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February 2, 2015

Mr. Gerald Horton, P.E.
Division of Water Infrastructure
NC Department of Environment and Natural Resources
512 N. Salisbury Street
Raleigh, NC 27604

Subject: City of Brevard – Neely Road Pump Station and Equalization Improvements
Project No. CS370 476-08
Response to Request for Additional Information

Dear Mr. Horton:

Thank you for your comments on the City of Brevard Neely Road Pump Station and Equalization Improvements project Engineering Report (ER) and Environmental Information Document (EID). This letter provides responses to your request for additional information. Your comments are listed below with responses to each in *italics*. Additionally, associated changes to the ER/EID have been made and are indicated by blue text throughout the documents.

1. Provide complete and specific description of facilities (i.e. lines, pump stations, crossings, etc) for alternatives for existing situation, i.e. form each's starting point to wastewater entry into EQ/WWTP.

   The text in the "Description" section of Table 5.1.4, page 5-4 and Table 5.1.5, page 5-7 has been updated to incorporate a description of the facilities associated with Alternative 4 and the Preferred Alternative, respectively.

2. Revise questionable capital costs and/or O&M costs in Alternative 4 and Preferred Alternative.

   The O&M costs associated with Alternative 4 were revised and Tables 5-12 through 5-16 were updated. Additionally, the Present Worth costs for Alternative 4 were updated in Tables 5.1.4, 5.2.28, and 5.3.1.

3. Comment from Susan Kubacki, DWI: On Figure 6-6 Wetland Delineation Map, please show the specific location of each of the impacts listed in Table 6-5 Wetland Impacts. (Show where the forcemain and sewer will cross the wetlands and show the proposed location of the EQ tank.)

   Response: Figure 6-6 has been revised as requested. The proposed force main, sewer, and tank have been added to the figure. The figure has been updated in the EID (Section 6).

4. Comment from Deborah Gore, PERCS Unit: The PERCS Unit has performed a cursory review of the subject project. At this time we have only the standard comment regarding compliance with the rules and MDC: Design of this project should meet 15A NCAC 2T; the Division's Gravity Sewer Minimum Design Criteria adopted February 12, 1996 as applicable; and the Division's Minimum Design Criteria for the Fast-Track Permitting of Pump Stations and Force Mains adopted June 1, 2000 as applicable. Projects involving an Environmental Assessment per 15A NCAC 01C .0408 must be submitted for a full technical review on application forms provided by the Division. An application for sewers involving an Environmental Assessment shall not be considered complete until either a Finding of No Significant Impact or Record of Decision is issued.

   Response: This project will be designed to meet the referenced regulations and minimum design criteria documents. The project will be submitted for a full technical review by the PERCS Unit, because it involves an Environmental Assessment (in the form of a Major EID).

5. Comments from DENR:
   Comment from Dan Brubaker, NC Department of Public Safety Emergency Management: The City of Brevard participates in the National Flood Insurance Program and regulates development in the Special Flood Hazard Area within its jurisdiction. Even though floodplain impacts are expected to be temporary and/or minimal, the Final Engineering Report and Environmental Information Document should note:
   1. The final plans should be reviewed and approved by the City of Brevard Floodplain Administrator; and
   2. A floodplain development permit will be required to be issued by the City of Brevard prior to construction.

Response: Comments noted. We met with the City Floodplain Administrator at the beginning of the project and will continue to coordinate with him during design. We have added a sentence to Section 6.1.2 stating this.

Comments from Allison Weakley, NC Natural Heritage Program (abridged):
The NCNHP database shows element occurrence records for the following rare species within the proposed project area as depicted in Figure 5-2 of the draft DWI Engineering Report and Environmental Information Document.

- French Broad River Crayfish
- Paddlefish
- Creeper

All three aquatic rare species listed above have been documented in the reach of French Broad River that may be impacted by the proposed project; the record for French Broad River Crayfish also extends into lower Lamb Creek and has been documented at the SR-1504 stream crossing.
In addition, the NCNHP database shows element occurrence records for the following rare species documented within one mile of the proposed project area (including those species listed above):

- Appalachian Elktoe
- Superb Jewelwing
- French Broad River Crayfish
- Hellbender
- Prickly Ground-pine
- Southern Blotched Chub
- Bog Turtle
- French Broad Heartleaf
- Common Mudpuppy
- Paddfefish
- Sweet Indian-plantain
- Creeper

As noted above, occurrence records for French Broad River Crayfish, Paddlefish and Creeper have been documented in the proposed project area. There are two occurrence records for Hellbender within one mile; one is located in the French Broad River in the reach just east of the proposed Neely Road pump station, and the other is from Davidson River. The records for Southern Blotched Chub and Common Mudpuppy are also from Davidson River. The occurrence of Appalachian Elktoe is located in the reach of French Broad River just east of Davidson River. The occurrence of French Broad

Heartleaf is located near a bog in the Deerlake Subdivision, which is under conservation easement with the Carolina Mountain Land Conservancy.
The occurrence records for Superb Jewelwing and Prickly Ground-pine have very low accuracy due to the lack of site-specific locational information associated with these records, but these species have been documented in Transylvania County. The occurrences of Bog Turtle and Sweet Indian-plantain are both from the vicinity of Brevard.

Also within one mile, the NCNHP database shows a conservation easement managed by the North Carolina Ecosystem Enhancement Program along King Creek (just south of the proposed Neely Road pump station).
Please note that occurrences of rare species documented within one mile of the proposed project area increase the likelihood that these species may be present within the project area if suitable habitat exists. The use of Natural Heritage Program data should not be substituted for actual field surveys if needed, particularly if the project area contains suitable habitat for rare species.

Response: We do not anticipate that the project will affect the listed species. The French Broad River crossing will be accomplished using directional drilling, so there will be no direct impact to the river. Sediment and erosion control measures will be used at the launching and receiving pits to prevent sediment from leaving the work site. The streams that will be open-trenched will be crossed within or directly adjacent to the existing road culverts where habitat for aquatic species has already been impacted. The force main will be installed primarily within the road pavement, where there is no habitat for these species. The project will not impact the conservation easement along King Creek or the Deerlake Subdivision. This project is likely to benefit aquatic species by reducing sanitary sewer overflows into these streams, thereby improving water quality for fish and aquatic species in the project area and downstream of the area. We have added this discussion to Section 6.8.1, 6.8.2, 2, 6.9.1, 6.9.2, 6.10.1, and 6.10.2.

Comments from Andrea Leslie, NC Wildlife Resources Commission: We do not anticipate any appreciable direct impacts of this project on either fish or wildlife resources in the area provided appropriate best management practices are used during construction of the new pump station, equalization tank, and sewer line crossings of the French Broad River and other streams. Vigilant attention to sediment and erosion control measures at the directional drilling site is needed to reduce risk of sediment impacts to aquatic community of the French Broad River.

The project will enable future increases in WWTP capacity and thereby facilitate future growth in the service area. The engineering and environmental documents included Brevard's 2014 Draft Comprehensive Plan as an appendix, but there is no detailed discussion of mitigation measures for secondary and cumulative impacts of the project on fish and wildlife habitats. The Draft Comprehensive Plan names a number of excellent proposed actions that, if implemented, would lessen the impacts of future growth on natural resources. We encourage the City of Brevard to undertake many of these recommendations, especially those that would result in restricting development from the floodplain and steep slopes, developing a robust stormwater program, and protecting and reestablishing forested riparian buffers. We recommend that the City refer to the Guidance Memorandum to Address and Mitigate Secondary and Cumulative Impacts to Aquatic and Terrestrial Wildlife Resources and Water Quality…for specific recommendations. Timely implementation of measures would facilitate environmental reviews of future WWTP capacity increases and similar infrastructure projects in the region.

Response: A Sediment and Erosion Control Plan will be developed for this project and submitted to NCDENR for review. Proper sediment and erosion control measures or other best management practices will be implemented prior to construction of the project, including at the directional drilling site at the French Broad River. As discussed during our October 21, 2014 meeting at the site, we will consider the use of super silt fence or double-row silt fence at this location, if acceptable to NCDENR DEMLR.

Mitigation measures for secondary and cumulative impacts of the project on fish and wildlife habitats are described in Sections 6.8.3 and 6.9.3 of the EID. As mentioned in the comments, restricting development from the floodplain is addressed by the City's flood hazard ordinance, which requires flood protection for structures constructed in flood hazard areas but also states that development of land within special flood hazard areas cannot occur without a determination that the construction will not cause flooding. The Draft Comprehensive Plan does address a number of ways to reduce the impacts of future growth on natural resources. This Plan is in draft format but is expected to be finalized in the near future.

Comments from Pete Doorn, NC Division of Waste Management Special Remediation Branch Head (abridged): Five sites were identified within a 1-mile radius of the project as listed below and shown on the attached map. It is not anticipated that these sites will affect the proposed project or vice versa.

However, due to the potential for groundwater contamination in the proposed construction areas, it is recommended that site files be reviewed so that proper health and safety precautions can be taken if needed.

Response: As noted in the comment, no effect is anticipated. However, as requested, CDM Smith will review the site files during design to determine if any health and safety precautions need to be taken. This sentence has been added to Section 6.2.2.

Comments from Deb Aja, NC Division of Waste Management Western District Supervisor (abridged) - Solid Waste Section: The Solid Waste Section has reviewed the DW1 Engineering Report & Environmental Information Document for the proposed Neely Road Pump Station and Equalization Project. The review has been completed and has seen no adverse impact on the surrounding community and likewise knows of no situations in the community, which would affect this project from a solid waste perspective. During construction, the City of Brevard (City) should make every feasible effort to minimize the generation of waste, to recycle materials for which viable markets exist, and to use recycled products and materials in the development of this project where suitable. Any waste generated by this project that cannot be beneficially reused or recycled must be disposed of at a solid waste management facility approved to manage the respective waste type. The Section strongly recommends that the City require its contractors to provide proof of proper disposal for all waste generated as part of the project. The nearest permitted facility to the project is the Transylvania County Landfill, Brevard, North Carolina.

Response: Comments noted. As recommended, the project specifications will require that waste and excess material be disposed of properly at a permitted facility. This is also noted in Section 6.2.2.

Comments from Asheville Regional Office (abridged): After review of this project it has been determined that the ENR permit(s) and/or approvals indicated may need to be obtained in order for this project to comply with North Carolina Law.

- Permit to construct & operate wastewater treatment facilities, sewer system extensions & sewer systems not discharging into state surface waters.
- The Sedimentation Pollution Control Act of 1973 must be properly addressed for any land disturbing activity. An erosion & sedimentation control plan will be required if one or more acres to be disturbed. Plan

filed with proper Regional Office (Land Quality Section) At least 30 days before beginning activity. A fee of $65 for the first acre or any part of an acre. An express review option is available with additional fees.

- 401 Water Quality Certification
- Notification of the proper regional office is requested if "orphan" underground storage tanks (USTs) are discovered during any excavation operation.
- If existing water lines will be relocated during the construction, plans for the water line relocation must be submitted to the Division of Water Resources/Public Water Supply Section.
- DWR PWS: Modifications and repairs to water infrastructure shall be in compliance with the Rules Governing Public Water Systems, [RGPWS]. Particular attention shall be given to RGPWS .0906 RELATION OF WATER MAINS TO SEWERS, which includes separation requirements for water and sewer infrastructure.
- DEMLR (LQ & SW): Trout buffer waiver will be necessary if trout buffer is disturbed. All streams in area are classified trout; Lambo (Gilbreath), Lamb, Allison, and King. NPDES Construction Stormwater Permit also required if E&SCP is required.
- DWR UST: Checked Orphan UST box above.

Response: Comments noted. The referenced permits will be acquired prior to construction.

Comment from Ramona M. Bartos, NC Department of Cultural Resources SHPO (abridged): There are no known archaeological sites within the proposed project area. Based on our knowledge of the area, it is unlikely that any archaeological resources that may be eligible for inclusion in the National Register of Historic Places will be affected by the project. We, therefore, recommend that no archaeological investigation be conducted in connection with this project.

We have reviewed the project description and map. According to the HPOGIS website http://gis.ncdcr.gov/hpoweb/ the following surveyed properties are located within view of or in the vicinity of the project area. Although these properties are not currently considered eligible for inclusion in the NRHP, we request the City of Brevard note their presence.

- Patton-Barnett House (TV0470)
- Smathers House (TV0374)
- Pebbledash House (TV0365)

We also request that the City of Brevard note that the Gallimore Hill House (TV0365), a property determined eligible for inclusion in the National Register of Historic Places, is located in the project vicinity.
We understand the majority of work will be performed within existing right-of-ways and should not impact historic properties. However, if the undertaking may affect significant landscape features, i.e. retaining walls and/or fences, or mature plantings, we request you contact us to initiate additional consultation.

Response: Comments noted. If any significant landscape features such as retaining walls, fences, or mature plantings are affected, we will seek additional consultation with SHPO as requested. This sentence has been added to Section 6.11.2.

Comments from Janet Mizzi, US Fish and Wildlife Service (abridged):
Federally Listed Species – We have assessed the proposed project for potential impacts to several federally listed species including the federally endangered Appalachian elktoe (*Alasmidonta raveneliana*), and Virginia spiraea (*Spiraea virginiana*), which is currently federally listed as a threatened species. We have data indicating that Appalachian elktoe have been found in the French Broad River just downstream of the existing wastewater treatment plant. Because the crossing of the French Broad River will be directionally drilled, we believe that the project is "not likely to adversely affect" this species. We do recommend that strict measures be implemented to control sediment and erosion at the drill pits adjacent to the French Broad River and that the drilling be conducted during dry weather. During the site visit, Mr. Tompkins did not find suitable habitat at any of the stream crossing sites and the project will have "no effect" on this species. For these reasons, we believe the requirements under section 7(c) of the Act have been fulfilled. However, obligations under section 7 of the Act must be reconsidered if: (1) new information reveals impacts of this identified action that may affect listed species or critical habitat in a manner not previously considered, (2) this action is subsequently modified in a manner that was not considered in this review, or (3) a new species is listed or critical habitat is determined that may be affected by the identified action.

General Comments –We are concerned about the direct impacts this project could have on aquatic resources. We are particularly concerned about the indirect, secondary, and cumulative impacts associated with the construction of the proposed project (i.e., increased development, loss of riparian areas and floodplains, and increased storm water runoff and erosion). We want to

emphasize that stringent measures to control sediment and erosion should be implemented prior to any ground disturbance and should be maintained throughout project construction. Temporary (e.g., rye, grain, wheat, millet) or permanent herbaceous material should be planted to help control erosion immediately following any ground disturbing activity. Native annual small grains and herbs appropriate for the season are recommended. Fescue based mixtures should be avoided. Also, fertilizers and pesticides should not be used near streams.

Stream and Wetland Buffers – One of the best ways to minimize the impacts of development on streams and wetlands is to maintain and/or create wide forested riparian buffers. The City of Brevard has developed ordinances that protect 25-foot riparian buffers on streams. Though 25-foot riparian buffers are the minimum required, we recommend that the City of Brevard adopt ordinances to protect and/or establish native forested buffers that are a minimum of 100 feet wide along each side of perennial streams and a minimum of 50 feet wide along each side of intermittent streams and wetlands throughout the present and future service area of the entire municipal jurisdiction. We also encourage the implementation of buffers on ephemeral streams due to the important functions they provide as headwater streams (Alexander et al. 2000, Peterson et al. 2001). Riparian areas generally comprise less than 1 percent of the landscape; however, for their size they support a disproportionately high number of wildlife species and provide a number of essential ecological functions (Environmental Law Institute. 2003. Conservation Thresholds for Land Use Planners. Pp. 19 23.). Specifically, forested riparian buffers serve as filters for contaminants, lessen storm water velocities, supply thermal protection, protect stream bank stability, provide important nutrients and woody cover for aquatic life, and improve the quality of water and wildlife habitat. Buffers should be measured horizontally from the edge of the stream bank (Knutson and Naef 1997), which may result in wider buffers at higher gradients, and must be provided over the entire length of the stream, including headwater streams. Further, we recommend leaving 30 percent of the developed area as green space, which would include buffers and wetlands, and ensure that the green space is connected to natural resources. Wide contiguous riparian buffers have greater and more flexible potential than other options to maintain biological integrity (Horner et al. 1999) and could ameliorate many ecological issues related to land use and environmental quality (Naiman et al. 1993).

Floodplain Protection - In addition to the protection of riparian buffers, we strongly discourage the in-fill of 100 year floodplains for commercial and

residential development. Development in the floodplain increases the potential for flooding adjacent properties and interferes with the natural hydrological process of the waterways. It also disrupts the continuity of wildlife migration corridors. Additionally, allowing fill in the floodplain will alter the volume of water the floodplain will hold, thus altering the extent of the floodplain. Any floodplain fill will necessitate recalculating and redrawing the 100 year floodplain. This, undoubtedly, will: (1) lead to a floodplain that contains property and facilities that once were not in the floodplain, (2) cause flooding in new areas, and (3) have negative impacts on fish and wildlife resources. We recommend that any floodplain fill be mitigated by restoring or creating floodplain in adjacent areas.

Stormwater Management – We suggest that the City of Brevard also adopt ordinances that will require the adequate treatment of storm water in developed areas. This is essential for the protection of water quality and aquatic habitat in rapidly developing landscapes. The expansion of urban areas is creating more impervious surfaces, such as roofs, roads, and parking lots, which collect pathogens, metals, sediment, and chemical pollutants and quickly transmit them to receiving waters. According to the Environmental Protection Agency, this nonpoint source pollution is one of the major threats to water quality in the United States and is linked to chronic and acute illnesses from exposure through drinking water, seafood, and contact recreation. The North Carolina Wildlife Resources Commission has developed a "Guidance Memorandum to Address and Mitigate Secondary and Cumulative Impacts to Aquatic and Terrestrial Wildlife Resources and Water Quality" that we support and encourage you to use.

Response: Comments noted. As noted, sediment and erosion control measures will be used prior to ground disturbance. The sediment and erosion control plan for the project will include temporary and permanent herbaceous material including native annual small grains and herbs appropriate for the season to control erosion immediately following any ground disturbing activity. Fescue based mixtures will not be allowed, and fertilizers and pesticides will not be allowed near streams. This has been added to Section 6.9.2.

Impacts to the floodplain will be reduced by the City's flood hazard ordinance, which requires flood protection for structures constructed in flood hazard areas but also states that development of land within special flood hazard areas cannot occur without a determination that the construction will not cause flooding. General comments regarding stream

and wetland buffers, floodplain protection, and stormwater management are noted.

Comments from David Brown, P.G., Regulatory Specialist, USACE: We have reviewed your submitted documents, conducted a site meeting with representatives of CDM Smith to discuss this project, and determined the proposed work will result in impacts to jurisdictional WoUS. Therefore, the project will require DA authorization pursuant to our regulatory authority under Section 404 of the Clean Water Act (CWA) and Section 10 of the Rivers and Harbors Act (RHA). DA authority under Section 10 of the RHA encompasses activities in, over, or under a navigable waterway that affect or has the potential to affect course, condition or capacity of navigation. Under Section 404 of the CWA, DA authorities regulates discharge of dredge or fill material into WoUS.
The project does propose impacts to jurisdictional wetlands, the French Broad River, Lamb Creek, Lambo Creek, Gilbreath Branch, and unnamed tributaries of these streams. Please note, the information submitted with your letter did not provide detailed data or other information necessary to verify the size and type of impacts to jurisdictional waters present within the possible work corridors/areas. Also, lacking from the submitted documents was an estimate of the amount of impacts, temporary or permanent, proposed for the work. The type of DA authorization required (i.e., general or individual permit) will be determined by the location, type, and extent of jurisdictional area impacted by the work, and by the project design and construction limits. Before work is started, we recommend more detailed information regarding the presence jurisdictional WoUS and the expected impacts within the work corridors be performed and submitted to our office for review.

Response: We acknowledge the need for a Section 404/Section 10 permit for this project. We will submit a permit application to USACE prior to construction.

Enclosed are two copies of a revised report incorporating these changes. Thank you again for your review of the Brevard Neely Road Pump Station and Equalization Improvements ER-EID. Please let me know if you have any questions about these responses.

Very truly yours,

Michael K. Sloop, P.E.
CDM Smith

cc: David Lutz, City of Brevard

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December 19, 2014

Mr. Seth Robertson, P.E.
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NC Department of Environment and Natural Resources
512 N. Salisbury Street
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Subject: City of Brevard – Neely Road Pump Station and Equalization Improvements
Project No. CS370 476-08
Response to Request for Additional Information

Dear Mr. Robertson:

Thank you for your comments on the City of Brevard Neely Road Pump Station and Equalization Improvements project Engineering Report (ER) and Environmental Information Document (EID). This letter provides responses to your request for additional information. Your comments are listed below with responses to each in *italics*. Additionally, associated changes to the ER/EID have been made and are indicated by blue text throughout the documents.

A. <u>General Comments: No Response Needed</u>

1. Engineering Reports not approved by March 2, 2015 will lose assurance of funding and must reapply for CWSRF funds under the current competitive priority system.
2. Provide a response to all comments on a "Comment for Comment" basis. You can include this as an Appendix in the Revised Engineering Report.
3. Submit two (2) copies of revised report incorporating all the changes or Submit two (2) copies of signed and sealed replacement pages (choose one as applicable).
4. Incorporate correspondence in DWI's Questions and your Comments from CDM Smith letter dated November 7, 2014 into Engineering report.

B. Technical Comments

Section 1 - Executive Summary

1. The capacity and ADF of the existing WWTP should be stated in Section 1.

   The ADF (1.6 MGD), the rated average day treatment capacity (2.6 MGD), and the peak hour hydraulic capacity (4.6 MGD) have all been added to Section 1, page 1-1.

Section 2 - Current Situation

1. Narrative in second block above Table 2.1.1. page 2-3 states "As such Figure 2-2 only shows the manholes where SSOs occurred." No manholes are shown. Provide clarification on type/location of the 60+ SSOs as to where the overflows are occurring. Specifically, are the SSOs at manhole(s) upstream of pump station and/or at pump station wetwell/site and/or at downstream location(s) from the pump station or from a breach in the force main? Please indicate location and type of SSO.

