Northbridge/Sutton
Sewer Extension Feasibility Study

Submitted to:

Towns of Northbridge & Sutton, MA

Preparation Date:

February 4, 2010

Prepared By:

GRAVES ENGINEERING, INC.

100 Grove Street ■ Worcester, MA 01605
P:508-856-0321 F:508-856-0357
www.gravesengineering.com

TABLE OF CONTENTS

Page

1.0 INTRODUCTION 3
2.0 STUDY AREA 3
2.1 Boundaries 3
2.2 Zoning and Land Use 3
3.0 EXISTING SEWER SYSTEM ANALYSIS 5
3.1 Existing Sewer Infrastructure - General 5
3.2 Existing Flow Criteria and Peak Factors 5
3.3 Gilmore Drive Pump Station 5
3.4 Sutton Advanced Wastewater Treatment Facility 5
3.5 Sewer System Capacities 7
4.0 FUTURE DEVELOPMENTS AND PROJECTED WASTEWATER FLOWS 7
4.1 Future Development Land Area 7
4.2 Future Development Projected Wastewater Flows 9
4.3 Future Sewer System Layout - General 9
4.4 Future Full Build Development Scenario 9
4.5 Sutton Wastewater Flow Allocation 11
4.6 Future Limited Development Scenario 12
5.0 FINDINGS AND COST ESTIMATES 13
5.1 Future Full-Build Development Scenario 13
5.2 Future Limited Development Scenario 13

FIGURES

FIGURE 1: Study Area Boundaries 4
FIGURE 2: Existing Sewer Infrastructure 6
FIGURE 3: Future Development Land Areas 8
FIGURE 4: Full Build Out Conceptual Sewer Layout 10

APPENDICES

APPENDIX A: Water Use Records
- Table 1 - Gilmore Drive (South Sutton Commerce Park)
- Table 2 - Wal-Mart & National Grid Water Use Records

APPENDIX B: Table 3 – Sutton Wastewater Treatment Facility ADF Records
APPENDIX C: Cost Estimates

1.0 INTRODUCTION

This study is funded through a Priority Development Site and Chapter 43D Technical Assistance Grant through the Executive Office of Housing and Economic Development. Grants issued under this program are intended to assist in economic development endeavors in the grant communities. The Towns of Northbridge and Sutton jointly contracted Graves Engineering, Inc. (GEI) to investigate the feasibility of extending sanitary sewers within both towns near the intersection of Route 146 and Main Street(Northbridge)/Whitins Road(Sutton). The proposed extension would connect areas in both towns to the existing sanitary sewer system in Sutton which ultimately discharges to the Sutton Advanced Wastewater Treatment Facility. The purpose of the extension is to make the areas more attractive and suitable for commercial/industrial development and stimulate economic growth within the communities.

Graves Engineering, Inc. was requested to evaluate the existing sanitary sewer system infrastructure within the defined study area and determine the available capacity of these systems to accommodate additional wastewater flows for future developments. GEI was also asked to develop a conceptual layout plan to service the study area including location and sizing of gravity sewers, pump stations and force mains as needed. And finally, provide cost estimates for design, permitting, construction to both new and existing wastewater infrastructure within the study area.

2.0 STUDY AREA

2.1 Boundaries

The study area incorporates a total land area of about 305 contiguous acres and is bounded by the area shown on Figure 1. In general, the study area incorporates an area along Whitins Road/Main Street in Sutton and Northbridge from Hough Road to Oakhurst Road. The study area also includes the existing National Grid and Wal-Mart sites and two priority development sites in Northbridge. Within the study area, the primary location for potential future development consists of largely undeveloped land on the north side of Oakhurst Road to Main Street and on the south side of Oakhurst Road to Lackey Dam Road. Portions of this area south of Oakhurst Road also lie within the towns of Uxbridge and Douglas.

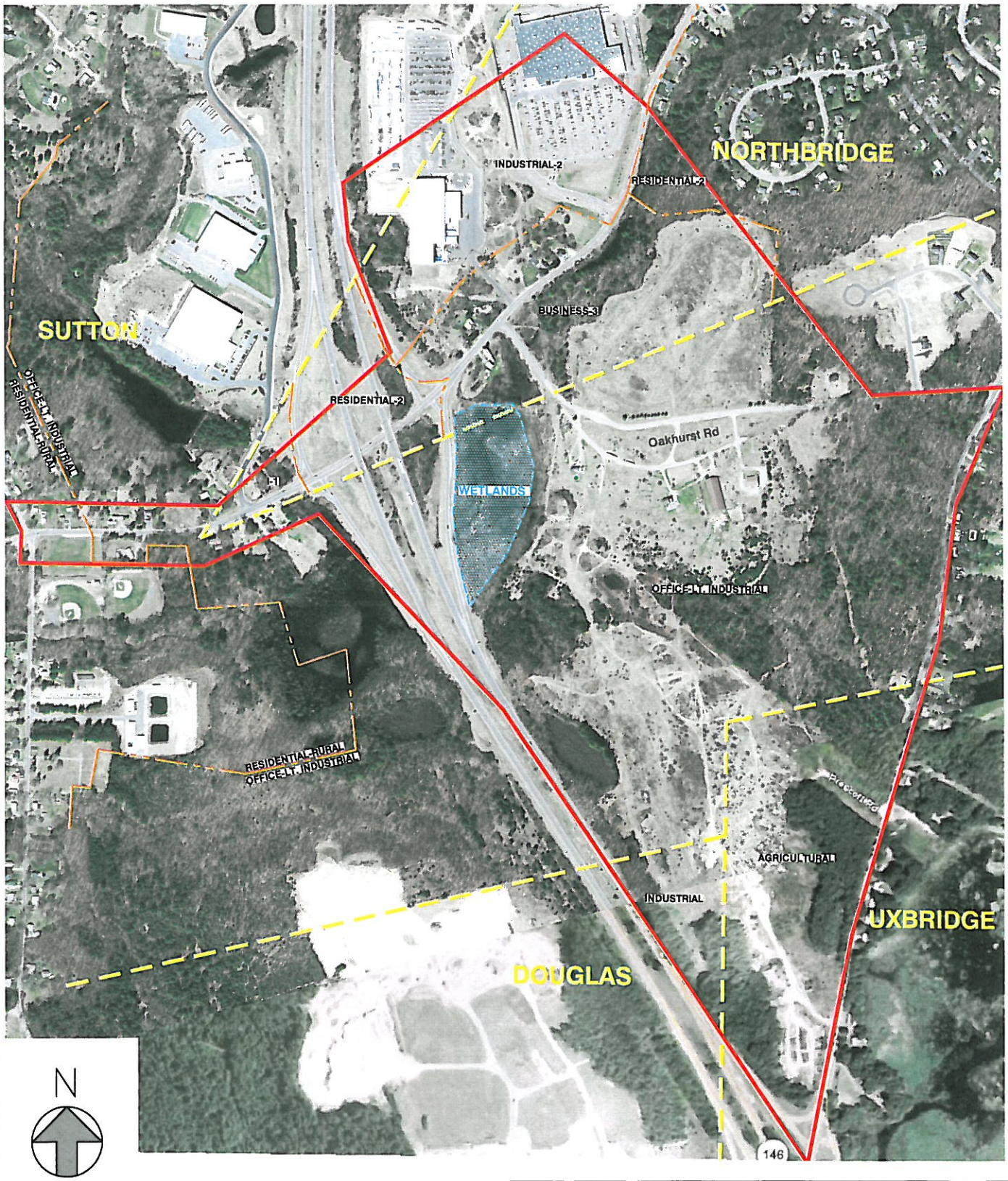
2.2 Zoning and Land Use

Zoning classifications of each Town within the study area are as follows:

