

Section 4

Sewer Alternative Analysis

4.1 Introduction

Initially, the project area was broken into twelve smaller subareas that were evaluated separately. The evaluation included an alternatives analysis that considered the system planning criteria, results of field investigations, and the estimated present day unit costs for construction that were discussed in Section 3. This section summarizes the alternatives that were evaluated for each subarea and provides a recommendation for the type and location of proposed sewers.

4.2 Sewer Subareas

The unsewered streets in the project area were broken into twelve subareas based on location, as shown on Figure 4-1a and 4-1b. Note that Zachary Road is shown on Figure 4-1a as not being sewerred. However, all buildings are already sewerred with individual pump stations to the City's collection system on East Industrial Drive and therefore sewerred this street is not required.

4.2.1 Subarea 1 - Wellington Road

The Wellington Road subarea is the most complicated area in regard to sewerred alternatives. The Wellington Road subarea includes Wellington Road, Lakeview Lane, Highview Terrace, Highview Circle, Killdeer Drive, Linda Lane, Little Brook Way, Lakeside Drive, Spring Valley Street, Sinclair Avenue, and the Eastwind Estates Neighborhood. The Eastwind Estates neighborhood has an existing private sewer system that consists of a network of gravity sewers and a pump station located at the end of Aladdin Street.

Lakeview Lane, Killdeer Drive, and Sinclair Avenue

Lakeview Lane, Killdeer Drive, and Sinclair Avenue can be sewerred by conventional gravity sewer and did not require an alternatives analysis.

Highview Terrace, Highview Circle, and Little Brook Way

Three alternatives were evaluated for sewerred the homes on Highview Terrace, Highview Circle, and Little Brook Way, as shown on Figure 4-2.

Alternative 1-All Gravity Sewers

Alternative 1 includes sewerred Highview Circle and the northern end of Highview Terrace with gravity sewer to Little Brook Way via cross-country sewer. This alternative would require easements from multiple land owners and could possibly have wetland impacts depending on the route chosen in final design. The estimated present day construction cost for Alternative 1 is \$844,000 (not including the cost of acquiring easements).

Insert Figure 4-1a - Subareas

Insert Figure 4-1b - subareas

Insert Figure 4-2 - Highview alternatives

Alternative 2-Gravity and Low Pressure Sewers

Alternative 2 includes sewerage for the thirteen homes on Highview Circle with pressure sewer and grinder pumps and sewerage for the entire length of Highview Terrace with gravity sewer. This alternative creates a deeper gravity sewer on Highview Terrace. Alternative 2 saves the city from acquiring easements but requires the City or property owners to purchase and pay operation and maintenance (O&M) expenses for grinder pumps. Alternative 2 has an estimated present day construction cost of \$671,000.

Alternative 3- Gravity Sewers with Pump Station

Alternative 3 includes sewerage for Highview Circle and the northern end of Highview Terrace with gravity sewer to a pump station at the end of Highview Circle. The sewer would be pumped through a force main to the high point on Highview Terrace. This alternative will require an easement for the pump station and add long-term O&M cost for the City. Alternative 3 has an estimated present day construction cost of \$1,037,000.

Recommendation

Alternative 3 is not recommended as it is the most expensive, requires an easement, and requires O&M of a pump station. Alternative 1 saves the City and/or homeowners from any long-term O&M cost of individual grinder pumps or pump station. However, this comes at an additional cost of nearly \$175,000 in construction versus Alternative 2. Alternative 1 also requires multiple easements and potential permitting for a wetlands crossing. The City prefers to sewer properties by gravity. Given this, it is recommended that the City proceed with Alternative 1. If during design wetlands permits, easements or costs become an issue, the City could fall back on Alternative 2, which is less expensive.

Linda Lane and Wellington Road

Alternatives for sewerage for Linda Lane and Wellington Road are shown on Figure 4-3 and included looking at the feasibility of utilizing the private sewers that already exist in the Eastwind Estates neighborhood. The infrastructure in the Eastwind Estates neighborhood is currently owned through a homeowner's association. Individual homeowners pay an association fee to cover the current operation and maintenance costs for the association system and also pay the full City sewer rate for the transport and ultimate disposal.

