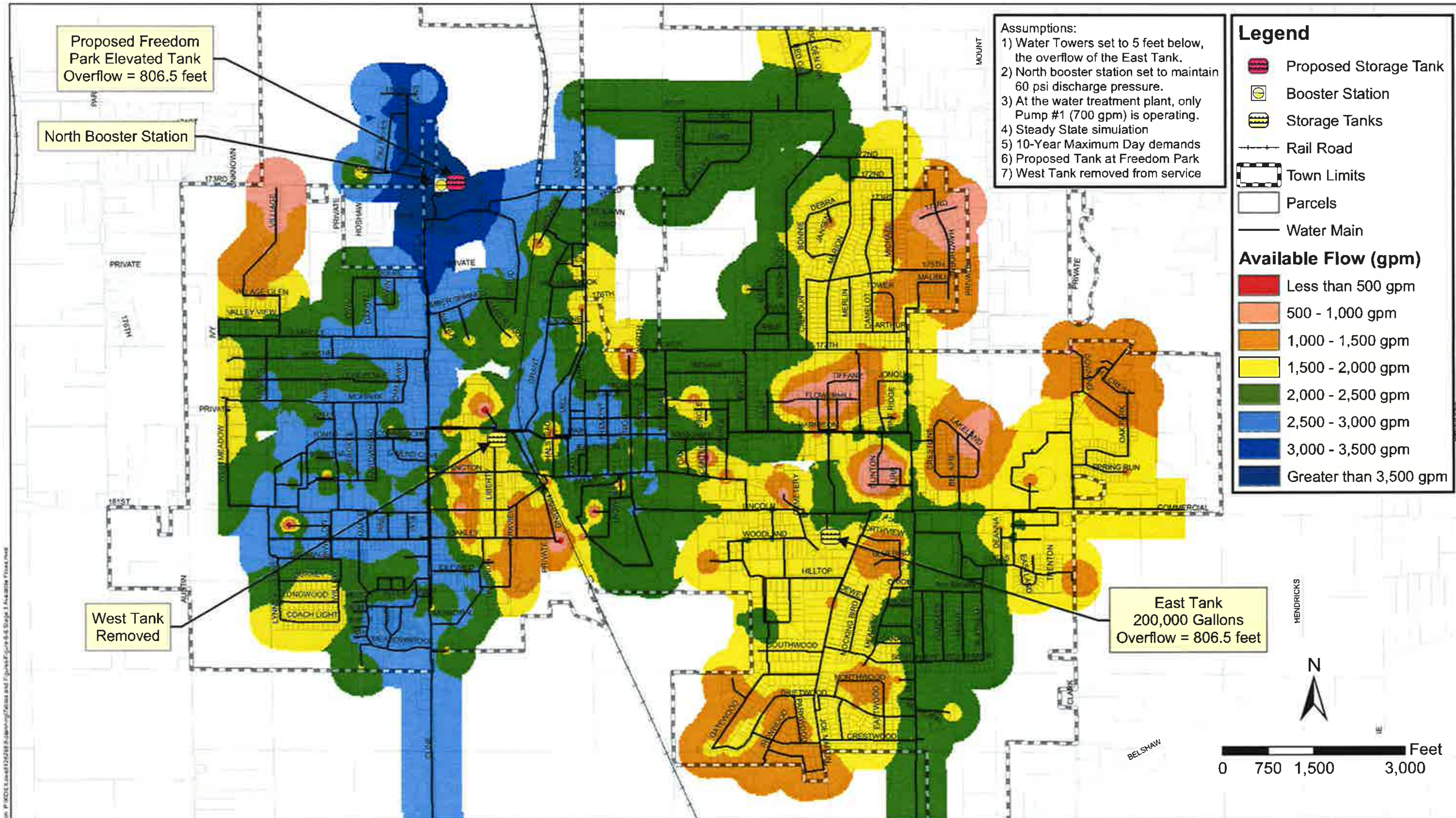
Map by: jbohnen
Projection: Indiana West (feet)
Source: Town of Lowell

Stage 2 Available Flows at 20 psi under 2035 Maximum Day Demands with Raised Overflow

Lowell Water System Master Plan - Lowell, Indiana

Figure 6-5



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Map by: jbohnert
Projection: Indiana West (feet)
Source: Town of Lowell

Stage 3 Available Flows at 20 psi under 2035 Maximum Day Demands

Lowell Water System Master Plan

Lowell, Indiana

Figure 6-6

7.0 Service to Future Service Areas

Using GIS elevation information, the existing elevations of the future service areas provided a basis to determine the ability of the proposed Freedom Park tank to serve the future service areas. Several standard methods were used in this study to project water supply and storage needs based on estimates of population and community growth. This section provides discussion on how the Town may serve the future service areas using the proposed Freedom Park tank and the existing water treatment plant.

7.1 Future Service Area Water Requirements

Past water consumption characteristics were analyzed by reviewing annual pumpage and water sales records for the period from 2004 to 2013 for the Town of Lowell. Average and maximum day water consumption during this period, together with the amount of water sold in each customer category, were analyzed. Projections of future water requirements were based on the results of the consumption analysis in Section 4.0 together with estimates of population and community growth discussed in Section 2.0. See Section 4.0 for projected water requirements.

Table 4-15 in Section 4.0 showed the projected water needs of the future service areas. The total average day demand of the Town in 2035 with Service Area 1 and Service Area 2 was estimated to be 1.9 mgd with a maximum day of 3.5 mgd. Table 4-13 showed that the expected average day demand of just the service areas is 920,000 gpd, or an average of 640 gpm.

Table 7-1 compares the projected water needs in Section 4.0 with the reliable pumping capacity of the high lift pumps and the production capacity of the water treatment plant. To fully serve the Town in 2035 and 100 percent of development in the future service areas, **the water treatment plant will need an estimated 2.0 mgd of additional capacity for a total of 3.5 mgd. The wells will also need a combined capacity of at least 3.5 mgd plus treatment process water.** The high lift pumps will need an estimated 710 gpm of additional pumping capacity, not accounting for the difference in head condition with the increased overflow elevation of the system. The high lift pumps in the water treatment plant would need to be replaced to maintain the existing rate capacity of the high lift pumping station.

7.2 Future Service Area Storage Requirements

Table 5-8 projected the existing system would need up to 950,000 gallons of storage (rounded to one million gallons) by year 2035 according to the population projection. The assumption for the one million gallon tank was that one average day demand would be contained in elevated storage. If only fire protection, plant operation, and equalization storage is desired, then Table 5-8 recommended 780,000 gallon (rounded to 750,000 gallons) elevated storage tank.

Table 7-2 provides the same analysis for the Town with the future service areas and includes the proposed one million gallon elevated tank at Freedom Park. **If the future service areas fully develop, up to 870,000 gallons of additional storage in excess of the proposed one million gallon tank may be needed** if the Town wishes to contain one average day supply in storage. If the Town does not wish to store an average day supply in storage, the new elevated tank at Freedom Park will provide the recommended total elevated storage volume for fire protection, operation, and equalization is approximately one million gallons.

Table 7-1
Reliable Pumping and Plant Capacity Needs
with Town Projections and Full Service Area Buildout
Lowell Water Utility
Town of Lowell, Indiana

	Town with Service Area 1	Town with Service Area 2	Town with Service Areas 1 & 2
Average Day Sales (gpd)	1,010,000	1,030,000	1,402,000
Average Day Pumpage (gpd)	1,350,000	1,380,000	1,870,000
Design Maximum Day Pumpage (mgd)	2.5	2.6	3.5
Existing Water Plant Capacity (mgd)	1.5	1.5	1.5
Existing Reliable Pumping Capacity (mgd)	2.5	2.5	2.5
Additional Plant Capacity Required (mgd)	**1.0**	**1.1**	**2.0**
Additional Pumping Capacity Required (gpm)	**30**	**70**	**710**

Notes:

1. Design maximum day pumpage requirements were estimated based on 190% of average day pumpage.
2. The above figures are based on the pumps running 24 hours per day.

\\sehlx\projects\KO\L\Lowell\126268\8-planning\Tables and Figures\[Chapter 7 Tables.xlsx]TABLE 6-2

Table 7-2
Projected Storage Needs
with Town Projections and Full Service Area Buildout
Lowell Water Utility
Town of Lowell, Indiana

Storage Requirements	Town with Service Area 1	Town with Service Area 2	Town with Service Areas 1 & 2
Storage for One Average Day	**1,350,000**	**1,380,000**	**1,870,000**
Peak Hour Equalizing Requirements (gallons)	320,000	330,000	450,000
Fire Protection Needs (gallons)	450,000	450,000	450,000
Industrial: 2,500 gpm for 3 hours			
Operating Storage (gallons; 15% of Total)	120,000	120,000	140,000
Total Optimum Storage Requirements (gallons)	**890,000**	**900,000**	**1,040,000**
Greater between Average Day and Optimum	**1,350,000**	**1,380,000**	**1,870,000**
Total Storage Capacity (gallons):			
Freedom Park Tank	1,000,000	1,000,000	1,000,000
East Tank	0	0	0
Total	**1,000,000**	**1,000,000**	**1,000,000**
Additional Recommended Elevated Capacity (gallons) if One Average Day is Desired in Storage	**350,000**	**380,000**	**870,000**

Notes:
1. Peak hour storage is storage required to meet demands which exceed the reliable supply capacity. Future peak hour equalizing storage requirements were calculated assuming the vailable supply is equal to the maximum day demand rate.
2. Projected storage requirements assume the Town pumps into the system at the maximum day rate.
3. Projected storage needs assume AWWA Residential diurnal curve with peaking factor of 1.6.
4. The West Tank is assumed to be removed from service.
5. Reserve storage is storage required to provide a start/stop range for well pump operation and an emergency reserve storage supply.

\\sehlx\projects\KO\L\Lowell\126268\8-planning\Tables and Figures\[Chapter 7 Tables.xlsx]TABLE 6-3

The two previous paragraphs revealed a convenient anomaly that occurred within the calculations and projections. Constructing a one million gallon tank today would store one average day supply of the Town through 2035 according to population projections in Table 5-8. The same one million gallon tank would also provide the minimum recommended storage needs for the Town in 2035 with full future service area development, but without the benefit of one full average day supply in elevated storage. An alternative might be constructing a cheaper ground storage tank in the future service areas to provide the average day demand in storage.

7.3 Static Pressures in Future Service Areas

Water system pressure will vary around the future service areas based on differences in topographic elevations as well as supply rates and customer demands. First, areas higher in topographic elevation experience lower static pressures. Second, as customer demands increase, pressures decrease, but only by a relatively small amount in properly sized transmission mains.

The Indiana Administrative Code requires that municipal water systems be designed with a minimum pressure of 35 psi under average daily demands. The Ten States Standards recommends that typical pressures in the service area under normal operating conditions be between 60 psi and 80 psi. Furthermore, Indiana Administrative Code requires the minimum pressure in all service areas of the distribution system not fall below 20 psi during fire flows events during maximum day demands. For the purposes of this study, 80 psi is assumed to be the maximum recommended pressure and 45 psi the minimum acceptable pressure.

Figure 7-1 graphically maps the estimated static pressures under average day demands according to the existing elevations of the future service areas. The static pressure shown in Figure 7-1 is simply the difference between the overflow elevation of the Freedom Park tank (830 feet) and the existing elevation minus an assumed four feet for headloss. Figure 7-1 revealed that the northwestern area of Service Area 2 (in red) would not be serviceable by the main pressure zone. **A second pressure zone in the future service areas would be required.** However, Figure 7-1 is based on elevation alone and future modeling is required as the future service areas develop and water mains are installed.

The second pressure zone would require a booster station to boost the pressure from the main pressure zone to the second pressure zone and an elevated storage tank to meet peak hour, maximum day, fire suppression and operational needs. An alternative the Town may wish to consider is constructing a second water treatment plant to serve the second pressure zone. This would reduce the burden at the existing water treatment plant, provide additional reliability because water could be fed into the main pressure zone from this new plant and eliminate the need for a booster station.

Additionally, while a new elevated tank at Freedom Park will meet fire and operational needs for future service areas outside of the second pressure zone, it will not meet the needs of providing average day demand in storage. SEH recommends a second storage tank be considered in the main pressure zone to provide storage for average day demand in the system where it is needed. This second storage tank would most likely be a ground storage tank. Ground storage tanks are less expensive than elevated but require a pumping station to introduce water into the system.

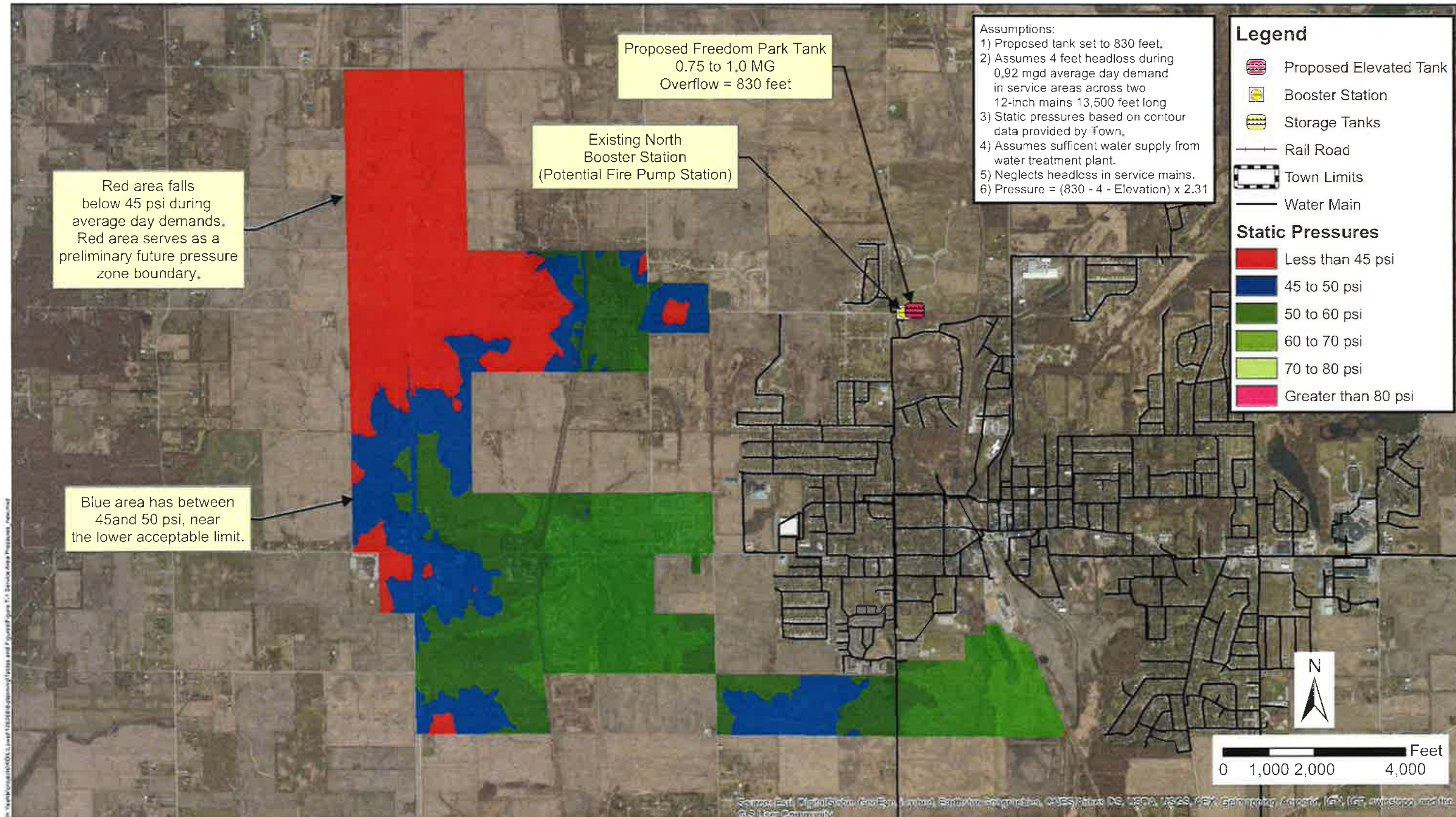
Water mains would be sized and constructed to meet the needs and schedules of the new development. Refined modeling and engineering designs would have to be developed once new development occurs.

7.4 Fire Protection in Future Service Areas

Fire protection in the second pressure zone would be accomplished from a new elevated storage tank. If a new water treatment plant is constructed, it could be accomplished by a combination of plant storage and elevated storage.

Fire protection for future service areas outside of the second pressure zone would be supplied by the new elevated tank at Freedom Park. Depending upon the schedule and direction of development, booster pumps may have to be utilized to boost the pressure in the area during fire flows. During fire flow situations, the pressure losses in transmission mains become substantial compared to the shorter length and looped mains within the Town itself. The answer to the problem is not simply a larger water main, as a large water main would cause the problem of water stagnation within the main itself.

SEH recommends minimum 12-inch transmission mains be installed to serve the future service areas. Smaller mains can be utilized to distribute the water to areas of need. Emergency booster station(s) will most likely be required during fire situations to push the fire flow through the transmission mains while maintaining a minimum 20 psi pressure. Section 7.3 contemplates a potential second storage tank to provide additional storage needs and fire protection for the future service areas. This tank would eliminate the need for the emergency booster station(s).



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Project: LOWEL 126268
Print Date: 11/7/2014

Static Pressures in Future Service Areas with Freedom Park Tank

Lowell Water System Master Plan

Lowell, Indiana

Figure 7-1

Cause No. 45550
Docket Entry Request No. 4
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7.5 Summary

This section provided recommendations for the Town to serve the future areas growth occurs over time. SEH of Indiana made the following conclusions in this chapter:

1) With the addition of the proposed elevated tank at Freedom Park, the Main Pressure Zone can to provide adequate static pressure a portion of the future service areas, shown in Figure 7-1.

2) Generally speaking, Future Service Areas north of 173rd Avenue would be served through a second pressure zone.

3) Because the required pipe length is thousands of feet to reach the future service areas, 16-inch main is not recommended due to water stagnation in the 16-inch mains.

4) Because the required pipe length is thousands of feet to reach the future service areas, 12-inch water mains do not provide enough capacity to sustain a 2,500 gpm fire flow during the projected maximum day demand without the pressure being boosted.

5) A second tank is recommended to serve customers in the developed future service areas.

8.0 Capital Improvements Plan

This section summarizes the recommended water system improvements and presents a proposed Water Utility Capital Improvements Plan. The recommended Capital Improvements Plan prioritizes system improvements and provides a schedule for the timing of construction. Budget cost estimates for each improvement are also summarized.

8.1 Improvements within Existing System

This section summarizes the recommended water system improvements in Section 6.0 and presents a proposed Water Utility capital improvements program. The recommended Capital Improvements Plan prioritizes system improvements and provides a schedule for the timing of construction. Budget cost estimates for each improvement are also summarized in Table 8-1 and Table 8-2. Stage 1 improvements are summarized in Appendix G and Stage 2 improvements are summarized in Appendix E.

1. Water Treatment Plant Capacity
2. Well Capacity
3. Water System Storage
4. High Lift Pump Improvements
5. Distribution System Improvements
6. System Automation
7. Emergency Backup Power
8. Water Meters
9. Record Keeping
10. Plan Updates

8.2 Water Treatment Plant Capacity

With future growth, the capacity of the water treatment plant is expected to be exceeded. Table 5-5 showed that an additional 0.3 mgd would be required from the plant in 2035 according to population growth projections. In Table 5-6, with full Town buildout, an additional 1.4 mgd would be required. In Table 7-1, with full service area buildout in 2035, an additional 2.0 mgd would be required.

SEH recommends the Town review the assumptions of this report every five years. If development continues as projected in this report, SEH recommends the plant capacity be increased or a second water source be provided.

8.3 Well Capacity

To increase the plant's water source capacity, additional well(s) would be required. Discussions with the Town indicated a new shallow well is desired in the near future. Figure 8-1 shows the preliminary location of the future well. A complete well site investigation would be required, however, in order to validate the location in Figure 8-1. Installation costs for a new shallow well are on the order of $280,000.