TOWN	ZONING	AREA (acres)
SUTTON	Office – Light Industrial (OLI) Residential –Rural (RR)	167.8 4.2
NORTHBRIDGE	Industrial One (I-1) Industrial Two (I-2) Business Three (B-3)	2.7 31.3 36.2
UXBRIDGE	Agricultural (A)	42.0
DOUGLAS	Industrial (I)	8.8

In Sutton, within the study area zoning is primarily Office-Light Industrial (OLI) with a small area of Rural Residential near Hough Road. Northbridge zoning within the study area consists primarily of Industrial and Business.

Land use within the study area in Sutton along Whitins Road and Oakhurst Road is single-family residential. There is a business (Sutton Animal Hospital) also located on Oakhurst Road. Northbridge land use within the study area is primarily business with Wal-Mart and a National Grid office as the major uses. There are a few single-family residences along Main Street in the vicinity of the National Grid and Wal-Mart buildings. Land uses within the study area within Uxbridge and Douglas are vacant.



LEGEND	
STUDY AREA BOUNDARY	
TOWN LINE	
ZONING BOUNDARY	

FIGURE 1
STUDY AREA BOUNDARIES
NORTHBRIDGE/SUTTON
SEWER EXTENSION FEASIBILITY STUDY

GRAVES ENGINEERING, INC.

100 GROVE STREET, WORCESTER, MA 01605
P:(508) 856-0321 F:(508)856-0357
www.gravesengineering.com

DATE:
SCALE: 1"=800'
JOB#: 09128

3.0 EXISTING SEWER SYSTEM ANALYSIS

3.1 Existing Sewer Infrastructure - General

The existing sewer system within the study area consists solely of a 4" PVC force main on Whitins Road in Sutton that receives pumped flow from the Gilmore Drive pump station and discharges to the terminus of an 8" gravity sewer at the intersection of Whitins Road and Hough Road. This gravity sewer then flows to the Whitins-2 pump station on Whitins Road where it is then pumped to the Sutton Advanced Wastewater Treatment Plant on Hough Road, (see Figure 2).

3.2 Existing Flow Criteria and Peak Factors

To establish existing wastewater flows within the study area, GEI utilized available historical water records to establish the existing wastewater flow. In generating estimated peak wastewater flows, for average daily flows less than 100,000 gallons per day (gpd), a peaking factor of 6 was used. For average daily flows greater than 100,000 gpd, the "*Relation of Extreme Discharges on Maximum and Minimum Days to the Average Daily Discharge of Domestic Sewage*" graph within TR-16 for the Design of Wastewater Treatment Works, New England Interstate Water Pollution Control Commission, 1998 Edition, was used. For design and sizing of new wastewater facilities, peak hourly flow rates are used; these peaking factors are represented by the "Peak on Maximum Day" line on the aforementioned graph.

3.3 Gilmore Drive Pump Station

The Gilmore Drive pump station is currently privately owned and operated and is located on the easterly side of Gilmore Drive about 600 feet north of the intersection of Whitins Road. GEI understands the roadway and infrastructure has not yet been accepted by the Town of Sutton. This pump station serves as the collection point for inflow from the gravity sewers on Gilmore Drive, also known as the South Sutton Commerce Park. The Park currently contains seven commercial/industrial facilities. The pump station discharges to a 4" diameter PVC force main heading south on Gilmore Drive, then turns west on Whitins Road where it discharges at the terminus of the gravity sewer system at the intersection of Whitins Road and Hough Road. The total length of the force main is about 1,300 feet.

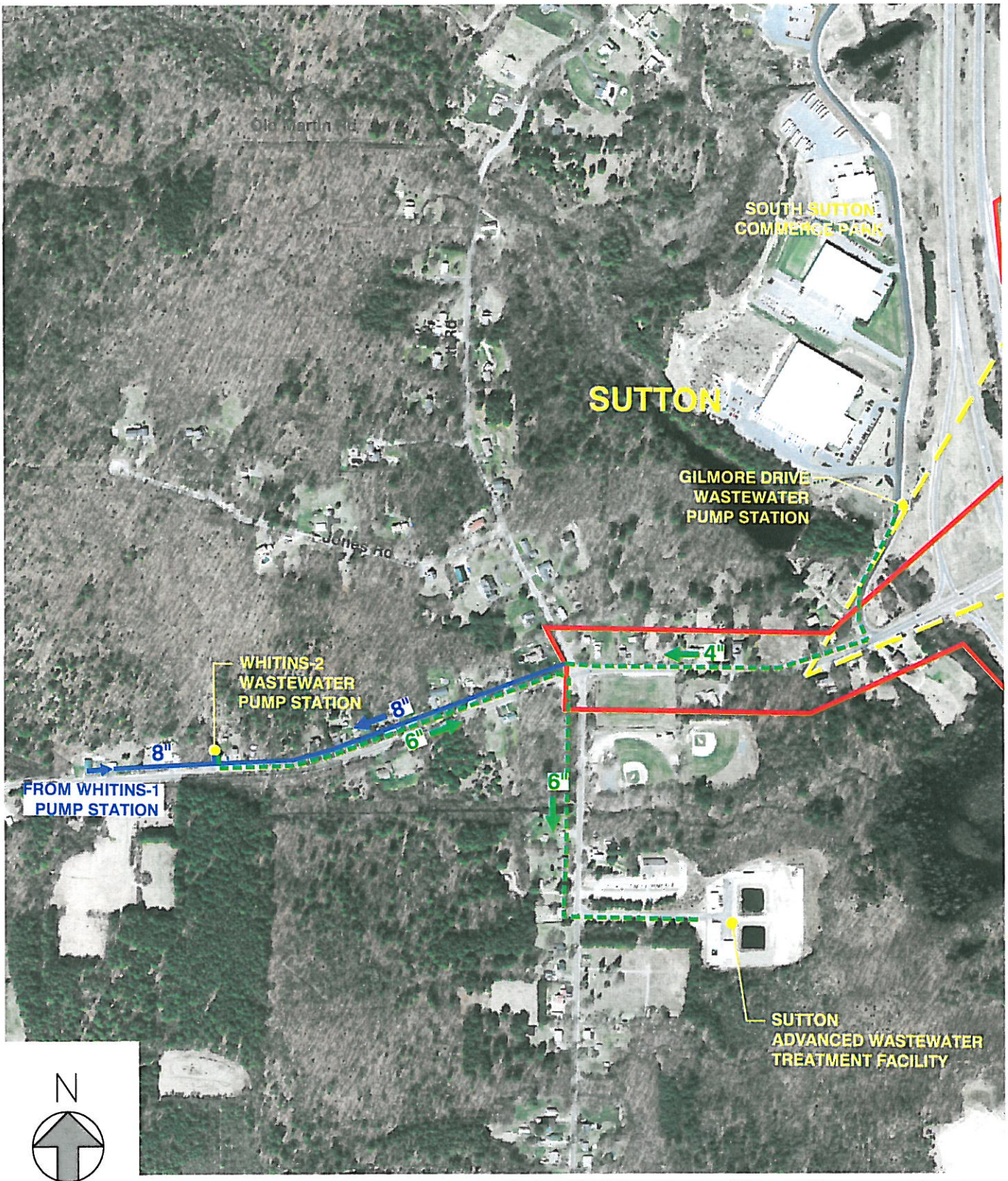
Water meter recording data provided by the Whitinsville Water Company indicates that the total average daily water usage of all existing buildings within South Sutton Commerce Park is 10,372 gpd; see Appendix A, Table 1. The MassDEP Sewer Extension Permit states that the development is permitted for 6,225 gpd, therefore, the current water usage may be exceeding the permitted flow. It must be noted that there is very likely some unknown volume of water that does not drain to sewer, primarily for irrigation. The water records indicate higher water usages in the summer months which would be consistent with irrigation. Unfortunately, the Gilmore Drive pump station lacks any flow recording device. For the purposes of this study we have assumed that all 10,372 gpd drains to the pump station.