Alternative 1-Gravity Sewer

The nine homes in the western most area of Wellington Road and all homes on Linda Lane would be seweraged by gravity with a cross country sewer from the cul-de-sac at the end of Linda Lane to the existing private sewer behind the homes on Aladdin Street. The homes in the central portion of Wellington Road (from Lakeview Lane to Little Brook Way) and all sewage flow from side streets would be seweraged by gravity and connect to the existing private sewers on Tiffany Lane and Eastwind Drive. To do this, the city would need to assume ownership and future O&M of the existing sewers

Insert Figure 4-3 - Wellington Road Alternatives

and pump station in this development. The eastern most area of Wellington Road would be sewerred by gravity to the Londonderry Turnpike. Excluding the cost for acquiring easements and to potentially update/operate/maintain or eliminate the existing Aladdin Street Pump Station, the estimated present day construction cost of this alternative is \$3,100,000 (not including the cost for acquiring easements).

Alternative 2-Gravity with Pump Station

Due to topography, western Wellington Road and Linda Lane would require either a gravity sewer to a pump station at the end of Linda Lane (and corresponding force main to proposed gravity sewer on Wellington Road) or a pressure sewer with grinder pumps. Given that approximately 30 homes would be sewerred, the preferred alternative would be to install the pump station. The center portion of Wellington Road would be sewerred by gravity to eastern Wellington Road. This gravity sewer would be deeper than Alternative 1 (due to topography) and the size of the proposed sewer on eastern Wellington Road would be larger than Alternative 1. The estimated present day construction cost is \$3,420,000 (not including the cost of acquiring easements and long-term O&M of the Linda Lane pump station).

Recommendation

Both alternatives require the potential O&M of a pump station. However, Alternative 1 will cost approximately \$350,000 less to construct than Alternative 2, and, therefore, is the recommended alternative. The City should approach the Eastwind Estates Community to connect to the existing sewers and potentially assume ownership and future O&M (See Section 7.2.15 for additional discussion). Prior to assuming ownership the City should consider inspecting the existing private sewer system. If an agreement with the homeowners association from Eastwind Estates cannot be reached Alternative 2 is the only other solution.

Aladdin Street Pump Station

The Eastwind Estates neighborhood is currently sewerred by a system of private sewers and a pump station located at the eastern end of Aladdin Street. The existing 6-inch force main runs along Eastwind Drive and Wellington Road up to Lindstrom Lane. The residents of this neighborhood currently pay a sewer bill to the City and pay for the O&M of the pump station through a homeowners association. It would be in the best interest of the City, and most likely the homeowners, if the City were to acquire the infrastructure.

Acquiring the infrastructure would allow the City to keep the pump station and use it to convey the sewage from the Wellington Road area. The existing 6-inch force main should be adequate for the proposed additional flow from the area. The existing pump station may also be adequate for the proposed additional flow, but would need to be evaluated during final design to determine the actual capacity of the pump station and deciding if upgrades to the station are necessary and prudent. However, the Aladdin Street pump station could be decommissioned by installing a gravity sewer using trenchless techniques under Route 101 to Lakeside Drive, see Figure 4-4.

Insert Figure 4-4 - Lakeside alternatives

Applicable trenchless technologies for this crossing are horizontal directional drilling and jack and bore. Horizontal direction drilling involves drilling a borehole along the proposed pipeline route, enlarging the bore to the specified diameter with multiple passes of reaming tools, and finally pulling the pipe through the slightly oversized hole. The drilling is performed from the surface with the pipe entering the ground at an angle of 8 to 16 degrees. Jack and bore is installed horizontally from work pits on each end of the proposed pipeline. For small diameter sewer pipes crossing state highways, typically a larger diameter sleeve is jacked mechanically between the two work pits and the smaller diameter sewer pipe is installed in the sleeve.

This alternative would allow the City to remove the pump station at a later date. The estimated present day construction cost to eliminate the pump station and install a new gravity sewer via trenchless technologies to Lakeside Drive is \$668,000.