8.4 Water System Storage

To increase system pressures and to provide adequate fire protection to the Town, Table 5-8 showed that a new 1.0 mg tank would be required with a raised overflow elevation. The existing elevated tanks would be removed from service, with the West tank demolished and the East tank kept on stand-by. The location of the proposed tank was shown in Figure 6-1. Estimated installation costs for a new 1.0 MG elevated, watersphere and necessary appurtenances is $3.46M.

Table 8-1
Capital Improvements Summary

System Improvements - Facilities	Budget Estimate
Stage 1 Improvements	
1.0 MG Water Tower at Freedom Park with Site Work	$3,420,000
Treatment Plant Pump Upgrades	$200,000
New 12-inch Along North Nichols Street	$650,000
New Shallow Well (40 to 50 feet deep in sand, not through bedrock)	$250,000
Total	**$4,500,000**
Stage 2 Improvements	
E-1 Hawthorn and Michael	*$890,000*
E-2 Oakley	*$1,160,000*
E-3 Kankakee	*$2,810,000*
E-4 Cherokee	*$690,000*
E-5 Hilltop Court	*$370,000*
E-6 Freemont	*$1,140,000*
E-7 Apache	*$850,000*
Total	**$7,910,000**
Total for Stage 1 and Stage 2 Improvements	**$12,410,000**

Note:
1. All costs are reported in 2014 dollars.

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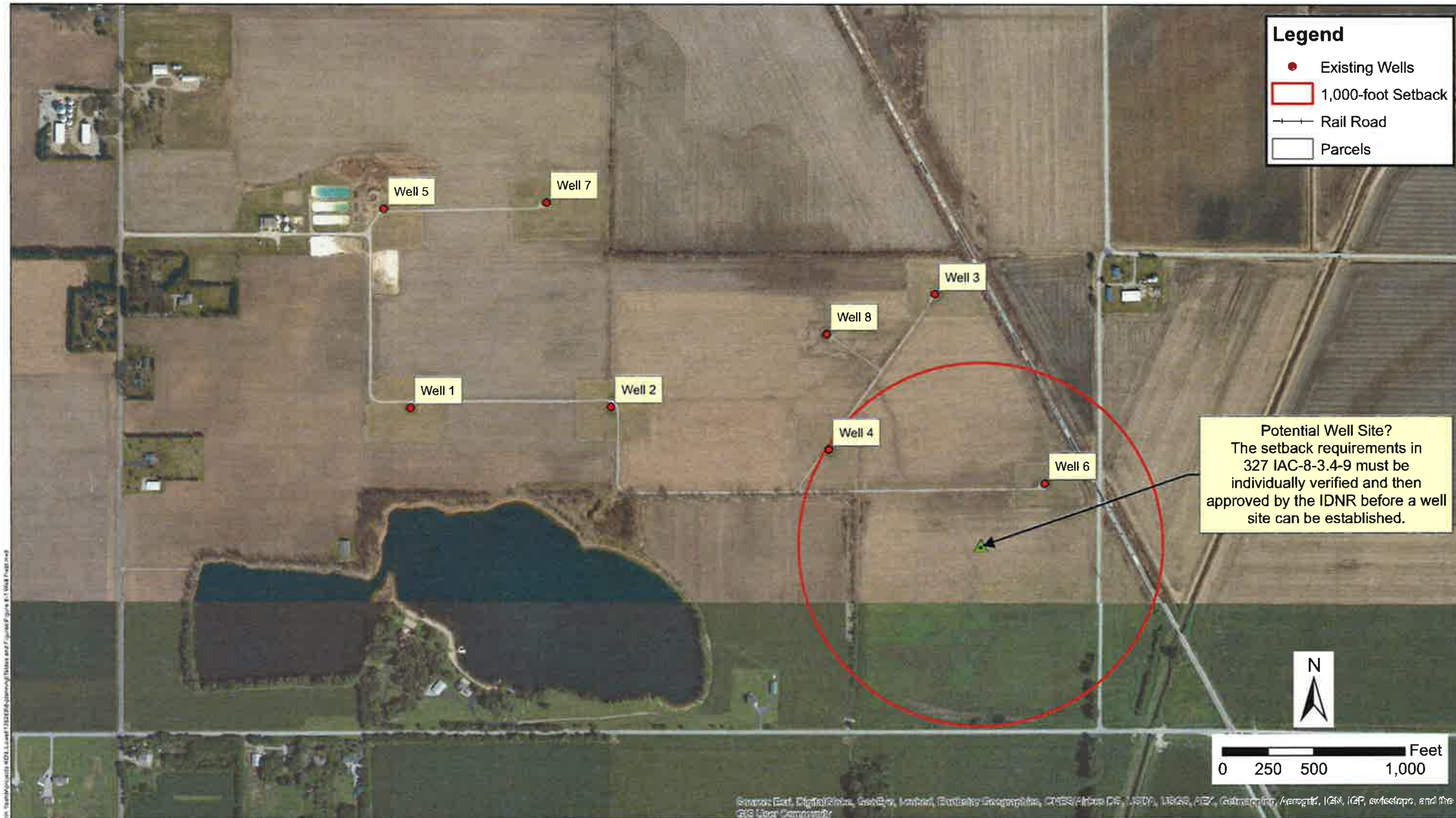

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Project: LOWEL 126268
Print Date: 12/3/2014

Map by: jbohnert
Projection: Indiana West (feet)
Source: Town of Lowell

Future Well Location

Lowell Water System Master Plan
Lowell, Indiana

Figure 8-1

Cause No. 45550
Docket Entry Request No. 4
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8.5 High Lift Pump Improvements

With the raised elevated storage tank at Freedom Park in Figure 6-1, the system would have a new pressure condition. In order for the high lift pumps in the water treatment plant to maintain the rated capacity, the motors and pumps would need to be replaced or improved to provide the same flow with the new higher pressure. Budgetary costs for pump and motor replacements with variable frequency drives are on the order of $200,000 as shown in Table 8-1.

Variable frequency drives (VFDs) are recommended in order to maximum the reliability and efficiency of the high lift pumps. VFDs allow the motors to turn the pumps along a range of speeds, allowing the pumps to be flexible in their flow versus pressure curves. This allows the operators to determine what flow rate the pumps operate at rather than the pressure condition of the system.

8.6 Distribution System Improvements

A series of distribution system improvements were recommended in Section 6.0. Stage 1 distribution system improvements (Appendix G) were directly related to the new tank at Freedom Park. Stage 2 improvements (Appendix E) were to provide the Town with improved fire protection with the new tank located far to the Northwest. Stage 3 improvements are necessary to resolve local fire protection deficiencies around the Town.

The distribution system improvements are individually shown summarized in Appendix E and summarized in Table 8-2. Table 8-2 shows the recommended order in which the distribution system improvements occur, along with the storage and water treatment plan improvements. SEH associates a proposed year to each set of improvements in order to help the Town plan year by year budget needs.

8.7 System Automation

With the proposed elevated tank at Freedom Park and the improvements to the high lift pumps in the water treatment plant, SEH recommends the Town implement automated controls to its distribution system. A water level measuring device would be installed with the new tank, and SCADA controls would be provided with the high lift pump improvements. The SCADA would automatically control the high lift pump relative to the level in the elevated tank. Field monitoring equipment, SCADA hardware, programming, and telemetry costs are typically on the order of $5,000 to $20,000, depending on the improvements provided. Additional comments on the automation of the system is in Section 6.0.

8.8 Emergency Power

Emergency power to the water treatment plant is provided by a generator that is engaged when a power interruption is detected. The generator currently does not control backwash room, backwash pumps, or the offices. SEH recommends the backup power generator be connected to these elements of the water treatment plant. In the case of power failure, the backwash pumps would not operate, putting the plant at risk or inoperability. SEH expects these costs to be minor compared to other improvements in the distribution system. An electrical contractor would provide an estimate to the Town as the Town decides to move forward with this improvement.

Table 8-2
Recommended Capital Improvements Plan

Improvements	Year	Budget Estimate
Short Term (2015-2019)		
Stage 1 Improvements		
1.0 MG Water Tower at Freedom Park with Site Work	2015	$3,420,000
Treatment Plant Pump Upgrades	2015	$200,000
New 12-inch Along North Nichols Street with Street Work	2015	$650,000
New Shallow Well (40 to 50 feet deep in sand, not through bedroc	2015	$250,000
Stage 2 Improvements		
E-3 Harrison between East Street and Burr Street	2015	$700,000
E-3 Harrison/Kankakee/Main between East Street and Mill Street	2015	$1,360,000
E-1 Brookwood extension to 171st and 172nd	2016	$560,000
E-7 Apache from Tomahawk to existing Main	2016	$300,000
E-4 Connect Existing Crossing Pipes	2017	$30,000
E-5 Southview from Joe Martin to existing Main	2017	$100,000
E-5 New Main between Gatewood and Hilltop	2018	$270,000
E-2 Commercial between Willow and Navajo	2018	$60,000
E-3 Viant Street between Harrison Street and 177th Ave.	2019	$500,000
E-3 New Main between Harrison Street and Public Library	2019	$250,000
Total Short Term Costs (2015-2019)		**$8,650,000**
Intermediate-Term Improvements (2020-2024)		
Stage 2 Improvements		
E-2 Oakley between Nichols Ave and West End of Road	2020	$850,000
E-7 Apache between Nichols and Tomahawk	2020	$130,000
E-4 Shawnee between Navajo and Existing 10-inch Main	2021	$150,000
E-6 Lincoln from Union to East of Powell Ditch	2021	$450,000
E-6 Union from Lincoln to Commerical	2021	$200,000
E-7 Tomahawk from Apache to Cheyenne	2022	$130,000
E-1 Unimproved 173rd Ave. between Hawthorn and Michael	2022	$150,000
E-4 Cherokee from Shawnee to existing main and main connectio	2023	$100,000
E-7 Cheyenne from Tomahawk to 8-inch Main	2023	$290,000
E-1 Burr St./Sunset Dr. between Arthur Ct. and Malibu Dr.	2024	$180,000
E-4 Arrowhead between Mohawk and Shawnee	2024	$440,000
Total Intermediate Term Costs (2020-2024)		**$3,070,000**
Long-Term Improvements (2025-2035)		
Stage 2 Improvements		
E-6 Franklin from Fremont to Union	2025	$140,000
E-6 Fremont from Franklin to Oakley	2026	$220,000
E-6 Oakley from Fremont to Cedar Creek	2027	$130,000
E-2 From Carriage Dr. to Commercial Ave.	Before Service Areas	$250,000
Stage 3 Improvements	To Be Determined	Varies
E-8 Improvements Along Highway 2		
E-9 Improvements Around Cottage Grove		
E-10 Improvements Around Indiana Street		
E-11 Improvements Along East Street		
E-12 Improvements Around Michigan Street		
E-13 Improvements Around Cherokee Drive		
E-14 Improvements Around Pine Street		
E-15 Improvements Around Southwood Drive		
E-16 Improvements Around Hickory Plaza		
Future Distribution System Expansion		
Service Area 1	Unknown	Unknown
Service Area 2	After Service Area 1	Unknown

Notes:
1. All costs are reported in 2014 dollars.

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8.9 Water Treatment Plant Water Meters

SEH recommends the effluent water meter in the water treatment plant be replaced, repaired or recalibrated. New meters typically cost $3,000 to $8,000 each, depending on the accuracy and features, and recalibration is typically a fraction of the capital cost. Town personnel are suspicious that the meter may be too close to pipe bends and are causing the meter to misread the flow. If this is the case, a new meter vault would be necessary to house a new, relocated meter. The cost of installing a new flow meter in a vault could be upwards of $55,000. Section 6.0 provided discussion on the purpose for the recommendation.

8.10 Record Keeping

Section 6.0 provided discussion for SEH of Indiana's recommendation on record keeping. Record keeping does have costs associated with it: human-hours if performed manually and capital costs if performed automatically.

SEH recommends record keeping be an aspect of future SCADA improvements. Compute controlled record keeping is highly reliable and well-documented in computer databases, allowing the Town to view historical data as far back as the memory of the computer allows.

Record keeping may be performed manually, and manual record keeping is still performed by many utilities. Manual record keeping has the advantage of imbedded daily inspections of equipment as the operators gather data, but has the drawbacks of potential human error and no-data records on vacation days and holidays.

8.11 Plan Updates

This planning document contains the results using best available information as of November 2014. As growth occurs and needs change in the system, the actual needs of the system will certainly deviate from the projections in this plan. As more historical flow and customer data is obtained, the Town will need to review the projections in this plan and revise the projections, if necessary, to prevent the construction of unnecessary, undersized, or oversized facilities and infrastructure. Routine plan updates will help the Town use its limited money efficiently on infrastructure changes.

SEH recommends the Town budget annually to provide for routine water master plan updates every five to ten years.

8.12 Future Service Areas

This section summarizes the recommended water system improvements in Section 7.0 and presents a proposed Water Utility capital improvements program for each service area. The development and needs of the future service areas is completely dependent on future growth.

Section 7.0 provided general recommendations for the Future Service Areas. Transmission mains of at least 12-inches in diameter should be constructed along major corridors identified in the Town's Thoroughfare Plan. Designs and estimated costs of improvements in Future Service Areas are dependent upon the locations of development and development schedules. Developments driving the extension of utilities typically pay for the extensions with municipalities paying upsize costs.

8.13 Summary

This section provided recommendations on improvements to the water distribution system to help the Town plan financially for future growth. Table 8-1 and Table 8-2 provide a summary of budgetary costs provided by this study.

Appendix A

Glossary of Terms

Glossary of Terms

Aquifer:	A saturated geological formation capable of transmitting significant quantities of water under normal hydraulic gradients.
Average Day Demand:	The average quantity of daily water usage in a municipal water system.
Drawdown:	The difference between the pumping water level and static water level in a well (usually expressed as feet at a specific flow rate).
Elevated Storage:	A facility for storing water supplies above ground level at a specific elevation
Flow Capacity:	The maximum flow rate that can be supplied by a water distribution system at a specified location and residual pressure (usually expressed as gallons per minute).
Formation:	A geological soil and rock profile.
Groundwater Level (or Water Table):	The highest elevation of fully saturated soil in a geological formation.
Groundwater Depletion:	The removal of water supplies from a groundwater system.
Groundwater Recharge:	The entry of water into the saturated zone of a geological formation, together with the associated flow away from the water table.
Hydraulic Gradient:	The unconfined change in water surface elevation with respect to horizontal distance for a sloping water surface.
Hydrology:	Study of the physical behavior of water from its occurrence as precipitation to its entry into streams, lakes and reservoirs, and its return to the atmosphere.
Maximum Day Demand:	The highest quantity of daily water usage in a municipal water system.
Maximum Day Ratio:	The ratio of maximum day to average pumpage (usually expressed as a percentage).
Peak Hour Demand:	The daily rate of water usage during the hour of greatest water demand on a maximum usage day.
Peak Hour Demand Ratio:	The ratio of peak hour pumpage (expressed as a daily rate) to average day pumpage (usually expressed as a percentage).
Pipe Roughness Coefficient:	A coefficient (generally assumed to be constant) which describes the energy loss due to friction that will occur as water flows through a section of piping.
Pumping Water Level:	The water level in a well while it is being pumped (usually measured from ground surface or top of well casing).
Reliable Supply Capacity:	The pumping capacity of a water supply facility with the largest pumping unit out of service.

Glossary of Terms (Continued)

Residual Pressure:	Pressure at a specified location in the water distribution system when water is being removed or flowed.
Specific Capacity:	The specific capacity of a well is the yield per unit of drawdown (usually expressed as gallons per minutes per foot of drawdown).
Static Pressure:	Normal pressure at a specified location in the water distribution system when no water is being removed or flowed.
Static Water Level:	The water level in a well when no water is being taken from the aquifer either by pumping or free flow (usually measured from ground surface or top of well casing).
Time-of-day Demand Curve:	A curve which describes changes in the quantities of water used by customers at different times of the day.
Total Dynamic Head:	The total energy that a pump must overcome to deliver a given flow rate including suction lift, discharge, and friction loses (usually expressed in feet of water).
Transmissivity:	The rate at which is transmitted through a unit width of the aquifer under a unit gradient. Expressed as gallons per day per foot (gpd/ft).
Ultimate Service Area:	The area which is expected to develop in the future and require municipal utility services.
Unaccounted-For Water:	The difference between the total volume of water pumped and the volume of water sold (expressed as gallons or as a percentage of total pumpage).
Water Demand:	The amount of water required by a water user or users at a specific point or area within a water distribution system.
Water Distribution Main:	A water main which primarily extends water services and fire protection to an area.
Water Distribution System:	A facility usually consisting of a network of piping which is designed to distribute water from a given water supply to specific water users.
Water Supply System:	Facilities designed to collect and furnish a controlled supply of water for consumption or other water needs.
Water Transmission Main:	A large water main (generally 10-inch or larger) which is used to convey water between a water system's supply/storage facilities and service area.

Appendix B

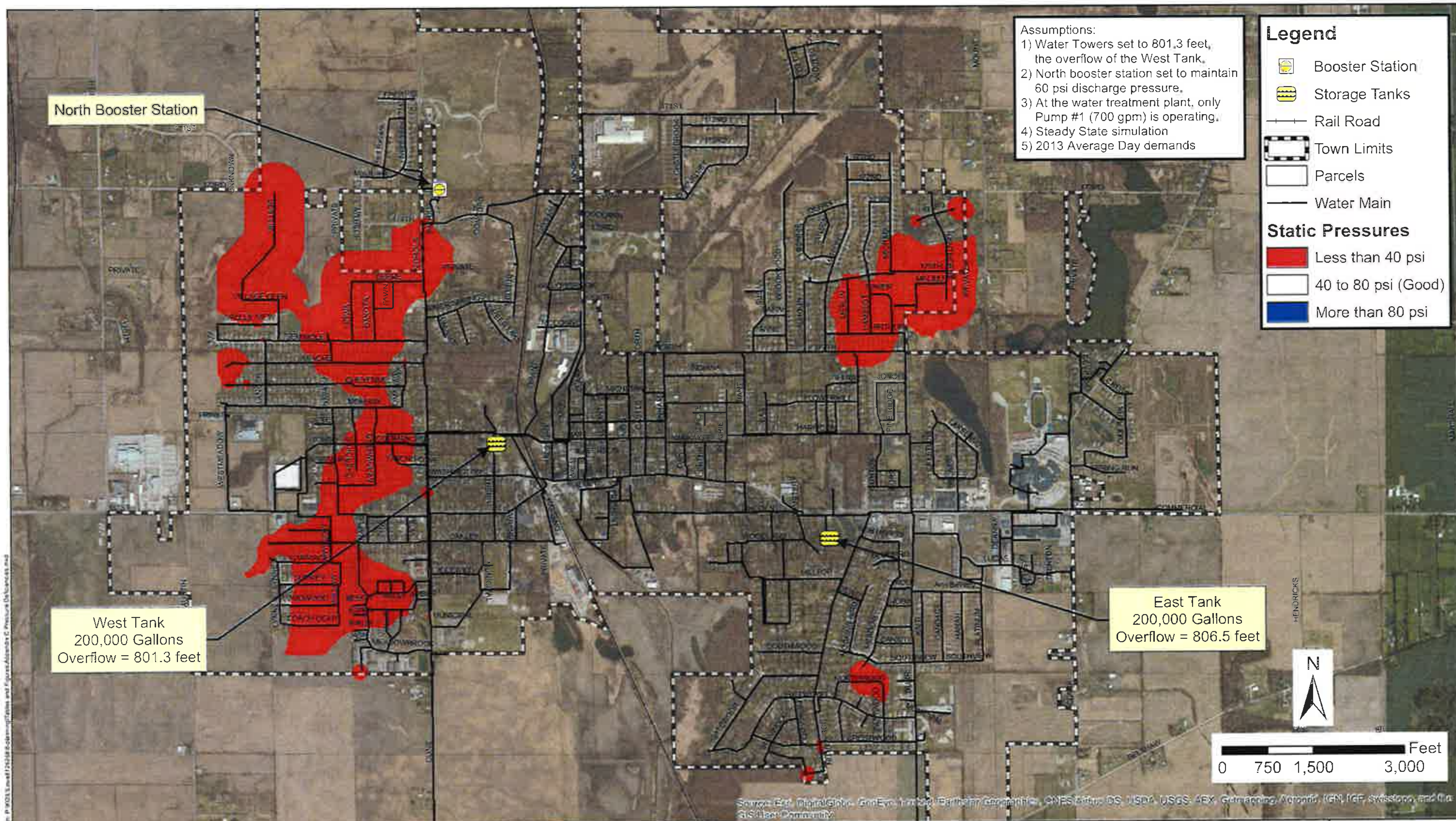
List of Abbreviations

List of Abbreviations

ASR	Aquifer Storage and Recovery
CTH	County Trunk Highway
est.	Estimate
ft.	Feet
fps	Feet per Second
gal	Gallon
gpcd	Gallons per Capita per Day
gpm	Gallons per Minute
gpm/ft	Gallons per Minute per Foot
HGL	Hydraulic Grade Line
Hp	Horsepower
in.	Inch
ISO	Insurance Services Office
MG	Million Gallons
mgd	Million Gallons per Day
MGY	Million Gallons per Year
PSC	Public Service Commission
psi	Pounds per Square Inch
PVC	Polyvinyl chloride
RPM	Revolutions per Minute
SCADA	Supervisory Controls and Data Acquisition
STH	State Trunk Highway
TDH	Total Dynamic Head
PSC	Public Service Commission
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
USH	United States Highway
WWTP	Wastewater Treatment Plant
IDEM	Indiana Department of Environmental Management