   Figure 2-2 only shows the manholes at which SSOs occurred. The locations of these manholes are represented by the enlarged green circles. The letter (A through G) next to each green circle corresponds to the "Map Key" column in Table 2.1.1. The number next to each letter corresponds to the number of SSOs that have occurred in the past five years at the associated manhole.

   As Figure 2-2 shows, the majority of the SSOs have occurred at manholes directly upstream of the existing Neely Rd and Gallimore Rd pump stations as follows:

   - *Neely Rd Pump Station*
     - *24 SSOs have occurred at the manhole on the Neely Rd pump station site.*
   - *Gallimore Rd Pump Station*
     - *16 SSOs have occurred at the manhole on the Gallimore Rd pump station site*
     - *19 SSOs have occurred at the manhole directly upstream of the Gallimore Rd pump station site.*

   A total of 7 SSOs have occurred throughout the remainder of the system, and are considered to represent isolated incidents.

2. On Table 2.2.1. (page 2-9) - in the discussion on impact of brewery on WW operations, it is unclear if the brewery impacts the WWTP/Equalization basin hydraulic loading and/or has an impact on the new pump station. Please explain.

   The proposed Equalization tank is being designed to handle wet-weather flows only, not diurnal flows. As such, hydraulic loading on the WWTP from the brewery was not used as a factor when sizing the Equalization tank. Additionally, the brewery discharge is conveyed to the WWTP via the Wilson Rd pump station, and therefore has no impact on the proposed Neely Rd pump station.

Section 3 - Future Situation

1. Table 3.2.1, page 3-4 explain use of and justification for the 5.0 peaking factor.

   The peaking factor used in Table 3.2.1, page 3-4 has been updated to 6.5. The peaking factor was calculated by dividing the post-rehabilitation peak wet-weather flow (4,760 gpm) by the post-rehabilitation average day dry-weather flow (736 gpm). However, it is important to point out that a peaking factor of 6.5 is a vast improvement over the pre-rehabilitation peaking factor. Prior to beginning rehabilitation of the collection system, the peak wet-weather flow to the Neely Road pump station was 10,654 gpm while the average day dry-weather flow was only 686 gpm. This represented a peaking factor of 15.5. While it is noted that rehabilitation efforts are still ongoing, the City has made significant progress in addressing I/I. Thus a peaking factor of 6.5 was used, as this represents the conditions the proposed Neely Road pump station is being designed for.

2. As part of project objective in reducing SSOs, Section 3 page 3-7 concludes proposing an equalization basin at WWTP of 4.5 MG volume. Please provide rationale and preliminary calculations for sizing Equalization basin.

   In sizing the proposed Equalization Tank, a model was generated to analyze 73 years of historic rainfall records (1940-2013). By analyzing rainfall

record data, the model was able to predict the wet-weather flows to the WWTP and route wet-weather flows in excess of the WWTPs hydraulic capacity (4.4 MGD) to the Equalization Tank. When the total daily flow into the system declined, stored wastewater was drained out of the tank back to the WWTP. The model repeated this process for the entire 73 years of historical rainfall records, and statistical summaries were produced. Based on the data generated from the model, the recommended storage volume was 3.2 MG if all recommended upstream rehabilitation has been performed. Once all recommended upstream rehabilitation has been performed, a 3.2 MG equalization tank will provide the City with a 2-year level of service. This information is also presented in Appendix B, pages 3-6 to 3-8.

Although a volume of 3.2 MG was determined adequate to provide the desired 2-year level of service, the City has requested an evaluation of the benefits and costs of increasing the equalization volume to 4.5 MG. By increasing the equalization volume to 4.5 MG, the City can add an extra factor of safety to the 2-year level of service for an incremental increase in the overall cost of the tank. The final decision on the tank size is still pending further investigations of the site and impacts including site surveys, wetland impacts, and geotechnical investigations.

Section 5 - Alternatives Analysis

1. DWI concurs with Engineering Report's conclusions for Alternatives 1 & 2.

2. Table 5.1.4 Alternative 4, the Gravity sewer option - Rejection of this apparently viable alternative in Engineering Report is largely based upon: 1) the time it takes to acquire numerous easements across farmland and 2) constructing a gravity sewer in the flood plain being "impractical." Please elaborate on rationale for discarding this alternative based on these 2 items, considering the fact that a pump station is required for both Alternative 4 or for the Preferred Alternative. That is to say, a gravity sewer instead of replacing the long force main appears to be equally effective in reducing SSOs.

   Alternative 4 was rejected for three main reasons.
   - *Environmental – As stated in Table 5.1.4, the proposed location of the gravity sewer pipe is within the floodway, an area that is frequently flooded according to the City. Flooding would prevent the City from accessing the pipe in the event of an emergency situation such as a*

pipe break. Additionally, location within the floodplain, and the proximity to the French Broad River increase the potential for environmental impacts in the event of a pipe break or SSO.

- *Schedule – The proposed alignment traverses several farmland parcels. Based on the City's knowledge of the owners of some of these parcels, acquiring easements would prove difficult and time consuming. The City has stated that if they were to route the pipe along the proposed alignment, they would likely have to condemn some properties. In addition to creating further tension between the City and local residents, such a process would result in significant project delays.*
- *Cost – Alternative 4 is estimated to cost $1.1M (Capital Costs) more than the Preferred Alternative. This increased cost is closely related to the anticipated delays resulting from easement acquisition. As stated in the Description portion of Table 5.1.4, a 4,100 LF portion of the existing Neely Road force main is structurally deficient and in need of replacement if continued use of the force main is to be expected. As stated in the above bullet, easement acquisition is expected to result in significant project delays, thus requiring the Project Administration costs to be $500,000 more than that of the Preferred Alternative. Additionally, the lengthened project schedule will result in the need to replace the 4,100 LF portion of force main at an estimated cost of nearly $850,000 (see Table 5.2.6). However, shortly after construction of the gravity sewer, the entire Neely Road force main, including the newly replaced portion, would be abandoned. Thus, while the project would require the $850,000 in new infrastructure in order to get through construction and to start-up, the new infrastructure would be abandoned within a few years of its start-up. For this reason, and when compared to the Preferred Alternative, this method was not recommended.*

While the Engineer agrees that Alternative 4 could be equally effective in reducing SSOs as the Preferred Alternative, for the reasons listed above Alternative 4 is not recommended, and therefore was rejected.

3. Please complete the information requested (specifically Present Worth:) in Table 5.1.4 page 5-4 and Table 5.1.5 page 5-6.

   The requested information has been completed in Table 5.1.4 page 5-4 and Table 5.1.5 page 5-6.

4. Referring to Table 5.2.6 page 5-16 vs. Table 5.2.17 page 5-28, explain or correct difference ($542,000) in pump station cost of $2,167,000 vs. $1,625,000. Also, explain difference in the Total Capital Costs on these two pages.

   The pump station cost for Alternative 4 has been corrected and the difference in Total Capital Costs ($1.1M) has been updated. Although there are numerous differences that lead to the difference in Total Capital Costs, the difference stems largely from the need to replace 4,100 LF of the existing Neely Road force main associated with Alternative 4, as discussed in the Description portion of Table 5.1.4. This will add an estimated $850,000 to Alternative 4. Additionally, based on the City's knowledge of property owners along the proposed gravity sewer alignment, easement acquisition is anticipated to lead to significant project delays. The elongated schedule and easement acquisition will require an additional $500,000 in Project Administration costs.

5. A parcels tax map or description of a preliminary gravity sewer routing for Alternative 4 is needed to support the Engineering Report's conclusion that acquisition of easements merits Rejection of Alternative 4.

   A map has been created and included in the body of the Engineering Report as Figure 5-2. Subsequent Section 5 figures have been renumbered accordingly.

6. Referring to Table 5.2.13 page 5-23 vs. Table 5.2.24 page 5-35. Alternatives Present Worth explain why or how annual O&M costs differ so greatly for the 2 similar Alternatives (Alternative 4 and Preferred Alternative), that is, $641,847 vs. $63,619. That is to say, it seems a dilemma that the passive Alternative 4 has greater O&M costs than the Preferred Alternative which involves equipment and operational costs.

This apparent discrepancy is also summarized in Table 5.2.1 page 5-39. Explain or correct fable 5.2.1 Annual O&M PW costs.

The differences in O&M costs for Alternative 4 and the Preferred Alternative have been corrected and updated in Table 5.2.13, Table 5.2.24, and Table 5.2.28. As Table 5.2.28 page 5-39 summarizes, the Preferred Alternative O&M cost is now $149,859 less than Alternative 4. It is important to note that while the gravity sewer portion of Alternative 4 may be passive, the alternative still includes a pump station and force main. O&M costs for Alternative 4 are slightly higher than the Preferred Alternative as a result of the increased O&M (CCTV, Jet/Flush/Root Removal, Manhole/Cleanout Inspection) associated with the gravity sewer.

7. Table 5.3.1 - Alternatives Analysis Summary, page 5-40 - explain in Preferred Alternative column how or account for why the Present worth costs are only $205,008 more than Capital costs, whereas in Alternative 4 the present worth costs for a very similar alternative and a new pump station are $783,236 more?

   See response to question 6 above. O&M costs have been updated for both Alternative 4 and the Preferred Alternative.

8. On page 5- 40 in the Rationale for Rejection/Acceptance - provide more details or cost breakdown on how "... $1.7M more .." was derived on Alternative 4-Gravity Option. Note that the statement also appears on page 5-4.

   For detailed cost breakdown, please refer to Table 5.2.6 page 5-16 and Table 5.2.17 page 5-28. While there are numerous differences in the Capital Cost estimates presented in these tables, the $1.1M difference (updated) in Capital Costs between Alternative 4 and Preferred Alternative results mainly from the following two line items:

   - *Replace Portion of Existing Neely Road Force Main – As mentioned previously, easement acquisition associated with the gravity sewer is expected to cause the schedule for Alternative 4 to be significantly longer than that of the Preferred Alternative. As such, the portion of the existing Neely Road force main found to*

be structurally deficient (discussed in Table 5.1.4 and Section 3.1.3 Appendix B) will need to be replaced to allow for continued use during construction of the gravity sewer. Replacement of the 4,100 LF section of force main is expected to cost an estimated $844,000.

- *Project Administration – As mentioned above, the construction schedule for Alternative 4 is expected to be significantly longer and will require substantial easement acquisition coordination. This will result in increased Project Administration costs of approximately $500,000.*

9. Section 5.4.1 Proposed Project Overview page 5-41 - existing pump station is 2,920 gpm capacity, proposed new Neely Rd. pump station is 4,760 gpm capacity. Is increase in capacity solely to account for peak flow? Provide basis for increased pumping capacity.

   The design of the existing Neely Road pump station allowed for overflows directly to Lambo Creek. However, the overflow mechanism has since been removed but the capacity of the pump station was never increased. Thus the existing pump station capacity of 2,920 gpm is undersized to handle the conveyed flows, as evidenced by the SSOs that have occurred at manholes directly upstream of the pump station. Additionally, the City is currently working on projects to rehab the collection system upstream of the Neely Road pump station. As rehab work is completed and issues currently leading to SSOs are eliminated, the Neely Road pump station is expected to see increased flows. As such, hydraulic model simulations conducted as part of the Wastewater Collection System Improvements Plan (Appendix B) predicted peak flows to the proposed Neely Road pump station of 4,760 gpm. The pump station was designed to handle these peak flows.

<u>Section 7 - Financial Analysis</u>

1. Refer to comments under Section 5. Rewrite summary statement for consistency. It appears the use or definition of several words are interchanged or inconsistent in narrative.

See responses to comments under Section 5. Summary statement for Section 7 has been modified for consistency.

2. Make a conclusive summary statement.

   A conclusive summary statement has been added to the end of Section 7.

Section 8 - Public Participation

1. Submit Addendum to this Engineering Report when the record is complete on public participation.

   Engineer will submit Addendum to this Engineering Report when the public participation meeting has been held and all documentation complete.

C. Environmental Comments

1. General: Please review and address all of the attached comments from cross-cutter agencies.

2. Section 5 Alternatives Analysis:
   a. The Environmental Impact Description must be completed for every alternative, regardless of feasibility. Revise Tables 5.1.1, 5.1.2, and 5.1.3 to include a summary of both construction related and operational impacts.

      The tables have been revised to include both construction and operational impacts for each alternative.

   b. The Rationale for Acceptance/Rejection must be completed for every alternative, regardless of feasibility. Revise Tables 5.1.1, 5.1.2, and 5.1.3 to include the rationale. (This information can be copied from Table 5.3.1. but it does need to be in the individual tables, not just the summary table.)

      The tables have been revised to include the rationale for acceptance/rejection for each alternative.

3. Section 6.1 Topography and Floodplains: For all projects funded through the CWSRF programs where there are proposed permanent impacts to the 100-year floodplain, alternatives to the impact must be provided. Impacts

are only allowed where there is no practicable alternative. Per Section 12.2.2.2 of the guidance revise Section 6.1.2 to explain why alternatives to impacts to the floodplain, such as locating the pump station and EQ basin outside of the floodplain, are not practicable.

The Neely Road Pump Station will not be constructed in the 100-year floodplain or floodway. A small portion of the pump station site is located within the 100-year floodplain adjacent to Lambo Creek; however, impacts in this area will be limited to minor grading if needed with no permanent loss of floodplain area anticipated. This has been clarified in Section 6.1. A discussion of the need to locate the EQ tank in the floodplain has also been added to Section 6.1.

4. Section 6.2 Soils: The discussion of direction impacts does not quantify the amount of soil that will be disturbed and the amount that will be moved. Per Section 12.2.3.2 of the guidance, provide estimated quantities, if possible, or a qualitative discussion that gives a better idea of the extent of soil disturbance.

   The quantity of soils that will be disturbed for construction of this project has been added to Section 6.2.

5. Section 6.6 Wetlands and Streams:
   a. The discussion of impacts indicates that there will be stream and wetland crossings. Per Section 12.2.7.2 of the guidance, a table must be included for each crossing that contains a unique identifier for each crossing tied to a map, the diameter and type of line that will be installed, the installation method, the acreage (wetlands) or linear feet (streams) impacted, and total impacts.

      Maps with tables listing the stream and wetland impacts have been added. Streams are shown on Figure 6-5, and wetlands are shown on Figure 6-6. (The figures previously labeled Figures 6-5, 6-6, and 6-7 have been renumbered.) Tables 6-4 and 6-5 have been added to describe the stream and wetland impacts. (The subsequent tables have been renumbered.)

   b. The quantity of streams impact is not provided. Also include the quantity of total impacts to streams and wetlands (the totals shown on the table to be created) within the discussion of direct impacts. You can use Table 6.6.2 from Appendix J of the guidance or create your own

table with the same information. Crossings that will have minimal or no impacts, such as direct bore, must be included in the table and identified on the map.

Tables 6-4 and 6-5 have been added to list the total stream and wetland impacts (subsequent tables have been renumbered).

c. Note that for projects funded through the CWSRF program, if there are proposed permanent impacts to wetlands, alternatives to those impacts must be discussed. If wetland impacts will be permanent, revise the discussion to explain how impacts have been minimized and why alternatives, such as other locations, were rejected.

The equalization tank will require permanent impacts to wetlands. A discussion of alternatives, avoidance, and minimization has been added to Section 6.6.

6. Section 6.9 Wildlife, Natural Vegetation, and Protected Terrestrial and Vegetative Species: Note that some rare species do grow in previously disturbed areas such as road rights-of-way. Because rare species are located within a mile of the project, it will be important to determine if any vegetated areas are possible habitat for rare species prior to land disturbance activities. Revise the discussion of impacts to provide more detail on avoiding disturbance of rare vegetation.

   Additional discussion of protected species impacts has been added to Section 6.9.

7. Table 6.12.1 Air Quality: No mention is made of sources of air emissions in the project area. Per Section 12.2.13.1 of the guidance, if there are other sources of emissions, such as vehicular traffic or industrial facilities, identify those sources; otherwise clarify that there are no other emission sources in the project area.

   Discussion of sources of air emissions has been added to Section 6.12.1.

8. Section 6.16 Mitigative Measures:
   a. Wetlands & Streams: No mention is made of permits from the Army Corps of Engineers. Revise the table to include this information.

Section 404/401 permits will be obtained for this project, and this note has been added to the Wetlands and Streams row of the table.

b. Noise: Noise-dampening devices are included as mitigation under environmental justice but not here. Revise the table to include this information with mitigative measures for noise.

This has been added to the Noise Levels row of the table.

c. Revise the table as needed to include any information added to the revised report based upon the above comments and agency comments.

The table has been updated.

Enclosed are two copies of a revised report incorporating these changes. Thank you again for your review of the Brevard Neely Road Pump Station and Equalization Improvements ER-EID. Please let me know if you have any questions about these responses.

Very truly yours,

Michael K. Sloop, P.E.
CDM Smith

cc: David Lutz, City of Brevard

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Appendix E – U.S. Census Data
Appendix F – Collection System Flow Monitoring and Data Analysis
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- 2003 Comprehensive Water Study
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Appendix H – SDC Population Projections
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Section 1

Executive Summary

The City of Brevard (City) currently experiences sanitary sewer overflows (SSOs) during periods of heavy rainfall. A study conducted on the collection system found that excessive inflow and infiltration (I/I) as well as gravity sewer and pump station capacity constraints causes surcharging in wet-weather events, ultimately leading to SSOs. In the past 5 years alone, sixty six SSOs have been reported within the City's sewersheds. As a result of the SSOs, the City is currently under a Settlement Agreement and is negotiating a special order of consent (SOC) with the North Carolina Environmental Management Commission (EMC) to bring operation of the system back in compliance with applicable permits. As such, the City is currently undertaking several projects, including this one, to address these problems. It is also important to note that the City operates the Brevard Wastewater Treatment Plant (WWTP). The WWTP currently receives average daily flows (ADF) of 1.6 MGD (1,100 gpm) and is rated for an average day treatment capacity of 2.6 MGD (1,800 gpm). Peak hour hydraulic flows are estimated to be 4.4 MGD (3,050 gpm).

The proposed project is located in the City of Brevard, North Carolina in Transylvania County and a location map showing the general vicinity of the project and the surrounding area is provided on **Figure 1-1**. The proposed project location is shown on **Figure 1-2**.

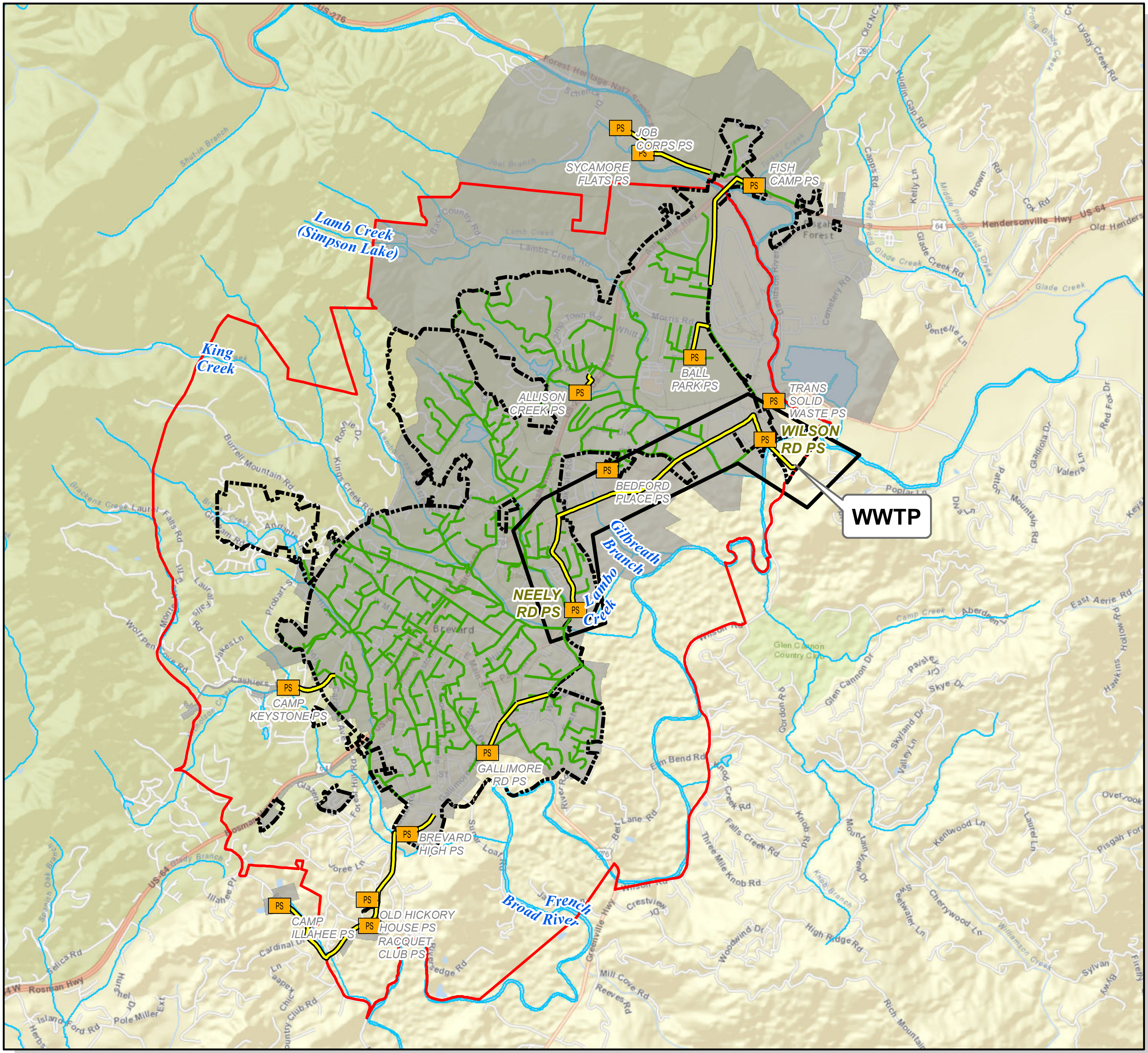
As part of this study, five alternatives were evaluated in detail, including:

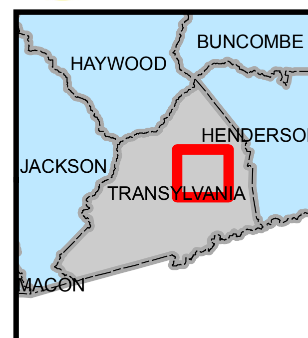
- Alternative 1 "No-Action" or "Do Nothing" – Maintain the Neely Road pump station, associated force main, and Brevard WWTP in current operation.
- Alternative 2 – Optimize performance of existing facilities.
- Alternative 3 – Adjust pump configuration at Neely Road pump station.
- Alternative 4 – Abandon Neely Road pump station. Install gravity sewer interceptor and construct new 4,760 gpm influent pump station near the WWTP. Construct equalization tank at the WWTP and replace a portion of the existing Neely Road force main for use during construction activities. Abandon existing force main after project completion.
- Preferred Alternative – Abandon 2,900 gpm Neely Road pump station. Construct new 4,760 gpm Neely Road pump station and 20" force main to convey flows to the WWTP. Construct 4.5 MG equalization tank at the WWTP.