If the city acquires the Aladdin Street pump station but either is unable to permit or elects not to install a sewer under Route 101, the City should consider terminating the force main at the intersection of Eastwind Drive and Wellington Road. This would save on energy for the pumps by lowering the discharge elevation by 150 vertical feet and remove this separated flow from the downstream Cemetery Brook combined sewer drainage basin. This would be a suggestion to the private owners even if the city does not acquire the Eastwind Estates sewer system. The Aladdin Street Pump Station was built over 20 years ago. Issues related to utilizing the existing pump station (i.e., age and condition of existing pumps, pumping capacity, existing generator, etc.) will need to be addressed during the final design phase.

Recommendation

Assuming the City proceeds with approaching the Eastwind Estates Community to connect to and take on ownership of the existing sewers, the City should proceed with exploring eliminating the Aladdin Street Pump Station with a new gravity sewer to Lakeside Drive. If during design wetlands permit, easements, permit from NHDOT (See Section 7.2.3 for additional discussion on required permit from NHDOT required during design phase), or costs become an issue, the City could fall back on operating and maintaining the existing pump station and evaluate redirecting the force main to the new proposed sewer at the intersection of Eastwind Drive and Wellington Road. The costs of options utilizing and/or rehabilitating the pump station will be less than the cost of the gravity sewer option carried in the probable cost for this contract.

Lakeside Drive / Spring Valley Street

Alternatives for sewerage Lakeside Drive are shown on Figure 4-4 and vary based upon decisions made regarding the Eastwind Estates private sewers and pump station.

Alternative 1-Gravity Sewer

Alternative 1 includes sewerage Lakeside Drive by gravity with a cross-country sewer and connecting to Candia Road via Spring Valley Street. Regardless of the current

decision with the private sewer and pump station in Eastwind Estates it is prudent for the gravity sewer to Candia Road to be sized to include potential flows if the Aladdin Street pump station was eliminated. Concerns with Alternative 1 include construction near/through sensitive archaeological areas, wetlands, and the size of the easement required. The estimated present day construction cost of Alternative 1 is \$757,000 (not including the cost of acquiring easements).

Alternative 2-Pressure Sewer

Alternative 2 eliminates the cross country sewer and therefore requires either a pump station or pressure sewer and grinder pumps to sewer Lakeside Drive. Given that only about 20 homes on Lakeside Drive would be sewered the preferred sewer for this alternative would include a pressure sewer with grinder pumps. Spring Valley Street would be sewered with a smaller 8-inch gravity sewer. Alternative 2 has no construction concerns. The estimated present day construction cost is \$275,000.

Recommendation

Assuming the City intends to acquire the Eastwind Estates infrastructure based on the analysis above, Alternative 1 is the recommended long-term decision. This would allow for the Aladdin Street pump station to be decommissioned now or at some point in the future. However, if easements, permitting (potential impacts to wetlands and sensitive archaeological areas) and/or costs become an issue, the City could fall back on Alternative 2, which is less expensive.

4.2.2 Subarea 2 – North Reading and Reading Streets

Reading Street and North Reading Street are east of Bypass 28 and are at a much lower elevation. Therefore, sewerage this area would require pressure sewer or a pump station. Given that only approximately ten homes would be sewered, the preferred alternative would be pressure sewer and grinder pumps. However, the Town of Auburn will eventually sewer this section of their community and it would be in the best interest of the City to come to an agreement with Auburn to sewer the Manchester homes as part of the Auburn sewer. Most likely the sewer from Auburn would require a pump station near this subarea that the sewer from North Reading and Reading Streets could be connected to.

4.2.3 Subarea 3 – Northern Lake Shore Road

Included in the northern Lake Shore Road subarea are Minot Street, Kalisz Lane, Carron Avenue, Friend Street, Garlact Avenue, Hartt Avenue, Phinney Avenue, Peabody Avenue, Garvin Avenue, Proctor Road, Callaghan Street, Groveland Avenue, and Lake Shore Road from 1222 Lake Shore Road to Candia Road. The majority of this area can be serviced by conventional gravity sewers in the roadway with the exception to Hartt Avenue and Garvin Avenue. The sewer in Subarea 3 with the exception of Proctor Road, Callaghan Street, and nine homes on Lake Shore Road flow by gravity to the pump station at the intersection of Candia Road and Lake Shore Road.