Appendix C

Static Pressure Deficiencies



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Static Pressures Deficiencies

Lowell Water System Master Plan

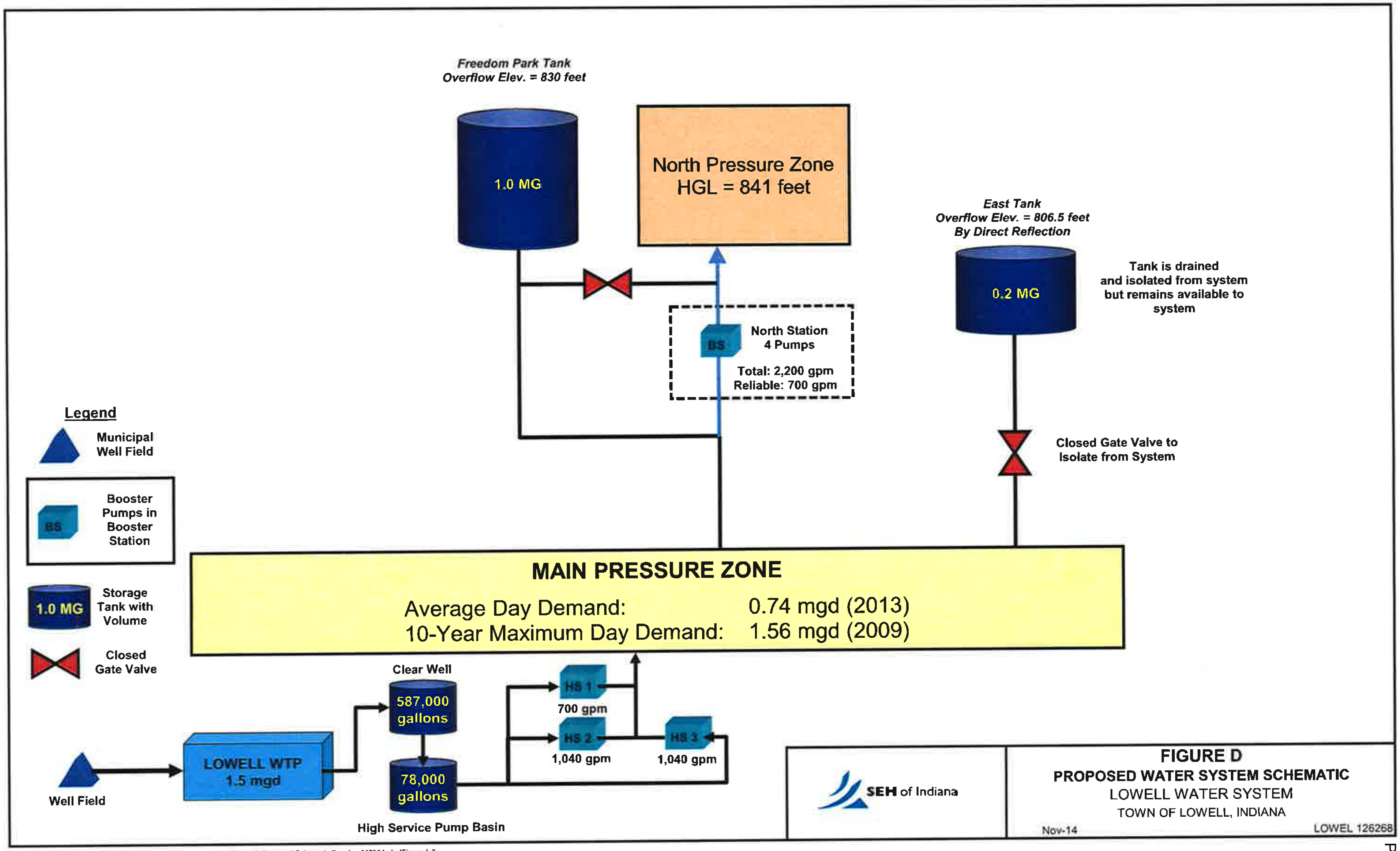
Lowell, Indiana

Figure C

Cause No. 45550
Docket Entry Request No. 4
Page 130 of 181

Appendix D

Proposed Water System Schematic



\\sehlx\projects\KO\L\Lowell\126268\8-planning\Tables and Figures\[Figure D Proposed Schematic Drawing 110514.xlsx]Figure 4-2

Appendix E

Distribution System Improvements

Stage 2: Hawthorn Drive and Michael Drive

Stage 2: West Oakley Avenue

Stage 2: East Main Street, Kankakee Street, and Harrison Street

Stage 2: Cherokee Drive

Stage 2: Hilltop Court

Stage 2: Freemont Street

Stage 2: Apache Lane

Stage 3: Highway 2

Stage 3: Cottage Grove

Stage 3: Indiana Street

Stage 3: East Street

Stage 3: Michigan Street, North Freemont Street, and Halstead Street

Stage 3: Cherokee Drive

Stage 3: Pine Street

Stage 3: Southwood Drive

Stage 3: Hickory Plaza

Stage 2 Improvements Cost Summary

TOWN OF LOWELL, INDIANA STAGE 2 WATER DISTRIBUTION SYSTEM IMPROVEMENTS

Engineer's Estimate of Probable Project Cost
SEH of Indiana,LLC
November, 2014

Item No.	Priority Area	Sewer Improvement Location & Description	Construction Cost	Non-Construction Cost (2)	Total Cost
1	E-1 HAWTHORN AND MICHAEL	Brookwood extension to 171st and 172nd	$ 486,700.00	$ 75,600.00	$ 560,000
		Unimproved 173rd Ave. between Hawthorn and Michael	$ 131,600.00	$ 21,300.00	$ 150,000
		Burr St./Sunset Dr. between Arthur Ct. and Malibu Dr.	$ 154,500.00	$ 24,700.00	$ 180,000
2	E-2 OAKLEY	Oakley between Nichols Ave and West End of Road	$ 734,100.00	$ 111,700.00	$ 850,000
		Commercial between Willow and Navajo	$ 48,300.00	$ 8,300.00	$ 60,000
		From Carriage Dr. to Commercial Ave.	$ 213,800.00	$ 33,600.00	$ 250,000
3	E-3 KANKAKEE	Harrison between East Street and Burr Street	$ 611,200.00	$ 93,200.00	$ 700,000
		Harrison/Kankakee/Main between East Street and Mill Street	$ 1,178,000.00	$ 178,200.00	$ 1,360,000
		Viant Street between Harrison Street and 177th Ave.	$ 433,700.00	$ 66,600.00	$ 500,000
		New Main between Harrison Street and Public Library	$ 218,800.00	$ 34,400.00	$ 250,000
4	E-4 CHEROKEE	Arrowhead between Mohawk and Shawnee	$ 383,700.00	$ 59,100.00	$ 440,000
		Cherokee from Shawnee to existing main and main connections	$ 85,700.00	$ 14,400.00	$ 100,000
		Shawnee between Navajo and Existing 10-inch Main	$ 127,100.00	$ 20,600.00	$ 150,000
5	E-5 HILLTOP COURT	Southview from Joe Martin to existing Main	$ 83,000.00	$ 14,000.00	$ 100,000
		New Main between Gatewood and Hilltop	$ 234,800.00	$ 36,800.00	$ 270,000
6	E-6 FREEMONT	Lincoln from Union to East of Powell Ditch	$ 391,400.00	$ 60,300.00	$ 450,000
		Union from Lincoln to Commerical	$ 172,300.00	$ 27,400.00	$ 200,000
		Franklin from Fremont to Union	$ 118,800.00	$ 19,400.00	$ 140,000
		Fremont from Franklin to Oakley	$ 191,300.00	$ 30,200.00	$ 220,000
		Oakley from Fremont to Cedar Creek	$ 110,000.00	$ 18,000.00	$ 130,000
7	E-7 APACHE	Apache between Nichols and Tomahawk	$ 115,500.00	$ 18,900.00	$ 130,000
		Apache from Tomahawk to existing Main	$ 257,500.00	$ 40,200.00	$ 300,000
		Tomahawk from Apache to Cheyenne	$ 111,700.00	$ 18,300.00	$ 130,000
		Cheyenne from Tomahawk to 8-inch Main	$ 253,500.00	$ 39,600.00	$ 290,000
		SUBTOTAL	**$ 6,847,000.00**	**$ 1,065,000.00**	**$ 7,910,000.00**
				GRAND TOTAL	**$ 7,910,000**

Note: (1) Estimate is Remove & Replace
(2) Non-Construction Cost includes design, construction management, geotechnical, survey and other direct costs.

Appendix E-1 A

Brookwood extension to 171st and 172nd

TOWN OF LOWELL, INDIANA STAGE 2 WATER DISTRIBUTION SYSTEM IMPROVEMENTS

Engineer's Estimate of Probable Project Cost
SEH of Indiana, LLC
November, 2014

Construction Item	Unit	Quantity	Unit Cost	Total Cost
Mobilization / Demobilization	LS	1	$ 20,000	$ 20,000
Construction Engineering	LS	1	$ 10,000	$ 10,000
Maintenance of Traffic	LS	1	$ 3,000	$ 3,000
Erosion Control	LS	1	$ 3,000	$ 3,000
Connect to Existing Water Main	EACH	3	$ 2,000	$ 6,000
Common Excavation	CYS	3750	$ 20	$ 75,000
Structural Backfill	CYS	3750	$ 30	$ 112,500
Water Main, Ducticle Iron Pipe, 12 IN.	LFT	2120	$ 85	$ 180,200
12 IN. Gate Valve	EACH	5	$ 2,400	$ 12,000
Sedding Restoration	SYS	1500	$ 1	$ 1,500
			Sub-total	**$ 423,200**
			15% contingency	$ 63,480
			Total Estimated Construction Costs	$ 486,700
Non-Construction Costs				
Design Engineering			10%	$ 48,670
Construction Engineering			5%	$ 24,335
Permitting, Easements, and Legal				$ 2,500
			Total Estimated Non-Construction Costs	$ 75,600

Grand Total	$ 562,300

Appendix E-1 B

Unimproved 173rd Ave. between Hawthorn and Michael

TOWN OF LOWELL, INDIANA STAGE 2 WATER DISTRIBUTION SYSTEM IMPROVEMENTS

Engineer's Estimate of Probable Project Cost
SEH of Indiana, LLC
November, 2014

Construction Item	Unit	Quantity	Unit Cost	Total Cost
Mobilization / Demobilization	LS	1	$ 5,000	$ 5,000
Construction Engineering	LS	1	$ 2,500	$ 2,500
Maintenance of Traffic	LS	1	$ 1,000	$ 1,000
Erosion Control	LS	1	$ 1,000	$ 1,000
Connect to Existing Water Main	EACH	2	$ 2,000	$ 4,000
Common Excavation	CYS	1120	$ 20	$ 22,400
Structural Backfill	CYS	1120	$ 30	$ 33,600
Water Main, Ducticle Iron Pipe, 8 IN.	LFT	630	$ 65	$ 40,950
8 IN. Gate Valve	EACH	2	$ 1,800	$ 3,600
Sedding Restoration	SYS	300	$ 1	$ 300
			Sub-total	**$ 114,400**
			15% contingency	$ 17,160
			Total Estimated Construction Costs	**$ 131,600**
Non-Construction Costs				
Design Engineering			10%	$ 13,160
Construction Engineering			5%	$ 6,580
Permitting, Easements, and Legal				$ 1,500
			Total Estimated Non-Construction Costs	**$ 21,300**

Grand Total	**$ 152,900**

Appendix E-1 C

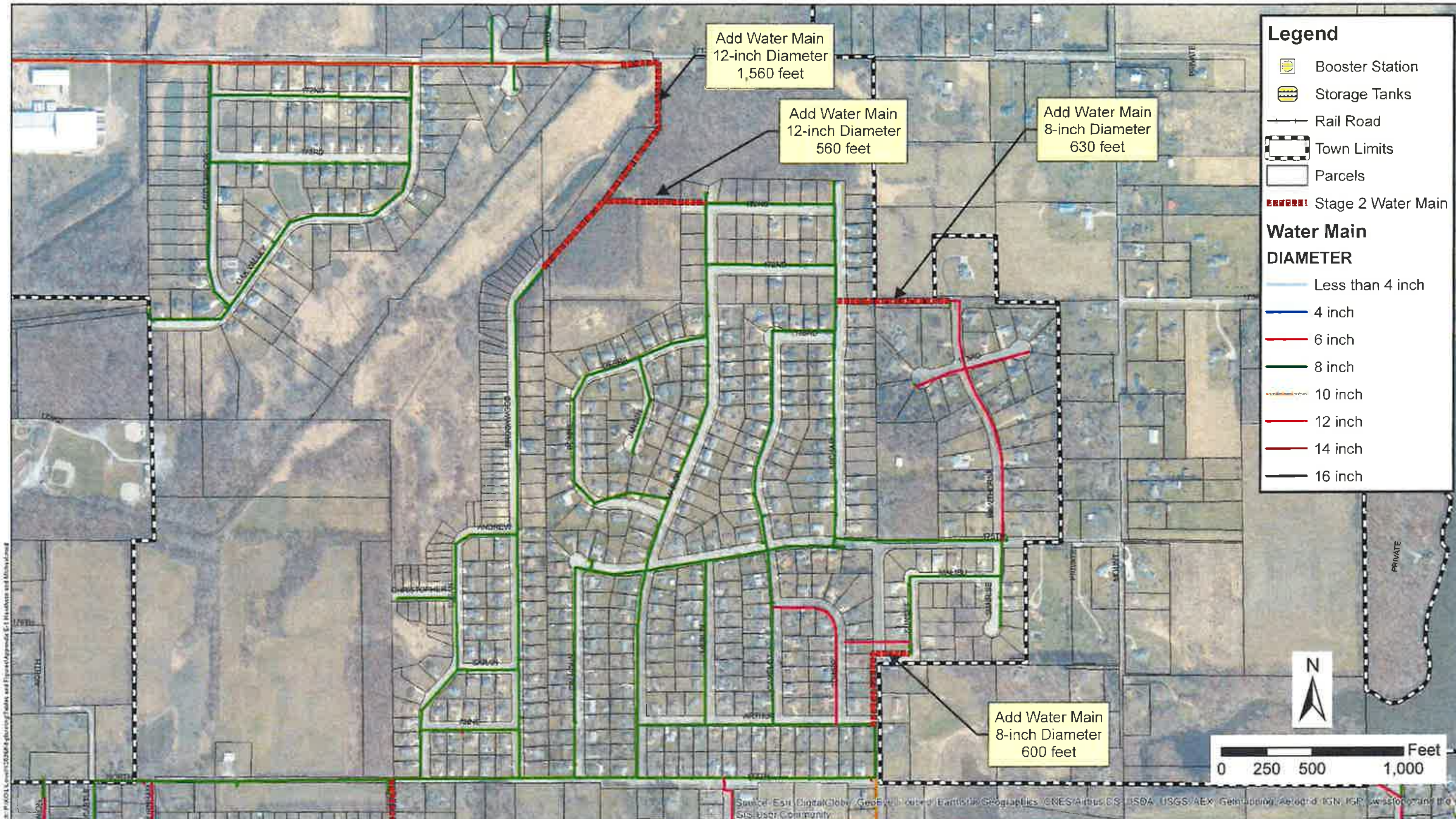
Burr St./Sunset Dr. between Arthur Ct. and Malibu Dr.

TOWN OF LOWELL, INDIANA STAGE 2 WATER DISTRIBUTION SYSTEM IMPROVEMENTS

Engineer's Estimate of Probable Project Cost
SEH of Indiana, LLC
November, 2014

Construction Item	Unit	Quantity	Unit Cost	Total Cost
Mobilization / Demobilization	LS	1	$ 6,250	$ 6,250
Construction Engineering	LS	1	$ 3,125	$ 3,125
Maintenance of Traffic	LS	1	$ 1,250	$ 1,250
Erosion Control	LS	1	$ 1,250	$ 1,250
Connect to Existing Water Main	EACH	2	$ 2,000	$ 4,000
Common Excavation	CYS	1050	$ 20	$ 21,000
Structural Backfill	CYS	1050	$ 30	$ 31,500
Subgrade Treatment	SYS	550	$ 5	$ 2,750
Compacted Aggregate, No. 53	TON	175	$ 25	$ 4,375
HMA Intermediate	TON	75	$ 85	$ 6,375
HMA Surface	TON	50	$ 90	$ 4,500
Water Main, Ducticle Iron Pipe, 8 IN.	LFT	600	$ 65	$ 39,000
8 IN. Gate Valve	EACH	2	$ 1,800	$ 3,600
Fire Hydrant Assembly	EACH	1	$ 5,000	$ 5,000
Sedding Restoration	SYS	300	$ 1	$ 300
			Sub-total	**$ 134,300**
			15% contingency	$ 20,145
			Total Estimated Construction Costs	$ 154,500
Non-Construction Costs				
Design Engineering			10%	$ 15,450
Construction Engineering			5%	$ 7,725
Permitting, Easements, and Legal				$ 1,500
			Total Estimated Non-Construction Costs	$ 24,700

Grand Total	$ 179,200



SEH of Indiana

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Project: LOWEL 126268
Print Date: 11/5/2014

Map by: jbolinert
Projection: Indiana West (feet)
Source: Town of Lowell

Stage 2 Distribution System Improvements

Lowell Water System Master Plan
Lowell, Indiana

Figure
E-1

Cause No. 45550
Docket Entry Request No. 4
Page 138 of 181

Appendix E-2 A

Oakley between Nichols Ave and West End of Road

TOWN OF LOWELL, INDIANA STAGE 2 WATER DISTRIBUTION SYSTEM IMPROVEMENTS

Engineer's Estimate of Probable Project Cost
SEH of Indiana, LLC
November, 2014

Construction Item	Unit	Quantity	Unit Cost	Total Cost
Mobilization / Demobilization	LS	1	$ 30,000	$ 30,000
Construction Engineering	LS	1	$ 15,000	$ 15,000
Maintenance of Traffic	LS	1	$ 6,000	$ 6,000
Erosion Control	LS	1	$ 6,000	$ 6,000
Connect to Existing Water Main	EACH	3	$ 2,000	$ 6,000
Common Excavation	CYS	4800	$ 20	$ 96,000
Structural Backfill	CYS	4800	$ 30	$ 144,000
Subgrade Treatment	SYS	2500	$ 5	$ 12,500
Compacted Aggregate, No. 53	TON	780	$ 25	$ 19,500
HMA Intermediate	TON	325	$ 85	$ 27,625
HMA Surface	TON	200	$ 90	$ 18,000
Water Main, Ducticle Iron Pipe, 12 IN.	LFT	2660	$ 85	$ 226,100
Existing Hydrant Connections	EACH	9	$ 1,500	$ 13,500
12 IN. Gate Valve	EACH	7	$ 2,400	$ 16,800
Sedding Restoration	SYS	1200	$ 1	$ 1,200
			Sub-total	**$ 638,300**
			15% contingency	$ 95,745
			Total Estimated Construction Costs	**$ 734,100**
Non-Construction Costs				
Design Engineering			10%	$ 73,410
Construction Engineering			5%	$ 36,705
Permitting, Easements, and Legal				$ 1,500
			Total Estimated Non-Construction Costs	**$ 111,700**