Design data indicates that the pump station is a wetwell/submersible configuration with two pumps each pumping 95 gallons per minute (gpm), however, actual post-construction field tests revealed the pumps operate at about 110 gpm. At this pumping rate the station needs to operate at about 7% of the time to handle the 10,372 gpd. Therefore, the pump station has more than adequate capacity to handle current demands within the South Sutton Commerce Park.

3.4 Sutton Advanced Wastewater Treatment Facility

Although not part of the defined study area, the capacity of the Sutton Sutton Advanced Wastewater Treatment Facility ("treatment plant") must be at least briefly discussed. According to design plans prepared by BETA Group, Inc., the treatment plant's average daily design flow is 100,000 gpd[1] with a peak (hourly) design flow of 450,000 gpd. From treatment plant effluent flow records, the observed

[1] *Design plans by BETA conflict with regard to plant design flow; grading plans indicate a revision to increase infiltration bed capacity to 110,000 gpd however this is not reflected elsewhere on the plans. For the purposes of this study, we have assumed the plant design flow is 100,000 gpd.*



LEGEND

- STUDY AREA BOUNDARY
- TOWN LINE
- EXISTING GRAVITY SEWER
- EXISTING FORCE MAIN

FIGURE 2
EXISTING SEWER INFRASTRUCTURE
NORTHBRIDGE/SUTTON
SEWER EXTENSION FEASIBILITY STUDY

GRAVES ENGINEERING, INC.

100 GROVE STREET, WORCESTER, MA 01605
P:(508) 856-0321 F:(508)856-0357
www.gravesengineering.com

DATE:
SCALE: 1"=600'
JOB#: 09128

average daily flow is 35,000 gpd; see Appendix B Table 3. Based upon this average daily flow rate, the plant is operating at 35% of capacity.

GEI understands that the plant currently has two basins that infiltrate the treated wastewater to the ground and the design plans show two future reserve basin areas. The Sutton Sewer Department has indicated that if these two reserve basins were constructed, the plant capacity could increase to 185,000 gpd (average daily flow). GEI has no knowledge though if this expansion would require other plant upgrades.

3.5 Sewer System Capacities

When discussing capacities of force mains, they are typically sized based on flow velocity. The maximum force main velocity under peak conditions should not exceed 7 feet per second (fps). There are also minimum force main pipe velocities for design; 2 fps to keep solids suspended in the wastewater and 3 fps to re-suspend solids that settle within the force main between pump cycles. The 4" force main from the Gilmore Drive pump station flows at 110 gpm which results in a velocity of 2.7 fps. This velocity is certainly less than the maximum allowable velocity of 7 fps, but is also less than the 3 fps minimum velocity. The 4" force main has already experienced some operational problems attributed to solids accumulation within the force main and septicity of the wastewater. Graves Engineering, Inc. reviewed the Gilmore Drive pump station for Sutton and issued a report dated June 18, 2009 with recommendations. Certainly if additional wastewater flows from the future development areas can be added to this force main, this will increase the flow velocity within the force main and alleviate some of the observed operational problems.