Hartt Avenue

Due to topography the northern portion of Hartt Avenue cannot be sewerred with typical gravity sewer without the need for easements. Two alternatives, shown on Figure 4-5, were evaluated for sewerred the four homes at the northern end of Hartt Avenue.

Alternative 1-Gravity Sewer

The four homes in the northern most area of Hartt Avenue could be sewerred by gravity with a cross country sewer running behind the four homes on Hartt Avenue and connecting to the proposed gravity sewer on Carron Avenue. This alternative would require easements from five separate land owners; four of these landowners are the homes being sewerred. In addition to easements this alternative would also require a wetland impact permit. The estimated present day construction cost for sewerred Hartt Avenue is \$72,000 (not including the cost of negotiating easements).

Alternative 2-Pressure Sewer

Alternative 2 includes sewerred the four homes with pressure sewer and grinder pumps. This alternative would not require easements and would not impact wetlands. The pressure sewer would connect to the proposed gravity that ends on Hartt Avenue at Medwick Street. The estimated present day construction cost of alternative 2 is \$74,000.

Recommendation

There is no recommended alternative for Hartt Avenue. The two alternatives are close in cost and both have advantages and disadvantages. During design a meeting with the owners of the five easement properties should be considered to determine their preference before making a final decision.

Garvin Avenue

Due to topography, two alternatives for sewerred Garvin Avenue were evaluated, see Figure 4-6.

Alternative 1- Gravity Sewer

Garvin Avenue is at a lower elevation than Peabody Avenue. However, Garvin Avenue can be sewerred with a gravity sewer running north to south with a cross-country sewer from the southernmost point on Garvin Avenue to Lake Shore Road. This alternative would require an easement on Manchester Water Works property and could potentially impact wetlands. The estimates construction cost of this alternative is \$437,000 (excluding the cost of negotiating easements).

Alternative 2-Pressure Sewer

The alternative to sewerred Garvin Avenue with a cross-country sewer to Lake Shore Road is a pump station or pressure sewer and grinder pumps. There are only 19 homes on Garvin Avenue and little to no space for future development. With this number of homes a pressure sewer and grinder pumps are the preferred method of

Insert Figure 4-5 - Hartt alternatives

Insert Figure 4-6 - Garvin alternatives

sewering Garvin Avenue. This alternative has an estimated present day construction cost of \$239,000.

Recommendation

Alternative 1 saves the City or homeowners from any long-term O&M cost of individual grinder pumps. However, this comes at an additional cost of approximately \$200,000 in construction versus Alternative 2. Alternative 1 also requires multiple easements (majority of the easement is on Manchester Water Works property) and potential permitting for wetlands impacts/crossing. The City prefers to sewer properties by gravity. Given this, it is recommended that the City proceed with Alternative 1. If during design wetlands permits, easements or costs become an issue, the City could fall back on Alternative 2, which is less expensive.

4.2.4 Subarea 4 – Central Lake Shore Road

The central Lake Shore Road subarea currently only consists of three homes. Lake Shore Road is relatively flat and these homes cannot be sewerred to the northern or southern end of Lake Shore Road by gravity. Alternatives, for sewerred this area are shown on Figure 4-7 and include a cross-country sewer connecting to the existing Cohas Brook Sewer Interceptor or pressure sewer and grinder pumps to the northern Lake Shore Road subarea.

Alternative 1- Gravity Sewer

Alternative 1 includes sewerred the three homes by gravity with a cross-country sewer connecting to the existing Cohas Brook Sewer interceptor. Depending on the location for the cross country sewer, this alternative would require easements and potentially a stream and/or wetland crossing. The estimated present day construction cost for Alternative 1 is \$456,000 (not including the cost of negotiating easements).

Alternative 2- Pressure Sewer

The second alternative includes a pressure sewer with grinder pumps for the homes. This alternative would not require easements or impact wetlands. The estimated present day construction cost of alternative is \$315,000.

Recommendation

Alternative 1 saves the City or homeowners from any long-term O&M cost of individual grinder pumps. However, this comes at an additional cost of approximately \$140,000 in construction versus Alternative 2. Alternative 1 also requires multiple easements and potential permitting for wetlands impacts/crossing. The City prefers to sewer properties by gravity. Even though there are currently only three homes, there is a large amount of undeveloped land. Given this, if the City provided sewer to this area it is recommended to proceed with Alternative 1. If during design wetlands permits, easements or costs become an issue, the City could fall back on Alternative 2, which is less expensive. However, because there are currently only three homes in this subarea and they all on large parcels (smallest parcel is greater than 3-acres) the City should consider this area a low priority.