Grand Total	**$ 845,800**

Appendix E-2 B

Commercial between Willow and Navajo

TOWN OF LOWELL, INDIANA STAGE 2 WATER DISTRIBUTION SYSTEM IMPROVEMENTS

Engineer's Estimate of Probable Project Cost
SEH of Indiana, LLC
November, 2014

Construction Item	Unit	Quantity	Unit Cost	Total Cost
Mobilization / Demobilization	LS	1	$ 2,000	$ 2,000
Construction Engineering	LS	1	$ 1,000	$ 1,000
Maintenance of Traffic	LS	1	$ 400	$ 400
Erosion Control	LS	1	$ 400	$ 400
Connect to Existing Water Main	EACH	2	$ 2,000	$ 4,000
Common Excavation	CYS	300	$ 20	$ 6,000
Strucural Backfill	CYS	300	$ 30	$ 9,000
Subgrade Treatment	SYS	150	$ 5	$ 750
Compacted Aggregate, No. 53	TON	50	$ 25	$ 1,250
HMA Intermediate	TON	20	$ 85	$ 1,700
HMA Surface	TON	15	$ 90	$ 1,350
Water Main, Ducticle Iron Pipe, 8 IN.	LFT	160	$ 65	$ 10,400
8 IN. Gate Valve	EACH	2	$ 1,800	$ 3,600
Sedding Restoration	SYS	150	$ 1	$ 150
			Sub-total	**$ 42,000**
			15% contingency	$ 6,300
			Total Estimated Construction Costs	**$ 48,300**
Non-Construction Costs				
Design Engineering			10%	$ 4,830
Construction Engineering			5%	$ 2,415
Permitting, Easements, and Legal				$ 1,000
			Total Estimated Non-Construction Costs	**$ 8,300**

Grand Total	**$ 56,600**

[redacted]

PROVEMENTS

	Unit Cost	Total Cost
	$ 8,500	$ 8,500
	$ 4,250	$ 4,250
	$ 1,750	$ 1,750
	$ 1,750	$ 1,750
	$ 2,000	$ 4,000
	$ 20	$ 28,000
	$ 30	$ 42,000
	$ 5	$ 3,500
	$ 25	$ 5,625
	$ 85	$ 8,075
	$ 90	$ 5,400
	$ 85	$ 65,450
	$ 2,400	$ 7,200
	$ 1	$ 350
	Sub-total	**$ 185,900**
	contingency	$ 27,885
	ruction Costs	**$ 213,800**
	10%	$ 21,380
	5%	$ 10,690
		$ 1,500
	ıction Costs	**$ 33,600**
	irand Total	**$ 247,400**

SEH of Indiana

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Project: LOWEL 126268
Print Date: 11/5/2014

Stage 2 Distribution System Improvements

Lowell Water System Master Plan
Lowell, Indiana

Figure
E-2

Appendix E-3 A

Harrison between East Street and Burr Street

TOWN OF LOWELL, INDIANA STAGE 2 WATER DISTRIBUTION SYSTEM IMPROVEMENTS

Engineer's Estimate of Probable Project Cost
SEH of Indiana, LLC
November, 2014

Construction Item	Unit	Quantity	Unit Cost	Total Cost
Mobilization / Demobilization	LS	1	$ 25,000	$ 25,000
Construction Engineering	LS	1	$ 12,500	$ 12,500
Maintenance of Traffic	LS	1	$ 5,000	$ 5,000
Erosion Control	LS	1	$ 5,000	$ 5,000
Connect to Existing Water Main	EACH	2	$ 2,000	$ 4,000
Common Excavation	CYS	4050	$ 20	$ 81,000
Structural Backfill	CYS	4050	$ 30	$ 121,500
Subgrade Treatment	SYS	2000	$ 5	$ 10,000
Compacted Aggregate, No. 53	TON	675	$ 25	$ 16,875
HMA Intermediate	TON	300	$ 85	$ 25,500
HMA Surface	TON	175	$ 90	$ 15,750
Water Main, Ducticle Iron Pipe, 12 IN.	LFT	2280	$ 85	$ 193,800
12 IN. Gate Valve	EACH	6	$ 2,400	$ 14,400
Sedding Restoration	SYS	1000	$ 1	$ 1,000
			Sub-total	**$ 531,400**
			15% contingency	$ 79,710
			Total Estimated Construction Costs	**$ 611,200**
Non-Construction Costs				
Design Engineering			10%	$ 61,120
Construction Engineering			5%	$ 30,560
Permitting, Easement and Legal				$ 1,500
			Total Estimated Non-Construction Costs	**$ 93,200**

Grand Total	**$ 704,400**

Appendix E-3 B

Harrison/Kankakee/Main between East Street and Mill Street

TOWN OF LOWELL, INDIANA STAGE 2 WATER DISTRIBUTION SYSTEM IMPROVEMENTS

Engineer's Estimate of Probable Project Cost
SEH of Indiana, LLC
November, 2014

Construction Item	Unit	Quantity	Unit Cost	Total Cost
Mobilization / Demobilization	LS	1	$ 50,000	$ 50,000
Construction Engineering	LS	1	$ 25,000	$ 25,000
Maintenance of Traffic	LS	1	$ 10,000	$ 10,000
Erosion Control	LS	1	$ 10,000	$ 10,000
Connect to Existing Water Main	EACH	15	$ 2,000	$ 30,000
Common Excavation	CYS	6500	$ 20	$ 130,000
Structural Backfill	CYS	6500	$ 30	$ 195,000
Subgrade Treatment	SYS	3200	$ 5	$ 16,000
Compacted Aggregate, No. 53	TON	1050	$ 25	$ 26,250
HMA Intermediate	TON	450	$ 85	$ 38,250
HMA Surface	TON	275	$ 90	$ 24,750
Water Main, Ducticle Iron Pipe, 12 IN.	LFT	3570	$ 85	$ 303,450
Service Connections	EACH	65	$ 1,500	$ 97,500
Fire Hydrant Assembly	EACH	9	$ 5,000	$ 45,000
12 IN. Gate Valve	EACH	9	$ 2,400	$ 21,600
Sedding Restoration	SYS	1500	$ 1	$ 1,500
			Sub-total	**$ 1,024,300**
			15% contingency	$ 153,645
			Total Estimated Construction Costs	$ 1,178,000
Non-Construction Costs				
Design Engineering			10%	$ 117,800
Construction Engineering			5%	$ 58,900
Permitting, Easement and Legal				$ 1,500
			Total Estimated Non-Construction Costs	$ 178,200

Grand Total	$ 1,356,200

Appendix E-3 C

Viant Street between Harrison Street and 177th Ave.

TOWN OF LOWELL, INDIANA STAGE 2 WATER DISTRIBUTION SYSTEM IMPROVEMENTS

Engineer's Estimate of Probable Project Cost
SEH of Indiana, LLC
November, 2014

Construction Item	Unit	Quantity	Unit Cost	Total Cost
Mobilization / Demobilization	LS	1	$ 17,500	$ 17,500
Construction Engineering	LS	1	$ 8,750	$ 8,750
Maintenance of Traffic	LS	1	$ 3,500	$ 3,500
Erosion Control	LS	1	$ 3,500	$ 3,500
Connect to Existing Water Main	EACH	3	$ 2,000	$ 6,000
Common Excavation	CYS	2400	$ 20	$ 48,000
Structural Backfill	CYS	2400	$ 30	$ 72,000
Subgrade Treatment	SYS	1200	$ 5	$ 6,000
Compacted Aggregate, No. 53	TON	400	$ 25	$ 10,000
HMA Intermediate	TON	175	$ 85	$ 14,875
HMA Surface	TON	100	$ 90	$ 9,000
Water Main, Ducticle Iron Pipe, 12 IN.	LFT	1350	$ 85	$ 114,750
Service Connections	EACH	30	$ 1,500	$ 45,000
12 IN. Gate Valve	EACH	3	$ 2,400	$ 7,200
Fire Hydrant Assembly	EACH	2	$ 5,000	$ 10,000
Sedding Restoration	SYS	1000	$ 1	$ 1,000
			Sub-total	**$ 377,100**
			15% contingency	$ 56,565
			Total Estimated Construction Costs	**$ 433,700**
Non-Construction Costs				
Design Engineering			10%	$ 43,370
Construction Engineering			5%	$ 21,685
Permitting, Easement and Legal				$ 1,500
			Total Estimated Non-Construction Costs	**$ 66,600**

Grand Total	**$ 500,300**

Appendix E-3 D

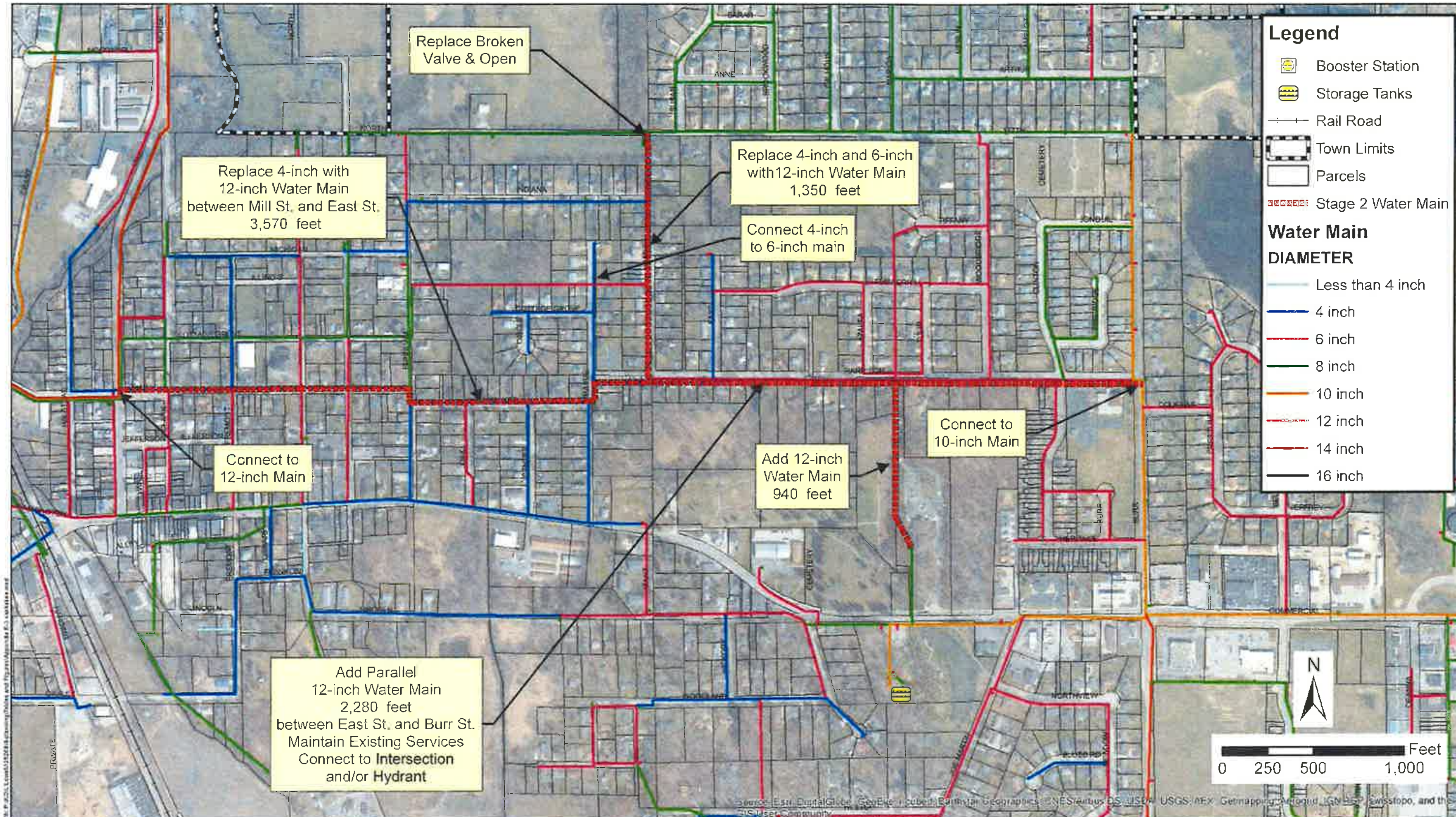
New Main between Harrison Street and Public Library

TOWN OF LOWELL, INDIANA STAGE 2 WATER DISTRIBUTION SYSTEM IMPROVEMENTS

Engineer's Estimate of Probable Project Cost
SEH of Indiana, LLC
November, 2014

Construction Item		Unit	Quantity	Unit Cost		Total Cost	
	Mobilization / Demobilization	LS	1	$	9,000	$	9,000
	Construction Engineering	LS	1	$	4,500	$	4,500
	Maintenance of Traffic	LS	1	$	1,700	$	1,700
	Erosion Control	LS	1	$	1,700	$	1,700
	Connect to Existing Water Main	EACH	2	$	2,000	$	4,000
	Common Excavation	CYS	1675	$	20	$	33,500
	Structural Backfill	CYS	1675	$	30	$	50,250
	Water Main, Ducticle Iron Pipe, 12 IN.	LFT	940	$	85	$	79,900
	12 IN. Gate Valve	EACH	2	$	2,400	$	4,800
	Sedding Restoration	SYS	850	$	1	$	850
				Sub-total		**$**	**190,200**
				15% contingency		$	28,530
				Total Estimated Construction Costs		$	218,800
Non-Construction Costs							
	Design Engineering			10%		$	21,880
	Construction Engineering			5%		$	10,940
	Permitting, Easement and Legal					$	1,500
				Total Estimated Non-Construction Costs		$	34,400

Grand Total	$	253,200



SEH of Indiana

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Project: LOWEL 126268
Print Date: 10/30/2014

Stage 2 Distribution System Improvements

Lowell Water System Master Plan
Lowell, Indiana

Figure E-3

Cause No. 45550
Docket Entry Request No. 4
Page 147 of 181

Appendix E-4 A

Arrowhead between Mohawk and Shawnee

TOWN OF LOWELL, INDIANA STAGE 2 WATER DISTRIBUTION SYSTEM IMPROVEMENTS

Engineer's Estimate of Probable Project Cost
SEH of Indiana, LLC
November, 2014

Construction Item	Unit	Quantity	Unit Cost	Total Cost
Mobilization / Demobilization	LS	1	$ 15,500	$ 15,500
Construction Engineering	LS	1	$ 8,000	$ 8,000
Maintenance of Traffic	LS	1	$ 2,250	$ 2,250
Erosion Control	LS	1	$ 2,250	$ 2,250
Connect to Existing Water Main	EACH	5	$ 2,000	$ 10,000
Common Excavation	CYS	2275	$ 20	$ 45,500
Structural Backfill	CYS	2275	$ 30	$ 68,250
Subgrade Treatment	SYS	1150	$ 5	$ 5,750
Compacted Aggregate, No. 53	TON	375	$ 25	$ 9,375
HMA Intermediate	TON	160	$ 85	$ 13,600
HMA Surface	TON	100	$ 90	$ 9,000
Water Main, Ducticle Iron Pipe, 8 IN.	LFT	1280	$ 65	$ 83,200
Service Connections	EACH	30	$ 1,500	$ 45,000
8 IN. Gate Valve	EACH	3	$ 1,800	$ 5,400
Fire Hydrant Assembly	EACH	2	$ 5,000	$ 10,000
Sedding Restoration	SYS	500	$ 1	$ 500
			Sub-total	**$ 333,600**
			15% contingency	$ 50,040
			Total Estimated Construction Costs	**$ 383,700**
Non-Construction Costs				
Design Engineering			10%	$ 38,370
Construction Engineering			5%	$ 19,185
Permitting, Easement and Legal				$ 1,500
			Total Estimated Non-Construction Costs	**$ 59,100**

Grand Total	**$ 442,800**

Appendix E-4 B

Cherokee from Shawnee to existing main and main connections

TOWN OF LOWELL, INDIANA STAGE 2 WATER DISTRIBUTION SYSTEM IMPROVEMENTS

Engineer's Estimate of Probable Project Cost
SEH of Indiana, LLC
November, 2014

Construction Item	Unit	Quantity	Unit Cost	Total Cost
Mobilization / Demobilization	LS	1	$ 3,500	$ 3,500
Construction Engineering	LS	1	$ 1,750	$ 1,750
Maintenance of Traffic	LS	1	$ 750	$ 750
Erosion Control	LS	1	$ 750	$ 750
Connect to Existing Water Main	EACH	5	$ 2,000	$ 10,000
Common Excavation	CYS	425	$ 20	$ 8,500
Structural Backfill	CYS	425	$ 30	$ 12,750
Subgrade Treatment	SYS	205	$ 5	$ 1,025
Compacted Aggregate, No. 53	TON	70	$ 25	$ 1,750
HMA Intermediate	TON	30	$ 85	$ 2,550
HMA Surface	TON	20	$ 90	$ 1,800
Water Main, Ducticle Iron Pipe, 8 IN.	LFT	230	$ 65	$ 14,950
Service Connections	EACH	5	$ 1,500	$ 7,500
8 IN. Gate Valve	EACH	1	$ 1,800	$ 1,800
Fire Hydrant Assembly	EACH	1	$ 5,000	$ 5,000
Sedding Restoration	SYS	100	$ 1	$ 100
			Sub-total	**$ 74,500**
			15% contingency	$ 11,175
			Total Estimated Construction Costs	**$ 85,700**
Non-Construction Costs				
Design Engineering			10%	$ 8,570
Construction Engineering			5%	$ 4,285
Permitting, Easement and Legal				$ 1,500
			Total Estimated Non-Construction Costs	**$ 14,400**