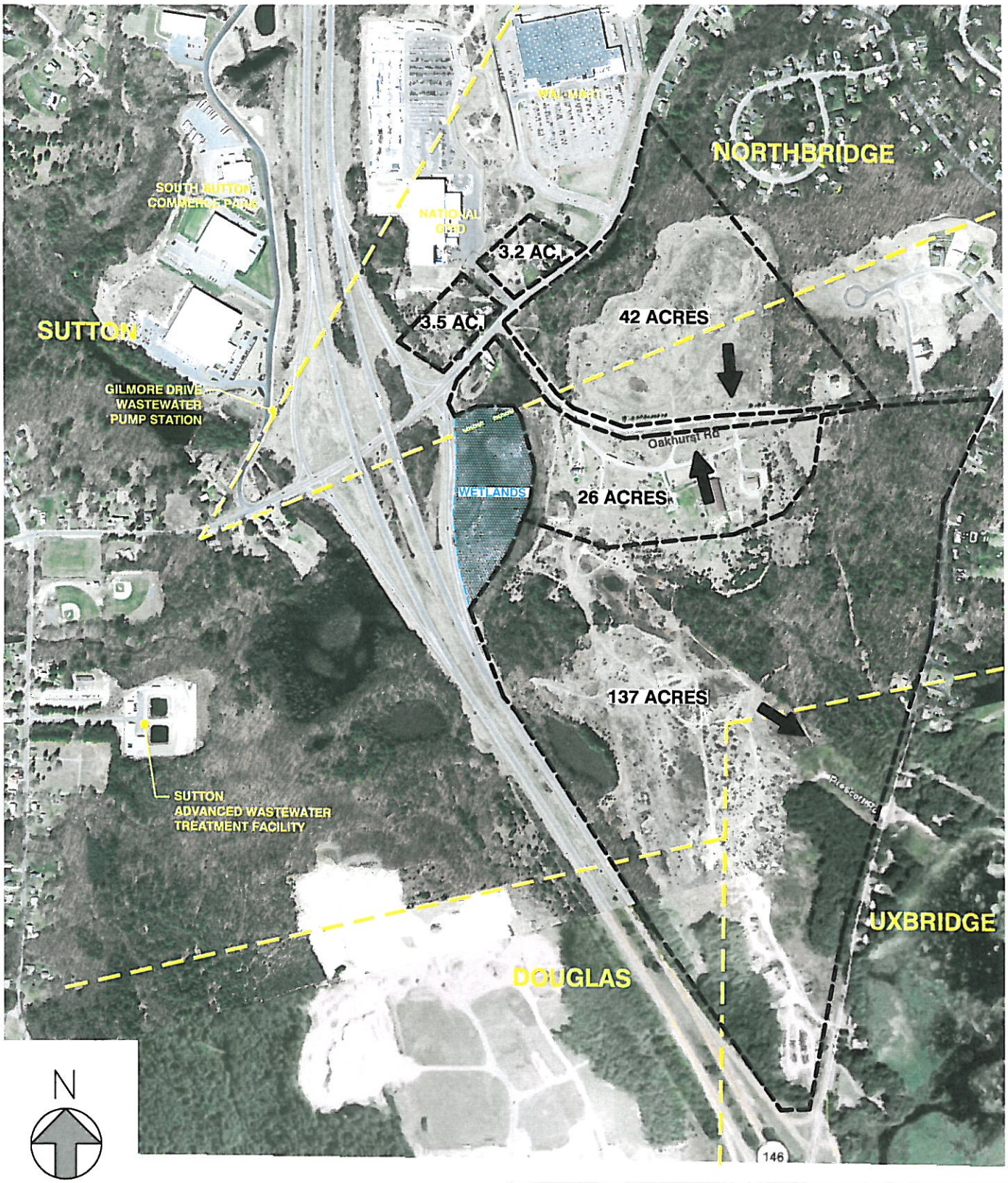
4.0 FUTURE DEVELOPMENTS AND PROJECTED WASTEWATER FLOWS

4.1 Future Development Land Area

Within the study area, the primary location for potential future development is 212 acres that can be broken down into five sub-areas as follows (see Figure 3):

LOCATION	AREA (acres)	DESCRIPTION
Main St. Northbridge	3.5	Current partial residential use on north side of Main Street south of National Grid site; designated Priority Development Site (PSD)
Main St. Northbridge	3.2	Current partial residential use on north side of Main Street between National Grid and Wal-Mart sites; designated Priority Development Site (PSD)
Oakhurst Rd. Northbridge/Sutton	42	Vacant and partially cleared (former gravel pit and harness racing track) land north of Oakhurst Rd. extending to Main. St. Northbridge.
Oakhurst Rd. Northbridge/Sutton	26	Current partial residential and business (Sutton Animal Hospital) use and partially cleared (former gravel pit) land south of Oakhurst Rd. extending to Main. St. Northbridge.
Lackey Dam Rd. Sutton/Uxbridge/Douglas	137	Vacant and partially cleared (former gravel pit) land north of Lackey Dam Rd.; contains electrical service easements.

It should be noted that we have included projected sewer flows for areas that currently contain residential homes; specifically the 3.5 and 3.2 acre areas and the 26 acre area. The existing wastewater flows from these existing uses can be considered negligible if they remain, however they are designated priority development sites and if they are re-developed as commercial/industrial as zoned, the flows would be greater. It is also important to note that the 212 acres is a gross area estimate and could include potentially non-developable areas such as wetlands, easements and right-of-ways.



LEGEND	
	STUDY AREA BOUNDARY
	TOWN LINE
	DIRECTION OF FUTURE WASTEWATER FLOWS

FIGURE 3
FUTURE DEVELOPMENT LAND AREAS
NORTHBRIDGE/SUTTON
SEWER EXTENSION FEASIBILITY STUDY

GRAVES ENGINEERING, INC.
100 GROVE STREET, WORCESTER, MA 01605
P:(508) 856-0321 F:(508)856-0357
www.gravesengineering.com

DATE:
SCALE: 1"=800'
JOB#: 09128

4.2 Future Development Projected Wastewater Flows

To establish projected wastewater flows within the potential future development area, we have used flow criteria from Metcalf and Eddy *Wastewater Engineering Treatment Disposal Reuse"* for light to medium industrial/commercial developments. The criteria of 1,500 gpd/acre was used to generate a projected average daily flow with an infiltration and inflow (I/I) allowance of 150 gpd/acre added to determine the total average daily flow. Using this criteria, projected sewer flows from each of the areas is as follows:

LOCATION	AREA (acres)	AVERAGE DAILY FLOW (ADF) (gpd)	INFILTRATION/INFLOW ALLOWANCE (gpd)	ADF + I/I TOTAL (gpd)
Main St. Northbridge	3.5	5,250	525	5,775
Main St. Northbridge	3.2	4,800	480	5,280
Oakhurst Rd. Northbridge/Sutton	42	63,000	6,300	69,300
Oakhurst Rd. Northbridge/Sutton	26	39,000	3,900	42,900
Lackey Dam Rd. Sutton/Uxbridge/Douglas	137	205,500	20,550	226,050

It must be noted that we have not considered wastewater flows from properties outside of and abutting the study area on the east side of Lackey Dam Road that could conceivably connect to the new gravity sewer. These properties we believe are primarily single family residential homes within the town of Uxbridge.

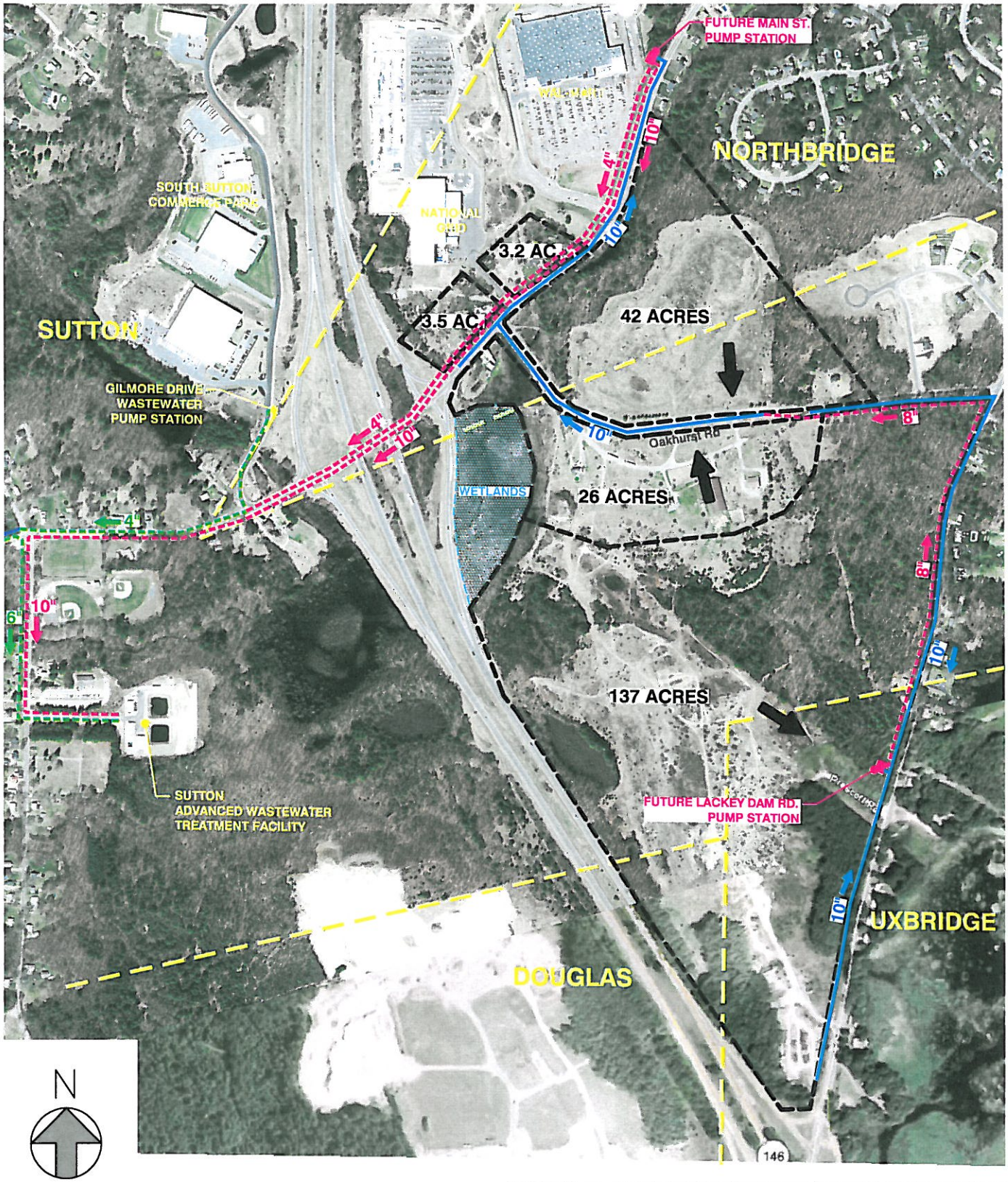
4.3 Future Sewer System Layout - General