Insert Figure 4-7 - Central Lake Shore Road Alternatives

4.2.5 Subarea 5 – Southern Lake Shore Road

There are less than 30 homes on 123 acres of land in the southern Lake Shore Road subarea. Alternatives for sewerage of the southern Lake Shore Road subarea are shown on Figure 4-8 and include gravity sewer with a cross-country sewer or a pump station.

Alternative 1-Gravity Sewer

Alternative 1 includes a gravity sewer on Lake Shore Road and Island Pond Road with a cross-country sewer from Island Pond Road to Cohas Avenue. The cross-country sewer would require a wetland permit and easements. This alternative would have a present day construction cost of \$1,520,000 (not including the cost of negotiating easements).

Alternative 2-Gravity Sewer with Pump Station

The second alternative is similar to Alternative 1 with gravity sewer on Lake Shore Road and Island Pond Road, but in lieu of a cross-country sewer there is a pump station located on Island Pond Road. This alternative would require the City to obtain an easement for the pump station. Pump stations also carry long-term O&M costs. The present day estimated construction cost for this alternative is \$1,480,000 (not including the cost of negotiating easements and long-term O&M costs).

Recommendation

Alternative 1 is recommended because both alternatives have approximately the same construction cost and this alternative does not require O&M of a pump station. However, due to the low population density in this area the City should consider this area a low priority. The cost of sewerage of the area is not justified for the current number of homes. Additionally, it has been brought to the attention of the City that developers may seek a change in the current zoning within this area. If a zoning change were granted by the City this could potentially change the pipe and/or pump station sizing in this area.

4.2.6 Subarea 6 – West Island Pond Road Area

The west Island Pond Road subarea includes Pepsi Road, Sibley Terrace, Cedar Hill Drive, Island Pond Road, and Cohas Avenue. This entire subarea can be sewerage by conventional gravity sewer and did not require an alternatives analysis.

4.2.7 Subarea 7 – Northern Cohas Avenue

The northern Cohas Avenue subarea currently only includes eight homes. However, there is over 75 acres of undeveloped land. Due to topography the eight homes in this area need to be sewerage by pressure sewer and grinder pumps to a gravity sewer that connects to the existing Cohas Brook Sewer Interceptor. The gravity sewer should be built as far as the road grades allow, which will accommodate the potential cross-country sewer that could service Subarea 5.

Insert Figure 4-8 – southern Lake Shore Road Alternatives

4.2.8 Subarea 8 – Northern Bodwell Road Area

The northern Bodwell Road subarea includes northern Bodwell Road, Pahray Lane, Cohas Avenue, and Hermit Road.

Hermit Road

Hermit Road can be sewerred by conventional gravity sewer and did not require an alternatives analysis. Some of the homes on western side of Hermit Road are below the street elevation and will require a grinder pump to lift the sewer to the gravity pipe in the street.

Pahray Lane and Cohas Avenue

Alternatives for sewerreding Pahray Lane and Cohas Avenue are shown Figure 4-9 and include a cross-country gravity sewer versus a pump station.

Alternative 1-Gravity Sewer

With this alternative the homes on the southern end of Cohas Avenue and all homes on Pahray Lane would be sewerred by gravity with a cross country sewer from the cul-de-sac at the end of Pahray Lane to Bodwell Road. This alternative would require an easement. The estimated present day construction cost of this alternative is \$702,000 (not including the cost of acquiring the easements).

Alternative 2- Gravity Sewer with Pump Station

This alternative would still sewer the homes with a gravity sewer but in lieu of the cross country sewer a gravity sewer to a pump station at the end of Pahray Lane (and corresponding force main to Cohas Avenue at Hermit Road) would be installed. This alternative would still require an easement for the pump station. The present day construction cost is \$1,190,000 (not including the cost of acquiring the easement and long-term O&M of the pump station).

Recommendation

The most cost effective alternative to sewer this area is Alternative 1.