The No-Action alternative was determined to be infeasible as implementation would result in continued overflows, resulting in violation of the City's Settlement Agreement and pending SOC with EMC. Alternatives 2 and 3 were also determined to be infeasible as they do not address capacity constraints within the system, and therefore do nothing to address the SSOs. Alternative 4 is feasible, but is not considered economical and creates the potential for more environmental impacts when compared to the Preferred Alternative. The Preferred Alternative provides the City with a long-term solution to address the frequency of SSOs. These alternatives are described in more detail in Section 5. Additionally, the Preferred Alternative provides the City with the most economical approach while mitigating environmental impacts to the extent practicable.

Figure 1-1
Vicinity Map
Neely Road Pump Station and Equalization Improvements Project

BREVARD, NORTH CAROLINA





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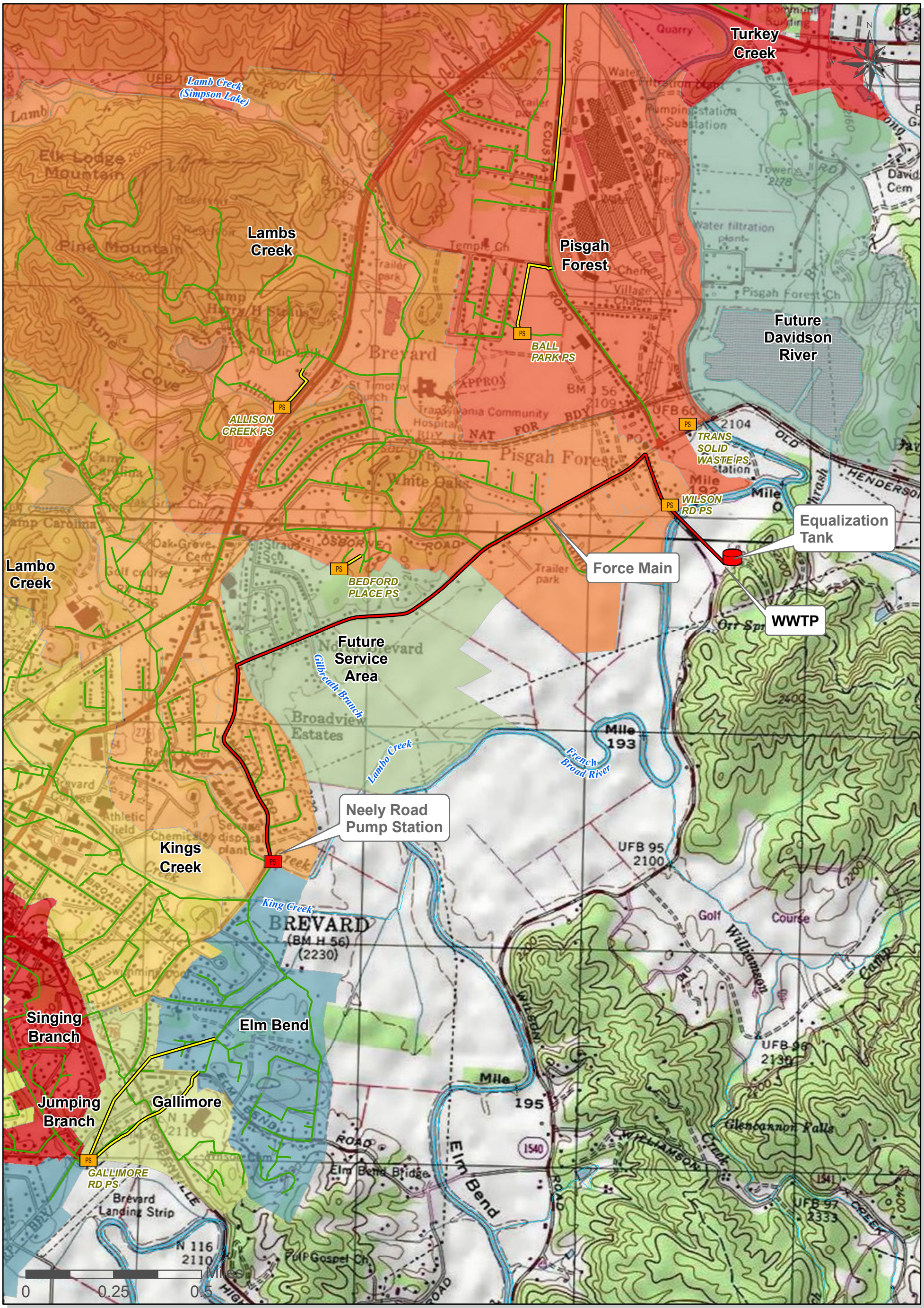

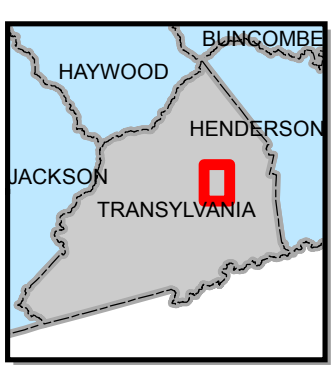

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LEGEND

- Sewer Basins
- Pump Station
- Surface Water
- Force Main
- Project Improvement
- Gravity Sewer

Figure 1-2
Project Location Map
Neely Road Pump Station
and Equalization
Improvements Project

BREVARD, NORTH CAROLINA

The potential direct environmental impacts associated with this project include: temporary impacts associated with land disturbance activities, temporary and permanent wetland impacts, temporary impacts associated with operation of construction equipment, and permanent impacts to floodplain areas. Measures that will be taken to mitigate these impacts include: minimizing the amount of wetlands impacted by installing the force main in NCDOT easements, implementing a Sedimentation and Erosion Control Plan, adherence to Federal and States regulations, construction sequencing, and requiring proper maintenance of construction equipment. The project will also result in a benefit to water quality, streams, and aquatic species by reducing SSOs. Secondary and cumulative impacts from growth and development in the service area will be mitigated by the City's 2014 Draft Comprehensive Plan and ordinances as well as state and federal regulations.

The City of Brevard submitted a Clean Water State Revolving Fund (CWSRF) application to the Division of Water Infrastructure (DWI) in March 2014 for funding of the proposed project. DWI notified the City on June 9, 2014 that the proposed project had been found eligible to receive a low interest (2.21%) loan. Subsequent revisions have increased the loan amount to $13,660,000. No other funding source has been requested. Per the financial analysis performed as part of this engineering report, the City will increase user fees over the next 3 fiscal years in order to generate sufficient income to pay back the CWSRF loan. Increases are not projected to significantly impact users. Per the analysis presented in Section 7, the projected revenue generated by the user fee increases is sufficient to pay all loans.

Section 2

Current Situation

2.1 Collection System Condition

The City's owns and operates an aging collection system that has been problematic in recent years. The following sections will detail the specifics of the collection system as they relate to the project as a whole.

2.1.1 Overview of System

The City of Brevard (City) owns and operates a wastewater collection system that currently serves 3,491 customers. The system, consisting of approximately 291,000 linear feet gravity pipe and 36,000 linear feet of force main, was mostly constructed in the 1920s and 1930s and is subdivided into eleven sewersheds. The City also has extraterritorial jurisdiction (ETJ) of an area extending beyond the City limits and the existing sewershed boundary. Additionally, the City has plans for the development and incorporation of two future sewersheds. These features are represented on Figure 1-1 and Figure 1-2. For the purposes of this report, the extents of this project will be considered the sewershed boundary defined by the existing eleven sewersheds and the two future sewersheds, as shown on **Figure 2-1**.

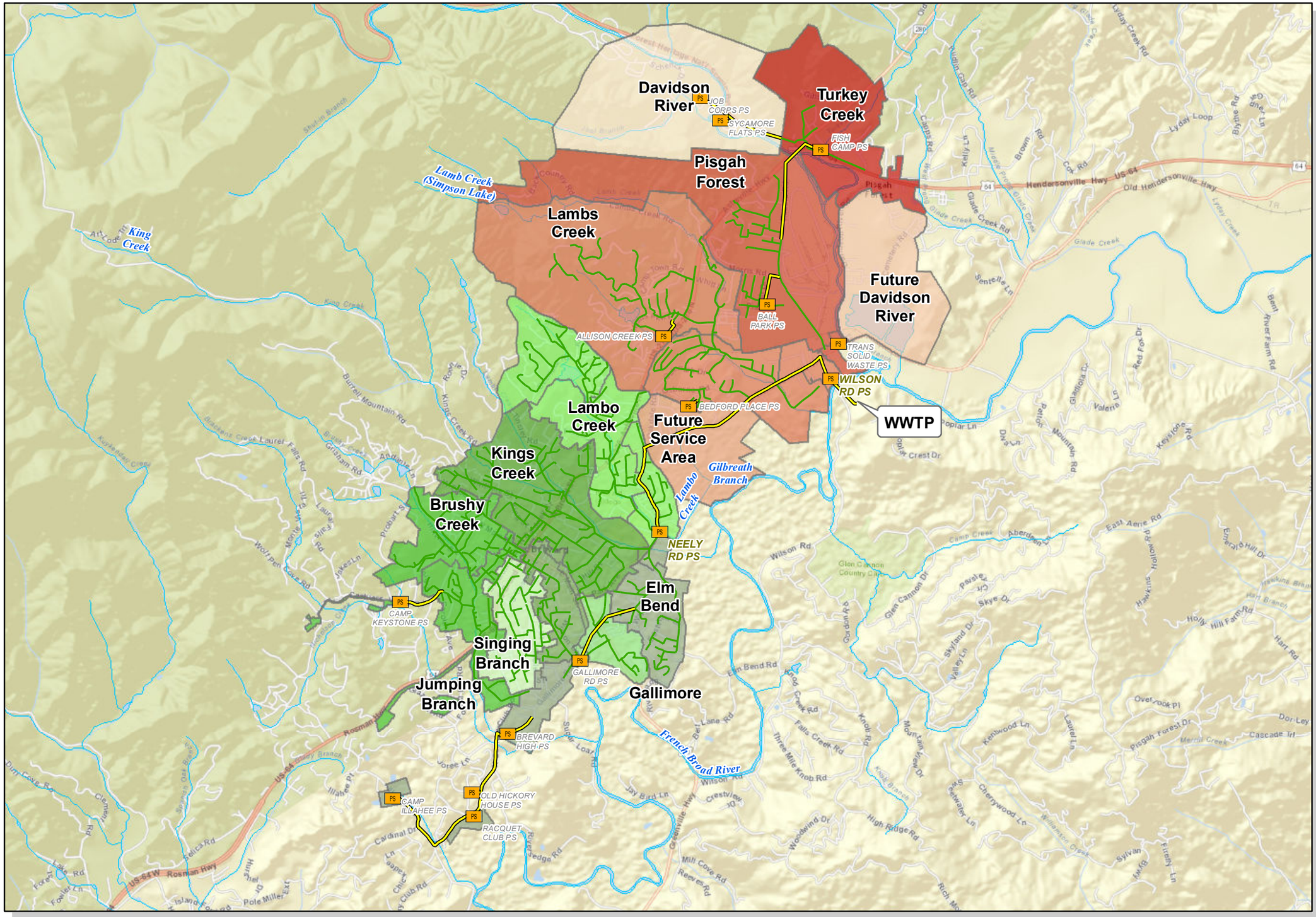
The Preferred Alternative consists of three main project components that can be grouped into two different sewershed influence groups. In total, all eleven sewersheds are influenced by the Preferred Alternative. Under current operation, flow from the Brushy Creek, Jumping Branch, Singing Branch, and Gallimore sewersheds is conveyed to the Gallimore Road pump station. The pump station then conveys flow via a 10-inch force main to the Neely Road gravity outfall. Flow from the Elm Bend, Kings Creek, and Lambo Creek sewersheds is also conveyed to the Neely Road outfall. The combined flow from the seven sewersheds ultimately drains to the Neely Road pump station. The Preferred Alternative includes replacement of the Neely Road pump station and associated force main. As such, the replacement of the Neely Road pump station and force main influences the seven sewersheds listed above. The Preferred Alternative also includes construction of an equalization tank at the Brevard WWTP. The equalization tank will receive flow from all sewersheds, including the Lambs Creek, Pisgah Forest, Turkey Creek, and Davidson River sewersheds via the existing Wilson Road pump station. Thus, the equalization tank influences the remaining four sewersheds. Figure 2-1 identifies the sewersheds associated with the two project components.

2.1.2 General Overflow History

SSOs have been problematic for the City in recent years. Over the past five years, sixty six SSO events have been recorded within the City's sewersheds. As a result of the large number of SSOs, the City entered into a Settlement Agreement with the North Carolina Environmental Management Commission (EMC), as described below in **Table 2.1.1**. In order to comply with the conditions of the Settlement Agreement (see Appendix A), a study was done to evaluate the City's collection system and identify sources causing SSOs. The Wastewater Collection System Improvements Plan (see Appendix B) concluded that a combination of high peak flows related to excessive I/I as well as gravity sewer and pump station capacity constraints is causing system surcharging, thus resulting in SSOs.

Figure 2-1
Sewershed Benefits
Neely Road Pump Station and Equalization Improvements Project

BREVARD, NORTH CAROLINA



LEGEND

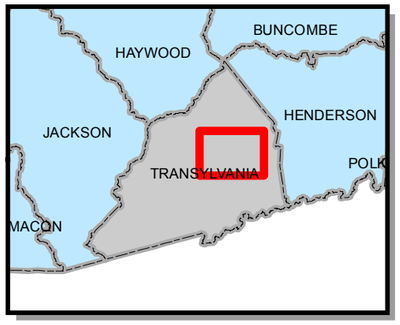
- Pump Station
- Surface Water
- Force Main
- Gravity Sewer

Benefits Due to Pump Station Improvements

- Brushy Creek
- Elm Bend
- Gallimore
- Jumping Branch
- Kings Creek
- Lambo Creek
- Singing Branch

Benefits Due to Equalization Tank Improvements

- Davidson River
- Future Davidson River
- Future Service Area
- Lambs Creek
- Pisgah Forest
- Turkey Creek



CDM Smith

0 0.5 1 2 3 Miles

Table 2.1.1 lists all SSOs that have occurred in the past five years. The corresponding reporting form for each individual SSO has been included in Appendix C. From the table it can be seen that the vast majority of SSOs have been caused by problems related to I/I. In fact, fifty seven of the SSOs can be attributed to excessive I/I during wet-weather events. The remaining SSOs were the result of either breaks in the Neely Road pump station's force main, vandalism, or blockage due to grease.

The location of the SSOs also provides insight into potential locations of hydraulic capacity limitations. As **Figure 2-2** shows, the vast majority of SSOs have occurred outside the Gallimore Road and Neely Road pump stations. The Wastewater Collection System Improvements Plan found that the SSOs outside of the Gallimore Road pump station could be addressed by reducing I/I entering the collection system. However, the evaluation also found that the Neely Road pump station and force main are undersized for wet-weather flows, even with I/I reduction. As can be seen in Table 2.1.1 below, the SSOs occurred at a limited number of manholes. As such, Figure 2-2 only shows the manholes where SSOs occurred. On Figure 2-2, the number next to the SSO location represents the number of SSOs that have occurred at the particular manhole in the last 5 years.

Table 2.1.1. SSO Description and Special Orders
Neely Road Pump Station and Equalization Improvements Project - City of Brevard

Provide the SSOs that have occurred in accordance with Section 4.3.1.2 of the guidance.

Figure number for SSO map:	2-2
Appendix Number for SSO Reports and Special Orders:	**A,C**

Date	Location	Brief Description of Cause	Estimated Amount Spilled (gal).	Map Key
09/20/09	BC-002	I/I due to Excessive Rainfall	370,000	A
09/20/09	LO-001	I/I due to Excessive Rainfall	Unknown	B
09/20/09	LO-001	I/I due to Excessive Rainfall	Unknown	B
09/21/09	MH-002	I/I due to Excessive Rainfall	143,000	C
11/10/09	MH-002	I/I due to Excessive Rainfall	313,000	C
12/02/09	MH-001	I/I due to Excessive Rainfall	165,000	D
12/08/09	MH-001	I/I due to Excessive Rainfall	202,000	D
12/25/09	MH-001	I/I due to Excessive Rainfall	297,000	D
01/17/10	MH-001	I/I due to Excessive Rainfall	109,000	D
01/24/10	MH-001	I/I due to Excessive Rainfall	282,000	D
02/05/10	MH-001	I/I due to Excessive Rainfall	294,000	D
06/05/10	MH-001	I/I due to Excessive Rainfall	13,000	D
08/14/10	MH-001	I/I due to Excessive Rainfall	36,000	D
08/15/10	MH-001	I/I due to Excessive Rainfall	27,000	D
08/21/10	MH-001	I/I due to Excessive Rainfall	53,000	D
10/27/10	MH-001	I/I due to Excessive Rainfall	39,000	D
10/27/10	MH-001	I/I due to Excessive Rainfall	57,000	D
11/30/10	MH-001	I/I due to Excessive Rainfall	390,000	D
02/01/11	MH-001	I/I due to Excessive Rainfall	34,000	D
03/06/11	MH-001	I/I due to Excessive Rainfall	124,000	D
03/09/11	LO-001	I/I due to Excessive Rainfall	380,000	B

Table 2.1.1. SSO Description and Special Orders
Neely Road Pump Station and Equalization Improvements Project - City of Brevard

03/09/11	MH-002	I/I due to Excessive Rainfall and valve malfunction at Neely Road Pump Station	95,000	C
04/16/11	MH-002	I/I due to Excessive Rainfall	101,000	C
07/07/11	LO-001	Pipe Break	126,000	B
09/23/11	MH-001	I/I due to Excessive Rainfall	124,000	D
11/28/11	MH-001	I/I due to Excessive Rainfall	162,000	D
12/22/11	MH-001	I/I due to Excessive Rainfall	108,000	D
12/27/11	MH-001	I/I due to Excessive Rainfall	47,000	D
09/18/12	LO-001	I/I due to Excessive Rainfall	133,000	B
12/26/12	MH-002	I/I due to Excessive Rainfall	84,000	C
01/15/13	MH-002	I/I due to Excessive Rainfall	37,000	C
01/17/13	MH-002	I/I due to Excessive Rainfall	116,000	C
01/17/13	LO-001	Pipe Break	Unknown	B
01/30/13	MH-002	I/I due to Excessive Rainfall	96,000	C
02/26/13	MH-002	I/I due to Excessive Rainfall	112,000	C
02/26/13	EB-001	I/I due to Excessive Rainfall	Unknown	E
04/28/13	LO-001	Pipe Break	149,000	B
05/05/13	MH-002	I/I due to Excessive Rainfall	349,000	C
05/05/13	LO-001	I/I due to Excessive Rainfall	405,000	B
07/03/13	MH-002	I/I due to Excessive Rainfall	81,000	C
07/03/13	EB-001	I/I due to Excessive Rainfall	Unknown	E
07/04/13	MH-002	I/I due to Excessive Rainfall	175,000	C
07/04/13	EB-001	I/I due to Excessive Rainfall	Unknown	E
11/26/13	EB-001	I/I due to Excessive Rainfall	Unknown	E
11/26/13	MH-002	I/I due to Excessive Rainfall	173,000	C
11/26/13	LO-001	I/I due to Excessive Rainfall	265,000	B
11/27/13	LO-001	Pipe Break	Unknown	B
12/06/13	LO-001	I/I due to Excessive Rainfall	22,000	B
12/09/13	LO-001	I/I due to Excessive Rainfall	99,000	B
12/09/13	LO-001	Pipe Break	120,000	B
12/10/13	LO-001	Pipe Break	205,000	B
12/14/13	LO-001	I/I due to Excessive Rainfall	42,000	B
12/22/13	LO-001	I/I due to Excessive Rainfall	592,000	B
12/22/13	MH-002	I/I due to Excessive Rainfall	96,000	C
12/29/13	LO-001	I/I due to Excessive Rainfall	140,000	B
01/11/14	LO-001	I/I due to Excessive Rainfall	262,000	B
01/11/14	MH-002	I/I due to Excessive Rainfall	83,000	C
02/21/14	LO-001	I/I due to Excessive Rainfall	57,000	B
04/07/14	LO-001	I/I due to Excessive Rainfall	122,000	B

Table 2.1.1. SSO Description and Special Orders
Neely Road Pump Station and Equalization Improvements Project - City of Brevard

04/07/14	MH-002	I/I due to Excessive Rainfall	33,000	C
04/10/14	BC-054	Vandalism	Unknown	F
05/15/14	LO-001	I/I due to Excessive Rainfall	42,000	B
06/08/14	LO-001	Pipe Break	87,000	B
07/29/14	LS-071	Grease	Unknown	G
08/09/14	LO-001	I/I due to Excessive Rainfall	53,200	B
09/03/14	LO-001	I/I due to Excessive Rainfall	38,000	B

Provide information related to special orders in accordance with Section 4.3.1.2.

Does the LGU have a SOC, pending SOC, or other special order?

☐ Yes, SOC is in place.
☒ Yes, SOC is pending.
☐ No

If Yes, provide the information discussed in Section 4.3.1.2.