Any proposed sewers within the future development area will need to be pumped to the existing sewer system in Sutton. After reviewing the topography of the entire study area, it appears that a combination of gravity sewers, force mains, and pump stations would be required; see Figure 4. The main collection point for the entire future development area would be a pump station located just west of the Wal-Mart site on the northerly side of Main Street in Northbridge. This pump station would collect gravity sewers on Main Street and Oakhurst Road and thus would directly collect wastewater flows from the 3.5-, 3.2-, 42-, and 26-acre areas. The 137-acre area naturally slopes down to Lackey Dam Road, therefore a gravity sewer would be constructed in the road collecting the area to a pump station in the low point of the road approximately 0.4 miles from the Route 146 on ramp. This pump station would pump to the terminus of the gravity sewer on Oakhurst Road and then flow by gravity to the Main Street pump station. From the Main Street pump station, depending on the level of development within the study area as discussed in the following sections, a 4" force main could initially be constructed to connect the pump station to the existing 4" force main in Whitins Road and ultimately a 10" force main could connect directly to the treatment facility.

The portion of the study area within Sutton along Whitins Road (between Hough Road and Route 146) could be served by individual grinder pump stations that connect directly to the force main within Whitins Road. This approximately 10-acre area is currently zoned about 50% residential and 50% office/light industrial with a number of existing homes. A gravity sewer and another municipal pump station could be constructed here to service this area, however based upon the land area and uses, we feel that individual privately owned pump stations may be a more practical means of providing sewer service. The options for future sewer system build-out are discussed in the following sections.

4.4 Future Full Build Development Scenario

A full build scenario of all available development areas within the study area would require significant new sewer infrastructure as well as upgrades to portions of the Sutton wastewater system not the least of which is the treatment plant. The full-build scenario, including the existing National Grid and Wal-Mart sites, would generate a total average daily flow of 353,971 gpd (including an infiltration and inflow



LEGEND

- TOWN LINE
- EXISTING GRAVITY SEWER
- EXISTING FORCE MAIN
- FUTURE GRAVITY SEWER
- FUTURE FORCE MAIN

FIGURE 4
FULL BUILD-OUT CONCEPTUAL SEWER LAYOUT
NORTHBRIDGE/SUTTON
SEWER EXTENSION FEASIBILITY STUDY

GRAVES ENGINEERING, INC.

100 GROVE STREET, WORCESTER, MA 01605
P:(508) 856-0321 F:(508)856-0357
www.gravesengineering.com

DATE:
SCALE: 1"=800'
JOB#: 09128

allowance). On an average daily flow basis this exceeds the current capacity of the Sutton treatment plant by 290%. Even if the plant was expanded to add the two additional reserve infiltration basins, the plant capacity would still be exceeded by 156%. Obviously, significant expansion will be necessary at the Sutton treatment plant to handle the full build development scenario. The required sewage collection system needed to service the full build scenario is described in the following paragraphs.

Beginning at the Lackey Dam Road pump station, projected average daily wastewater flow plus infiltration and inflow allowance from the 137 acre area is 226,050 gpd and the resulting projected peak flow could be carried in a 10" gravity sewer at a slope of 0.6%. The design of the pump station must also be based upon the projected peak flow, thus the pump station will need to pump 728 gpm or more. This flow would be pumped in an 8" force main to the terminus of the gravity sewer main on Oakhurst Road.

The Oakhurst Road gravity sewer would collect wastewater flows from both the 26 acre and 42 acre areas as well as pumped flow from the 137 acre area. Conservatively, an assumption was made that all of the 42 acre area would enter the sewer system on Oakhurst Road when in reality development in this area along Main Street would likely flow directly to the Main Street sewer. The total projected average daily wastewater flow plus infiltration and inflow allowance to the Oakhurst Road sewer is 338,200 gpd. To carry the projected peak flows from all contributing areas, a 10" gravity sewer at a slope of 1.5% is required.

The Oakhurst Road sewer would then enter a gravity sewer on Main Street which would additionally collect flows from the 3.5 and 3.2 acre areas as well as the existing National Grid and Wal-Mart sites. The total projected average daily wastewater flow plus infiltration and inflow allowance at this point is 353,971 gpd and the resulting projected peak flow could be carried in a 10" sewer at a slope of 1.5%. The Main Street pump station will also need to pump the projected peak flow of 1,175 gpm or more. The discharge from the Main Street pump could not be accommodated by any portion of the existing sewer system in Sutton due to surcharging issues, therefore, the force main would need to be carried directly to the treatment plant. A 10" force main would be required to carry this peak flow directly to the treatment plant. We strongly recommend that the sizing of this 10" force main be re-visited should the development reach the planning and design stages.

Due to the large required capacity of the new pump stations and size of the force mains, until full buildout is achieved, the incremental build out wastewater flows must be addressed. While pump stations can be modified with pumps and level controls to accommodate varying flows, the force main is a fixed component that if not fully utilized in terms of design flow velocity, can create operational problems. Thus, in order to maintain acceptable velocities within the force main until full build out, a smaller force main is required. This can be accomplished by constructing parallel force mains, a 4" pipe to connect to the existing 4" force main at Gilmore Drive and a 10" pipe that would run directly to the treatment plant. Ultimately this 4" force main could be abandoned or used in concert with the 10" force main as larger wastewater flows come on-line.

Obviously, under the full build scenario there would be considerable costs associated with both upgrades to the Sutton wastewater treatment plant as well as the required new collection system. For this reason, we have also analyzed a scenario to determine how much development the current treatment plant capacity can accommodate; this is discussed in a later section.