Grand Total	**$ 100,100**

Appendix E-4 C

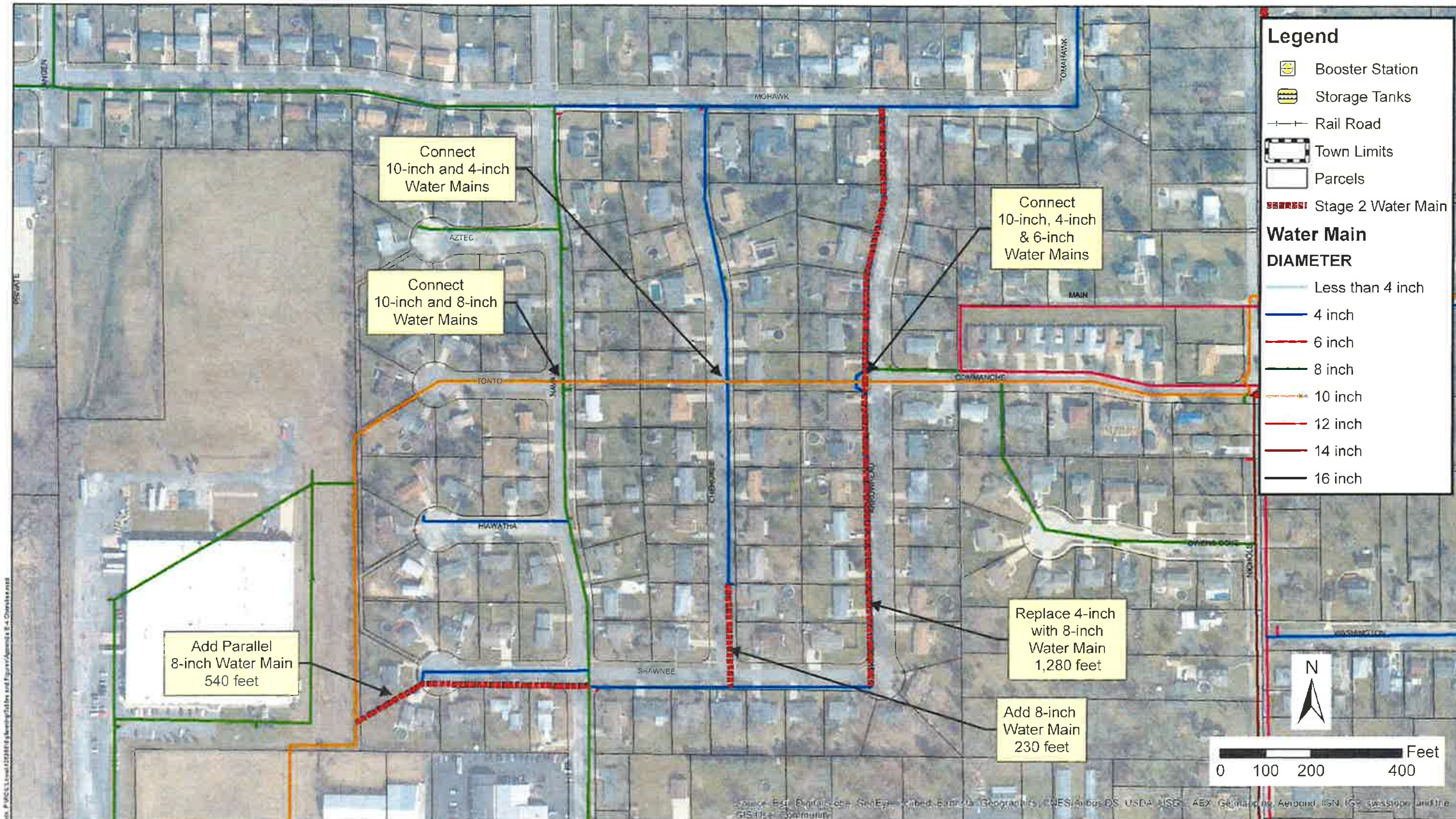
Shawnee between Navajo and Existing 10-inch Main

TOWN OF LOWELL, INDIANA STAGE 2 WATER DISTRIBUTION SYSTEM IMPROVEMENTS

Engineer's Estimate of Probable Project Cost
SEH of Indiana, LLC
November, 2014

Construction Item	Unit	Quantity	Unit Cost	Total Cost
Mobilization / Demobilization	LS	1	$ -	$ -
Construction Engineering	LS	1	$ -	$ -
Maintenance of Traffic	LS	1	$ -	$ -
Erosion Control	LS	1	$ -	$ -
Connect to Existing Water Main	EACH	2	$ 2,000	$ 4,000
Common Excavation	CYS	1000	$ 20	$ 20,000
Structural Backfill	CYS	1000	$ 30	$ 30,000
Subgrade Treatment	SYS	500	$ 5	$ 2,500
Compacted Aggregate, No. 53	TON	175	$ 25	$ 4,375
HMA Intermediate	TON	75	$ 85	$ 6,375
HMA Surface	TON	45	$ 90	$ 4,050
Water Main, Ducticle Iron Pipe, 8 IN.	LFT	540	$ 65	$ 35,100
8 IN. Gate Valve	EACH	2	$ 1,800	$ 3,600
Sedding Restoration	SYS	500	$ 1	$ 500
			Sub-total	**$ 110,500**
			15% contingency	$ 16,575
			Total Estimated Construction Costs	**$ 127,100**
No Design Engineering			10%	$ 12,710
Construction Engineering			5%	$ 6,355
Permitting, Easement and Legal				$ 1,500
			Total Estimated Non-Construction Costs	**$ 20,600**

Grand Total	**$ 147,700**



SEH of Indiana

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Project: LOWEL 126268
Print Date: 10/27/2014

Stage 2 Distribution System Improvements

Lowell Water System Master Plan
Lowell, Indiana

Figure E-4

Appendix E-5 A

Southview from Joe Martin to existing Main

TOWN OF LOWELL, INDIANA STAGE 2 WATER DISTRIBUTION SYSTEM IMPROVEMENTS

Engineer's Estimate of Probable Project Cost
SEH of Indiana, LLC
November, 2014

Construction Item	Unit	Quantity	Unit Cost	Total Cost
Mobilization / Demobilization	LS	1	$ 3,500	$ 3,500
Construction Engineering	LS	1	$ 1,750	$ 1,750
Maintenance of Traffic	LS	1	$ 700	$ 700
Erosion Control	LS	1	$ 700	$ 700
Connect to Existing Water Main	EACH	2	$ 2,000	$ 4,000
Common Excavation	CYS	480	$ 20	$ 9,600
Structural Backfill	CYS	480	$ 30	$ 14,400
Subgrade Treatment	SYS	250	$ 5	$ 1,250
Compacted Aggregate, No. 53	TON	80	$ 25	$ 2,000
HMA Intermediate	TON	35	$ 85	$ 2,975
HMA Surface	TON	20	$ 90	$ 1,800
Water Main, Ducticle Iron Pipe, 8 IN.	LFT	270	$ 65	$ 17,550
Service Connections	EACH	2	$ 1,500	$ 3,000
8 IN. Gate Valve	EACH	2	$ 1,800	$ 3,600
Fire Hydrant Assembly	EACH	1	$ 5,000	$ 5,000
Sedding Restoration	SYS	240	$ 1	$ 240
			Sub-total	**$ 72,100**
			15% contingency	$ 10,815
			Total Estimated Construction Costs	**$ 83,000**

Non-Construction Costs		
Design Engineering	10%	$ 8,300
Construction Engineering	5%	$ 4,150
Permitting, Easement and Legal		$ 1,500
	Total Estimated Non-Construction Costs	**$ 14,000**

Grand Total	**$ 97,000**

Appendix E-5 B

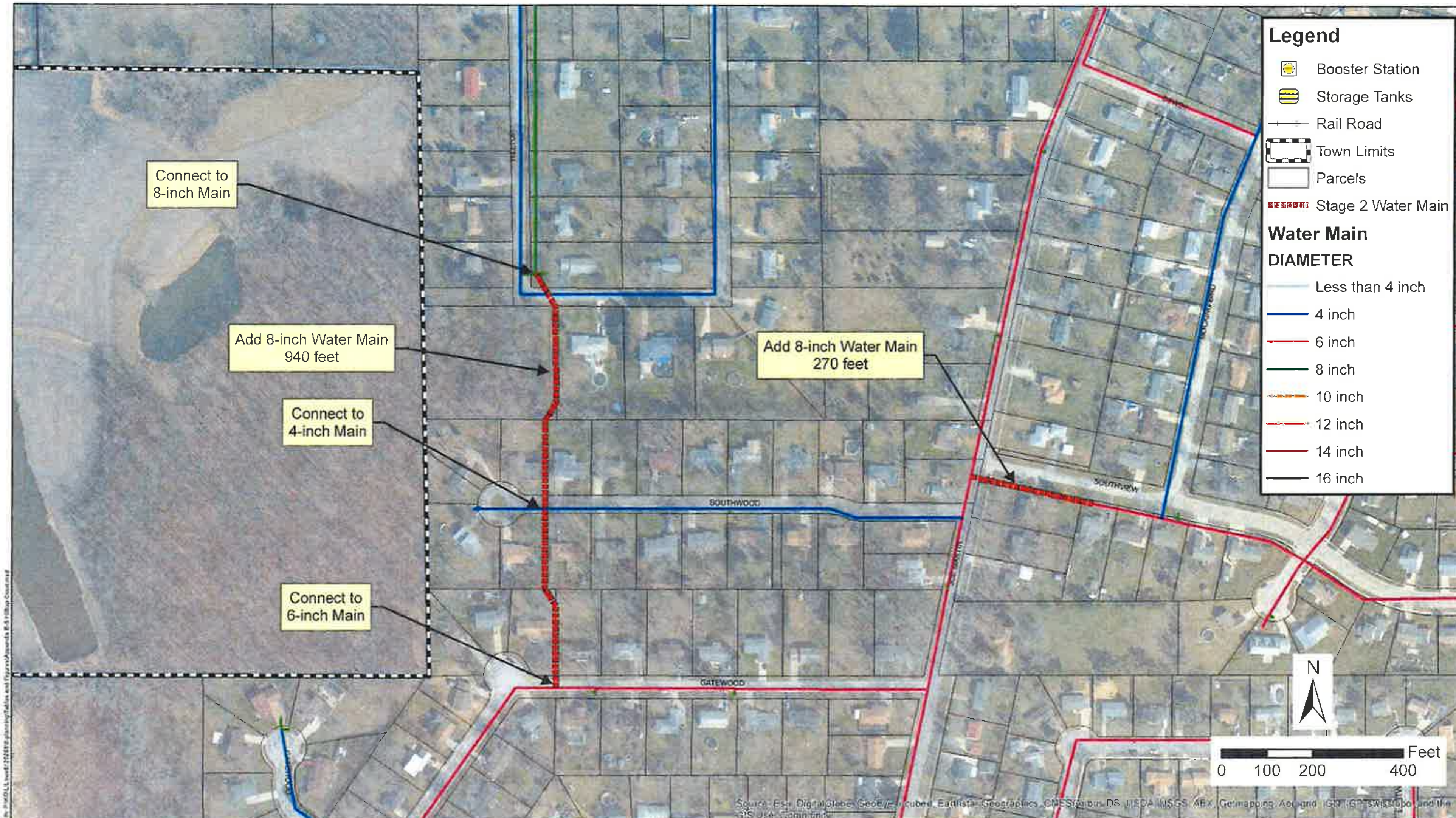
New Main between Gatewood and Hilltop

TOWN OF LOWELL, INDIANA STAGE 2 WATER DISTRIBUTION SYSTEM IMPROVEMENTS

Engineer's Estimate of Probable Project Cost
SEH of Indiana, LLC
November, 2014

Construction Item	Unit	Quantity	Unit Cost	Total Cost
Mobilization / Demobilization	LS	1	$ 10,000	$ 10,000
Construction Engineering	LS	1	$ 5,000	$ 5,000
Maintenance of Traffic	LS	1	$ 2,000	$ 2,000
Erosion Control	LS	1	$ 2,000	$ 2,000
Connect to Existing Water Main	EACH	3	$ 2,000	$ 6,000
Common Excavation	CYS	1700	$ 20	$ 34,000
Structural Backfill	CYS	1700	$ 30	$ 51,000
Subgrade Treatment	SYS	120	$ 5	$ 600
Compacted Aggregate, No. 53	TON	40	$ 25	$ 1,000
HMA Intermediate	TON	20	$ 85	$ 1,700
HMA Surface	TON	10	$ 90	$ 900
Water Main, Ducticle Iron Pipe, 8 IN.	LFT	940	$ 65	$ 61,100
Service Connections	EACH	5	$ 1,500	$ 7,500
8 IN. Gate Valve	EACH	3	$ 1,800	$ 5,400
Fire Hydrant Assembly	EACH	3	$ 5,000	$ 15,000
Sedding Restoration	SYS	850	$ 1	$ 850
			Sub-total	**$ 204,100**
			15% contingency	$ 30,615
			Total Estimated Construction Costs	**$ 234,800**
Non-Construction Costs				
Design Engineering			10%	$ 23,480
Construction Engineering			5%	$ 11,740
Permitting, Easement and Legal				$ 1,500
			Total Estimated Non-Construction Costs	**$ 36,800**

Grand Total	**$ 271,600**



SEH of Indiana

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Project: LOWEL 126256
Print Date: 10/27/2014

Stage 2 Distribution System Improvements

Lowell Water System Master Plan

Lowell, Indiana

Figure E-5

Appendix E-6 A

Lincoln from Union to East of Powell Ditch

TOWN OF LOWELL, INDIANA STAGE 2 WATER DISTRIBUTION SYSTEM IMPROVEMENTS

Engineer's Estimate of Probable Project Cost
SEH of Indiana, LLC
November, 2014

Construction Item	Unit	Quantity	Unit Cost	Total Cost
Mobilization / Demobilization	LS	1	$ 15,500	$ 15,500
Construction Engineering	LS	1	$ 7,750	$ 7,750
Maintenance of Traffic	LS	1	$ 3,200	$ 3,200
Erosion Control	LS	1	$ 3,200	$ 3,200
Connect to Existing Water Main	EACH	2	$ 2,000	$ 4,000
Common Excavation	CYS	2500	$ 20	$ 50,000
Structural Backfill	CYS	2500	$ 30	$ 75,000
Subgrade Treatment	SYS	1250	$ 5	$ 6,250
Compacted Aggregate, No. 53	TON	400	$ 25	$ 10,000
HMA Intermediate	TON	170	$ 85	$ 14,450
HMA Surface	TON	100	$ 90	$ 9,000
Water Main, Ducticle Iron Pipe, 8 IN.	LFT	1360	$ 65	$ 88,400
Water Main, Ducticle Iron Pipe, 12 IN.	LFT	0	$ 85	$ -
Service Connections	EACH	15	$ 1,500	$ 22,500
8 IN. Gate Valve	EACH	3	$ 1,800	$ 5,400
12 IN. Gate Valve	EACH	0	$ 2,400	$ -
Fire Hydrant Assembly	EACH	2	$ 5,000	$ 10,000
Pipe River Crossing	LF	100	$ 150	$ 15,000
Sedding Restoration	SYS	650	$ 1	$ 650
			Sub-total	**$ 340,300**
			15% contingency	$ 51,045
			Total Estimated Construction Costs	$ 391,400
Non-Construction Costs				
Design Engineering			10%	$ 39,140
Construction Engineering			5%	$ 19,570
Permitting, Easement and Legal				$ 1,500
			Total Estimated Non-Construction Costs	$ 60,300

Grand Total	$ 451,700

Appendix E-6 B

Union from Lincoln to Commerical

TOWN OF LOWELL, INDIANA STAGE 2 WATER DISTRIBUTION SYSTEM IMPROVEMENTS

Engineer's Estimate of Probable Project Cost
SEH of Indiana, LLC
November, 2014

Construction Item	Unit	Quantity	Unit Cost	Total Cost
Mobilization / Demobilization	LS	1	$ 7,000	$ 7,000
Construction Engineering	LS	1	$ 3,500	$ 3,500
Maintenance of Traffic	LS	1	$ 1,500	$ 1,500
Erosion Control	LS	1	$ 1,500	$ 1,500
Connect to Existing Water Main	EACH	2	$ 2,000	$ 4,000
Common Excavation	CYS	1075	$ 20	$ 21,500
Structural Backfill	CYS	1075	$ 30	$ 32,250
Subgrade Treatment	SYS	550	$ 5	$ 2,750
Compacted Aggregate, No. 53	TON	185	$ 25	$ 4,625
HMA Intermediate	TON	80	$ 85	$ 6,800
HMA Surface	TON	50	$ 90	$ 4,500
Water Main, Ducticle Iron Pipe, 8 IN.	LFT	600	$ 65	$ 39,000
Water Main, Ducticle Iron Pipe, 12 IN.	LFT	0	$ 85	$ -
Service Connections	EACH	8	$ 1,500	$ 12,000
8 IN. Gate Valve	EACH	2	$ 1,800	$ 3,600
12 IN. Gate Valve	EACH	0	$ 2,400	$ -
Fire Hydrant Assembly	EACH	1	$ 5,000	$ 5,000
Sedding Restoration	SYS	250	$ 1	$ 250
			Sub-total	**$ 149,800**
			15% contingency	$ 22,470
			Total Estimated Construction Costs	**$ 172,300**
Non-Construction Costs				
Design Engineering			10%	$ 17,230
Construction Engineering			5%	$ 8,615
Permitting, Easement and Legal				$ 1,500
			Total Estimated Non-Construction Costs	**$ 27,400**

Grand Total	**$ 199,700**

Appendix E-6 C

Franklin from Fremont to Union

TOWN OF LOWELL, INDIANA STAGE 2 WATER DISTRIBUTION SYSTEM IMPROVEMENTS

Engineer's Estimate of Probable Project Cost
SEH of Indiana, LLC
November, 2014

Construction Item	Unit	Quantity	Unit Cost	Total Cost
Mobilization / Demobilization	LS	1	$ 5,000	$ 5,000
Construction Engineering	LS	1	$ 2,500	$ 2,500
Maintenance of Traffic	LS	1	$ 1,000	$ 1,000
Erosion Control	LS	1	$ 1,000	$ 1,000
Connect to Existing Water Main	EACH	3	$ 2,000	$ 6,000
Common Excavation	CYS	675	$ 20	$ 13,500
Structural Backfill	CYS	675	$ 30	$ 20,250
Subgrade Treatment	SYS	350	$ 5	$ 1,750
Compacted Aggregate, No. 53	TON	120	$ 25	$ 3,000
HMA Intermediate	TON	50	$ 85	$ 4,250
HMA Surface	TON	30	$ 90	$ 2,700
Water Main, Ducticle Iron Pipe, 8 IN.	LFT	380	$ 65	$ 24,700
Service Connections	EACH	7	$ 1,500	$ 10,500
8 IN. Gate Valve	EACH	1	$ 1,800	$ 1,800
Fire Hydrant Assembly	EACH	1	$ 5,000	$ 5,000
Sedding Restoration	SYS	300	$ 1	$ 300
			Sub-total	**$ 103,300**
			15% contingency	$ 15,495
			Total Estimated Construction Costs	$ 118,800
Non-Construction Costs				
Design Engineering			10%	$ 11,880
Construction Engineering			5%	$ 5,940
Permitting, Easement and Legal				$ 1,500
			Total Estimated Non-Construction Costs	$ 19,400

Grand Total	**$ 138,200**

Appendix E-6 D

Fremont from Franklin to Oakley

TOWN OF LOWELL, INDIANA STAGE 2 WATER DISTRIBUTION SYSTEM IMPROVEMENTS

Engineer's Estimate of Probable Project Cost
SEH of Indiana, LLC
November, 2014

Construction Item	Unit	Quantity	Unit Cost	Total Cost
Mobilization / Demobilization	LS	1	$ 8,000	$ 8,000
Construction Engineering	LS	1	$ 4,000	$ 4,000
Maintenance of Traffic	LS	1	$ 1,600	$ 1,600
Erosion Control	LS	1	$ 1,600	$ 1,600
Connect to Existing Water Main	EACH	3	$ 2,000	$ 6,000
Common Excavation	CYS	1200	$ 20	$ 24,000
Structural Backfill	CYS	1200	$ 30	$ 36,000
Subgrade Treatment	SYS	580	$ 5	$ 2,900
Compacted Aggregate, No. 53	TON	190	$ 25	$ 4,750
HMA Intermediate	TON	80	$ 85	$ 6,800
HMA Surface	TON	50	$ 90	$ 4,500
Water Main, Ducticle Iron Pipe, 8 IN.	LFT	650	$ 65	$ 42,250
Service Connections	EACH	10	$ 1,500	$ 15,000
8 IN. Gate Valve	EACH	2	$ 1,800	$ 3,600
Fire Hydrant Assembly	EACH	1	$ 5,000	$ 5,000
Sedding Restoration	SYS	300	$ 1	$ 300
			Sub-total	**$ 166,300**
			15% contingency	$ 24,945
			Total Estimated Construction Costs	**$ 191,300**
Non-Construction Costs				
Design Engineering			10%	$ 19,130
Construction Engineering			5%	$ 9,565
Permitting, Easement and Legal				$ 1,500
			Total Estimated Non-Construction Costs	**$ 30,200**