In response to the high number of SSOs (documentation included in Appendix C) within the collection system, the City entered into a Settlement Agreement with EMC on November 8th, 2012. The Settlement Agreement included in Appendix A, outlined six tasks to be completed to work toward eliminating SSOs in accordance with the City's System-Wide Wastewater Collection System Permit WQCS00084. The City has completed five of the six tasks (items 2a - 2e of the Settlement Agreement) within the allotted timeline. Per the remaining task (item 2f of the Settlement Agreement), the City is currently negotiating a SOC with EMC.

2.1.3 Unsewered Areas

An evaluation of unsewered areas within the project area was conducted as part of this analysis. Unsewered areas were divided into three categories based on their development status:

- Developed
- Developable
- Undevelopable

While the majority of the area encompassed by the sewershed boundaries is sewered, there remain areas that are unsewered. Of the unsewered area, the majority is considered to be undevelopable. **Figure 2-3** has been provided to visually depict the unsewered areas. It is important to note that the unsewered areas shown represent only those areas that are considered to be developable. The remaining areas are considered to be undevelopable and therefore are not anticipated to add any future flow to the collection system. **Table 2.1.2** has been provided below to summarize the evaluation.

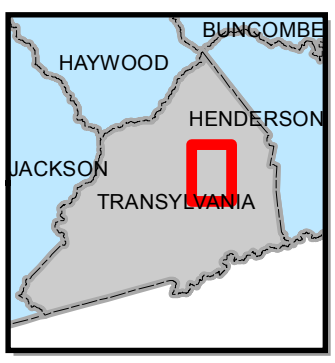
Davidson River
Turkey Creek
Pisgah Forest
Lamb Creek (Simpson Lake)
Lambs Creek
Future Davidson River
Lambo Creek
Future Service Area
Kings Creek
Gilbreath Branch
Lambo Creek
Brushy Creek
King Creek
Singing Branch
Elm Bend
Gallimore
Jumping Branch
French Broad River

JOB CORPS PS
SYCAMORE FLATS PS
FISH CAMP PS
BALL PARK PS
ALLISON CREEK PS
TRANS SOLID WASTE PS
WILSON RD PS
BEDFORD PLACE PS
NEELY RD PS
CAMP KEYSTONE PS
GALLIMORE RD PS
BREVARD HIGH PS
OLD HICKORY HOUSE PS
CAMP ILLAHEE PS
RACQUET CLUB PS

G-1
B-24
E-4
F-1
C-16
D-19
A-1

WWTP

0 0.25 0.5 1 Miles



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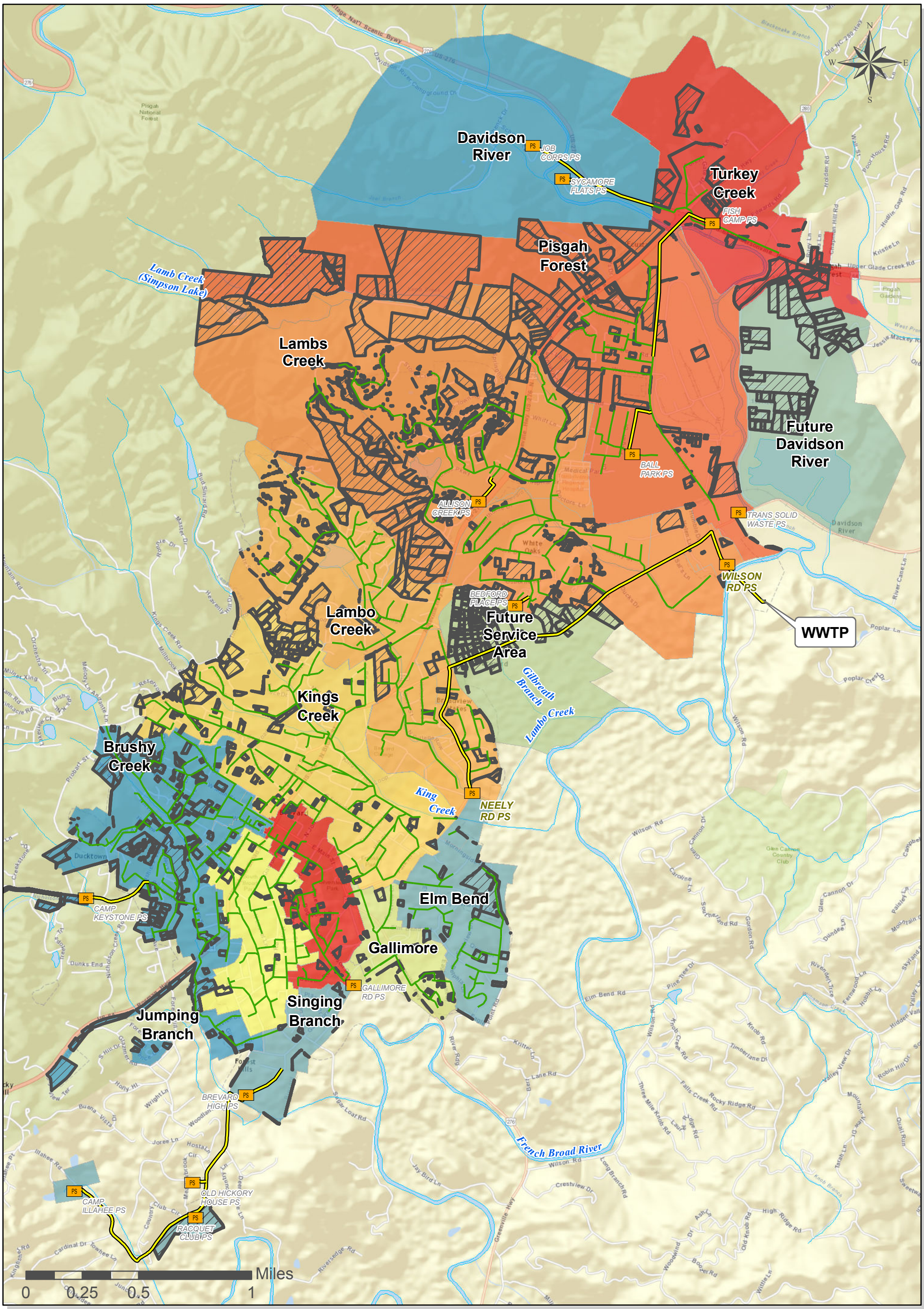
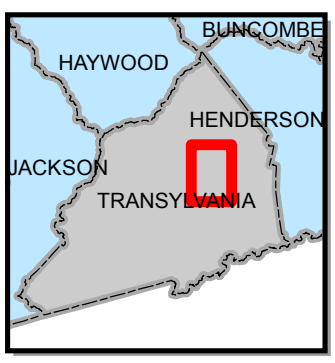
LEGEND

- SSO Events
- SSO
- Sewer Basin
- Surface Water
- Force Main
- Gravity Sewer
- Pump Station

Figure 2-2
Sanitary Sewer Overflows
Neely Road Pump Station
and Equalization
Improvements Project

BREVARD, NORTH CAROLINA





CDM Smith

LEGEND

- Sewer Basin
- Pump Station
- Surface Water
- Force Main
- Unsewered Area
- Gravity Sewer

Figure 2-3
Unsewered Areas
Neely Road Pump Station and Equalization Improvements Project

BREVARD, NORTH CAROLINA

Table 2.1.2. Unsewered Areas and Failing Septic System Description Neely Road Pump Station and Equalization Improvements Project – City of Brevard	
Provide information related to unsewered areas and septic systems in accordance with Section 4.4.3.1.3 of the guidance.	
Figure Number for Unsewered Areas map:	2-3
Are there any failing septic systems within the unsewered areas? ☒ Yes ☐ No	
If Yes, Appendix Reference for failing septic systems letter:	
Discuss any unsewered areas and failing septic systems.	
As part of this evaluation, the Transylvania Department of Health (TDOH) was contacted regarding potential failing septic systems within the Project Area. From conversations with TDOH, there are numerous areas within the Project Area that contain septic systems that frequently malfunction. However, TDOH had not preformed any studies to determine if these malfunctions were directly correlated to any water quality or public health concerns. Additionally, this project is not aimed at addressing malfunctioning septic systems, and as such, did not receive priority based on failing septic systems. For these reasons, failing septic systems were considered to be independent of this project and therefore were considered to be a non-issue.	

2.2 WWTP Condition

A description of the condition of the WWTP is included in **Table 2.2.1**.

Table 2.2.1. General WWTP Condition Neely Road Pump Station and Equalization Improvements Project – City of Brevard			
Provide a brief description of the WWTP condition.			
The City of Brevard WWTP was constructed in 1984 as a secondary treatment facility. The plant has undergone only one significant upgrade since the original construction. In 2013 the stationary screens were expanded and a new vortex grit removal system was added. Additionally, the belt filter press was replaced with new equipment. Current treatment processes include influent stationary screens, grit removal, rotating biological contactors (RBCs), secondary clarifiers, and chlorine contact chamber for disinfection. Treated effluent is then discharged to the French Broad River. Secondary clarifier solids are collected and retained in an aerobic solids holding tank and then dewatered prior to disposal at the local landfill. During recent site visits to the plant, each unit process appeared to be well maintained and functioning with the recently upgraded static screens and vortex grit removal system in service. The RBC units showed signs of recent upgrades to the air piping around the perimeter of the treatment basins. In recent years, the RBCs have been difficult to maintain and obtain spare parts for. The secondary clarifiers and chlorine contact chambers were operating and appeared to be producing a visually clear effluent stream. Overall the plant appears to be well maintained for a facility that is approximately 30 years old. WWTP flows over the past four years have varied widely throughout each year with little discernable patterns. However, the extreme peaks in flow can be closely related to excessive rainfall during storm events, indicative of excessive I/I in the collection system. Additionally, there is a connection between high WWTP flows and SSOs experienced within the collection system. **Figure 2-4** shows a plot of WWTP flow (30-day average) from January 2010 to February 2014. SSO events occurring during this time period are indicated along the x-axis. As Figure 2-4 shows, SSO events typically coincided with a peak in the WWTP flow.			
Provide the average daily flows for the past four years and the current flow.			
DMR Appendix Reference:		D	
Year	ADF (MGD)	Year	ADF (MGD)
2010	1.38	2012	1.32
2011	1.43	2013	1.65
Current Flow (MGD):		1.60	

Table 2.2.1. General WWTP Condition Neely Road Pump Station and Equalization Improvements Project – City of Brevard			
Current Capacity (MGD):		2.6	
Percentage of Capacity Currently Utilized:		62%	
Provide information related to any NOVs the WWTP may have received or any special orders that may be in place.			
NOVs		Special Orders	
Does the WWTP have any NOVs? ☒ Yes ☐ No ☐ N/A (new construction only)		Does the WWTP have any Special Orders or pending SOCs? ☐ Yes, Special Order is finalized ☒ Yes, Special Order is pending ☐ No ☐ N/A (new construction only)	
If yes, then describe and provide supporting information in an appendix of the ER/EID.		If yes, then describe and provide supporting information in an appendix of the ER/EID.	
Appendix Reference:	D	Appendix Reference:	A
The plant has received eleven NOVs since 2009, each resulting from BOD_5 levels that exceeded permit levels. The increase in BOD_5 loading is the result of the addition of the brewery discharge to the collection system. Since the brewery discharge was added to the collection system, effluent BOD_5 has doubled. The City is currently working with the brewery to implement pre-treatment at their facility.		As a result of the NOVs, the City is entering into a Settlement Agreement with EMC. The Settlement Agreement is currently in the draft phase.	

2.3 Current Population

The City of Brevard is currently home to 7,609 people according to U.S. Census data. Method 2 was utilized to determine the current population within the sewershed service area. **Table 2.3.1** details the findings of the analysis.

Table 2.3.1. Current Population Analysis Method 2 - Large Service Area Neely Road Pump Station and Equalization Improvements Project – City of Brevard	
Complete the areas shown in gray. Links are to U.S. Census Bureau websites for use with this table.	
U.S. Census Place or County:	Brevard, North Carolina
Appendix Reference for U.S. Census Information:	E
Total Census 2010 Population:	7,609
Persons per Square Mile in LGU:	1,486.10
LGU Land Area (miles^2):	5.12
WWTP Service Area (miles^2):	5.12
% of LGU in WWTP Service Area:	100.00%
% of WWTP Service Area in Sewershed Service Area:	100.00%
Current Population in Sewershed Service Area:	**7,609**

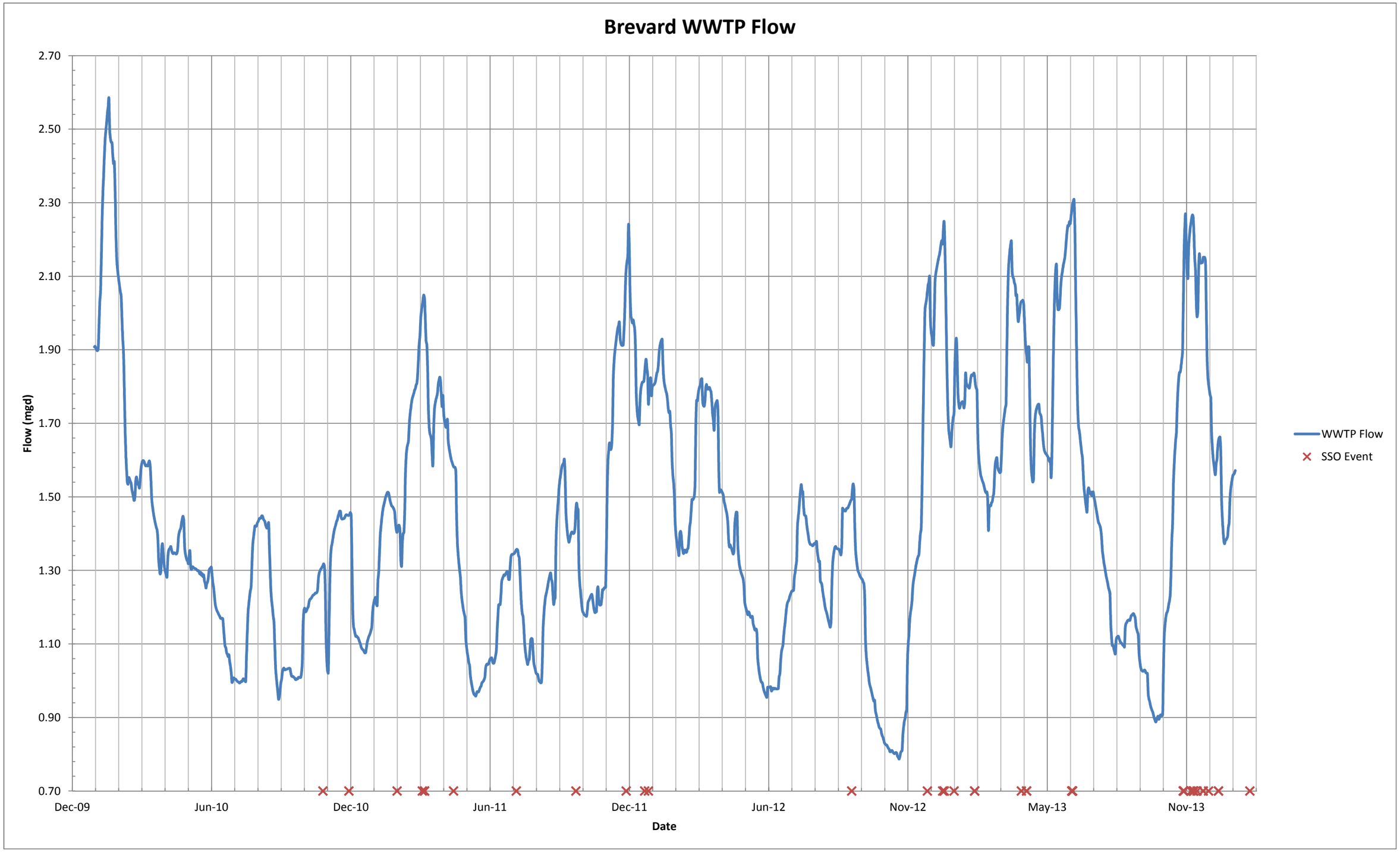


Figure 2-4
WWTP Flow vs. SSO Events

2.4 Current Wastewater Flow

Current wastewater average daily flows (ADF) were determined for the City's entire sewered area. In February and April of 2013, twelve flow monitors were placed throughout the City's sewered area as part of the Collection System Flow Monitoring and Data Analysis performed by CDM Smith (see Appendix F for copy of report). Flow monitor locations are shown on **Figure 2-5**. As part of this study, the hydrograph created from the flow monitoring data was decomposed into wastewaters three general components:

- Base wastewater flow (BWWF)
- Groundwater infiltration (GWI)
- Inflow and infiltration (I/I)

BWWF and GWI were then used to determine the ADF within the sewersheds. Based on this analysis, which is presented in full in Appendix F, the ADF in dry-weather conditions was determined to be 853 gpm. The ADF from the temporary flow monitors (853 gpm) was within 6 percent of the ADF reported in the WWTP DMR data (907 gpm) as shown in **Table 2-A**.

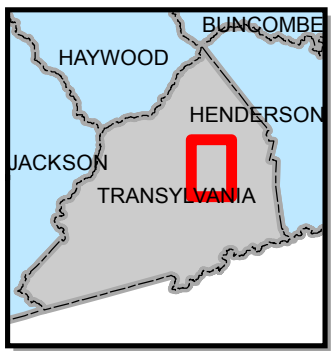
Table 2-A. Comparison of DMR and Temporary Flow Monitoring Data

Average Dry-Weather Flow	**gpm**
WWTP DMR	907
Average Dry-Weather Flow Based on Monitoring Data	
FM1 Lambs Creek 2	77
FM4A Kings Creek	177
FM9 Elm Bend	374
FM10 Lambo 2	75
FM12 Pisgah	90
Unmonitored Flow	60
Sum of Flow Monitors	853
Percent Difference Between Temporary Monitors and DMR	6%

It is important to note that the numbers being within 6 percent of each other provides an added level of confidence to the data. For this reason, the ADF used for this report was based on the flow monitor data. **Table 2.4.1** presents the current flow analysis.

Table 2.4.1. Current Flow Analysis Neely Road Pump Station and Equalization Improvements Project – City of Brevard		
Complete the cells in gray. Some cells have pulldown menus. Please use if present.		
Current Flow Determination Methodology:		Metered
Current Flow Appendix Reference:		F
Metered Flow		
Current Average Daily Flow via Meter **(gpd)**	**Current Average Daily Flow at WWTP** **(gpd)**	**Percentage of Flow to WWTP from Sewershed**
1,230,000	1,306,080	94.17%
Residential Flow as Percentage of Metered Flow in Sewershed:		51.00%
Commercial Flow as Percentage of Metered Flow in Sewershed:		49.00%

Davidson River
Turkey Creek
Pisgah Forest
Lamb Creek (Simpson Lake)
Lambs Creek
Future Davidson River
King Creek
Lambo Creek
Kings Creek
Future Service Area
Gilbreath Branch
Brushy Creek
Singing Branch
Elm Bend
Gallimore
Jumping Branch
French Broad River
RG1
RG2
RG3
RG4
RG5
RG6
RG7
RG8
RG9
JOB CORPS PS
SYCAMORE FLATS PS
FISH CAMP PS
BALL PARK PS
TRANS SOLID WASTE PS
WILSON RD PS
BEDFORD PLACE PS
NEELY RD PS
CAMP KEYSTONE PS
BREVARD HIGH PS
OLD HICKORY HOUSE PS
CAMP ILLAHEE PS
RACQUET CLUB PS
FM1 Lambs Creek 2
FM2 Lambs Creek 1
FM3 Lambo 1
FM4 Kings Creek
FM5 Brushy Creek 2
FM6 Jumping Branch
FM7 Singing Branch
FM8 Gallimore
FM9 Elm Bend
FM10 Lambo 2
FM11 Brush Creek 1
FM12 Pisgah
WWTP
Miles
0 0.25 0.5 1



CDM Smith

LEGEND

- Flow Monitor Locations
- Rain Gauge Locations
- Pump Station
- Force Main
- Gravity Sewer
- Surface Water
- Sewer Basins

Figure 2-5
Flow Monitoring Locations
Neely Road Pump Station
and Equalization
Improvements Project

BREVARD, NORTH CAROLINA

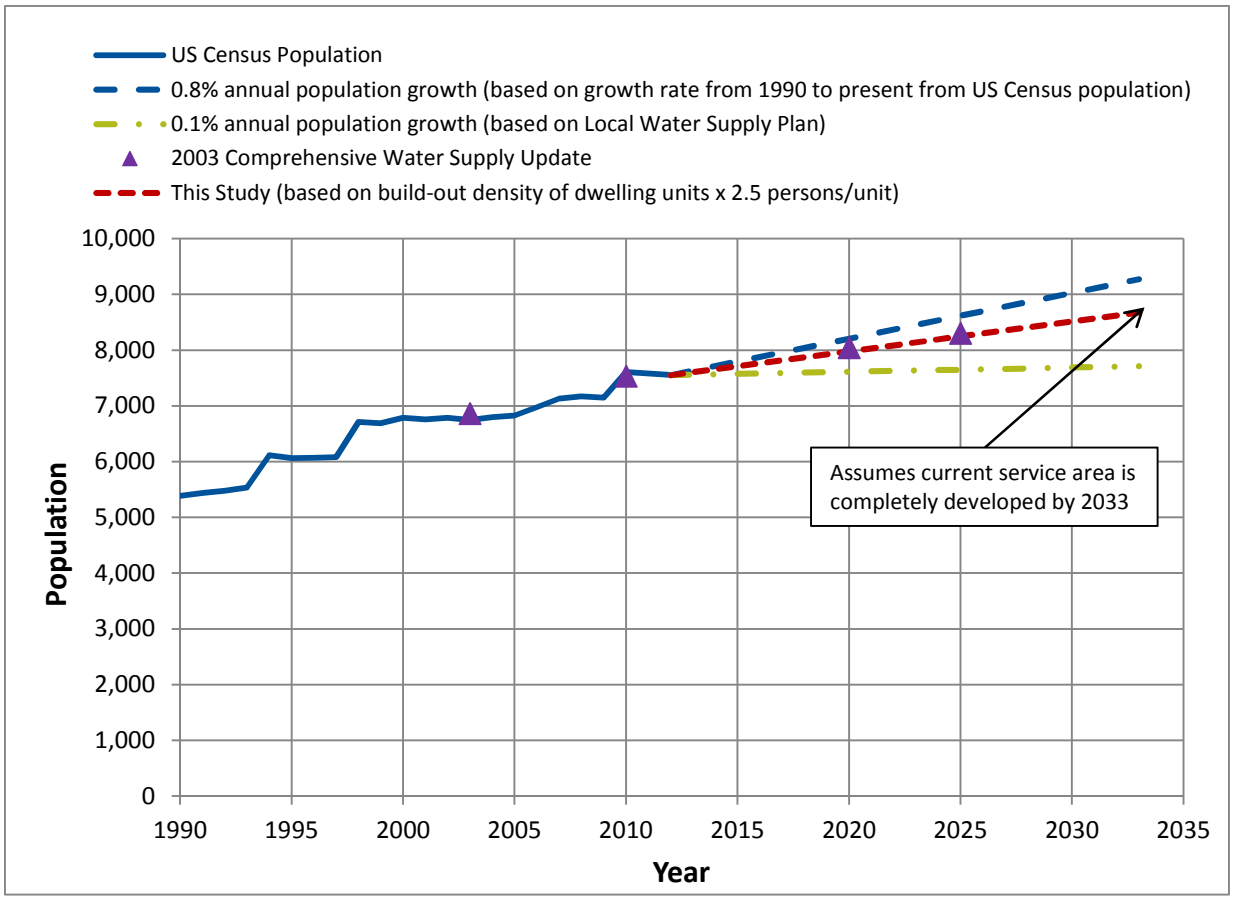
Section 3

Future Situation

3.1 Population Projections

Population projections were developed as part of the Wastewater Collection System Improvements Plan developed by CDM Smith for the City in June of 2014. A copy of this report has been included in Appendix B. The evaluation included information provided by the City regarding future development within the project area. This data was then utilized to develop the graph presented in **Figure 3-1**. Based on the analysis, the population within the project area in 20 years is approximately 8,891 persons. As shown in the figure, the future population estimates for this study are between the upper boundary of the historical population growth rate and the lower boundary of the population projections from Brevard's Local Water Supply Plan (Appendix G). The future population estimates for this study match well with those given for 2020 and 2025 in the 2003 Comprehensive Water Study Update (Appendix G).