Northern Bodwell Road

It is necessary for the sewer from northern Bodwell Road in the project area to cross Cohas Brook. Three alternatives for crossing the brook were considered during a field inspection of the area. These three options are shown on Figure 4-10. During final design a closer examination of these three alternatives will need to consider the following:

- Cost
- Associated wetland impact
- Disruption to impacted residents
- Ability to acquire easements

Insert Figure 4-9 - Pahray Lane Alternatives

- **Insert Figure 4-10 - Northern Bodwell Road Alternatives**

- Construction technique (siphon, horizontal direction drill, open cut, jacking, etc.)
- Results of Phase IB Archaeological survey (discussed later in report)
- Additional geotechnical information (soil type, bedrock, groundwater, etc) – Note that borings B-11 and B-12 were taken near the potential brook crossing and resulted in low blow counts.
- Detailed survey

Based on the available information, the estimated construction cost of all three alternatives (brook crossing locations) appears to be similar. Final selection of the preferred alternative will require the collection of additional data discussed above. Based on the limited available information, it appears that Alternative 2 on Figure 4-10 may be the best alternative and therefore this option was shown graphically on the proposed sewer layout in Section 5.

4.2.9 Subarea 9 – Southern Bodwell Road Area

The southern Bodwell Road subarea includes southern Bodwell Road, Sunset Pine Drive, Pheasant Lane, Quail Court, and Long Pond Brook Way. This subarea is the most densely populated in the Cohas Brook Sewer Master Plan project area and includes some areas that are already sewered by a system of private gravity sewers and pump stations, including those owned and operated by the Bodwell Waste Services Corporation. The residents in these areas are connected to the City's sewer system and currently pay a sewer bill to the City and to Bodwell Waste Services Corporation.

Pheasant Lane, Quail Court, and Long Pond Brook Way

Pheasant Lane can be sewered by conventional gravity sewer and did not require an alternatives analysis. Due to topography, the three homes on Quail Court will require pressure sewer and grinder pumps and also did not require alternative analysis. The homes on Long Pond Brook Way currently have a gravity system that conveys sewer to a community septic system. Long Pond Brook Way is a private street that will only require the City to leave a stub at the intersection of Long Pond Brook Way and Pheasant Lane. However, all pipes downstream of Long Pond Brook Way have been sized to convey the potential additional flow if the private street was connected to the sewer.

Southern Bodwell Road and Sunset Pine Drive

Alternatives for sewerage Bodwell Road are shown on Figure 4-11 and include evaluating the feasibility of a cross-country sewer running parallel to Interstate 93 versus a deep gravity sewer on Bodwell Road. The alternatives only include the analysis to sewer properties in Manchester. Alternatives for extending the sewer to Londonderry are discussed in the next subsection.

Insert Figure 4-11 – Bodwell Road Alternatives

Alternative 1-Gravity/Pressure Sewer

Alternative 1 includes a deep gravity sewer (exceeding 25 feet deep in some areas) on Bodwell Road. This alternative would have several brook/culvert crossings. Also, Alternative 1 would require pressure sewer and grinder pumps to the four homes on Sunset Pine Drive. The estimated present day construction cost of this alternative is \$3,280,000.

Alternative 2-Gravity/Pressure Sewer with Cross Country

Alternative 2 includes a cross-country sewer parallel to Interstate 93. This alternative would require easements from ten or more different property owners and would have significant wetland impacts and also has several brook crossings (unlike Alternative 1, the brooks are not in a culvert at these locations). Additionally, the NHDOT stated in a phone conversation that they will not grant an easement for a sewer interceptor running parallel to the Interstate and they strongly advised against municipalities installing parallel utilities in close proximity to the NHDOT right-of-way. This alternative would still require small localized sewers in Bodwell Road for the properties on the northeast side of the street and Pheasant Lane that would flow by gravity to the interceptor between two buildings via a necessary easement. The four homes on Sunset Pine Drive would be sewered by gravity to the sewer main behind the buildings. The estimated present day construction cost is \$3,404,000 (not including the cost of acquiring easements).

Recommendation

Alternative 1 is the most cost effective and recommended alternative for sewerage Bodwell Road. However, see below for additional considerations for allowing connection/capacity for the neighboring Towns of Londonderry and Auburn.