4.5 Sutton Wastewater Flow Allocation

As indicated in GEI's 2008 draft updates to the Sutton Comprehensive Wastewater Management Plan, the design capacity of wastewater treatment plant may likely be exceeded sometime beyond the year 2015. So, beyond the year 2010, the Town should initiate a plan to upgrade and expand plant capacity. Clearly, to accommodate the full build scenario of this study, such upgrades would be required. It is important to note that this study includes potential sewering of land outside of the Town of Sutton and thus any wastewater received from Northbridge, Uxbridge and Douglas reduces the available capacity in Sutton which is not included in Sutton's current Wastewater Management Plan.

As discussed earlier, the Sutton treatment plant's average daily design flow is 100,000 gpd and is averaging a daily flow of 35,000 gpd; this leaves an average daily flow of 65,000 gpd in reserve. For the purposes of this study we have assumed that the Town of Sutton will reserve 30,000 gpd of the plant's reserve capacity for future development within Sutton only. This reserve flow allocation number can certainly be adjusted, however increasing this number will obviously leave less capacity for development within the study area and decreasing it will leave less reserve capacity for future development within Sutton.

Out of this 30,000 gpd, wastewater flows from the last remaining lot within the South Sutton Commerce Park would be subtracted as well as any other planned developments or new connections within Sutton. We have assumed an estimated wastewater flow of 2,000 gpd for the final South Sutton Commerce Park lot. After discussions with Jennifer Hager, Sutton Town Planner, we understand that only one project within Sutton is planned at this time. The project is called "Bridle Path" and as currently proposed is a 37-lot single family home subdivision located at the end of Jones Road and looping back to Barnett Road near Old Martin Road. If this project is to be sewered as proposed, then the existing 25 homes on Jones Road and Barnett Road could also be sewered for a total of 62 homes. This new sewer might connect to the end of the existing gravity sewer at Whitins and Hough Road, which ultimately flows to the Whitins-2 pump station. We estimate that the projected average daily wastewater flow for this project is about 20,460 gpd (using a Title 5 criteria of 330 gpd per 3-bedroom, single-family home). Subtracting this 20,460 gpd and the assumed final South Sutton Commerce Park lot flow of 2,000 gpd from the 30,000 gpd reserve leaves 7,540 gpd for other future developments solely within Sutton.

The available Sutton treatment plant reserve capacity that could then be allocated to development within the study area is 35,000 gpd. After subtracting the known average daily flows from National Grid and Wal-Mart, this leaves 30,334 gpd available for new development.

4.6 Future Limited Development Scenario

In this scenario, development is limited to match the allocated portion of the current reserve capacity of the Sutton wastewater treatment plant. As discussed above, this allocated reserve capacity for development is 30,334 gpd. This equates to about 18 acres of industrial/commercial land that can presently be accommodated at the treatment plant or about 8% of the 212 acre potential development study area primarily within the Towns of Northbridge and Sutton.

The most likely area for development would be a portion of the 42 acre area on Oakhurst Road that also abuts Main Street. A large portion of the land is already partially cleared and graded from prior earth removal operations and as such may be more desirable for developers. In this limited development scenario, the 10" gravity sewer on Oakhurst Road, 10" gravity sewer on Main Street and Main Street pump station discussed under the full-build scenario would be constructed. To match the allocated reserve treatment plant capacity the pump station would require a pump rate of 125 gpm and would be carried in a 4" diameter force main. This new 4" force main could be connected to the existing 4" force main at Gilmore Drive and would aid in the current operational problems within this existing force main.

Alternatively, if the Sutton wastewater treatment plant average daily flow capacity was increased to 185,000 gpd as previously discussed in Section 3.4, then the allocated reserve capacity for development would then be 115,334 gpd. This equates to about 70 acres of industrial/commercial land that could be accommodated at the treatment plant or about 33% of the 212 acre potential development study area. These 70 acres would likely incorporate all of the 42 acre, the 26 acre, and 3.5 and 3.2 acre areas. To match this reserve treatment plant capacity the Main Street pump station would require a pump rate of 415 gpm and would be need to be carried in a 6" diameter force main. Please note again that this study discusses this plant expansion in only a conceptual manner and does not address other plant upgrades that may be needed.

5.0 FINDINGS AND COST ESTIMATES

5.1 Future Full-Build Development Scenario

As discussed above, the full-build scenario of all 212 acres within the study area results in significant new infrastructure within the study area as well as major upgrades to the existing sewer system and treatment plant. As they are out of the scope of this study, the cost estimates exclude upgrades to any part of the existing Sutton sewer system outside of the study area including the Sutton Wastewater Treatment Facility. The estimate includes only the infrastructure noted in Section 4.4 above. The estimated cost of this scenario is as follows (see Appendix C for a detailed construction cost estimate breakdown);

PHASE	COST	DESCRIPTION
Design	$416,000	Assumed 10% of construction cost
Permitting	$20,000	Includes Conservation Commission in 3 towns, DEP, MEPA, and local Sewer Dept. approvals
Construction	$4,784,230	Includes 15% Contingency & Engineering
TOTAL	**$5,220,230**	

5.2 Future Limited Development Scenario

Under the limited development scenario, 18 acres of development within the study area would occur as discussed in Section 4.6 above. The estimated cost of this scenario is as follows (see Appendix C for a detailed construction cost estimate breakdown);

PHASE	COST	DESCRIPTION
Design	$146,000	Assumed 10% of construction cost
Permitting	$15,000	Includes Conservation Commission in 3 towns, DEP, MEPA, and local Sewer Dept. approvals
Construction	$1,683,600	Includes 15% Contingency & Engineering
TOTAL	**$1,844,600**	

Appendix A

WATER USE RECORDS

Table 1 - Gilmore Drive (South Sutton Commerce Park)

Table 2 - Wal-Mart & National Grid Water Use Records

TABLE 1:
WATER USE RECORDS 2007-2009
GILMORE DRIVE (SOUTH SUTTON COMMERCE PARK)