Figure 3-1. City of Brevard Historical and Projected Population



Future population data was also obtained from the SDC and is included in **Table 3.1.1**.

Table 3.1.1. Future Population Analysis
Neely Road Pump Station and Equalization Improvements Project – City of Brevard

Complete the cells in gray. Note that some cells may contain pulldown menu. If so, please use pulldown menus to select data.

Current Population Methodology:			Method 2 - Large Service Area			SDC Data Appendix Reference:	H
Current LGU Population:			7,609			County Name:	Transylvania
Current Sewershed Service Area Population:			7,609			County Population (2010):	33,090
Percentage of LGU Population in County:			22.99%			Percentage of Service Area in LGU:	100.00%
		State Data Center			Alternate Data Source:	Wastewater Collection System Improvements Plan	
	Year	County Population	LGU Population	Sewershed Service Area Population	County Population	LGU Population	Sewershed Service Area Population
1	2016	33,530	7,710	7,710	See State Data Center Column	7,786	7,786
2	2017	33,768	7,765	7,765		7,844	7,844
3	2018	34,035	7,826	7,826		7,902	7,902
4	2019	34,313	7,890	7,890		7,960	7,960
5	2020	34,600	7,956	7,956		8,019	8,019
6	2021	34,887	8,022	8,022		8,077	8,077
7	2022	35,174	8,088	8,088		8,135	8,135
8	2023	35,464	8,155	8,155		8,193	8,193
9	2024	35,752	8,221	8,221		8,251	8,251
10	2025	36,042	8,288	8,288		8,309	8,309
11	2026	36,334	8,355	8,355		8,368	8,368
12	2027	36,621	8,421	8,421		8,426	8,426
13	2028	36,910	8,487	8,487		8,484	8,484
14	2029	37,200	8,554	8,554		8,542	8,542
15	2030	37,488	8,620	8,620		8,600	8,600
16	2031	37,779	8,687	8,687		8,659	8,659
17	2032	38,068	8,754	8,754		8,717	8,717
18	2033	38,356	8,820	8,820		8,775	8,775
19	2034	38,645	8,886	8,886		8,833	8,833
20	2035	38,934	8,953	8,953		8,891	8,891

If using an alternative source of data, provide a justification for use of this data below and provide supporting information in an appendix of the ER/EID.

Appendix Reference:	B	

Population projections based on SDC data (see Appendix H) and the Wastewater Collection System Improvements Plan were found to be very similar. However, for the purposes of this report the population projections utilized for future flow projections will be based off of the Wastewater Collection System Improvements Plan data, as build-out densities used to develop these projections were provided by the City Planning Department. Therefore these projections are considered to be more detailed and representative of future growth within the project area.

3.2 Flow Projections

Flow projections were also developed as part of the Wastewater Collection System Improvements Plan (Appendix B) developed by CDM Smith for the City in June of 2014. The flow projections were developed based on information provided by the City Planning Department regarding future development within the project area. Based on the analysis, the future wastewater ADF within the project area in 20 years is approximately 1.97 MGD. Assuming a wastewater return rate of 90%, the future flow projections for this study match well with the projected finished water production given for 2020 in the 2003 Comprehensive Water Study Update (Appendix G).

Future flow projections were also developed based on population information obtained from the SDC. **Table 3.2.1** included below summarizes the flow projections based on SDC data as well as the Wastewater Collection System Improvements Plan.

3.3 Interceptors of Multiple Diameters

This project does not include design and/or construction of interceptors of any size.

3.4 Future Situation Downstream of Project

There are not any interceptors downstream of the Preferred Alternative, as the project includes a force main that will discharge directly to the WWTP. As such, the downstream capacity analysis did not include evaluation of interceptors.

The capacity of the WWTP was evaluated, as it sees flow from all of the sewersheds. The capacity analysis at the WWTP involved looking at both dry-weather and wet-weather flows. Wet-weather flows were considered to be important, as Brevard's average annual rainfall is upwards of 70 inches per year.

The portion of **Table 3.4.1** labeled WWTP Capacity Analysis presents the analysis based on dry-weather flows. As is reflected in the table, dry-weather flows are projected to remain within acceptable ranges based on the WWTPs permitted capacity.

Table 3.2.1. Future Peak Flow Analysis
Neely Road Pump Station and Equalization Improvements Project – City of Brevard

Current Flow Estimation Method:	Metered			Alternative Flow Projections Used in Alternatives Analysis?	Yes
Current Flow for 2010 (gpd):	1,230,000	Peaking Factor:	6.5	Appendix Reference:	**B,G**

		SDC Data				Alternative Population Data Source: Wastewater Collection System Improvements Plan			
	Year	**Residential Flow**	**Commercial Flow**	**Industrial Flow**	**Total Flow**	**Residential Flow**	**Commercial Flow**	**Industrial Flow**	**Total Flow**
		(gpd)	**(gpd)**	**(gpd)**	**(gpd)**	**(gpd)**	**(gpd)**	**(gpd)**	**(gpd)**
1	2016	54,309	52,180	868,718	**2,205,207**	874,200	465,300	70,500	**1,410,000**
2	2017	83,637	80,357	906,096	**2,300,091**	911,400	485,100	73,500	**1,470,000**
3	2018	116,538	111,968	948,029	**2,406,536**	948,600	504,900	76,500	**1,530,000**
4	2019	150,795	144,882	991,690	**2,517,367**	985,800	524,700	79,500	**1,590,000**
5	2020	186,161	178,860	1,036,764	**2,631,785**	1,023,000	544,500	82,500	**1,650,000**
6	2021	221,527	212,839	1,081,838	**2,746,204**	1,060,200	564,300	85,500	**1,710,000**
7	2022	256,892	246,818	1,126,912	**2,860,623**	1,097,400	584,100	88,500	**1,770,000**
8	2023	292,628	281,152	1,172,457	**2,976,238**	1,134,600	603,900	91,500	**1,830,000**
9	2024	328,117	315,250	1,217,688	**3,091,055**	1,140,800	607,200	92,000	**1,840,000**
10	2025	363,852	349,584	1,263,234	**3,206,670**	1,147,000	610,500	92,500	**1,850,000**
11	2026	399,834	384,155	1,309,093	**3,323,082**	1,159,400	617,100	93,500	**1,870,000**
12	2027	435,200	418,133	1,354,167	**3,437,500**	1,165,600	620,400	94,000	**1,880,000**
13	2028	470,812	452,349	1,399,555	**3,552,717**	1,171,800	623,700	94,500	**1,890,000**
14	2029	506,548	486,683	1,445,100	**3,668,331**	1,178,000	627,000	95,000	**1,900,000**
15	2030	542,037	520,781	1,490,331	**3,783,149**	1,184,200	630,300	95,500	**1,910,000**
16	2031	577,896	555,233	1,536,034	**3,899,162**	1,158,000	598,300	173,700	**1,930,000**
17	2032	613,508	589,449	1,581,422	**4,014,378**	1,164,000	601,400	174,600	**1,940,000**
18	2033	648,997	623,546	1,626,653	**4,129,196**	1,170,000	604,500	175,500	**1,950,000**
19	2034	684,609	657,762	1,672,041	**4,244,412**	1,176,000	607,600	176,400	**1,960,000**
20	2035	720,221	691,977	1,717,429	**4,359,628**	1,182,000	610,700	177,300	**1,970,000**

Provide a justification for the peaking factor used for future peak flows.

As part of the City of Brevard Wastewater Collection System Improvements Plan dry-weather and wet-weather flows were recorded. The peaking factor was calculated by dividing the post-rehabilitation peak wet-weather flow (4,760 gpm) by the post-rehabilitation average day dry-weather flow (736 gpm). Although rehabilitation work is still ongoing, post-rehabilitation numbers were used, as the proposed Neely Road pump station was designed for post-rehabilitation conditions.

If the alternative flow projection was the one accepted for use in the alternatives analysis, then provide a justification as to why the alternative flow projections are preferred over the flows developed based on SDC population projections.

As can be seen in the above table, there is a significant difference between the SDC Data flow projections and those determined as part of the Wastewater Collection System Improvements Plan. In fact, SDC Data Year 1 projected flows are comparable to the alternative projected flows in Year 20. It is noted that 10% of the current base flow is added into the SDC Data calculation for Industrial Flow. However, based on data from the Wastewater Collection System Improvements Plan, Industrial Flow comprises the smallest flow in the collection system. Based on these findings, it was determined that the flow projections obtained from the Wastewater Collection System Improvements Plan were more accurate. Additionally, these flow projections included development information provided by the City Planning Department, thus providing an added level of confidence that these flow projections are more representative of future flows for the project area than the SDC projections. Therefore, the alternative flow projections are used in the remainder of this report.

Table 3.4.1. Downstream Capacity Analysis
Neely Road Pump Station and Equalization Improvements Project – City of Brevard

Complete the boxes shown in gray. Where indicated, use pulldown menus to enter data.

Current Flow Methodology Used:	Metered		Flow Projection Methodology Preferred:	Other

Collection System

Percent WWTP Service Area in Downstream Pipe Sewershed Service Area:	100.00%	WWTP Current Capacity (gpd):	2,600,000

	Current Year	Year 1	Year 5	Year 10	Year 15	Year 20
		2016	2020	2025	2030	2035
Peak Flow from Project (gpd):	1,230,000	1,410,000	1,650,000	1,850,000	1,910,000	1,970,000

Downstream Collection System

	Downstream Sewershed
Name:	N/A. Downstream sewersheds not included in project
Capacity of Pipe(s) in downstream sewershed (gallons):	
Diameter (inches):	
Peaking Factor:	

	Peak Flow from Downstream Flows (gpd)					
	Current Year	Year 1	Year 5	Year 10	Year 15	Year 20
	0	2016	2020	2025	2030	2035

N/A. Project does not include downstream flows

	Total Peak Flow Through Downstream Pipe (gpd)					
	Current Year	Year 1	Year 5	Year 10	Year 15	Year 20
	0	2016	2020	2025	2030	2035

N/A. Project does not include downstream flows

Will the downstream pipe be able to take on both project flow and flow from downstream sewersheds?

	Current Year	Year 1	Year 5	Year 10	Year 15	Year 20
	0	2016	2020	2025	2030	2035

N/A. Project does not include downstream flow or downstream pipes

Table 3.4.1. Downstream Capacity Analysis (continued) Neely Road Pump Station and Equalization Improvements Project – City of Brevard						
WWTP Capacity Analysis						
	ADF from Downstream Flows (gpd)					
	Current Year	**Year 1**	**Year 5**	**Year 10**	**Year 15**	**Year 20**
	0	**2016**	**2020**	**2025**	**2030**	**2035**
ADF from Project (gpd):	1,230,000	282,000	330,000	370,000	382,000	394,000
ADF from Downstream Interceptor only (gpd):	N/A	N/A	N/A	N/A	N/A	N/A
WWTP ADF without Project: (gpd):	1,306,080	1,410,000	1,650,000	1,850,000	1,910,000	1,970,000
WWTP ADF with Project (gpd):	1,306,080	1,410,000	1,650,000	1,850,000	1,910,000	1,970,000
% WWTP Capacity Utilized (without project):	**50.23%**	**54.23%**	**63.46%**	**71.15%**	**73.46%**	**75.77%**
% WWTP Capacity Utilized (with Project):	**50.23%**	**54.23%**	**63.46%**	**71.15%**	**73.46%**	**75.77%**
Should planning begin for a WWTP expansion regardless of project implementation?	**No**	**No**	**No**	**No**	**No**	**No**
Should construction begin for a WWTP expansion regardless of project implementation?	**No**	**No**	**No**	**No**	**No**	**No**
Should planning begin for a WWTP expansion due to the project flows?	**No**	**No**	**No**	**No**	**No**	**No**
Should construction begin for a WWTP expansion due to the project flows?	**No**	**No**	**No**	**No**	**No**	**No**
If the answer to the question regarding downstream collection line capacity is "No", discuss measures the LGU plans to take to ensure that said capacity will exist.						
If the answer to the question regarding WWTP is "Yes" for either question, discuss when the LGU will begin planning for the next WWTP expansion and/or will begin construction on the next WWTP expansion.						

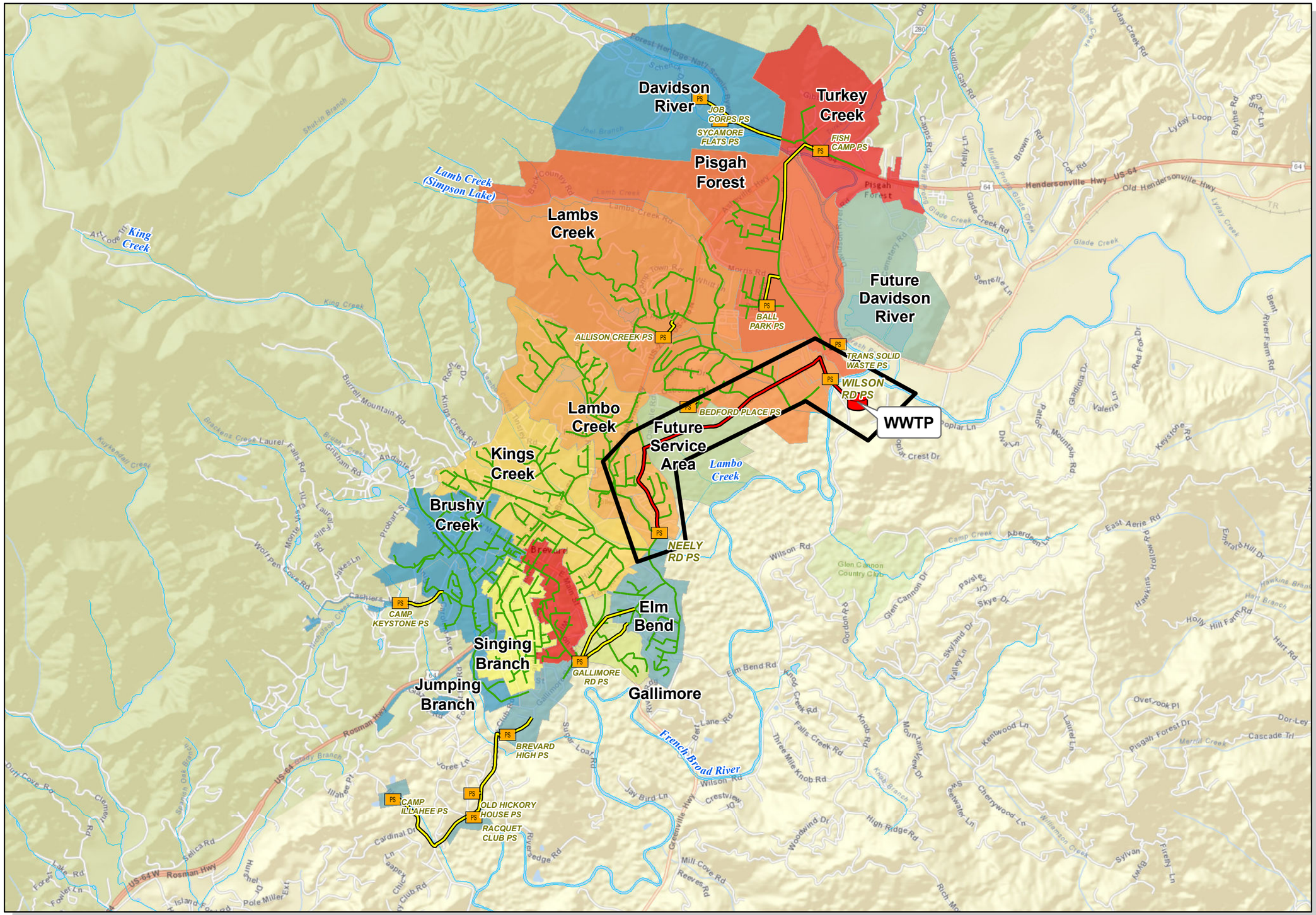
When considering wet-weather flows, the proposed pump station associated with the Preferred Alternative will have the greatest impact on the capacity of the WWTP. More specifically, the design capacity of the proposed pump station has the potential to affect the WWTPs ability to handle future flows. As it exists today, the WWTP is currently permitted to handle ADF flows up to 2.6 MGD with the ability to handle an estimated peak hour flow of 4.4 MGD. Currently there are not any plans to expand the plants hydraulic capacity. The City is currently working to reduce I/I problems by rehabilitating/replacing portions of the collection system found to contribute high levels of I/I. The Wastewater Collection System Improvements Plan (Appendix B) accounted for the rehabilitation/replacement projects when making recommendations on the pump station capacity. Based on the findings of the report, the recommended pump station capacity for the Preferred Alternative was 4,760 gpm (6.8 MGD). Additionally, the Wilson Rd pump station has a total capacity of 1,070 gpm (1.6 MGD). Thus, under the Preferred Alternative, in a wet-weather scenario the potential flow to the WWTP is greater than 8.0 MGD. It is apparent that during wet-weather events, the WWTP has insufficient capacity to handle flows from the two contributing pump stations.

In order to account for capacity these limitations, an equalization tank needs to be constructed. In order to determine the necessary size of the equalization tank, modeling was performed as part of the Wastewater Collection System Improvements Plan. The model used 73 years of rainfall data and a daily time step basis, to determine the wet-weather flow produced by the daily rainfall. The model routes flows that are in excess of the WWTPs available capacity to the equalization storage facility. As capacity in the WWTP becomes available again, the model drains the equalization tank back to the WWTP. The model repeated this process for all 73 years of rainfall data, and statistical summaries were used to determine the necessary volume. Based on model results, the Preferred Alternative proposed the construction of a 3.2 MG equalization tank in order to meet a 2-year level of service. Initial equalization tank sizing was determined based on wet-weather flows anticipated during more than a 2-year storm. However, the City has requested an evaluation of the benefits and costs of increasing the equalization volume to 4.5 MG. By increasing the equalization volume to 4.5 MG, the City can add an extra factor of safety to the 2-year level of service for an incremental increase in the overall cost of the tank. The final decision on the tank size is still pending further investigations of the site and impacts including site surveys, wetland impacts, and geotechnical investigations.

Figure 3-2 highlights the downstream force main leading to the WWTP as well as the equalization tank at the WWTP.

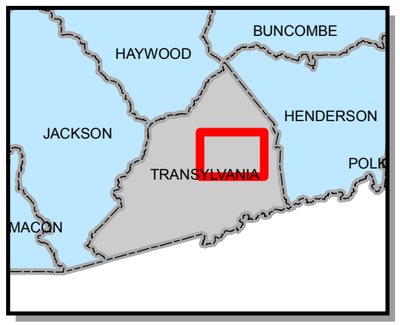
Figure 3-2
Downstream Impacts Neely Road Pump Station and Equalization Improvements Project

BREVARD, NORTH CAROLINA



LEGEND

- Equalization Improvements
- Proposed Project Location
- Pump Station
- Surface Water
- Force Main
- Downstream Force Main
- Gravity Sewer
- Sewer Basins



CDM Smith

0 0.5 1 2 3 Miles

Section 4

Purpose and Need

Table 4.1. Need and Purpose **Neely Road Pump Station and Equalization Improvements Project – City of Brevard**
Provide the purpose in need statement in accordance with the requirements in Section 2.2.3 of the guidance.
The City of Brevard owns and operates an aging wastewater collection system and WWTP. High levels of I/I, identified in the Wastewater Collection System Improvements Plan, lead to numerous SSOs during wet-weather events. Over the past 5 years alone, over 60 SSOs have been recorded throughout the City's collection system. As a result of the SSOs, the City is currently negotiating a SOC with EMC, in order to bring the City back in compliance with Permit WQCS00084. System modelling, performed as part of the Wastewater Collection System Improvements Plan, indicated that even with aggressive reductions in I/I, SSOs would still occur as the Neely Road pump station and associated force main are undersized for wet-weather flows. Additionally, the WWTP is undersized to handle wet-weather flows. The purpose of this proposed project is to reduce the number of SSOs and reduce the probability for future environmental impacts by constructing a new pump station and force main to replace the existing Neely Road pump station and force main. Additionally this proposed project will address hydraulic capacity limitations at the WWTP during wet-weather events by constructing a wet-weather equalization tank at the WWTP site.