Grand Total	**$ 221,500**

Appendix E-6 E

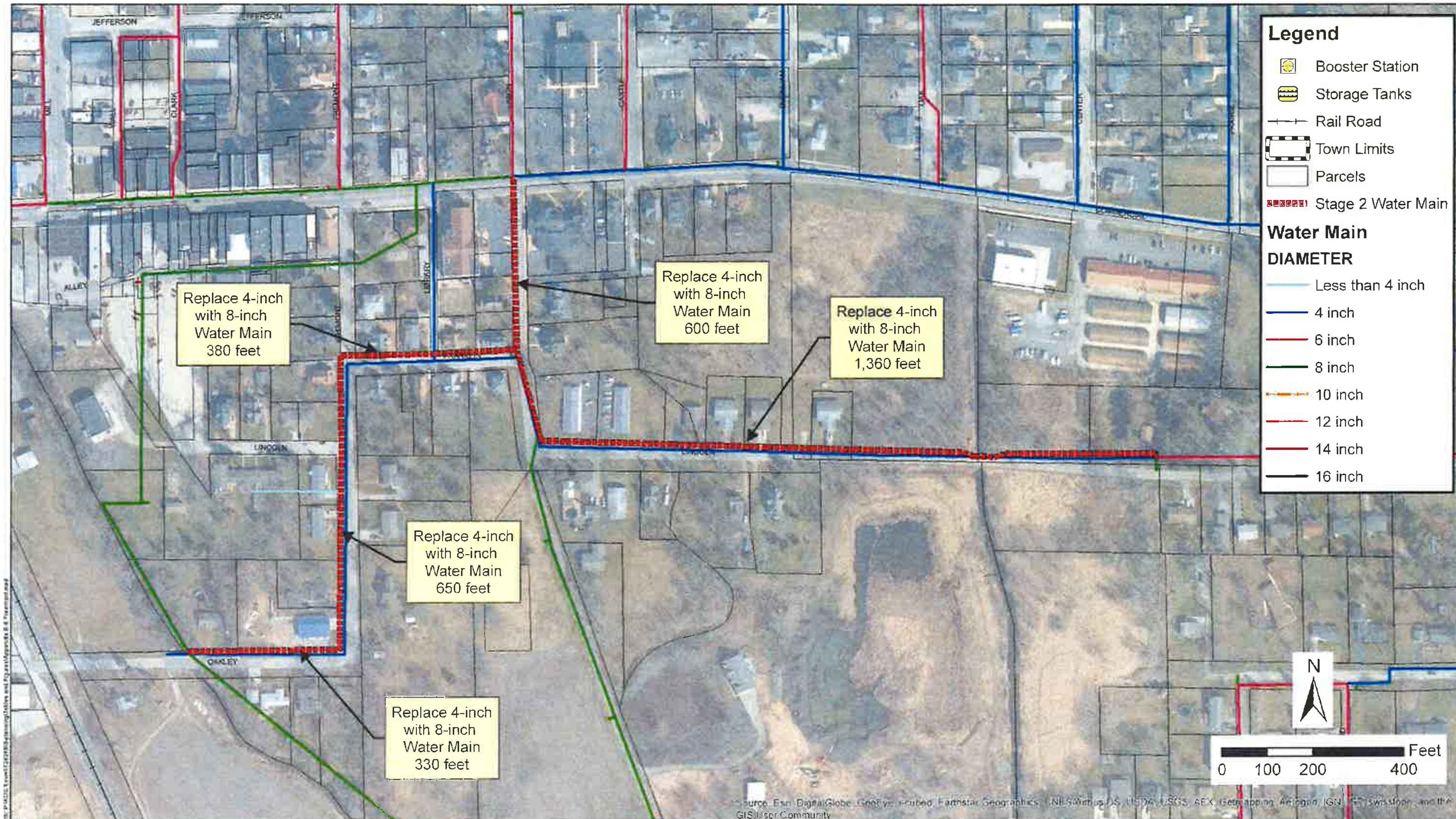
Oakley from Fremont to Cedar Creek

TOWN OF LOWELL, INDIANA STAGE 2 WATER DISTRIBUTION SYSTEM IMPROVEMENTS

Engineer's Estimate of Probable Project Cost
SEH of Indiana, LLC
November, 2014

Construction Item	Unit	Quantity	Unit Cost	Total Cost
Mobilization / Demobilization	LS	1	$ 4,500	$ 4,500
Construction Engineering	LS	1	$ 2,250	$ 2,250
Maintenance of Traffic	LS	1	$ 900	$ 900
Erosion Control	LS	1	$ 900	$ 900
Connect to Existing Water Main	EACH	2	$ 2,000	$ 4,000
Common Excavation	CYS	600	$ 20	$ 12,000
Structural Backfill	CYS	600	$ 30	$ 18,000
Subgrade Treatment	SYS	300	$ 5	$ 1,500
Compacted Aggregate, No. 53	TON	100	$ 25	$ 2,500
HMA Intermediate	TON	40	$ 85	$ 3,400
HMA Surface	TON	25	$ 90	$ 2,250
Water Main, Ducticle Iron Pipe, 12 IN.	LFT	0	$ 85	$ -
Service Connections	EACH	10	$ 1,500	$ 15,000
8 IN. Gate Valve	EACH	1	$ 1,800	$ 1,800
Fire Hydrant Assembly	EACH	1	$ 5,000	$ 5,000
Sedding Restoration	SYS	150	$ 1	$ 150
			Sub-total	**$ 95,600**
			15% contingency	$ 14,340
			Total Estimated Construction Costs	**$ 110,000**
Non-Construction Costs				
Design Engineering			10%	$ 11,000
Construction Engineering			5%	$ 5,500
Permitting, Easement and Legal				$ 1,500
			Total Estimated Non-Construction Costs	**$ 18,000**

Grand Total	**$ 128,000**



SEH of Indiana

SEH of Indiana, LLC
9200 Calumet Avenue, Suite N200
Munster, IN 46321
Phone: 219.513.2500
www.sehinc.com

Project: LOWEL 126268
Print Date: 10/30/2014

Stage 2 Distribution System Improvements

Lowell Water System Master Plan
Lowell, Indiana

Figure E-6

Cause No. 45550
Docket Entry Request No. 4
Page 160 of 181

Appendix E-7 A

Apache between Nichols and Tomahawk

TOWN OF LOWELL, INDIANA STAGE 2 WATER DISTRIBUTION SYSTEM IMPROVEMENTS

Engineer's Estimate of Probable Project Cost
SEH of Indiana, LLC
November, 2014

Construction Item	Unit	Quantity	Unit Cost	Total Cost
Mobilization / Demobilization	LS	1	$ 5,000	$ 5,000
Construction Engineering	LS	1	$ 2,500	$ 2,500
Maintenance of Traffic	LS	1	$ 1,000	$ 1,000
Erosion Control	LS	1	$ 1,000	$ 1,000
Connect to Existing Water Main	EACH	2	$ 2,000	$ 4,000
Common Excavation	CYS	625	$ 20	$ 12,500
Structural Backfill	CYS	625	$ 30	$ 18,750
Subgrade Treatment	SYS	325	$ 5	$ 1,625
Compacted Aggregate, No. 53	TON	105	$ 25	$ 2,625
HMA Intermediate	TON	45	$ 85	$ 3,825
HMA Surface	TON	30	$ 90	$ 2,700
Water Main, Ducticle Iron Pipe, 12 IN.	LFT	350	$ 85	$ 29,750
Service Connections	EACH	5	$ 1,500	$ 7,500
12 IN. Gate Valve	EACH	1	$ 2,400	$ 2,400
Fire Hydrant Assembly	EACH	1	$ 5,000	$ 5,000
Sedding Restoration	SYS	150	$ 1	$ 150
			Sub-total	**$ 100,400**
			15% contingency	$ 15,060
			Total Estimated Construction Costs	$ 115,500
Non-Construction Costs				
Design Engineering			10%	$ 11,550
Construction Engineering			5%	$ 5,775
Permitting, Easement and Legal				$ 1,500
			Total Estimated Non-Construction Costs	$ 18,900

Grand Total $ 134,400

Appendix E-7 B

Apache from Tomahawk to existing Main

TOWN OF LOWELL, INDIANA STAGE 2 WATER DISTRIBUTION SYSTEM IMPROVEMENTS

Engineer's Estimate of Probable Project Cost
SEH of Indiana, LLC
November, 2014

Construction Item	Unit	Quantity	Unit Cost	Total Cost
Mobilization / Demobilization	LS	1	$ 10,000	$ 10,000
Construction Engineering	LS	1	$ 5,000	$ 5,000
Maintenance of Traffic	LS	1	$ 2,000	$ 2,000
Erosion Control	LS	1	$ 2,000	$ 2,000
Connect to Existing Water Main	EACH	2	$ 2,000	$ 4,000
Common Excavation	CYS	1500	$ 20	$ 30,000
Structural Backfill	CYS	1500	$ 30	$ 45,000
Subgrade Treatment	SYS	750	$ 5	$ 3,750
Compacted Aggregate, No. 53	TON	250	$ 25	$ 6,250
HMA Intermediate	TON	105	$ 85	$ 8,925
HMA Surface	TON	65	$ 90	$ 5,850
Water Main, Ducticle Iron Pipe, 8 IN.	LFT	840	$ 65	$ 54,600
Service Connections	EACH	25	$ 1,500	$ 37,500
8 IN. Gate Valve	EACH	2	$ 1,800	$ 3,600
Fire Hydrant Assembly	EACH	1	$ 5,000	$ 5,000
Sedding Restoration	SYS	350	$ 1	$ 350
			Sub-total	**$ 223,900**
			15% contingency	$ 33,585
			Total Estimated Construction Costs	**$ 257,500**
Non-Construction Costs				
Design Engineering			10%	$ 25,750
Construction Engineering			5%	$ 12,875
Permitting, Easement and Legal				$ 1,500
			Total Estimated Non-Construction Costs	**$ 40,200**

Grand Total	**$ 297,700**

Appendix E-7 C

Tomahawk from Apache to Cheyenne

TOWN OF LOWELL, INDIANA STAGE 2 WATER DISTRIBUTION SYSTEM IMPROVEMENTS

Engineer's Estimate of Probable Project Cost
SEH of Indiana, LLC
November, 2014

Construction Item	Unit	Quantity	Unit Cost	Total Cost
Mobilization / Demobilization	LS	1	$ 4,500	$ 4,500
Construction Engineering	LS	1	$ 2,250	$ 2,250
Maintenance of Traffic	LS	1	$ 900	$ 900
Erosion Control	LS	1	$ 900	$ 900
Connect to Existing Water Main	EACH	2	$ 2,000	$ 4,000
Common Excavation	CYS	675	$ 20	$ 13,500
Structural Backfill	CYS	675	$ 30	$ 20,250
Subgrade Treatment	SYS	340	$ 5	$ 1,700
Compacted Aggregate, No. 53	TON	115	$ 25	$ 2,875
HMA Intermediate	TON	50	$ 85	$ 4,250
HMA Surface	TON	30	$ 90	$ 2,700
Water Main, Ducticle Iron Pipe, 8 IN.	LFT	380	$ 65	$ 24,700
Service Connections	EACH	5	$ 1,500	$ 7,500
8 IN. Gate Valve	EACH	1	$ 1,800	$ 1,800
Fire Hydrant Assembly	EACH	1	$ 5,000	$ 5,000
Sedding Restoration	SYS	250	$ 1	$ 250
			Sub-total	**$ 97,100**
			15% contingency	$ 14,565
			Total Estimated Construction Costs	**$ 111,700**
Non-Construction Costs				
Design Engineering			10%	$ 11,170
Construction Engineering			5%	$ 5,585
Permitting, Easement and Legal				$ 1,500
			Total Estimated Non-Construction Costs	**$ 18,300**

Grand Total	**$ 130,000**

Appendix E-7 D

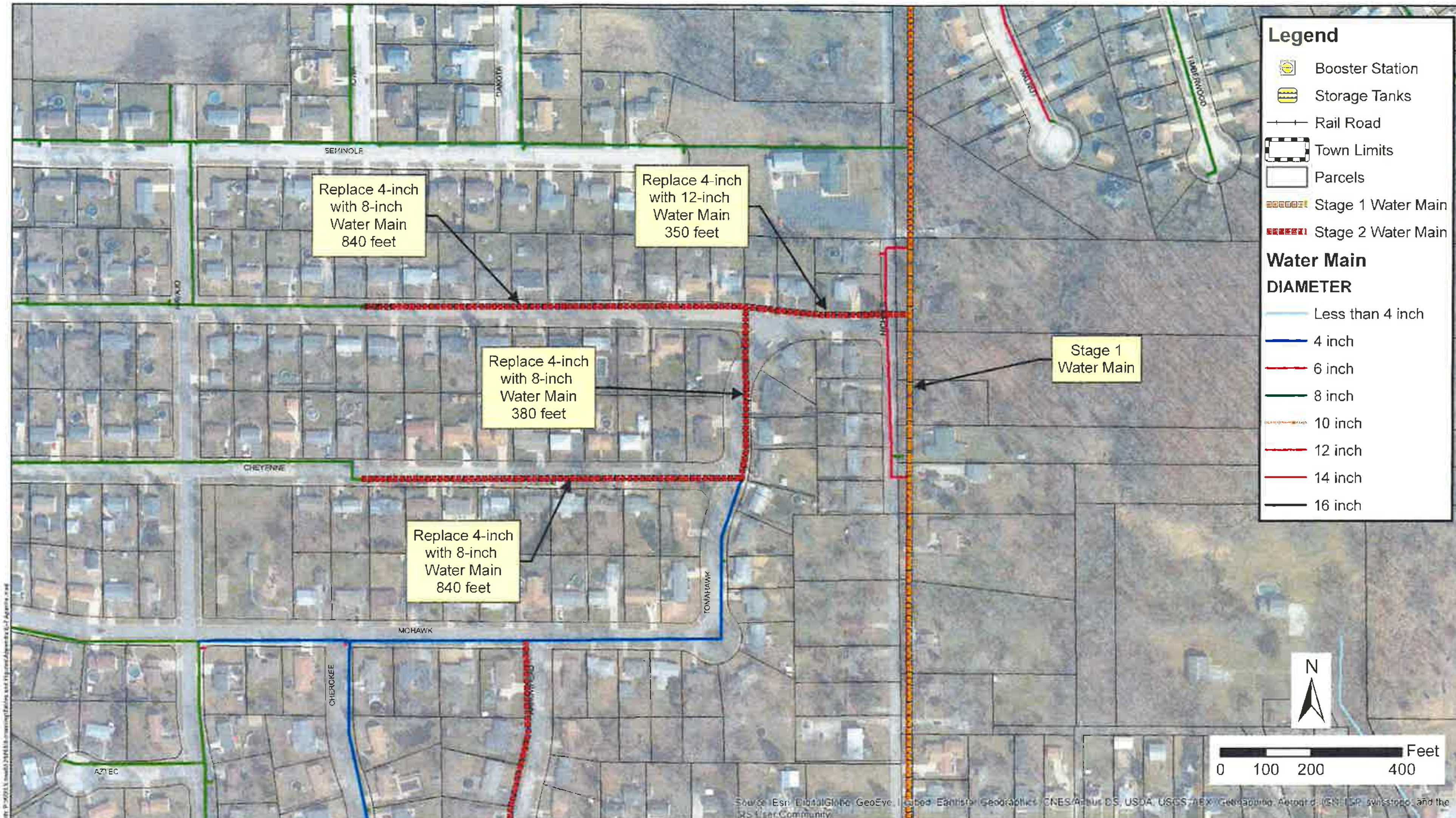
Cheyenne from Tomahawk to 8-inch Main

TOWN OF LOWELL, INDIANA STAGE 2 WATER DISTRIBUTION SYSTEM IMPROVEMENTS

Engineer's Estimate of Probable Project Cost
SEH of Indiana, LLC
November, 2014

Construction Item	Unit	Quantity	Unit Cost	Total Cost
Mobilization / Demobilization	LS	1	$ 10,000	$ 10,000
Construction Engineering	LS	1	$ 5,000	$ 5,000
Maintenance of Traffic	LS	1	$ 2,000	$ 2,000
Erosion Control	LS	1	$ 2,000	$ 2,000
Connect to Existing Water Main	EACH	4	$ 2,000	$ 8,000
Common Excavation	CYS	1500	$ 20	$ 30,000
Structural Backfill	CYS	1500	$ 30	$ 45,000
Subgrade Treatment	SYS	750	$ 5	$ 3,750
Compacted Aggregate, No. 53	TON	250	$ 25	$ 6,250
HMA Intermediate	TON	105	$ 85	$ 8,925
HMA Surface	TON	65	$ 90	$ 5,850
Water Main, Ducticle Iron Pipe, 8 IN.	LFT	840	$ 65	$ 54,600
Service Connections	EACH	20	$ 1,500	$ 30,000
8 IN. Gate Valve	EACH	2	$ 1,800	$ 3,600
Fire Hydrant Assembly	EACH	1	$ 5,000	$ 5,000
Sedding Restoration	SYS	350	$ 1	$ 350
			Sub-total	**$ 220,400**
			15% contingency	$ 33,060
			Total Estimated Construction Costs	**$ 253,500**
Non-Construction Costs				
Design Engineering			10%	$ 25,350
Construction Engineering			5%	$ 12,675
Permitting, Easement and Legal				$ 1,500
			Total Estimated Non-Construction Costs	**$ 39,600**

Grand Total	**$ 293,100**



SEH of Indiana

SEH of Indiana, LLC
9200 Calumet Avenue, Suite N300
Munster, IN 46321
Phone: 219.513.2500
www.sehinc.com

Project: LOWEL 126268
Print Date: 11/5/2014

Map by: Jeheert
Projection: Indiana West (feet)
Source: Town of Lowell

Stage 2 Distribution System Improvements
Lowell Water System Master Plan
Lowell, Indiana

Figure E-7

Cause No. 45550
Docket Entry Request No. 4
Page 165 of 181

SEH of Indiana

SEH of Indiana, LLC
9200 Calumet Avenue, Suite N300
Munster, IN 46321
Phone: 219.513.2500
www.sehinc.com

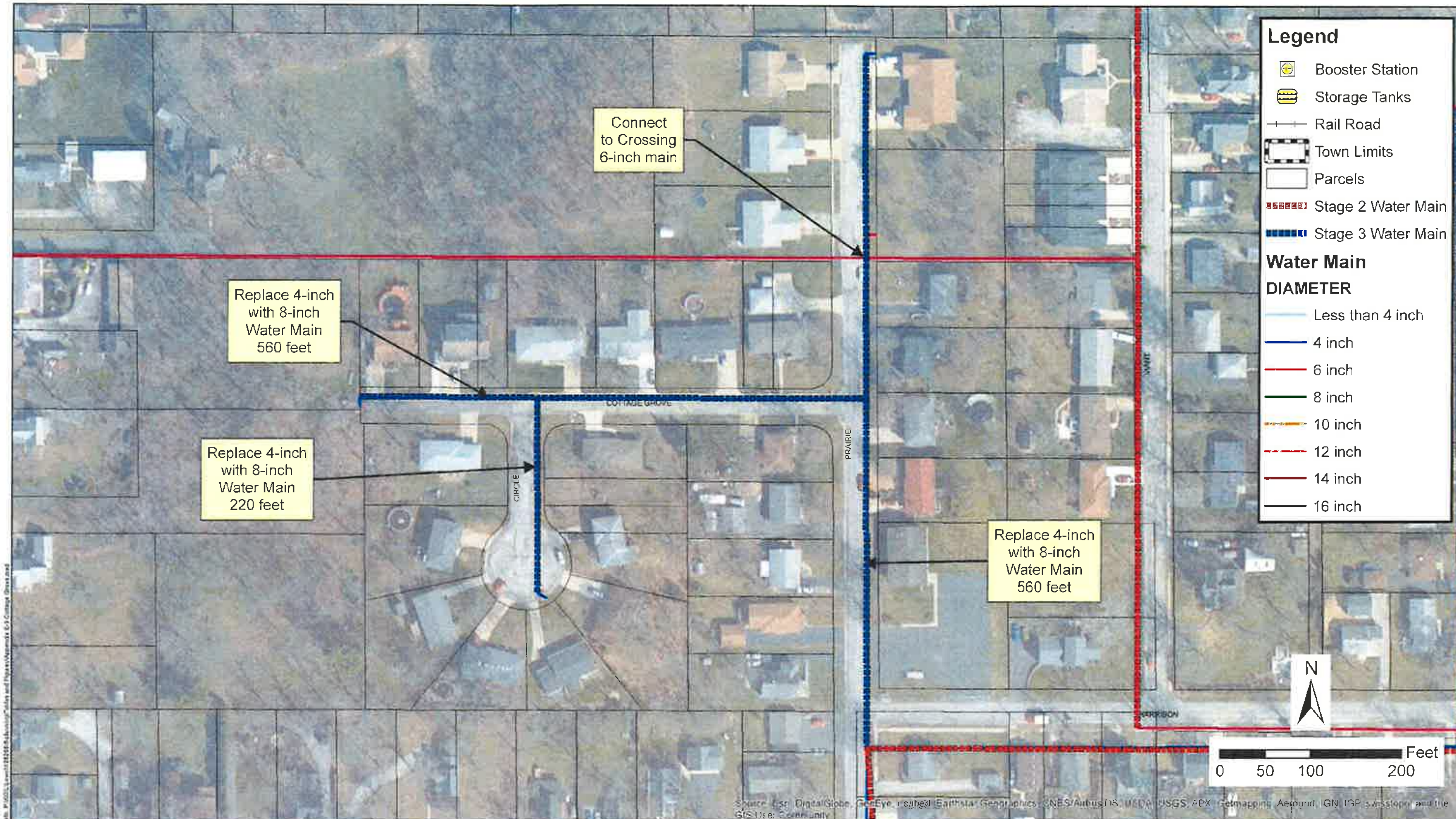
Project: LOWEL 126268
Print Date: 10/30/2014