Londonderry and Auburn

In addition to sewerage the Manchester residents on and near Bodwell Road it is the City's intent to provide sewer access and capacity to the neighboring communities of Londonderry to the south and Auburn to the east. Londonderry has recently completed a Wastewater Facilities Plan Update and Auburn is currently finalizing a Sewer Master Plan. Both plans include connecting sewer to the Manchester town-line on/near Bodwell Road. The two alternatives below provide the total cost for providing this capacity/extension, which revises the Bodwell Road and Sunset Drive alternatives discussed above. Both alternatives are shown on Figure 4-12 and require the size of the interceptor on Bodwell Road to be increased to a 24-inch pipe due to the additional capacity required to convey the flow.

Alternative 1- Gravity Sewer

Alternative 1 provides gravity sewer to the Londonderry town-line on Bodwell Road. As mentioned above, this alternative changes the size of the interceptor on Bodwell Road to a 24-inch. To extend a gravity sewer to the Londonderry line, this alternative also increases the length of the proposed interceptor and requires a significantly deeper construction (up to 6 feet deeper in some areas) and has an estimated present

Insert Figure 4-12 – Londonderry/ Auburn Alternatives

day construction cost of \$4,900,000. Note this alternative is \$1,619,000 more to construct than the Southern Bodwell Road alternative recommended on page 4-23.

Alternative 2- Gravity with Pumping from Others

Alternative 2 also provides sewer service to Londonderry and Auburn, but this alternative would require the two communities to pump in to Manchester. This alternative still requires the pipe on Bodwell Road to be increased to a 24-inch, but does not change the required length and minimally changes the depth of the interceptor on Bodwell Road. This alternative would require Londonderry and/or Auburn to extend an adequately sized force main to connect to the 24-inch gravity sewer. Alternative 2 has an estimated present day construction cost of \$3,330,000. Note this alternative is only \$50,000 more to construct than the Southern Bodwell Road alternative recommended on page 4-23.

Recommendation

Although it is prudent for the City to install a 24-inch interceptor to allow for future connections from neighboring towns, it is currently unclear what the best approach is for sewerage Londonderry and Auburn or where the interceptor or force main should be extended to. This should be decided by Manchester, Londonderry, and Auburn officials during the design phase of this interceptor. However, given the fact that installing a gravity sewer to the town-line is estimated to be \$1.7 million more to construct (which would be approximately \$2.5 million more project costs with engineering and contingencies), it is recommended for the City to proceed with Alternative 2 at this time. With this alternative Auburn and Londonderry will be required to pump to the gravity sewer.

4.2.10 Subarea 10 – Bryant Road and Corning Road

Bryant Road

Bryant Road was recently sewerage by a private developer. Sewer stubs were left for Skyline Drive, Meadow Glen Drive, and Bernice Avenue. These streets can be sewerage by conventional gravity sewer and did not require an alternatives analysis.

Corning Road

There are only two unsewerage homes on Corning Road. These homes can be sewerage by conventional gravity sewer and did not require an alternatives analysis.

4.2.11 Subarea 11 – South Mammoth Road

The South Mammoth Road subarea includes South Mammoth Road and Lucas Road.

South Mammoth Road

New gravity sewer on South Mammoth Road will be conveyed to the exiting pump station on South Mammoth Road. Pumping records from the South Mammoth Road pump station and the Sheffield Road pump station were obtained from the City.

Review of the data revealed that the South Mammoth Road pump station has more capacity available for the additional flow.

Lucas Road

Lucas Road is sparsely populated and cannot be entirely sewerred by gravity. Due to the topography it would require multiple pump stations making pressure sewer and grinder pumps the best alternative for Lucas Road. A gravity sewer on Lucas Road from South Mammoth Road was extended as far as existing topography allows. Given the fact that the southeastern homes on Lucas Road are on large lots of land, none of the homes reported problems with their existing septic system, and they would require a pressure sewer and individual grinder pumps, this area was considered a low priority to sewer.

4.2.12 Subarea 12 - Glen Forrest and Lone Pine Drive

Glen Forrest Drive and Lone Pine Drive can be sewerred by gravity to South Mammoth Road and Bodwell Road, respectively. This area did not require further analysis.