Section 5

Alternative Analysis

5.1 Alternatives Description

5.1.1 No Action Alternative – Do Nothing

Table 5.1.1. Alternatives Description

Neely Road Pump Station and Equalization Improvements Project – City of Brevard

No-Action Alternative – Do Nothing

Provide a description of the above alternative in accordance with Sections 4.6.1.1 through 4.6.1.6 of the guidance.			
Supporting Information Appendix Reference:		N/A	
Description			
Per Section 4.6.1.2 of the guidance documents, the alternatives analysis is to include an evaluation of optimizing the performance of the existing facilities. However, the SSOs problems the City is currently facing are independent of facility optimization. Instead, SSOs result from excessive I/I and hydraulic limitations related to the Neely Road pump station and force main being undersized for peak wet-weather flows. As such, this alternative was considered to be infeasible and therefore not evaluated.			
Is Figure Included? ☐ Yes ☒ No		If Yes, Figure #: N/A	
Alternative Feasibility:	☐ Feasible	☒ Infeasible	
Capital Cost:	N/A	**Present Worth:**	N/A
Environmental Impact Description			
Provide a qualitative description of the environmental impacts and compare the impacts to that of the Preferred Alternative.			
Alternative 2 does not address system issues relating to SSOs. As such, SSOs would continue to occur throughout the collection system, potentially leading to contamination of various streams.			
Environmental Impact Analysis			
☒ Greater than Preferred Alternative ☐ Less than Preferred Alternative ☐ Same as Preferred Alternative			
Acceptance/Rejection			
Alternative:	☐ Accepted	☒ Rejected	
Rationale for Acceptance/Rejection			
Discuss the rationale for acceptance/rejection of the above-referenced alternative.			
Alternative 2 was found to be infeasible as facility optimization does not address hydraulic limitations at the existing pump station. Additionally, Alternative 2 would lead to continued environmental impacts from continued SSOs, thus the City would not meet the conditions outlined in their SOC with EMC.			

5.1.2 Alternative 2 – Optimum Performance of Existing Facilities

Table 5.1.2. Alternatives Description

Neely Road Pump Station and Equalization Improvements Project – City of Brevard

Alternative 2 – Optimum Performance of Existing Facilities

Provide a description of the above alternative in accordance with Sections 4.6.1.1 through 4.6.1.6 of the guidance.	
Supporting Information Appendix Reference:	N/A
Description	
Per Section 4.6.1.2 of the guidance documents, the alternatives analysis is to include an evaluation of optimizing the performance of the existing facilities. However, the SSOs problems the City is currently facing are independent of facility optimization. Instead, SSOs result from excessive I/I and hydraulic limitations related to the Neely Road pump station and force main being undersized for peak wet-weather flows. As such, this alternative was considered to be infeasible and therefore not evaluated.	
Is Figure Included? ☐ Yes ☒ No	If Yes, Figure #: N/A
Alternative Feasibility: ☐ Feasible	☒ Infeasible
Capital Cost: N/A	**Present Worth:** N/A
Environmental Impact Description	
Provide a qualitative description of the environmental impacts and compare the impacts to that of the Preferred Alternative.	
Alternative 2 does not address system issues relating to SSOs. As such, SSOs would continue to occur throughout the collection system, potentially leading to contamination of various streams.	
Environmental Impact Analysis	
☒ Greater than Preferred Alternative ☐ Less than Preferred Alternative ☐ Same as Preferred Alternative	
Acceptance/Rejection	
Alternative: ☐ Accepted	☒ Rejected
Rationale for Acceptance/Rejection	
Discuss the rationale for acceptance/rejection of the above-referenced alternative.	
Alternative 2 was found to be infeasible as facility optimization does not address hydraulic limitations at the existing pump station. Additionally, Alternative 2 would lead to continued environmental impacts from continued SSOs, thus the City would not meet the conditions outlined in their SOC with EMC.	

5.1.3 Alternative 3 – Pump Configuration

Table 5.1.3. Alternatives Description

Neely Road Pump Station and Equalization Improvements Project – City of Brevard

Alternative 3 – Pump Configuration

Provide a description of the above alternative in accordance with Sections 4.6.1.1 through 4.6.1.6 of the guidance.	
Supporting Information Appendix Reference:	N/A
Description	
The pump configuration was evaluated per Section 4.6.1.4 of the guidance documents. The analysis determined that three pumps will likely be necessary to handle the wide range of flows during dry-weather and wet-weather events. However, it was determined that the existing pump station is not large enough to accommodate the addition of a third pump, therefore pump optimization would not address pump station capacity limitations. Additionally, the Neely Road force main is undersized and would not be able to handle the anticipated peak wet-weather flows. Thus, even with pump optimization, the City would continue to experience frequent SSOs. In addition to capacity limitations, both the pump station and force main are at least 30 years old and are nearing the end of their useful life expectancy. This is evidenced by several recent breaks in the existing force main. Optimizing the Neely Road pump configuration, and thereby sending more flow through the force main, would only serve to exacerbate the known structural deficiencies of the force main. For these reasons, this alternative was deemed infeasible and therefore not evaluated.	
Is Figure Included? ☐ Yes ☒ No	If Yes, Figure #: N/A
Alternative Feasibility: ☐ Feasible	☒ Infeasible
Capital Cost: N/A	**Present Worth:** N/A
Environmental Impact Description	
Provide a qualitative description of the environmental impacts and compare the impacts to that of the Preferred Alternative.	
Alternative 3 does not address system issues relating to SSOs. As such, SSOs would continue to occur throughout the collection system, potentially leading to contamination of various streams.	
Environmental Impact Analysis	
☒ Greater than Preferred Alternative ☐ Less than Preferred Alternative ☐ Same as Preferred Alternative	
Acceptance/Rejection	
Alternative: ☐ Accepted	☒ Rejected
Rationale for Acceptance/Rejection	
Discuss the rationale for acceptance/rejection of the above-referenced alternative.	
Alternative 3 was found to be infeasible as pump configuration does not address hydraulic limitations at the existing pump station. Additionally, Alternative 3 would lead to continued environmental impacts from continued SSOs, thus the City would not meet the conditions outlined in their SOC with EMC.	

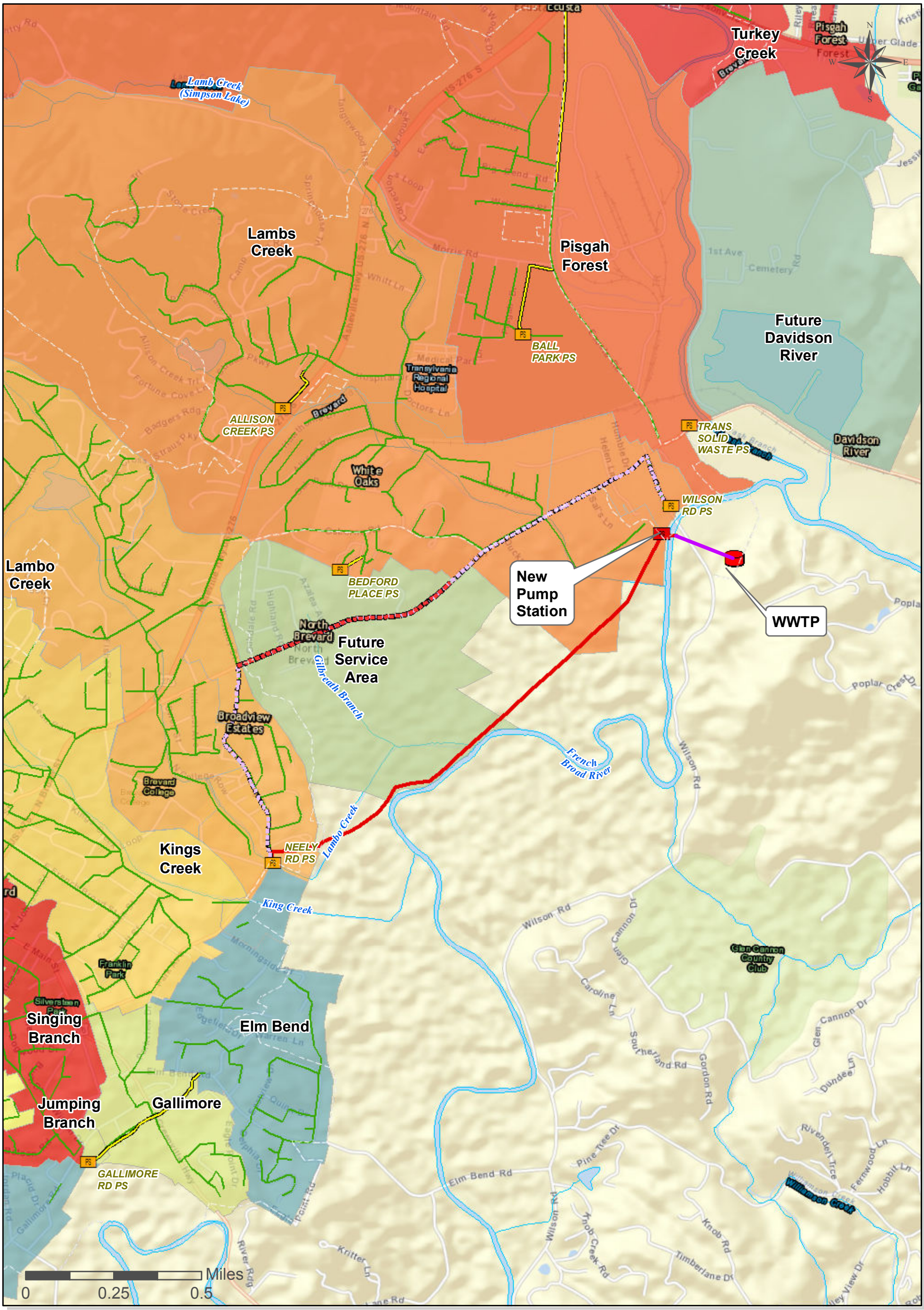
5.1.4 Alternative 4 – Gravity Sewer Option

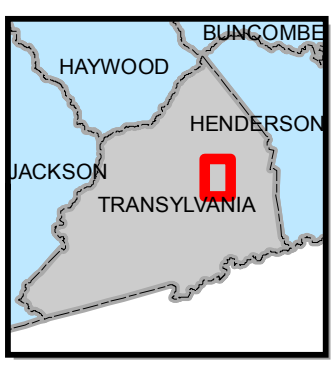
Table 5.1.4. Alternatives Description

Neely Road Pump Station and Equalization Improvements Project – City of Brevard

Alternative 4 – Gravity Sewer Option

Provide a description of the above alternative in accordance with Sections 4.6.1.1 through 4.6.1.6 of the guidance.	
Supporting Information Appendix Reference:	**B**
Description	
Alternative 4 includes installation of a new 30-inch gravity sewer interceptor from an abandoned Neely Road pump station to a new influent pump station near the WWTP. The 30-inch gravity sewer interceptor would originate at the existing Neely Road pump station site and travel north east, crossing numerous agricultural properties, before terminating at a new influent pump station located just west of the French Broad River. The influent pump station would be utilized to convey flow underneath the French Broad River and Wilson Road to the Brevard WWTP via a 20-inch force main. This alignment is shown of **Figure 5-1** and **Figure 5-2**. The influent pump station would need to be sized to handle peak flows of 4,760 gpm. This alternative also includes construction of a 4.5 MG equalization tank at the WWTP to store peak flows in excess of the peak WWTP capacity of 4.4 MGD. The WWTPs effluent discharge pipe would be relocated around the proposed equalization tank. Additionally, a 4,100 LF portion of the existing Neely Road force main has been found to be structurally deficient and in need of replacement. Due to the anticipated construction schedule elongation resulting from easement acquisition associated with this alternative, it was determined that replacement of the 4,100 LF of force main would not be able to wait until project completion. As such, Alternative 4 includes the replacement of the structurally deficient portion of the force main.	
Is Figure Included? [X] Yes [ ] No	If Yes, Figure #: **5-1**, **5-2**
Alternative Feasibility: [X] Feasible	[ ] Infeasible
Capital Cost: $14,732,000	**Present Worth:** $14,756,841
Environmental Impact Description	
Provide a qualitative description of the environmental impacts and compare the impacts to that of the Preferred Alternative.	
Potential environmental impacts associated with implementation of Alternative 4 largely relate to the proposed alignment of the 30-inch gravity sewer. Due to the surrounding topography, and in order to accomplish flow via gravity, Alternative 4 gravity pipe would need to take the shortest path toward the WWTP. As such, the 30-inch gravity sewer would run across numerous farmlands as shown in **Figure 5-1**. Due to their proximity to the French Broad River, the majority of these farmlands lay within the floodway. Thus, nearly the entire 8,300 LF of 30-inch gravity sewer would also be located within the floodway. Additionally, the proposed gravity sewer would be located closer to the French Broad River, increasing the potential for contamination to the river in the event of a SSO. When compared to the Preferred Alternative, Alternative 4 does not locate the gravity sewer away from floodways and the French Broad River.	
Environmental Impact Analysis	
[X] Greater than Preferred Alternative Less than Preferred Alternative Same as Preferred Alternative	
Acceptance/Rejection	
Alternative: [ ] Accepted	[X] Rejected
Rationale for Acceptance/Rejection	
Discuss the rationale for acceptance/rejection of the above-referenced alternative.	
Alternative 4 is not a practical alternative because of economic and environmental impacts. From an economic standpoint, Alternative 4 would cost approximately $1.1 M (capital cost difference) more than the Preferred Alternative. The placement of the gravity sanitary sewer pipe within the floodway also makes this alternative not recommended, as the area could become inaccessible during periods of flooding. Additionally, based on the City's knowledge of property owners along the alignment shown on **Figure 5-2**, easement acquisition is expected to result in significant project delays.	





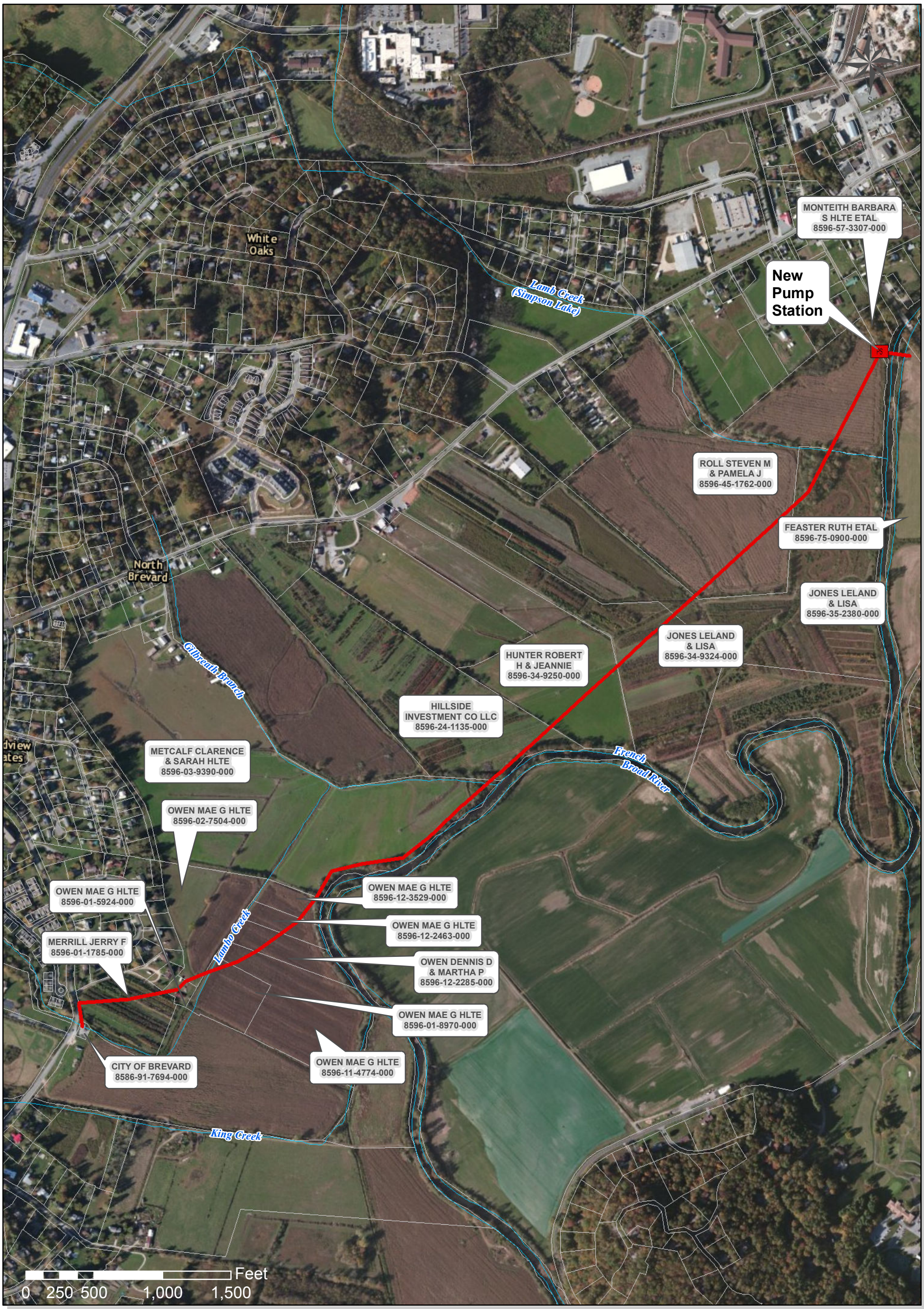
CDM Smith

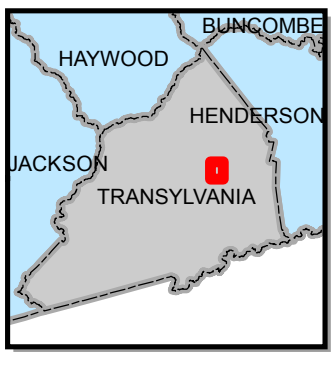
LEGEND

- Abandoned Force Main
- Force Main Improvement
- Equalization Improvements
- Pump Station
- Temporary Force Main Improvement
- Initial Gravity Sewer Improvement
- Gravity Sewer
- Surface Water

Figure 5-1
Alternative 4
Neely Road Pump Station and Equalization Improvements Project

BREVARD, NORTH CAROLINA





CDM Smith

LEGEND

- Parcel Boundary
- Gravity Sewer Improvement
- Surface Water

Figure 5-2
Alternative 4
Alignment Evaluation
Neely Road Pump Station
and Equalization
Improvements Project

BREVARD, NORTH CAROLINA

5.1.5 Preferred Alternative

Table 5.1.5. Alternatives Description

Neely Road Pump Station and Equalization Improvements Project – City of Brevard

Preferred Alternative – Force Main Option

Provide a description of the above alternative in accordance with Sections 4.6.1.1 through 4.6.1.6 of the guidance.	
Supporting Information Appendix Reference:	**B**
Description	
This alternative includes construction of a new pump station adjacent to the existing Neely Road pump station. The new Neely Road pump station will be designed to convey a peak flow of 4,760 gpm to the Brevard WWTP via a new 13,500 LF 20-inch force main. After leaving the pump station site, he 20-inch force will travel north along Neely Road, east along Old Hendersonville Highway (NC Hwy 64), and then south along Wilson Road. The force main will be constructed within the travel lanes on the roads listed above. Just north of the French Broad River along Wilson Road, the force main will exit the travel lane and cross onto City of Brevard property. From this point the HDD technology will be utilized to install the force main underneath the French Broad River. The HDD will terminate on the south side of the French Broad River on City of Brevard property and will continue on city property until its termination at the WWTP. It is important to note that the Wilson Road force main does not tie into the 20-inch Neely Road force main. The alignment described above is shown on **Figure 5-3**. PVC will be used for the force main material, as it in an NCDOT approved material. A 4.5 MG equalization tank will be constructed at the WWTP to store peak flows in excess of the plants 4.4 MGD peak capacity. The WWTPs effluent discharge pipe would be relocated around the proposed equalization tank. During construction of the new Neely Road pump station and force main, the existing infrastructure will be used to convey sanitary flows to the WWTP, which limits the need for bypass pumping. It is important to note that the construction schedule is expected to be much shorter than that of Alternative 4, as easement acquisition should not be necessary. As a result of the reduced schedule, the existing force main is anticipated to be sufficient and not require replacement of the 4,100 LF of structurally deficient pipe.	
Is Figure Included? [X] Yes [ ] No	If Yes, Figure #: **5-3**
Alternative Feasibility: [X] Feasible	[ ] Infeasible
Capital Cost: $13,660,000	**Present Worth:** $13,992,247
Environmental Impact Description	
Provide a qualitative description of the environmental impacts and compare the impacts to that of the Preferred Alternative.	
The proposed environmental impacts include construction of the new Neely Road pump station, which will be located within the 100-year floodplain. However, the proposed location will be outside of the floodway and will not cause a rise in the floodplain level. Additionally, the existing Neely Road pump station, which is located within the floodway, will be abandoned. The Preferred Alternative also includes construction of the new force main, which will be predominantly located in the road right-of-way. This will minimize the impacts to any aquatic species, wildlife, and other natural resources. Minimal impacts will be made to environmentally sensitive areas. These impacts will result from construction activities associated with approximately 800 LF of new force main to be located between the French Broad River and the WWTP, as shown on **Figure 5-3**. Areas temporarily impacted by the construction of the new force main will be restored to pre-construction conditions. The Preferred Alternative also includes construction of an equalization tank at the WWTP. Due to the narrow footprint available at the WWTP, construction of the equalization tank will result in permanent wetland impacts of less than 0.10 acres.	
Environmental Impact Analysis	
[ ] Greater than Preferred Alternative [ ] Less than Preferred Alternative [X] Same as Preferred Alternative	
Acceptance/Rejection	
Alternative: [X] Accepted	[ ] Rejected
Rationale for Acceptance/Rejection	
Discuss the rationale for acceptance/rejection of the above-referenced alternative.	
The Preferred Alternative was selected for implementation as it will reduce the number of SSOs for the lowest capital cost with the least environmental impacts. Out of the five alternatives evaluated, only this alternative and Alternative 4 provided a solution for the existing SSO problems. In addition to saving $1.1 M (capital cost difference) when compared to Alternative 4, the Preferred Alternative can also be constructed quicker, thus helping to reduce the number of future SSOs. The Preferred Alternative provides the City with a long-term solution to not only the identified problem but also the bigger picture of the overall quality of the City's water resources.	