Stage 3 Distribution System Improvements

Lowell Water System Master Plan

Lowell, Indiana

Figure E-8



SEH of Indiana

SEH of Indiana, LLC
9200 Calumet Avenue, Suite N300
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Phone: 219.513.2500
www.sehinc.com

Project: LOWEL 126268
Print Date: 10/30/2014

Stage 3 Distribution System Improvements

Lowell Water System Master Plan
Lowell, Indiana

Figure E-9

Cause No. 45550
Docket Entry Request No. 4
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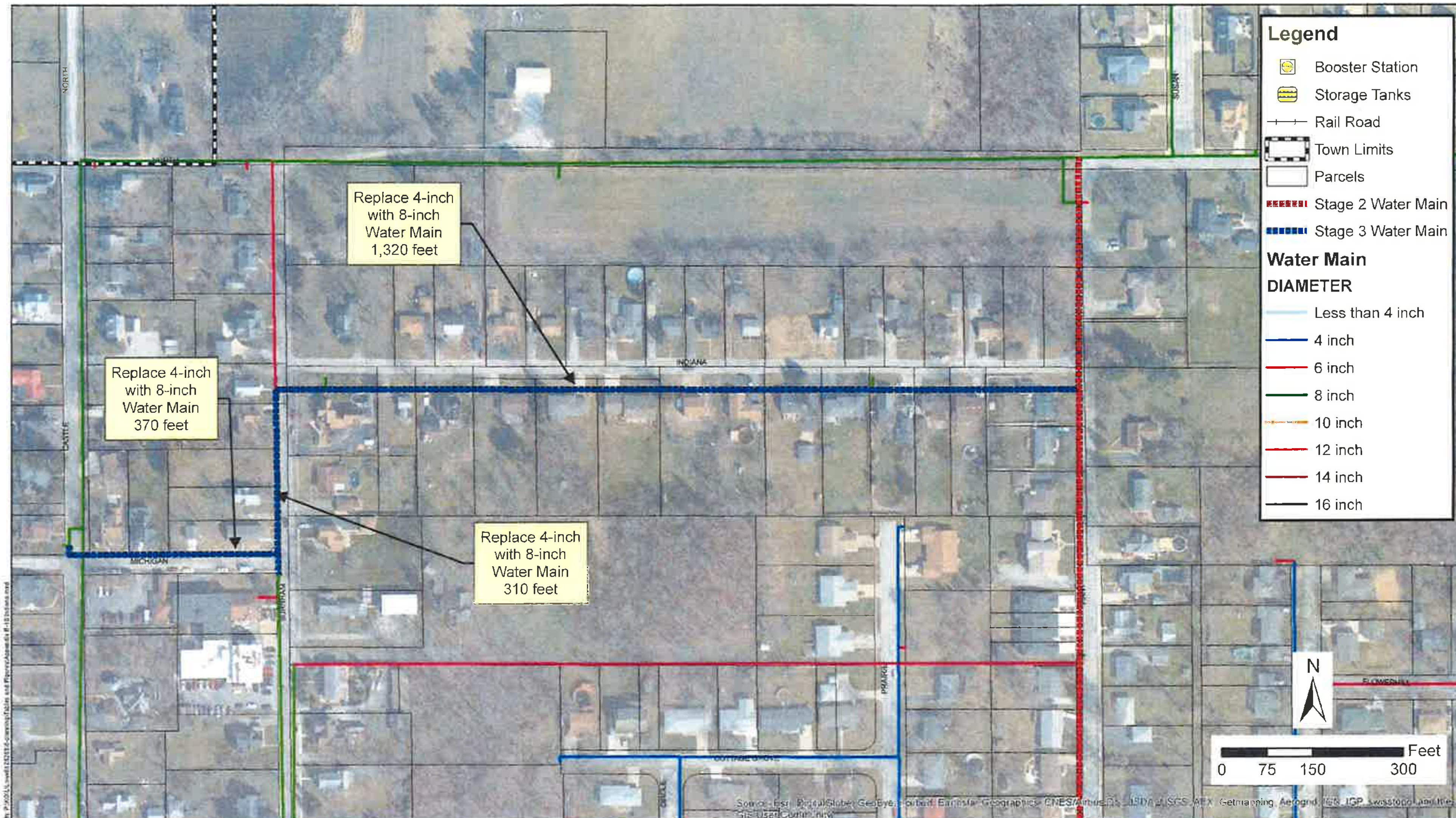

SEH of Indiana

SEH of Indiana, LLC
9200 Calumet Avenue, Suite N300
Munster, IN 46321
Phone: 219.513.2500
www.sehinc.com

Project: LOWEL 126268
Print Date: 10/30/2014

Map by: jbohnert
Projection: Indiana West (feet)
Source: Town of Lowell

Stage 3 Distribution System Improvements

Lowell Water System Master Plan
Lowell, Indiana

Figure E-10

SEH of Indiana

SEH of Indiana, LLC
9200 Calumet Avenue, Suite N500
Munster, IN 46321
Phone 219.513.2500
www.sehinc.com

Project: LOWEL 126268
Print Date: 10/30/2014

Map by: jpohnert
Projection: Indiana West (feet)
Source: Town of Lowell

Stage 3 Distribution System Improvements

Lowell Water System Master Plan
Lowell, Indiana

Figure E-11

Cause No. 45550
Docket Entry Request No. 4
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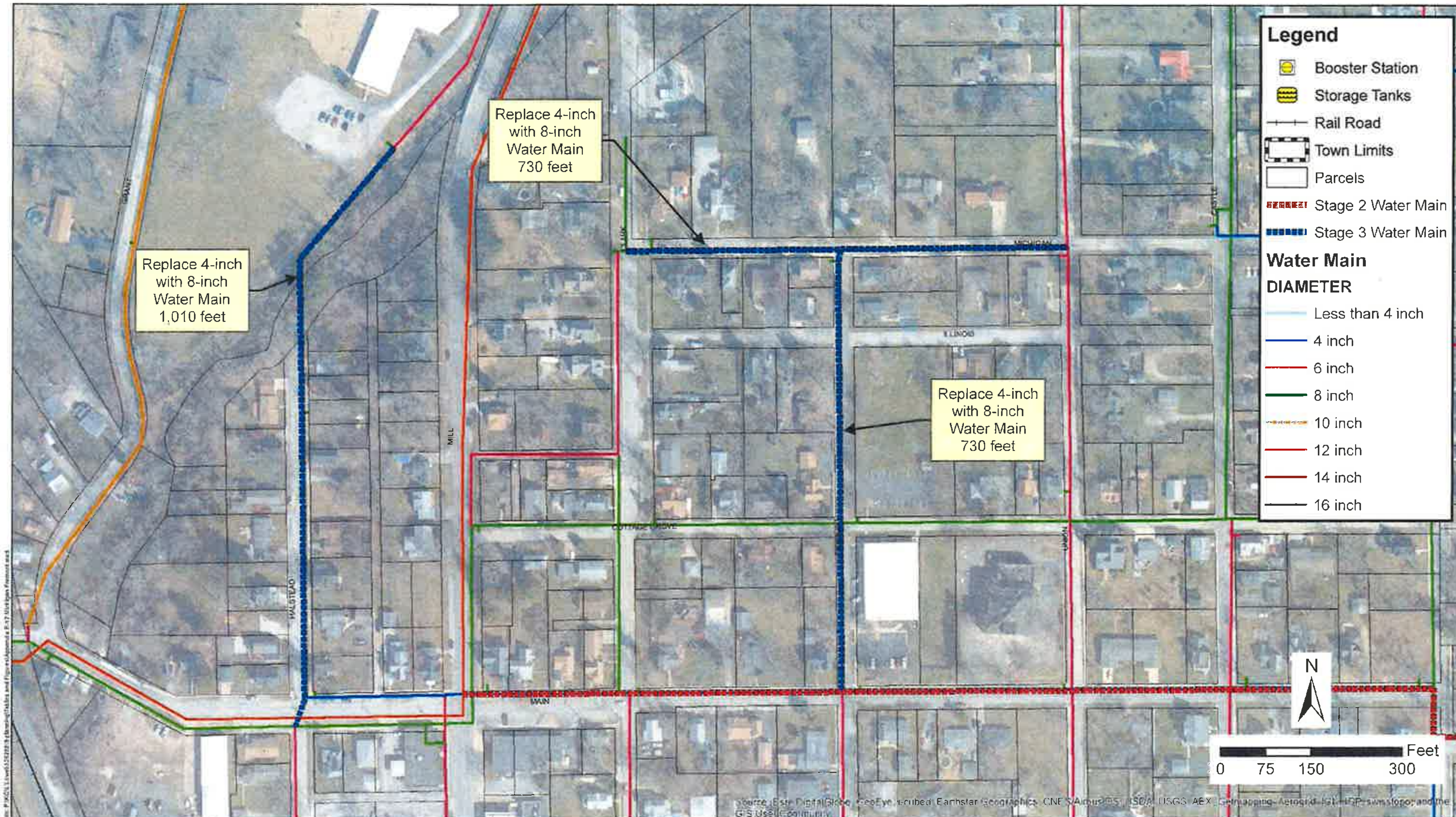


SEH of Indiana

SEH of Indiana, LLC
9200 Calumet Avenue, Suite N300
Munster, IN 46321
Phone: 219.513.2500
www.sehinc.com

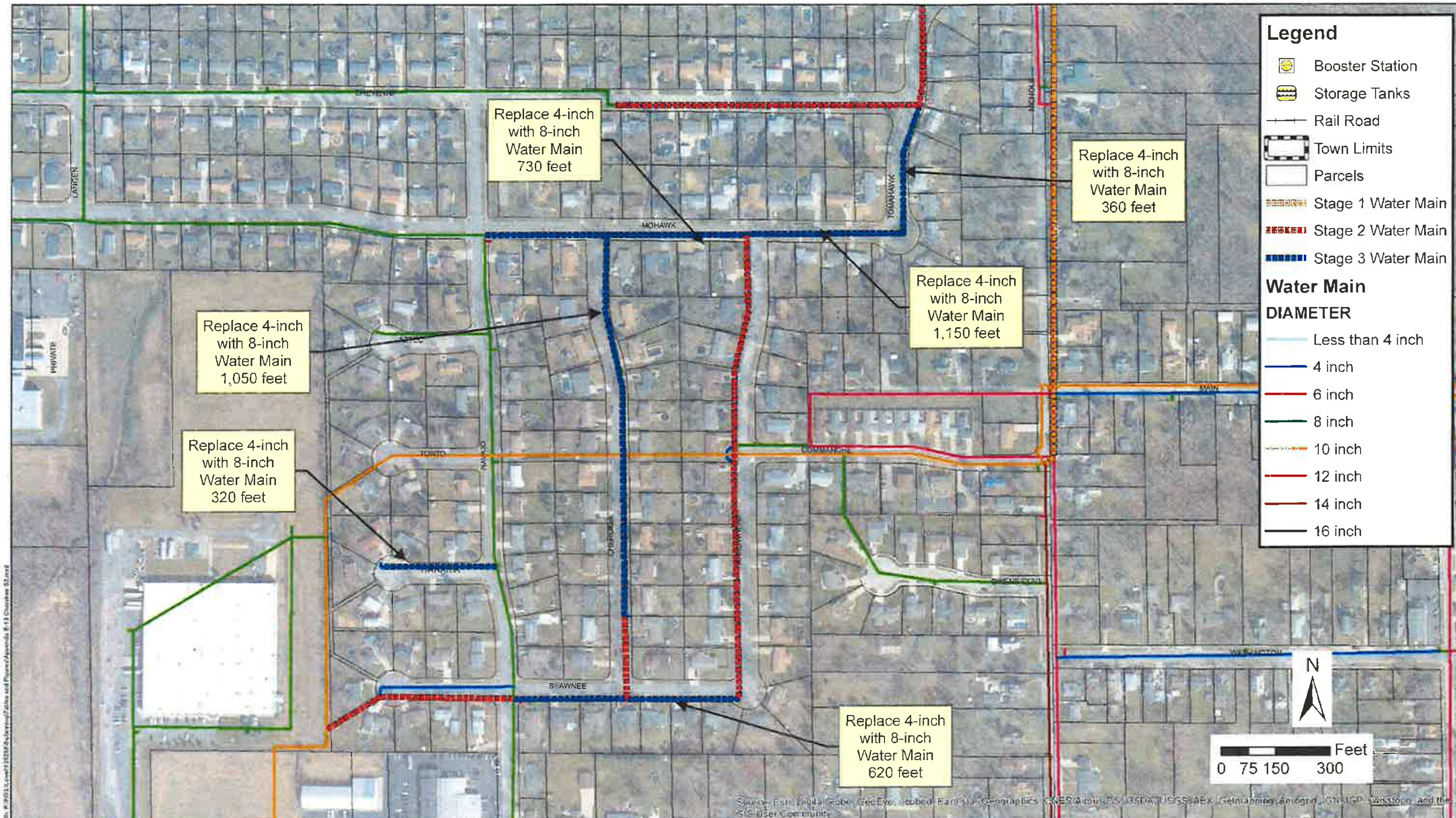
Project: LOWEL 126268
Print Date: 10/30/2014

Stage 3 Distribution System Improvements

Lowell Water System Master Plan

Lowell, Indiana

Figure E-12



SEH of Indiana

SEH of Indiana, LLC
9200 Calumet Avenue, Suite N300
Munster, IN 46321
Phone: 219.513.2500
www.sehinc.com

Project: LOWEL 126268
Print Date: 11/5/2014

Stage 3 Distribution System Improvements
Lowell Water System Master Plan
Lowell, Indiana

Figure E-13

SEH of Indiana

SEH of Indiana, LLC
9200 Calumet Avenue, Suite N500
Munster, IN 46321
Phone: 219.513.2500
www.sehinc.com

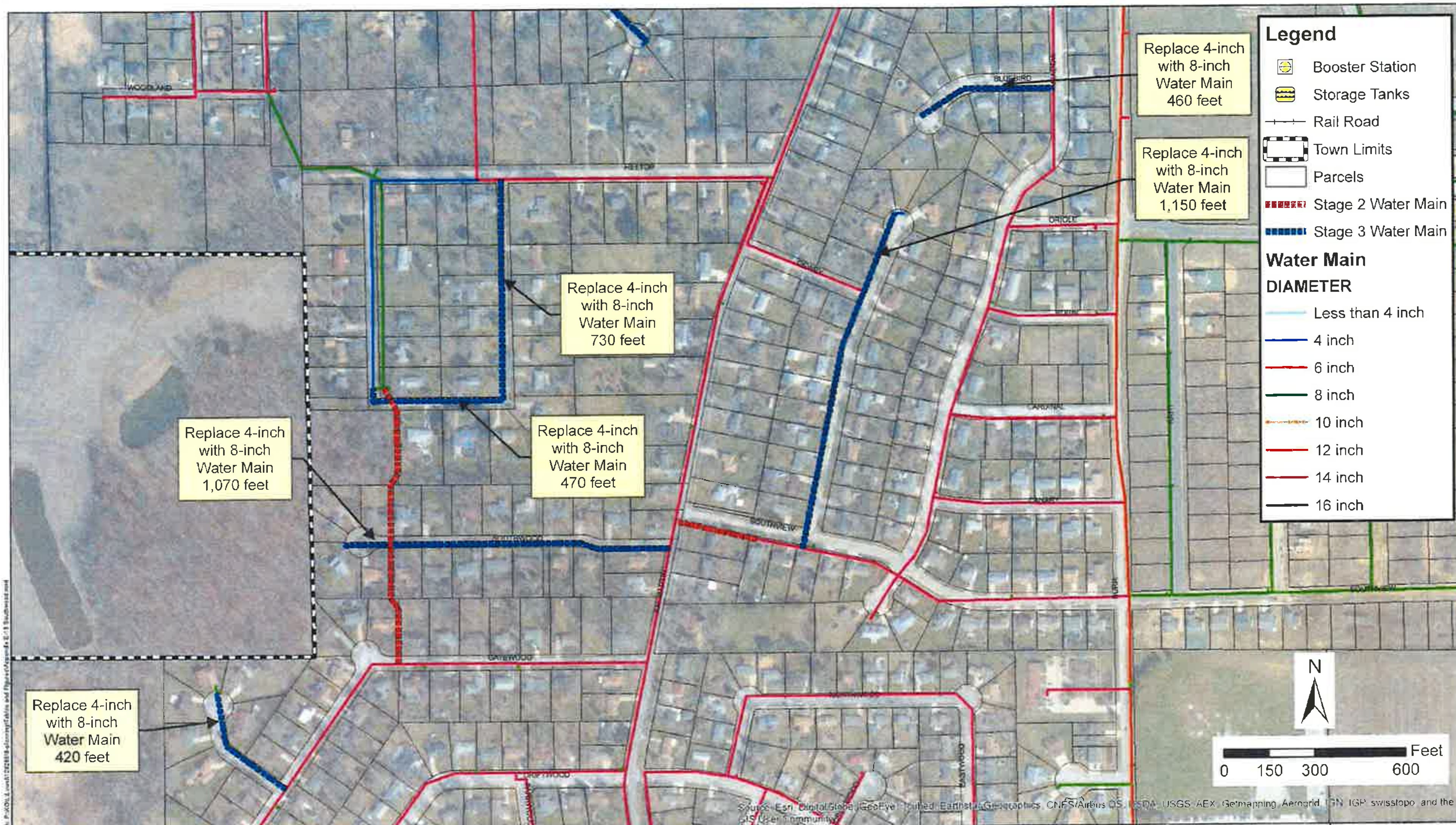
Project: LOWEL 126268
Print Date: 10/30/2014

Stage 3 Distribution System Improvements

Lowell Water System Master Plan

Lowell, Indiana

Figure E-14



SEH of Indiana

SEH of Indiana, LLC
9230 Calumet Avenue, Suite N300
Munster, IN 46321
Phone: 219.513.2500
www.sehinc.com

Project: LOWEL 126268
Print Date: 10/30/2014

Map by: jbohnert
Projection: Indiana West (feet)
Source: Town of Lowell

Stage 3 Distribution System Improvements

Lowell Water System Master Plan

Lowell, Indiana

Figure E-15

Cause No. 45550
Docket Entry Request No. 4
Page 173 of 181

SEH of Indiana

SEH of Indiana, LLC
9200 Calumet Avenue, Suite N300
Munster, IN 46321
Phone: 219.513.2500
www.sehinc.com