Location	Date	Water Usage cu. ft.	Water Usage gal.	# Days	Water Usage gal/day		
#17 Gilmore Drive (CarQuest)	1/6/07	10,100	75,558	87	868		
	4/10/07	7,500	56,108	94	597		
	7/7/07	45,400	339,637	86	3,949		
	10/10/07	68,100	509,456	95	5,363		
	1/6/08	17,600	131,666	88	1,496		
	4/8/08	6,900	51,619	93	555		
	7/6/08	55,700	416,692	89	4,682		
	10/6/08	77,900	582,770	92	6,334		
	1/10/09	10,800	80,795	96	842		
	4/10/09	6,900	51,619	90	574		
	7/11/09	46,300	346,370	92	3,765		
	10/10/09	6,900	51,619	91	567	Avg.=	2,466 gpd
#29 Gilmore Drive (Turflinks)	1/6/07	2,900	21,695	87	249		
	4/10/07	1,000	7,481	94	80		
	7/7/07	50,800	380,035	86	4,419		
	10/10/07	93,000	695,733	95	7,324		
	1/6/08	11,600	86,780	88	986		
	4/8/08	4,000	29,924	93	322		
	7/6/08	77,700	581,274	89	6,531		
	10/6/08	123,500	923,904	92	10,042		
	1/10/09	5,700	42,642	96	444		
	4/10/09	2,500	18,703	90	208		
	7/11/09	42,800	320,187	92	3,480		
	10/10/09	85,700	641,122	91	7,045	Avg.=	3,428 gpd
#39 Gilmore Drive (Ross Express)	1/6/07	3,000	22,443	87	258		
	4/10/07	2,100	15,710	94	167		
	7/7/07	10,900	81,543	86	948		
	10/10/07	20,300	151,864	95	1,599		
	1/6/08	7,300	54,611	88	621		
	4/8/08	2,000	14,962	93	161		
	7/6/08	14,600	109,223	89	1,227		
	10/6/08	15,100	112,963	92	1,228		
	1/10/09	5,000	37,405	96	390		
	4/10/09	4,900	36,657	90	407		
	7/11/09	16,800	125,681	92	1,366		
	10/10/09	17,800	133,162	91	1,463	Avg.=	820 gpd
#55 Gilmore Drive (Interstate Specialty Products)	1/6/07	1,000	7,481	87	86		
	4/10/07	1,100	8,229	94	88		
	7/7/07	1,200	8,977	86	104		
	10/10/07	1,400	10,473	95	110		
	1/6/08	1,400	10,473	88	119		
	4/8/08	1,300	9,725	93	105		
	7/6/08	11,700	87,528	89	983		
	10/6/08	16,200	121,192	92	1,317		
	1/10/09	1,200	8,977	96	94		
	4/10/09	1,200	8,977	90	100		
	7/11/09	14,400	107,726	92	1,171		
	10/10/09	25,000	187,025	91	2,055	Avg.=	528 gpd

Location	Date	Water Usage cu. ft.	Water Usage gal.	# Days	Water Usage gal/day		
#65 Gilmore Drive (Schwan Sales)	1/6/07	2,000	14,962	87	172		
	4/10/07	3,700	27,680	94	294		
	7/7/07	9,100	68,077	86	792		
	10/10/07	15,000	112,215	95	1,181		
	1/6/08	3,000	22,443	88	255		
	4/8/08	1,200	8,977	93	97		
	7/6/08	6,600	49,375	89	555		
	10/6/08	15,400	115,207	92	1,252		
	1/10/09	1,100	8,229	96	86		
	4/10/09	900	6,733	90	75		
	7/11/09	7,700	57,604	92	626		
	10/10/09	13,800	103,238	91	1,134	Avg.=	543 gpd
#75 Gilmore Drive (Champion Container)	1/6/07	200	1,496	87	17		
	4/10/07	500	3,741	94	40		
	7/7/07	500	3,741	86	43		
	10/10/07	31,800	237,896	95	2,504		
	1/6/08	7,200	53,863	88	612		
	4/8/08	500	3,741	93	40		
	7/6/08	30,400	227,422	89	2,555		
	10/6/08	38,800	290,263	92	3,155		
	1/10/09	3,400	25,435	96	265		
	4/10/09	800	5,985	90	66		
	7/11/09	11,400	85,283	92	927		
	10/10/09	24,200	181,040	91	1,989	Avg.=	1,018 gpd
#83 Gilmore Drive (New England Disposal Tech)	1/6/07		No records available				
	4/10/07						
	7/7/07	8,600	64,337	71	906		
	10/10/07	47,800	357,592	95	3,764		
	1/6/08	4,600	34,413	88	391		
	4/8/08	1,700	12,718	93	137		
	7/6/08	17,000	127,177	89	1,429		
	10/6/08	39,100	292,507	92	3,179		
	1/10/09	4,800	35,909	96	374		
	4/10/09	2,200	16,458	90	183		
	7/11/09	21,500	160,842	92	1,748		
	10/10/09	43,600	326,172	91	3,584	Avg.=	1,570 gpd

Gilmore Drive Pump Station Average Daily Flow (ADF): 10,372 gpd

TABLE 2:
WATER USE RECORDS 2007-2009
WAL-MART & NATIONAL GRID

Location	Date	Water Usage cu. ft.	Water Usage gal.	# Days	Water Usage gal/day
#1152 Main Street (National Grid)	1/6/07				
	4/10/07		No records available		
	7/7/07				
	10/10/07	1,600	11,970	43	278
	1/6/08	500	3,741	87	43
	4/8/08	2,500	18,703	94	199
	7/6/08	2,800	20,947	88	238
	10/6/08	2,600	19,451	92	211
	1/10/09	2,800	20,947	96	218
	4/10/09	2,700	20,199	87	232
	7/11/09	2,800	20,947	95	220
	10/10/09	3,000	22,443	91	247
		National Grid Average Daily Flow (ADF), gpd:			**231**
#1056 Main Street (Wal-Mart)	1/6/07		No records available		
	4/10/07	24,800	185,529	45	4,123
	7/7/07	47,400	354,599	86	4,123
	10/10/07	54,200	405,470	95	4,268
	1/6/08	56,100	419,684	88	4,769
	4/8/08	60,000	448,860	94	4,775
	7/6/08	54,000	403,974	88	4,591
	10/6/08	55,600	415,944	92	4,521
	1/10/09	55,300	413,699	96	4,309
	4/10/09	51,700	386,768	87	4,446
	7/11/09	62,200	465,318	95	4,898
	10/10/09	48,200	360,584	91	3,962
		Wal-Mart Average Daily Flow (ADF), gpd:			**4,435**

Appendix B

Table 3 – Sutton Wastewater Treatment Facility ADF Records

Table 3:

2009 Sutton Wastewater Treatment Facility Average Daily Flow Records

JANUARY 09		FEBRUARY 09		MARCH 09		APRIL 09		MAY 09		JUNE 09		JULY 09		AUGUST 09		SEPTEMBER 09	
Day	Flow (gpd)	Day	Flow (gpd)	Day	Flow (gpd)	Day	Flow (gpd)	Day	Flow (gpd)	Day	Flow (gpd)	Day	Flow (gpd)	Day	Flow (gpd)	Day	Flow (gpd)
1	38,324	1	32,960	1	39,356	1	32,796	1	28,091	1	31,879	1	33,752	1	40,027	1	34,079
2	40,433	2	41,910	2	37,592	2	33,673	2	26,756	2	35,487	2	47,502	2	34,433	2	34,326
3	40,433	3	32,036	3	37,669	3	35,805	3	28,057	3	36,863	3	40,422	3	38,780	3	34,413
4	40,433	4	34,762	4	36,661	4	41,718	4	30,695	4	37,224	4	34,371	4	36,946	4	37,212
5	42,231	5	31,443	5	35,239	5	40,172	5	35,194	5	27,687	5	38,769	5	37,777	5	34,870
6	34,621	6	35,740	6	38,511	6	37,611	6	33,313	6	26,502	6	32,502	6	34,139	6	34,256
7	47,991	7	35,740	7	38,511	7	39,733	7	38,930	7	25,907	7	38,200	7	35,238	7	34,055
8	38,145	8	35,740	8	38,511	8	37,439	8	33,760	8	34,179	8	35,884	8	32,885	8	32,517
9	36,901	9	38,879	9	47,776	9	34,163	9	32,796	9	30,866	9	38,522	9	29,578	9	33,671
10	36,901	10	31,642	10	41,457	10	35,945	10	31,519	10	28,726	10	34,248	10	36,906	10	34,614
11	36,901	11	39,209	11	41,347	11	40,237	11	35,633	11	27,340	11	29,247	11	32,829	11	38,890
12	33,817	12	38,417	12	39,078	12	37,864	12	31,792	12	31,363	12	30,976	12	31,520	12	36,239
13	31,115	13	35,217	13	37,658	13	35,846	13	33,934	13	28,850	13	28,197	13	32,970	13	35,289
14	39,377	14	35,217	14	37,568	14	34,250	14	31,302	14	31,929	14	25,835	14	33,020	14	35,376
15	20,081	15	35,217	15	37,568	15	34,920	15	32,525	15	35,950	15	24,406	15	32,287	15	33,194
16	37,993	16	35,217	16	39,381	16	33,948	16	30,612	16	34,995	16	24,542	16	30,301	16	33,524
17	37,993	17	40,170	17	39,386	17	35,013	17	30,915	17	30,346	17	27,403	17	29,829	17	33,582
18	37,993	18	35,528	18	38,849	18	34,900	18	35,095	18	33,717	18	33,929	18	30,168	18	32,471
19	37,993	19	39,876	19	37,463	19	33,092	19	30,410	19	37,043	19	29,272	19	30,611	19	32,523
20	37,161	20	37,512	20	35,833	20	33,053	20	32,273	20	28,898	20	31,416	20	32,195	20	31,202
21	32,658	21	37,512	21	34,200	21	45,010	21	31,297	21	33,862	21	34,692	21	33,472	21	31,460
22	35,897	22	37,512	22	35,855	22	39,981	22	38,040	22	36,680	22	34,541	22	32,909	22	33,023
23	31,587	23	34,144	23	34,548	23	38,172	23	29,014	23	35,242	23	32,219	23	31,697	23	34,216
24	31,587	24	32,254	24	34,070	24	35,954	24	28,377	24	29,106	24	59,645	24	31,731	24	31,855
25	31,587	25	33,012	25	34,161	25	35,169	25	34,649	25	35,441	25	41,224	25	31,369	25	35,042
26	32,362	26	36,713	26	33,459	26	36,439	26	31,370	26	29,161	26	35,341	26	30,232	26	31,797
27	38,485	27	39,356	27	35,027	27	33,378	27	31,832	27	28,011	27	39,360	27	31,535	27	40,719
28	39,574	28	39,356	28	31,630	28	30,680	28	21,255	28	28,728	28	35,360	28	32,013	28	38,875
29	39,633	29		29	32,277	29	29,207	29	31,678	29	24,846	29	34,710	29	40,526	29	33,306
30	32,960	30		30	33,412	30	29,547	30	29,341	30	24,719	30	38,321	30	32,572	30	35,673
31	32,960	31		31	29,276	31		31	30,951	31		31	37,025	31	34,459	31	
ADF=	***36,327***	*ADF=*	***36,153***	*ADF=*	***36,882***	*ADF=*	***35,857***	*ADF=*	***31,658***	*ADF=*	***31,385***	*ADF=*	***34,898***	*ADF=*	***33,386***	*ADF=*	***34,409***

YEAR TO DATE AVERAGE DAILY FLOW (ADF), gpd: 34,550

Appendix C

Cost Estimates

NORTHBRIDGE/SUTTON SEWER EXTENSION FEASIBILITY STUDY
CONSTRUCTION COST ESTIMATE - FULL BUILD SCENARIO***

Item No.	Description	Qty.	Unit	Unit Price	Total
1	**Gravity Sewer***				
	10" SDR 35 PVC	9,105	L.F.	$ 200	$ 1,821,000
2	**Sewer Force Main***				
	8" SDR 21 PVC	3,428	L.F.	$ 120	$ 411,400
	10" SDR 21 PVC	6,450	L.F.	$ 140	$ 903,000
	4" SDR 21 PVC (parallel to 10" for lesser flows)	3,428	L.F.	$ 100	$ 342,800
3	**Lackey Dam Road Pump Station (728 gpm)****				
	Wetwell	1	L.S.	$ 50,000	$ 50,000
	Valve Pit	1	L.S.	$ 10,000	$ 10,000
	Pumps & Electrical	1	L.S.	$ 75,000	$ 75,000
	Generator	1	L.S.	$ 75,000	$ 75,000
	Site Work	1	L.S.	$ 100,000	$ 100,000
4	**Main Street Pump Station (1,175 gpm)****				
	Wetwell	1	L.S.	$ 75,000	$ 75,000
	Valve Pit	1	L.S.	$ 12,000	$ 12,000
	Pumps & Electrical	1	L.S.	$ 100,000	$ 100,000
	Generator	1	L.S.	$ 85,000	$ 85,000
	Site Work	1	L.S.	$ 100,000	$ 100,000
				Subtotal:	$ 4,160,200
				15% Contingency & Engineering:	$ 624,030
				Total Probable Cost	**$ 4,784,230**

* Gravity Sewer and Force Main cost per lineal foot includes trench excavation, backfill materials, excess materials haul-off, pipe, services and fittings, testing, compaction testing of backfill, temp. and permanent roadway patching, road overlay, traffic control, sediment and erosion control, ledge (20% volume assumed), dewatering and manholes.

** Excludes building superstructures.

** Excludes upgrades to any part of the existing Sutton sewer system outside of the study area such as gravity sewers, force mains, pump stations and the wastewater treatment plant.

NORTHBRIDGE/SUTTON SEWER EXTENSION FEASIBILITY STUDY
CONSTRUCTION COST ESTIMATE - LIMITED DEVELOPMENT SCENARIO***

Item No.	Description	Qty.	Unit	Unit Price	Total
1	**Gravity Sewer***				
	10" SDR 35 PVC	4,005	L.F.	$ 200	$ 801,000
2	**Sewer Force Main***				
	4" SDR 21 PVC	3,630	L.F.	$ 100	$ 363,000
3	**Main Street Pump Station (125 gpm)****				
	Wetwell	1	L.S.	$ 75,000	$ 75,000
	Valve Pit	1	L.S.	$ 10,000	$ 10,000
	Pumps & Electrical	1	L.S.	$ 85,000	$ 85,000
	Generator	1	L.S.	$ 50,000	$ 50,000
	Site Work	1	L.S.	$ 80,000	$ 80,000
			Subtotal:		$ 1,464,000
			15% Contingency & Engineering:		$ 219,600
			Total Probable Cost		**$ 1,683,600**

* Gravity Sewer and Force Main cost per lineal foot includes trench excavation, backfill materials, excess materials haul-off, pipe, services and fittings, testing, compaction testing of backfill, temp. and permanent roadway patching, road overlay, traffic control, sediment and erosion control, ledge (20% volume assumed), dewatering and manholes.

** Excludes building superstructures.

** Excludes upgrades to any part of the existing Sutton sewer system outside of the study area such as gravity sewers, force mains, pump stations and the wastewater treatment plant.