Turkey Creek

Lambs Creek

Pisgah Forest

Future Davidson River

BALL PARK PS

ALLISON CREEK PS

TRANS SOLID WASTE PS

Stream Crossing

WILSON RD PS

WWTP

Lambo Creek

Stream Crossing

BEDFORD PLACE PS

Lamb Creek (Simpson Lake)

Stream Crossing

Future Service Area

Gilbreath Branch

French Broad River

Stream Crossing

Lambo Creek

Kings Creek

NEELY RD PS IMPROVEMENTS

King Creek

Singing Branch

Elm Bend

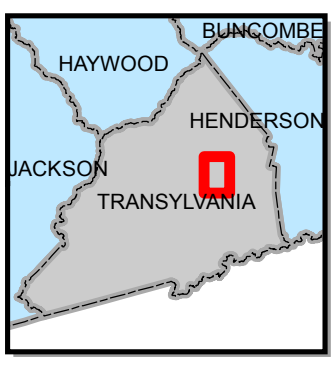
Jumping Branch

Gallimore

GALLIMORE RD PS

Miles

0 0.25 0.5



CDM Smith

LEGEND

- Equalization Improvements
- Surface Water
- Pump Station
- Neely Rd Pump Station
- Force Main
- Force Main Improvements
- Gravity Sewer
- Sewer Basins

Figure 5-3
Preferred Alternative
Neely Road Pump Station
and Equalization
Improvements Project

BREVARD, NORTH CAROLINA

5.2 Present Worth Analysis

This section provides capital, replacement, operations and maintenance (O&M), and net present worth costs for the each of the feasible alternatives. Although found to be infeasible, O&M costs were calculated for the No-Action alternative, for the reasons detailed below. O&M costs include utility, labor, and maintenance costs escalated to a year 20 cost using an inflation rate of 1.27 percent. Net present worth costs were calculated using an EPA discount rate of 4.875 percent. Costs are presented in 2014 dollars. It is important to note that a construction contingency of 20% was used in place of the recommended 10% contingency when calculating the capital costs. Based on industry experience, and given the level of detail currently available, it was determined that a 20% contingency was more appropriate to assume.

It should be noted that the O&M costs associated with maintaining the existing Neely Road pump station and associated force main were calculated for the No-Action alternative and included as negative values for Alternative 4 and the Preferred Alternative. The O&M activities associated with each of the proposed alternatives were included as positive values. The purpose of this is to show the net change in O&M costs between the alternative being considered versus what the City spends to perform the required O&M activities for the existing system (i.e. the No-Action alternative). As a result, it can be seen throughout the following tables that some of the O&M costs (annual and intermittent) as well as the Total Present Worth costs are relatively low for the proposed alternatives. What this means is the cost to operate and maintain these alternatives is only slightly more than what it would cost the City to perform the required O&M activities for the existing system.

No-Action Alternative – Do Nothing Option

Table 5.2.1. Present Value of Operations and Maintenance Costs (Years 1-10)
Neely Road Pump Station and Equalization Improvements Project
City of Brevard
No-Action Alternative

Complete the cells shown in gray below.

e Based on Municipal Cost Index: 1.27% EPA Discount Rate: 4.875%

				Present Value of O&M Costs for Year:									
Component	**Unit Cost**	**Unit**	**Quantity**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Force Main													
ARV/VB	$6,000.00	LS	1	$5,794	$5,595	$5,403	$5,217	$5,038	$4,865	$4,697	$4,536	$4,380	$4,230
Jet/Flush	$5,000	LS	1	$4,828	$4,662	$4,502	$4,347	$4,198	$4,054	$3,914	$3,780	$3,650	$3,525
CCTV	$4	LF	4,075	$15,740	$15,199	$14,677	$14,173	$13,686	$13,215	$12,761	$12,323	$11,899	$11,490
Pipe Repair	$10,000	EA	2	$19,313	$18,649	$18,008	$17,390	$16,792	$16,215	$15,658	$15,120	$14,600	$14,099
Neely Road Pump Station													
Pump Operation	$40,000	LS	1	$38,626	$37,298	$36,017	$34,779	$33,584	$32,430	$31,316	$30,240	$29,201	$28,197
Change Oil	$4,500	LS	1	$4,345	$4,196	$4,052	$3,913	$3,778	$3,648	$3,523	$3,402	$3,285	$3,172
Pull/Inspect Pumps	$2,500	LS	1	$2,414	$2,331	$2,251	$2,174	$2,099	$2,027	$1,957	$1,890	$1,825	$1,762
Well	$1,200	LS	1	$1,159	$1,119	$1,081	$1,043	$1,008	$973	$939	$907	$876	$846
Instrumentation Calibration	$2,500	LS	1	$2,414	$2,331	$2,251	$2,174	$2,099	$2,027	$1,957	$1,890	$1,825	$1,762
Sanitary Sewer Overflows													
Equipment	$1,500	EA	13	$18,830	$18,183	$17,558	$16,955	$16,372	$15,810	$15,266	$14,742	$14,235	$13,746
Oversight and Clean-up	$1,000	EA	13	$12,553	$12,122	$11,705	$11,303	$10,915	$10,540	$10,178	$9,828	$9,490	$9,164
Reporting	$500	EA	13	$6,277	$6,061	$5,853	$5,652	$5,457	$5,270	$5,089	$4,914	$4,745	$4,582
Total Present Value of Yearly O&M Expenses (Years 1-10):				**$132,293**	**$127,747**	**$123,357**	**$119,119**	**$115,026**	**$111,073**	**$107,256**	**$103,571**	**$100,012**	**$96,576**

Table 5.2.2. Present Value of Operations and Maintenance Costs (Years 11-20)
Neely Road Pump Station and Equalization Improvements Project
City of Brevard
No-Action Alternative

Rate Based on Municipal Cost Index: 1.27% EPA Discount Rate: 4.875%

				Present Value of O&M Costs for Year:									
Component	**Unit Cost**	**Unit**	**Quantity**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Force Main													
ARV/VB	$6,000	LS	1	$4,084	$3,944	$3,808	$3,678	$3,551	$3,429	$3,311	$3,198	$3,088	$2,982
Jet/Flush	$5,000	LS	1	$3,404	$3,287	$3,174	$3,065	$2,959	$2,858	$2,759	$2,665	$2,573	$2,485
CCTV	$4	LF	4,075	$11,096	$10,714	$10,346	$9,991	$9,647	$9,316	$8,996	$8,687	$8,388	$8,100
Pipe Repair	$10,000	EA	2	$13,614	$13,146	$12,695	$12,258	$11,837	$11,431	$11,038	$10,658	$10,292	$9,939
Neely Road Pump Station													
Pump Operation	$40,000	LS	1	$27,228	$26,293	$25,389	$24,517	$23,674	$22,861	$22,075	$21,317	$20,584	$19,877
Change Oil	$4,500	LS	1	$3,063	$2,958	$2,856	$2,758	$2,663	$2,572	$2,483	$2,398	$2,316	$2,236
Pull/Inspect Pumps	$2,500	LS	1	$1,702	$1,643	$1,587	$1,532	$1,480	$1,429	$1,380	$1,332	$1,287	$1,242
Grease/Scum Pump Out Wet-Well	$1,200	LS	1	$817	$789	$762	$736	$710	$686	$662	$640	$618	$596
Instrumentation	$2,500	LS	1	$1,702	$1,643	$1,587	$1,532	$1,480	$1,429	$1,380	$1,332	$1,287	$1,242
Sanitary Sewer Overflows													
Equipment	$1,500	EA	13	$13,274	$12,818	$12,377	$11,952	$11,541	$11,145	$10,762	$10,392	$10,035	$9,690
Oversight and Clean-up	$1,000	EA	13	$8,849	$8,545	$8,252	$7,968	$7,694	$7,430	$7,175	$6,928	$6,690	$6,460
Reporting	$500	EA	13	$4,425	$4,273	$4,126	$3,984	$3,847	$3,715	$3,587	$3,464	$3,345	$3,230
Total Present Value of Yearly O&M Expenses (Years 11-20):				**$93,257**	**$90,053**	**$86,958**	**$83,970**	**$81,085**	**$78,299**	**$75,609**	**$73,011**	**$70,502**	**$68,079**
Total Present Value of Annual O&M Costs (Life of Project):													**$1,936,852**

Table 5.2.3 Intermittent Operations and Maintenance Costs

Neely Road Pump Station and Equalization Improvements Project

City of Brevard

Alternative: No-Action Alternative

Enter any intermittent O&M activities, associated unit and cost information, and the quantity.																							
				Year O&M Needed? (Insert Y in year where O&M is needed.)																			
Component	**Unit Cost**	**Unit**	**Quantity**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Neely Road PS Pump Overhaul	$20,000	LS	1					Y					Y					Y					Y
Inspection/Testing of Electrical Gear	$5,000	LS	1				Y				Y				Y				Y				Y

Table 5.2.4. Present Value of Intermittent Operations and Maintenance Costs (Years 1-10)
Neely Road Pump Station and Equalization Improvements Project
City of Brevard
No-Action Alternative

Current Inflation Rate Based on Municipal Cost Index: 1.27% EPA Discount Rate: 4.875%

Component	Unit Cost	Unit	Quantity	Present Value of O&M Costs for Year:									
				1	2	3	4	5	6	7	8	9	10
Neely Road PS Pump Overhaul	$20,000	LS	1	$0	$0	$0	$0	$16,792	$0	$0	$0	$0	$14,099
Inspection/Testing of Electrical Gear	$5,000	LS	1	$0	$0	$0	$4,347	$0	$0	$0	$3,780	$0	$0
Total Present Value of Intermittent Operations & Maintenance Costs (Years 1-10):				**$0**	**$0**	**$0**	**$4,347**	**$16,792**	**$0**	**$0**	**$3,780**	**$0**	**$14,099**

Table 5.2.5. Present Value of Intermittent Operations and Maintenance Costs (Years 11-20)
Neely Road Pump Station and Equalization Improvements Project
City of Brevard
No-Action Alternative

Inflation Rate Based on Municipal Cost Index: 1.27% EPA Discount Rate: 4.875%

Component	Unit Cost	Unit	Quantity	Present Value of O&M Costs for Year:									
				11	12	13	14	15	16	17	18	19	20
Neely Road PS Pump Overhaul	$20,000	LS	1	$0	$0	$0	$0	$11,837	$0	$0	$0	$0	$9,939
Inspection/Testing of Electrical Gear	$5,000	LS	1	$0	$3,287	$0	$0	$0	$2,858	$0	$0	$0	$2,485
l Present Value of Intermittent Operations & Maintenance Costs (Years 11-20):				**$0**	**$3,287**	**$0**	**$0**	**$11,837**	**$2,858**	**$0**	**$0**	**$0**	**$12,423**
Total Present Value of Intermittent Operations & Maintenance Costs (Life of Project):													**$86,215**

Alternative 4 – Gravity Sewer Option

Table 5.2.6. Capital Costs
Neely Road Pump Station and Equalization Improvements Project
City of Brevard

Complete the areas shown in gray below. Where shown, use pulldown menu to select options. The spreadsheet will calculate the capital costs.

	Gravity Sewer Option			
Project Administration ($):	$2,682,000			
Component	**Unit Cost[a]**	**Unit**	**Quantity**	**Total Cost**
Land Acquisition	$81,000	LS	1	$81,000
30" Gravity Sewer (0-12 feet deep)	$268	LF	4,760	$1,273,000
30" Gravity Sewer (12-20 feet deep)	$308	LF	3,505	$1,078,000
Abandon Neely Road Pump Station	$54,000	EA	1	$54,000
4,760 gpm Pump Station	$1,625,000	LS	1	$1,625,000
20-inch PVC Force Main	$156	LF	460	$72,000
HDD French Broad River	$650	LF	600	$390,000
Replace Portion of Existing Neely Road Force Main	$206	LF	4,100	$844,000
Temporary Pavement Replacement	$46	SY	2,700	$123,000
Full Roadway Replacement	$108,000	EA	1	$108,000
Abandon Existing Force Main	$172	CY	510	$88,000
Equalization Tank (4.5 MG)	$2,074,000	LS	1	$2,074,000
Equalization Tank Dome and Odor Control	$542,000	LS	1	$542,000
Coarse Screening	$33,000	LS	1	$33,000
Equalization Tank Mixing	$433,000	LS	1	$433,000
Equalization Tank Drain	$106,000	LS	1	$106,000
Equalization Tank Pump Station	$190,000	LS	1	$190,000
24" RCP Effluent Pipe	$130	LF	400	$52,000
Effluent Pipe Manhole	$4,500	EA	2	$9,000
Rock Excavation	$54	CY	13,900	$753,000
Dewatering	$7	LF	8,265	$54,000
Special Inspections	$60,000	LS	1	$60,000
			Total Construction Cost:	**$10,042,000**
			Construction Contingency Cost:	**$2,008,000**
			Project Administration Cost:	**$2,682,000**
			Total Capital Cost:	**$14,732,000**

[a]Unit costs are in today's dollars, not future dollars.

Table 5.2.7 Replacement Costs Input
Neely Road Pump Station and Equalization Improvements
Project City of Brevard

Alternative: Gravity Sewer Option

For each component, enter "Y" in the gray area in the year in which replacement, if any, will occur.

					Year Replacement Needed? (Insert Y in year where replacement is needed.)																			
Component	**Unit Cost**	**Unit**	**Quantity**	**Replacement Needed? (Years 1-20)**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Land Acquisition	$81,000	LS	1	N																				
30" Gravity Sewer (0-12 feet deep)	$268	LF	4,760	N																				
30" Gravity Sewer (12-20 feet deep)	$308	LF	3,505	N																				
Abandon Neely Road Pump Station	$54,000	EA	1	N																				
4,760 gpm Pump Station	$1,625,000	LS	1	N																				
20-inch PVC Force Main	$156	LF	460	N																				
HDD French Broad River	$650	LF	600	N																				
Replace Portion of Existing Neely Road Force Main	$206	LF	4,100	N																				
Temporary Pavement Replacement	$46	SY	2,700	N																				
Full Roadway Replacement	$108,000	EA	1	N																				
Abandon Existing Force Main	$172	CY	510	N																				
Equalization Tank (4.5 MG)	$2,074,000	LS	1	N																				
Equalization Tank Dome and Odor Control	$542,000	LS	1	N																				
Coarse Screening	$33,000	LS	1	N																				
Equalization Tank Mixing	$433,000	LS	1	N																				
Equalization Tank Drain	$106,000	LS	1	N																				
Equalization Tank Pump Station	$190,000	LS	1	N																				
24" RCP Effluent Pipe	$130	LF	400	N																				
Effluent Pipe Manhole	$4,500	EA	2	N																				
Rock Excavation	$54	CY	13,900	N																				
Dewatering	$7	LF	8,265	N																				
Special Inspections	$60,000	LS	1	N																				

Table 5.2.8. Replacement Costs (Years 1 to 5)
Neely Road Pump Station and Equalization Improvements Project
City of Brevard
Gravity Sewer Option

Index: 2.64% EPA Discount Rate: 4.875%

Component	Unit Cost	Unit	Quantity	Present Value of Replacement Costs in Year: 1	2	3	4	5
Land Acquisition	$81,000	LS	1	$0	$0	$0	$0	$0
30" Gravity Sewer (0-12 feet deep)	$268	LF	4,760	$0	$0	$0	$0	$0
30" Gravity Sewer (12-20 feet deep)	$308	LF	3,505	$0	$0	$0	$0	$0
Abandon Neely Road Pump Station	$54,000	EA	1	$0	$0	$0	$0	$0
4,760 gpm Pump Station	$1,625,000	LS	1	$0	$0	$0	$0	$0
20-inch PVC Force Main	$156	LF	460	$0	$0	$0	$0	$0
HDD French Broad River	$650	LF	600	$0	$0	$0	$0	$0
Replace Portion of Existing Neely Road Force Main	$206	LF	4,100	$0	$0	$0	$0	$0
Temporary Pavement Replacement	$46	SY	2,700	$0	$0	$0	$0	$0
Full Roadway Replacement	$108,000	EA	1	$0	$0	$0	$0	$0
Abandon Existing Force Main	$172	CY	510	$0	$0	$0	$0	$0
Equalization Tank (4.5 MG)	$2,074,000	LS	1	$0	$0	$0	$0	$0
Equalization Tank Dome and Odor Control	$542,000	LS	1	$0	$0	$0	$0	$0
Coarse Screening	$33,000	LS	1	$0	$0	$0	$0	$0
Equalization Tank Mixing	$433,000	LS	1	$0	$0	$0	$0	$0
Equalization Tank Drain	$106,000	LS	1	$0	$0	$0	$0	$0
Equalization Tank Pump Station	$190,000	LS	1	$0	$0	$0	$0	$0
24" RCP Effluent Pipe	$130	LF	400	$0	$0	$0	$0	$0
Effluent Pipe Manhole	$4,500	EA	2	$0	$0	$0	$0	$0
Rock Excavation	$54	CY	13,900	$0	$0	$0	$0	$0
Dewatering	$7	LF	8,265	$0	$0	$0	$0	$0
Special Inspections	$60,000	LS	1	$0	$0	$0	$0	$0
Total Present Value of Replacement Costs (Years 1 to 5):				**$0**	**$0**	**$0**	**$0**	**$0**

Table 5.2.9. Replacement Costs (Years 6 to 10)
Neely Road Pump Station and Equalization Improvements Project
City of Brevard
Gravity Sewer Option

Index: 2.64% EPA Discount Rate: 4.875%

Component	Unit Cost	Unit	Quantity	Present Value of Replacement Costs in Year: 6	7	8	9	10
Land Acquisition	$81,000	LS	1	$0	$0	$0	$0	$0
30" Gravity Sewer (0-12 feet deep)	$268	LF	4,760	$0	$0	$0	$0	$0
30" Gravity Sewer (12-20 feet deep)	$308	LF	3,505	$0	$0	$0	$0	$0
Abandon Neely Road Pump Station	$54,000	EA	1	$0	$0	$0	$0	$0
4,760 gpm Pump Station	$1,625,000	LS	1	$0	$0	$0	$0	$0
20-inch PVC Force Main	$156	LF	460	$0	$0	$0	$0	$0
HDD French Broad River	$650	LF	600	$0	$0	$0	$0	$0
Replace Portion of Existing Neely Road Force Main	$206	LF	4,100	$0	$0	$0	$0	$0
Temporary Pavement Replacement	$46	SY	2,700	$0	$0	$0	$0	$0
Full Roadway Replacement	$108,000	EA	1	$0	$0	$0	$0	$0
Abandon Existing Force Main	$172	CY	510	$0	$0	$0	$0	$0
Equalization Tank (4.5 MG)	$2,074,000	LS	1	$0	$0	$0	$0	$0
Equalization Tank Dome and Odor Control	$542,000	LS	1	$0	$0	$0	$0	$0
Coarse Screening	$33,000	LS	1	$0	$0	$0	$0	$0
Equalization Tank Mixing	$433,000	LS	1	$0	$0	$0	$0	$0
Equalization Tank Drain	$106,000	LS	1	$0	$0	$0	$0	$0
Equalization Tank Pump Station	$190,000	LS	1	$0	$0	$0	$0	$0
24" RCP Effluent Pipe	$130	LF	400	$0	$0	$0	$0	$0
Effluent Pipe Manhole	$4,500	EA	2	$0	$0	$0	$0	$0
Rock Excavation	$54	CY	13,900	$0	$0	$0	$0	$0
Dewatering	$7	LF	8,265	$0	$0	$0	$0	$0
Special Inspections	$60,000	LS	1	$0	$0	$0	$0	$0
Total Present Value of Replacement Costs (Years 6 to 10):				**$0**	**$0**	**$0**	**$0**	**$0**

Table 5.2.10. Replacement Costs (Years 11 to 15)
Neely Road Pump Station and Equalization Improvements Project
City of Brevard
Gravity Sewer Option

Index: 2.64% EPA Discount Rate: 4.875%

Component	Unit Cost	Unit	Quantity	Present Value of Replacement Costs in Year: 11	12	13	14	15
Land Acquisition	$81,000	LS	1	$0	$0	$0	$0	$0
30" Gravity Sewer (0-12 feet deep)	$268	LF	4,760	$0	$0	$0	$0	$0
30" Gravity Sewer (12-20 feet deep)	$308	LF	3,505	$0	$0	$0	$0	$0
Abandon Neely Road Pump Station	$54,000	EA	1	$0	$0	$0	$0	$0
4,760 gpm Pump Station	$1,625,000	LS	1	$0	$0	$0	$0	$0
20-inch PVC Force Main	$156	LF	460	$0	$0	$0	$0	$0
HDD French Broad River	$650	LF	600	$0	$0	$0	$0	$0
Replace Portion of Existing Neely Road Force Main	$206	LF	4,100	$0	$0	$0	$0	$0
Temporary Pavement Replacement	$46	SY	2,700	$0	$0	$0	$0	$0
Full Roadway Replacement	$108,000	EA	1	$0	$0	$0	$0	$0
Abandon Existing Force Main	$172	CY	510	$0	$0	$0	$0	$0
Equalization Tank (4.5 MG)	$2,074,000	LS	1	$0	$0	$0	$0	$0
Equalization Tank Dome and Odor Control	$542,000	LS	1	$0	$0	$0	$0	$0
Coarse Screening	$33,000	LS	1	$0	$0	$0	$0	$0
Equalization Tank Mixing	$433,000	LS	1	$0	$0	$0	$0	$0
Equalization Tank Drain	$106,000	LS	1	$0	$0	$0	$0	$0
Equalization Tank Pump Station	$190,000	LS	1	$0	$0	$0	$0	$0
24" RCP Effluent Pipe	$130	LF	400	$0	$0	$0	$0	$0
Effluent Pipe Manhole	$4,500	EA	2	$0	$0	$0	$0	$0
Rock Excavation	$54	CY	13,900	$0	$0	$0	$0	$0
Dewatering	$7	LF	8,265	$0	$0	$0	$0	$0
Special Inspections	$60,000	LS	1	$0	$0	$0	$0	$0
Total Present Value of Replacement Costs (Years 11 to 15):				**$0**	**$0**	**$0**	**$0**	**$0**