Project: LOWEL 126268
Print Date: 11/5/2014

Projection: Indiana West (feet)

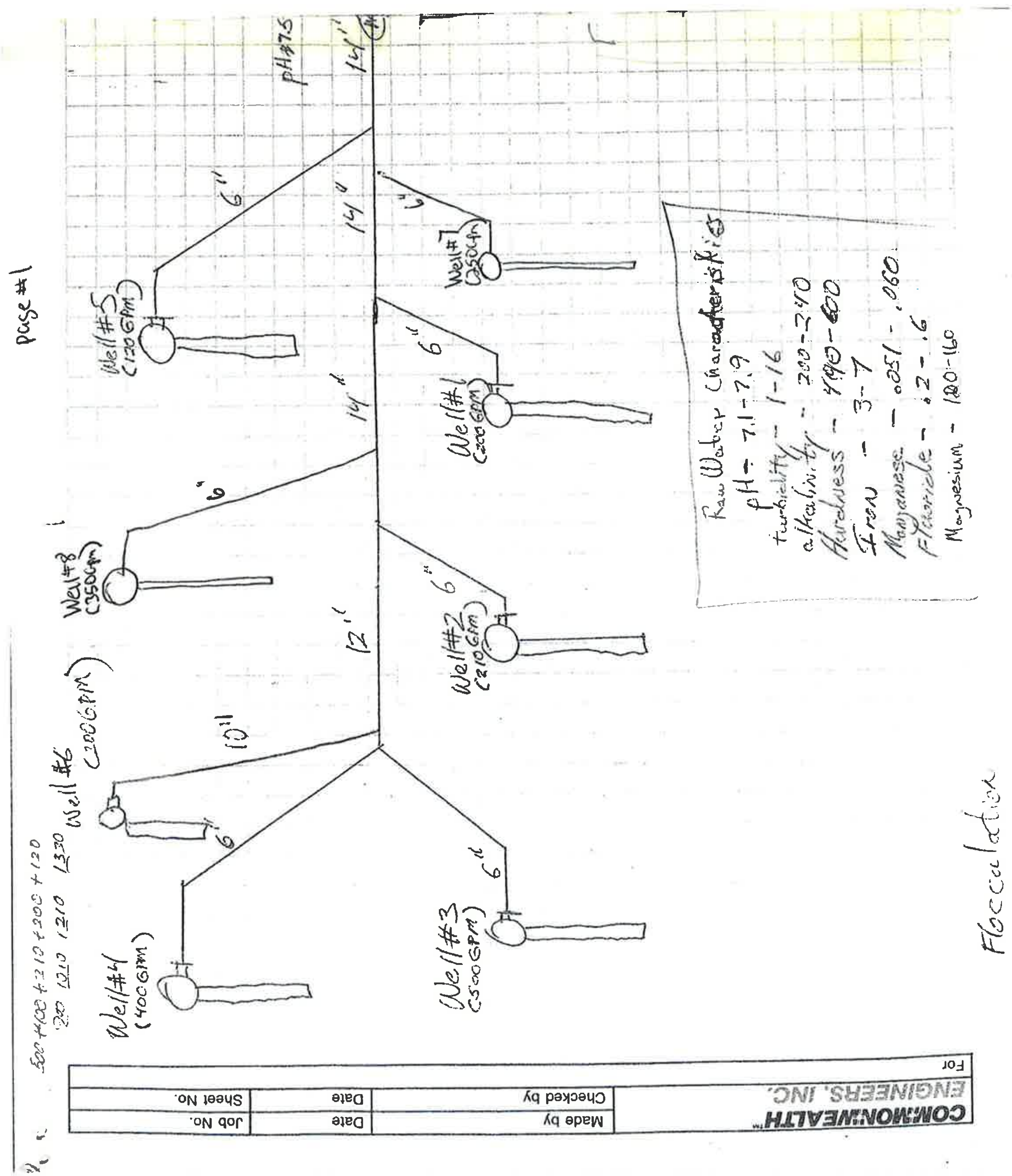
Stage 3 Distribution System Improvements

Lowell Water System Master Plan
Lowell, Indiana

Figure E-16

Appendix F

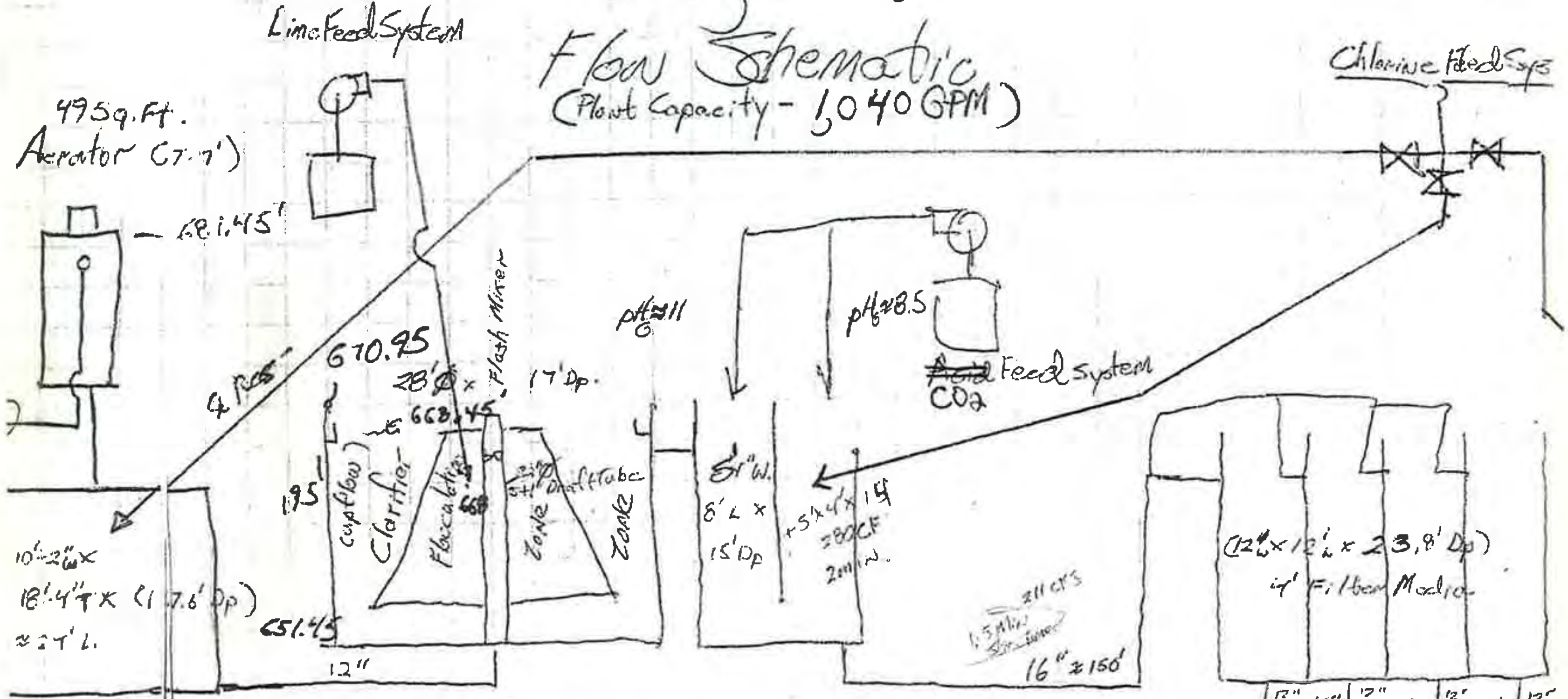
Water Treatment Plant Process Flow Diagram


Page #1
Well #5 (120 GPM)
Well #7 (350 GPM)
Well #1 (200 GPM)
Well #8 (350 GPM)
Well #2 (210 GPM)
Well #6 (200 GPM)
Well #3 (500 GPM)
Well #4 (400 GPM)
6"
14"
12"
10"
pH 7.5
Raw Water Characteristics
pH - 7.1-7.9
turbidity - 1-16
alkalinity - 200-240
Hardness - 400-600
Iron - 3-7
Manganese - .051-.060
Fluoride - .2-.6
Magnesium - 100-160
Flocculation
500+400+210+200+120
COMMONWEALTH ENGINEERS, INC.
Made by
Checked by
Date
Job No.
Sheet No.
For

Lowell, IN

Flow Schematic
(Plant Capacity - 1,040 GPM)

2 651.45 Page #2



solids contact tank influent flow equalization chamber

32,000 Gal total

30 Min Detention Time

pH in ≈ 7.5 pH out ≈ 11 (Cozi)

solids contact clarifiers (2)

78,000 Gal Ea

156,000 Gal total

700 Gal ea. (Flash Mix)

1400 " total " "

1.3 min Detention Time (Flash Mix)

2.5 hrs Detention Time (150 min.)

(Flocculation & Clarifier Zone)

615 Sq ft Each

1230 Sq ft total

stabilization chambers (2)

4,500 Gal Ea

9,000 Gal total

8.6

80 Min Detention Time

pH in ≈ 11 pH out ≈ 8.5 (Cozi)

Gravity Filters (4)

21,000 Gal Ea,

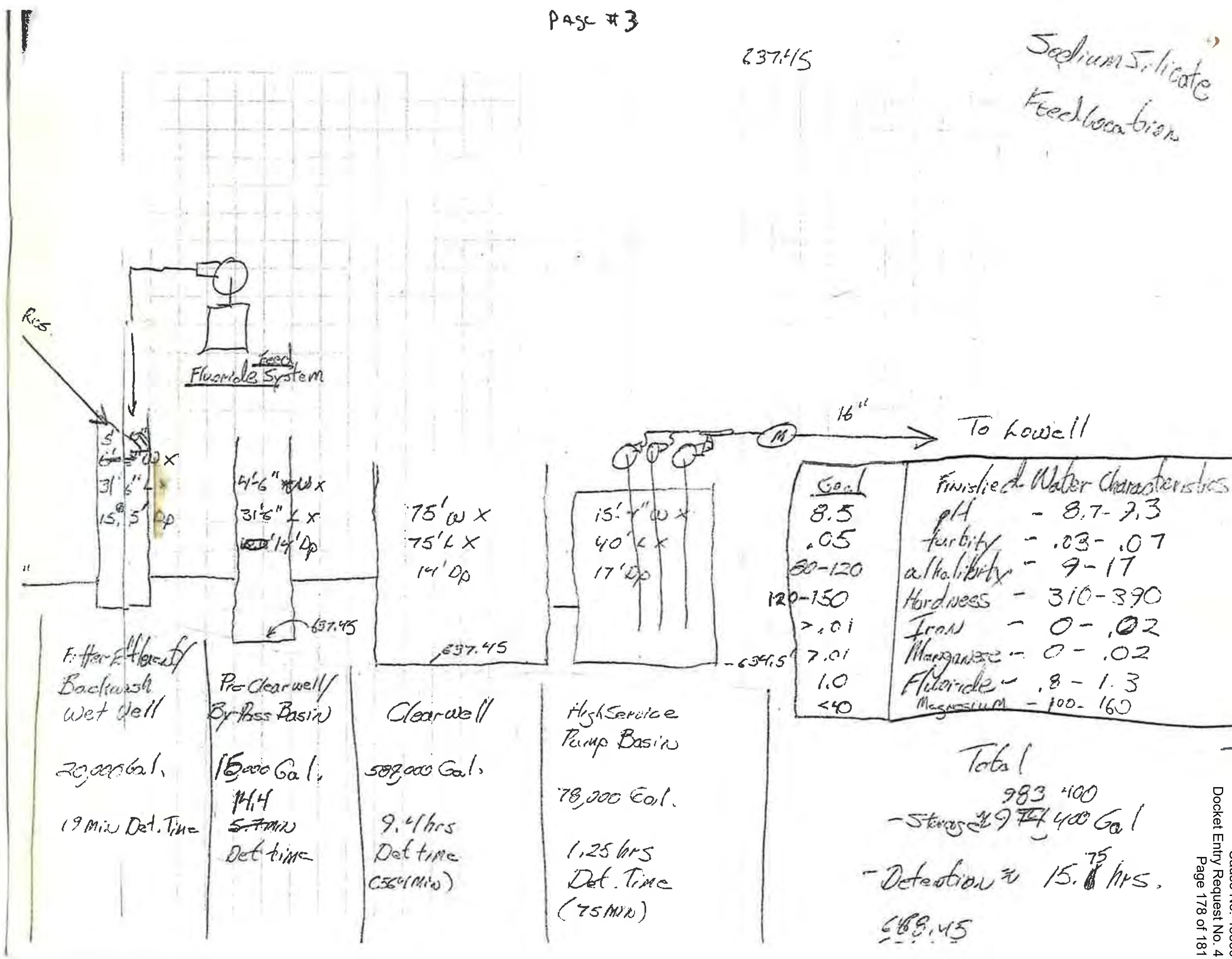
84,000 Gal total

144 Sq Ft each

576 Sq Ft total

1.8 GPM/sq. ft. filtration rate

80 min Det time


Page #3
637.45
Sodium Silicate
Feed location
Rus.
Feed
Fluoride System
16"
To Lowell
5'
6'-0" W x
31' 6" L x
15.5' Dp
4'-6" W x
31'6" L x
14' Dp
637.45
75' W x
75' L x
14' Dp
637.45
15'-4" W x
40' L x
17' Dp
-634.5'
Filter Effluent/
Backwash
Wet Well
20,000 Gal.
19 Min Det. Time
Pre-Clearwell/
By-Pass Basin
15,000 Gal.
14.4
5.7 min
Det time
Clearwell
588,000 Gal.
9.4 hrs
Det time
(564 Min)
High Service
Pump Basin
78,000 Gal.
1.25 hrs
Det. Time
(75 Min)
Goal
8.5
.05
80-120
120-150
>.01
7.01
1.0
<40
Finished Water Characteristics
pH - 8.7-7.3
turbity - .03-.07
alkalinity - 9-17
Hardness - 310-390
Iron - 0-.02
Manganese - 0-.02
Fluoride - .8-1.3
Magnesium - 100-160
Total
983,400
- Storage 497,400 Gal
- Detention ≈ 15.75 hrs.
588.45

Town of Lowell, IN
(Tankage Information @ Plant Capacity of 1,040 GPM)

Solids Contact Tank Influent Flow Equalization Chamber (10'-2" W x 24' L x 17.6' Dp)	Solids Contact Clarifiers (2) pH in ≈ 7.5 / pH out ≈ 11 (28' ø x 17' Dp)	Stabilization Chambers (2) pH in ≈ 11 / pH out ≈ 8.5 (5'-10" W x 8' L x 15' Dp)	Gravity Filters (4) (12' W x 12' L x 23.8' Dp)	Filter Effluent/ Backwash Wetwell (5'-10" W x 31'-8" L x 15.5' Dp)	Pre Clearwell/ Bypass Basin (4'-6" W x 31'-6" L x 14' Dp)	Clearwell (75' W x 75' L x 14' Dp)	High Service Pump Basin (15'-4" W x 40' L x 17' Dp)	Total
32,000 Gal. Total	78,000 Gal. Each	4,500 Gal. Each	21,000 Gal. Each	20,000 Gal.	15,000 Gal.	589,000 Gal.	78,000 Gal.	Storage: 983,000 Gal.
30 Min. Detention Time	156,000 Gal. Total	9,000 Gal. Total	84,000 Gal. Total	19 Min. Detention Time	14.4 Detention Time	9.4 Hrs. Detention Time (564 Min.)	1.25 Hrs. Detention Time (75 Min.)	Detention: ≈ 15.75 Hrs. (945 Min.)
	700 Gal. Each (Flash Mix)	8.6 Min. Detention Time	144 Sq. Ft. Each					
	14,000 Gal. Total (Flash Mix)		576 Sq. Ft. Total					
	1.3 Min. Detention Time (Flash Mix)		1.8 GPM/Sq. Ft. Filtration Rate					
	2.5 Hrs. Detention Time (150 Min.) (Flocculation and clarifier zone)		80 Min. Detention Time					
	615 Sq. Ft. Each							
	1,230 Sq. Ft. Total							

Appendix G

Stage One Improvements

SEH

PRELIMINARY CONSTRUCTION COST ESTIMATE
Town of Lowell
Water System Evaluation
Stage 1 Improvements
Appendix G

WATER TOWER, WATER TREATMENT PLANT, AND WELL

ITEM	UNIT	QUANTITY	UNIT PRICE	COST
1,000,000 GALLON ELEVATED SPHEROID TANK	Each	1	$2,406,000.00	$2,406,000
PILE FOUNDATION	L.S.	1	$100,000.00	$100,000
ALTITUDE VALVE AND BYPASS PIPING	L.S.	1	$25,000.00	$25,000
ADDITIONAL PIPING TO TANK	L.S.	1	$50,000.00	$50,000
TANK SITE WORK	L.S.	1	$50,000.00	$50,000
THREE NEW TREATMENT PLANT PUMPS WITH VFDS	L.S.	1	$150,000.00	$150,000
EFFLUENT METER AND VAULT	L.S.	1	$55,000.00	$55,000
NEW WELL (40 FEET DEEP IN SAND) & PUMP	L.S.	1	$75,000.00	$75,000
SITE WORK FOR WELL	L.S.	1	$20,000.00	$20,000
PIPING FOR WELL	L.F.	350	$70.00	$25,000
ELECTRIC FOR WELL	L.S.	1	$10,000.00	$10,000
TELEMETRY AND SCADA	Each	1	$10,000.00	$10,000
SUBTOTAL				$2,976,000
CONTINGENCY - 15%				$446,400
ENGINEERING - 15%				$446,400
TOTAL ESTIMATED WATER STORAGE CONSTRUCTION COST				$3,870,000

WATERMAIN

ITEM	UNIT	QUANTITY	UNIT PRICE	COST
12-INCH D.I. WATER MAIN	LF	3030	$85.00	$257,550
VALVE AND BOX, 12-INCH GATE VALVE	EACH	8	$1,400.00	$11,200
FIRE HYDRANT	EA	6	$3,500.00	$21,000
HYDRANT LEADS - 6 INCH	LF	180	$32.00	$5,760
HYDRANT VALVES - 6 INCH	EA	6	$1,200.00	$7,200
CONNECT TO EXISTING WATER MAIN	Each	3	$2,500.00	$7,500
SUBTOTAL				$310,210
CONTINGENCY - 15%				$46,530
ENGINEERING - 15%				$46,530
TOTAL ESTIMATED WATERMAIN CONSTRUCTION COST				$400,000

SITE, STREET, MISC. (ASSUME ONLY ONE LANE IS DISTURBED)

ITEM	UNIT	QUANTITY	UNIT PRICE	COST
MAINTENANCE OF TRAFFIC	L.S.	1	$5,000.00	$5,000
MOBILIZATION	L.S.	1	$10,000.00	$10,000
COMMON EXCAVATION (PLAN QUANTITY)	CY	5,500	$20.00	$110,000
PREPARATION OF SUBBASE	SY	2,400	$1.50	$3,600
CRUSHED AGGREGATE BASE COURSE	TN	792	$22.00	$17,424
ASPHALTIC MATERIAL FOR TACK COAT	TN	1	$1,200.00	$1,200
HMA ASPHALTIC, SURFACE	TN	198	$75.00	$14,850
HMA ASPHALTIC, INTERMEDIATE	TN	330	$60.00	$19,800
ADJUSTING MANHOLE COVERS	EA	7	$191.00	$1,337
ADJUSTING INLET COVERS	EA	7	$90.50	$634
EROSION CONTROL	LS	1	$7,500.00	$7,500
LAWN REPLACEMENT, TYPE D (SEEDING)	SY	1,500	$1.00	$1,500
SUBTOTAL				$192,840
CONTINGENCY - 15%				$28,930
ENGINEERING - 15%				$28,930
TOTAL ESTIMATED WATERMAIN CONSTRUCTION COST				$250,000

TOTAL PROJECT CONSTRUCTION COST (WITH WATER TOWER)	**$4,500,000**