Table 5.2.11. Replacement Costs (Years 16 to 20)
Neely Road Pump Station and Equalization Improvements Project
City of Brevard
Gravity Sewer Option

Index: 2.64% EPA Discount Rate: 4.875%

Component	Unit Cost	Unit	Quantity	Present Value of Replacement Costs in Year: 16	17	18	19	20
Land Acquisition	$81,000	LS	1	$0	$0	$0	$0	$0
30" Gravity Sewer (0-12 feet deep)	$268	LF	4,760	$0	$0	$0	$0	$0
30" Gravity Sewer (12-20 feet deep)	$308	LF	3,505	$0	$0	$0	$0	$0
Abandon Neely Road Pump Station	$54,000	EA	1	$0	$0	$0	$0	$0
4,760 gpm Pump Station	$1,625,000	LS	1	$0	$0	$0	$0	$0
20-inch PVC Force Main	$156	LF	460	$0	$0	$0	$0	$0
HDD French Broad River	$650	LF	600	$0	$0	$0	$0	$0
Replace Portion of Existing Neely Road Force Main	$206	LF	4,100	$0	$0	$0	$0	$0
Temporary Pavement Replacement	$46	SY	2,700	$0	$0	$0	$0	$0
Full Roadway Replacement	$108,000	EA	1	$0	$0	$0	$0	$0
Abandon Existing Force Main	$172	CY	510	$0	$0	$0	$0	$0
Equalization Tank (4.5 MG)	$2,074,000	LS	1	$0	$0	$0	$0	$0
Equalization Tank Dome and Odor Control	$542,000	LS	1	$0	$0	$0	$0	$0
Coarse Screening	$33,000	LS	1	$0	$0	$0	$0	$0
Equalization Tank Mixing	$433,000	LS	1	$0	$0	$0	$0	$0
Equalization Tank Drain	$106,000	LS	1	$0	$0	$0	$0	$0
Equalization Tank Pump Station	$190,000	LS	1	$0	$0	$0	$0	$0
24" RCP Effluent Pipe	$130	LF	400	$0	$0	$0	$0	$0
Effluent Pipe Manhole	$4,500	EA	2	$0	$0	$0	$0	$0
Rock Excavation	$54	CY	13,900	$0	$0	$0	$0	$0
Dewatering	$7	LF	8,265	$0	$0	$0	$0	$0
Special Inspections	$60,000	LS	1	$0	$0	$0	$0	$0
Total Present Value of Replacement Costs (Years 16 to 20):				**$0**	**$0**	**$0**	**$0**	**$0**
Total Present Value of Replacement Costs (Life of Project):								**$0**

Table 5.2.12. Present Value of Operations and Maintenance Costs (Years 1-10)
Neely Road Pump Station and Equalization Improvements Project
City of Brevard
Gravity Sewer Option

Complete the cells shown in gray below.

Current Inflation Rate Based on Municipal Cost Index: 1.27%

EPA Discount Rate: 4.875%

				Present Value of O&M Costs for Year:									
Component	**Unit Cost**	**Unit**	**Quantity**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Gravity Sewer													
~~CCTV~~	~~$4~~	~~LF~~	~~2,725~~	~~$10,525~~	~~$10,164~~	~~$9,815~~	~~$9,477~~	~~$9,152~~	~~$8,837~~	~~$8,534~~	~~$8,240~~	~~$7,957~~	~~$7,684~~
~~Jet/Flush/Root Removal~~	~~$15,000~~	~~LS~~	~~1~~	~~$14,485~~	~~$13,987~~	~~$13,506~~	~~$13,042~~	~~$12,594~~	~~$12,161~~	~~$11,743~~	~~$11,340~~	~~$10,950~~	~~$10,574~~
~~Manhole/Cleanout Inspection~~	~~$10,000~~	~~LS~~	~~1~~	~~$9,656~~	~~$9,325~~	~~$9,004~~	~~$8,695~~	~~$8,396~~	~~$8,108~~	~~$7,829~~	~~$7,560~~	~~$7,300~~	~~$7,049~~
Force Main													
ARV/VB	$6,000	LS	1	$5,794	$5,595	$5,403	$5,217	$5,038	$4,865	$4,697	$4,536	$4,380	$4,230
Jet/Flush	$5,000	LS	1	$4,828	$4,662	$4,502	$4,347	$4,198	$4,054	$3,914	$3,780	$3,650	$3,525
CCTV	($4)	LF	4,075	($15,740)	($15,199)	($14,677)	($14,173)	($13,686)	($13,215)	($12,761)	($12,323)	($11,899)	($11,490)
ARV/VB	($6,000)	LS	1	($5,794)	($5,595)	($5,403)	($5,217)	($5,038)	($4,865)	($4,697)	($4,536)	($4,380)	($4,230)
Jet/Flush	($5,000)	LS	1	($4,828)	($4,662)	($4,502)	($4,347)	($4,198)	($4,054)	($3,914)	($3,780)	($3,650)	($3,525)
Pipe Repair	($10,000)	EA	2	($19,313)	($18,649)	($18,008)	($17,390)	($16,792)	($16,215)	($15,658)	($15,120)	($14,600)	($14,099)
Neely Road Pump Station													
Pump Operation	$40,000	LS	1	$38,626	$37,298	$36,017	$34,779	$33,584	$32,430	$31,316	$30,240	$29,201	$28,197
Change Oil	$4,500	LS	1	$4,345	$4,196	$4,052	$3,913	$3,778	$3,648	$3,523	$3,402	$3,285	$3,172
Pull/Inspect Pumps	$2,500	LS	1	$2,414	$2,331	$2,251	$2,174	$2,099	$2,027	$1,957	$1,890	$1,825	$1,762
Grease/Scum Pump Out Wet-Well	$1,200	LS	1	$1,159	$1,119	$1,081	$1,043	$1,008	$973	$939	$907	$876	$846
Instrumentation Calibration	$2,500	LS	1	$2,414	$2,331	$2,251	$2,174	$2,099	$2,027	$1,957	$1,890	$1,825	$1,762
Pump Operation	($40,000)	LS	1	($38,626)	($37,298)	($36,017)	($34,779)	($33,584)	($32,430)	($31,316)	($30,240)	($29,201)	($28,197)
Change Oil	($4,500)	LS	1	($4,345)	($4,196)	($4,052)	($3,913)	($3,778)	($3,648)	($3,523)	($3,402)	($3,285)	($3,172)
Pull/Inspect Pumps	($2,500)	LS	1	($2,414)	($2,331)	($2,251)	($2,174)	($2,099)	($2,027)	($1,957)	($1,890)	($1,825)	($1,762)
Grease/Scum Pump Out Wet-Well	($1,200)	LS	1	($1,159)	($1,119)	($1,081)	($1,043)	($1,008)	($973)	($939)	($907)	($876)	($846)
Instrumentation Calibration	($2,500)	LS	1	($2,414)	($2,331)	($2,251)	($2,174)	($2,099)	($2,027)	($1,957)	($1,890)	($1,825)	($1,762)
Sanitary Sewer Overflows													
Equipment	($1,500)	EA	13	($18,830)	($18,183)	($17,558)	($16,955)	($16,372)	($15,810)	($15,266)	($14,742)	($14,235)	($13,746)
Oversight and Clean-up	($1,000)	EA	13	($12,553)	($12,122)	($11,705)	($11,303)	($10,915)	($10,540)	($10,178)	($9,828)	($9,490)	($9,164)
Reporting	($500)	EA	13	($6,277)	($6,061)	($5,853)	($5,652)	($5,457)	($5,270)	($5,089)	($4,914)	($4,745)	($4,582)
Equalization Tank													
EQ Tank Inspection/Cleaning	$12,000	LS	1	$11,588	$11,190	$10,805	$10,434	$10,075	$9,729	$9,395	$9,072	$8,760	$8,459
Mixer Operation	$10,000	LS	1	$9,656	$9,325	$9,004	$8,695	$8,396	$8,108	$7,829	$7,560	$7,300	$7,049
Change Lubricant/Inspect Mixers	$5,500	LS	1	$5,311	$5,129	$4,952	$4,782	$4,618	$4,459	$4,306	$4,158	$4,015	$3,877
Instrumentation Calibration	$3,500	LS	1	$3,380	$3,264	$3,151	$3,043	$2,939	$2,838	$2,740	$2,646	$2,555	$2,467
Odor Control System Operation	$10,000	LS	1	$9,656	$9,325	$9,004	$8,695	$8,396	$8,108	$7,829	$7,560	$7,300	$7,049
Odor Control System Fan Maintenance	$3,000	LS	1	$2,897	$2,797	$2,701	$2,608	$2,519	$2,432	$2,349	$2,268	$2,190	$2,115
Odor Control System Piping/Nozzle Maintenance	$2,500	LS	1	$2,414	$2,331	$2,251	$2,174	$2,099	$2,027	$1,957	$1,890	$1,825	$1,762
Drain PS Pump Operation	$10,000	LS	1	$9,656	$9,325	$9,004	$8,695	$8,396	$8,108	$7,829	$7,560	$7,300	$7,049
Drain PS Pump Pull/Inspect	$2,500	LS	1	$2,414	$2,331	$2,251	$2,174	$2,099	$2,027	$1,957	$1,890	$1,825	$1,762
Drain PS Pump Oil Change	$4,500	LS	1	$4,345	$4,196	$4,052	$3,913	$3,778	$3,648	$3,523	$3,402	$3,285	$3,172
Total Present Value of Yearly O&M Expenses (Years 1-10):				**($11,395)**	**($11,003)**	**($10,625)**	**($10,260)**	**($9,907)**	**($9,567)**	**($9,238)**	**($8,921)**	**($8,614)**	**($8,318)**

Table 5.2.13. Present Value of Operations and Maintenance Costs (Years 11-20)
Neely Road Pump Station and Equalization Improvements Project
City of Brevard
Gravity Sewer Option

Current Inflation Rate Based on Municipal Cost Index: 1.27%

EPA Discount Rate: 4.875%

				Present Value of O&M Costs for Year:									
Component	**Unit Cost**	**Unit**	**Quantity**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Gravity Sewer													
~~CCTV~~	~~$4~~	~~LF~~	~~2,725~~	~~$7,419.74~~	~~$7,164.78~~	~~$6,918.59~~	~~$6,680.86~~	~~$6,451.30~~	~~$6,229.63~~	~~$6,015.57~~	~~$5,808.87~~	~~$5,609.27~~	~~$5,416.53~~
~~Jet/Flush/Root Removal~~	~~$15,000~~	~~LS~~	~~1~~	~~$10,210.65~~	~~$9,859.80~~	~~$9,521.00~~	~~$9,193.85~~	~~$8,877.94~~	~~$8,572.88~~	~~$8,278.31~~	~~$7,993.85~~	~~$7,719.18~~	~~$7,453.94~~
~~Manhole/Cleanout Inspection~~	~~$10,000~~	~~LS~~	~~1~~	~~$6,807.10~~	~~$6,573.20~~	~~$6,347.33~~	~~$6,129.23~~	~~$5,918.62~~	~~$5,715.25~~	~~$5,518.87~~	~~$5,329.24~~	~~$5,146.12~~	~~$4,969.29~~
Force Main													
ARV/VB	$6,000	LS	1	$4,084.26	$3,943.92	$3,808.40	$3,677.54	$3,551.17	$3,429.15	$3,311.32	$3,197.54	$3,087.67	$2,981.57
Jet/Flush	$5,000	LS	1	$3,403.55	$3,286.60	$3,173.67	$3,064.62	$2,959.31	$2,857.63	$2,759.44	$2,664.62	$2,573.06	$2,484.65
CCTV	($4)	LF	4,075	($11,095.57)	($10,714.31)	($10,346.15)	($9,990.65)	($9,647.36)	($9,315.86)	($8,995.76)	($8,686.66)	($8,388.17)	($8,099.94)
ARV/VB	($6,000)	LS	1	($4,084.26)	($3,943.92)	($3,808.40)	($3,677.54)	($3,551.17)	($3,429.15)	($3,311.32)	($3,197.54)	($3,087.67)	($2,981.57)
Jet/Flush	($5,000)	LS	1	($3,403.55)	($3,286.60)	($3,173.67)	($3,064.62)	($2,959.31)	($2,857.63)	($2,759.44)	($2,664.62)	($2,573.06)	($2,484.65)
Pipe Repair	($10,000)	EA	2	($13,614.19)	($13,146.39)	($12,694.67)	($12,258.46)	($11,837.25)	($11,430.51)	($11,037.74)	($10,658.47)	($10,292.23)	($9,938.58)
Neely Road Pump Station													
Pump Operation	$40,000	LS	1	$27,228.39	$26,292.79	$25,389.34	$24,516.93	$23,674.50	$22,861.02	$22,075.48	$21,316.95	$20,584.47	$19,877.16
Change Oil	$4,500	LS	1	$3,063.19	$2,957.94	$2,856.30	$2,758.15	$2,663.38	$2,571.86	$2,483.49	$2,398.16	$2,315.75	$2,236.18
Pull/Inspect Pumps	$2,500	LS	1	$1,701.77	$1,643.30	$1,586.83	$1,532.31	$1,479.66	$1,428.81	$1,379.72	$1,332.31	$1,286.53	$1,242.32
Grease/Scum Pump Out Wet-Well	$1,200	LS	1	$816.85	$788.78	$761.68	$735.51	$710.23	$685.83	$662.26	$639.51	$617.53	$596.31
Instrumentation Calibration	$2,500	LS	1	$1,701.77	$1,643.30	$1,586.83	$1,532.31	$1,479.66	$1,428.81	$1,379.72	$1,332.31	$1,286.53	$1,242.32
Pump Operation	($40,000)	LS	1	($27,228.39)	($26,292.79)	($25,389.34)	($24,516.93)	($23,674.50)	($22,861.02)	($22,075.48)	($21,316.95)	($20,584.47)	($19,877.16)
Change Oil	($4,500)	LS	1	($3,063.19)	($2,957.94)	($2,856.30)	($2,758.15)	($2,663.38)	($2,571.86)	($2,483.49)	($2,398.16)	($2,315.75)	($2,236.18)
Pull/Inspect Pumps	($2,500)	LS	1	($1,701.77)	($1,643.30)	($1,586.83)	($1,532.31)	($1,479.66)	($1,428.81)	($1,379.72)	($1,332.31)	($1,286.53)	($1,242.32)
Grease/Scum Pump Out Wet-Well	($1,200)	LS	1	($816.85)	($788.78)	($761.68)	($735.51)	($710.23)	($685.83)	($662.26)	($639.51)	($617.53)	($596.31)
Instrumentation Calibration	($2,500)	LS	1	($1,701.77)	($1,643.30)	($1,586.83)	($1,532.31)	($1,479.66)	($1,428.81)	($1,379.72)	($1,332.31)	($1,286.53)	($1,242.32)
Sanitary Sewer Overflows													
Equipment	($1,500)	EA	13	($13,273.84)	($12,817.73)	($12,377.30)	($11,952.00)	($11,541.32)	($11,144.75)	($10,761.80)	($10,392.01)	($10,034.93)	($9,690.12)
Oversight and Clean-up	($1,000)	EA	13	($8,849.23)	($8,545.16)	($8,251.53)	($7,968.00)	($7,694.21)	($7,429.83)	($7,174.53)	($6,928.01)	($6,689.95)	($6,460.08)
Reporting	($500)	EA	13	($4,424.61)	($4,272.58)	($4,125.77)	($3,984.00)	($3,847.11)	($3,714.92)	($3,587.27)	($3,464.00)	($3,344.98)	($3,230.04)
Equalization Tank													
EQ Tank Inspection/Cleaning	$12,000	LS	1	$8,168.52	$7,887.84	$7,616.80	$7,355.08	$7,102.35	$6,858.30	$6,622.65	$6,395.08	$6,175.34	$5,963.15
Mixer Operation	$10,000	LS	1	$6,807.10	$6,573.20	$6,347.33	$6,129.23	$5,918.62	$5,715.25	$5,518.87	$5,329.24	$5,146.12	$4,969.29
Change Lubricant/Inspect Mixers	$5,500	LS	1	$3,743.90	$3,615.26	$3,491.03	$3,371.08	$3,255.24	$3,143.39	$3,035.38	$2,931.08	$2,830.36	$2,733.11
Instrumentation Calibration	$3,500	LS	1	$2,382.48	$2,300.62	$2,221.57	$2,145.23	$2,071.52	$2,000.34	$1,931.60	$1,865.23	$1,801.14	$1,739.25
Odor Control System Operation	$10,000	LS	1	$6,807.10	$6,573.20	$6,347.33	$6,129.23	$5,918.62	$5,715.25	$5,518.87	$5,329.24	$5,146.12	$4,969.29
Odor Control System Fan Maintenance	$3,000	LS	1	$2,042.13	$1,971.96	$1,904.20	$1,838.77	$1,775.59	$1,714.58	$1,655.66	$1,598.77	$1,543.84	$1,490.79
Odor Control System Piping/Nozzle Maintenance	$2,500	LS	1	$1,701.77	$1,643.30	$1,586.83	$1,532.31	$1,479.66	$1,428.81	$1,379.72	$1,332.31	$1,286.53	$1,242.32
Drain PS Pump Operation	$10,000	LS	1	$6,807.10	$6,573.20	$6,347.33	$6,129.23	$5,918.62	$5,715.25	$5,518.87	$5,329.24	$5,146.12	$4,969.29
Drain PS Pump Pull/Inspect	$2,500	LS	1	$1,701.77	$1,643.30	$1,586.83	$1,532.31	$1,479.66	$1,428.81	$1,379.72	$1,332.31	$1,286.53	$1,242.32
Drain PS Pump Oil Change	$4,500	LS	1	$3,063.19	$2,957.94	$2,856.30	$2,758.15	$2,663.38	$2,571.86	$2,483.49	$2,398.16	$2,315.75	$2,236.18
Total Present Value of Yearly O&M Expenses (Years 11-20):				**($8,032.37)**	**($7,756.37)**	**($7,489.85)**	**($7,232.49)**	**($6,983.98)**	**($6,744.00)**	**($6,512.27)**	**($6,288.50)**	**($6,072.42)**	**($5,863.76)**
Total Present Value of Annual O&M Costs (Life of Project):													**($166,823.79)**

Table 5.2.14 Intermittent Operations and Maintenance Costs
Neely Road Pump Station and Equalization Improvements Project
City of Brevard

Alternative: Gravity Sewer Option

Enter any intermittent O&M activities, associated unit and cost information, and the quantity.

				Year O&M Needed? (Insert Y in year where O&M is needed.)																			
Component	**Unit Cost**	**Unit**	**Quantity**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Neely Road PS Pump Overhaul	$20,000	LS	1					Y					Y					Y					Y
Inspection/Testing of Electrical Gear	$5,000	LS	1				Y				Y				Y				Y				Y
EQ Mixer Rebuild	$30,000	LS	1										Y										Y
Odor Control System Media Replacement	$20,000	LS	1					Y					Y					Y					Y
Drain PS Pump Overhaul	$20,000	LS	1					Y					Y					Y					Y
CCTV	$17,000	LS	1										Y										Y
Jet/Flush/Root Removal	$8,500	LS	1					Y					Y					Y					Y
Manhole/Cleanout Inspection	$2,833	LS	1					Y					Y					Y					Y
Neely Road PS Pump Overhaul	($20,000)	LS	1					Y					Y					Y					Y
Inspection/Testing of Electrical Gear	($5,000)	LS	1				Y				Y				Y				Y				Y

Table 5.2.15. Present Value of Intermittent Operations and Maintenance Costs (Years 1-10)
Neely Road Pump Station and Equalization Improvements Project
City of Brevard
Gravity Sewer Option

Inflation Rate Based on Municipal Cost Index: 1.27% EPA Discount Rate: 4.875%

Component	Unit Cost	Unit	Quantity	Present Value of O&M Costs for Year:									
				1	2	3	4	5	6	7	8	9	10
Neely Road PS Pump Overhaul	$20,000	LS	1	$0	$0	$0	$0	$16,792	$0	$0	$0	$0	$14,099
Inspection/Testing of Electrical Gear	$5,000	LS	1	$0	$0	$0	$4,347	$0	$0	$0	$3,780	$0	$0
EQ Mixer Rebuild	$30,000	LS	1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$21,148
Odor Control System Media Replacement	$20,000	LS	1	$0	$0	$0	$0	$16,792	$0	$0	$0	$0	$14,099
Drain PS Pump Overhaul	$20,000	LS	1	$0	$0	$0	$0	$16,792	$0	$0	$0	$0	$14,099
CCTV	$17,000	LS	1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$11,984
Jet/Flush/Root Removal	$8,500	LS	1	$0	$0	$0	$0	$7,137	$0	$0	$0	$0	$5,992
Manhole/Cleanout Inspection	$2,833	LS	1	$0	$0	$0	$0	$2,379	$0	$0	$0	$0	$1,997
Neely Road PS Pump Overhaul	($20,000)	LS	1	$0	$0	$0	$0	($16,792)	$0	$0	$0	$0	($14,099)
Inspection/Testing of Electrical Gear	($5,000)	LS	1	$0	$0	$0	($4,347)	$0	$0	$0	($3,780)	$0	$0
Total Present Value of Intermittent Operations & Maintenance Costs (Year 1-10):				**$0**	**$0**	**$0**	**$0**	**$43,100**	**$0**	**$0**	**$0**	**$0**	**$69,318**

Table 5.2.16. Present Value of Intermittent Operations and Maintenance Costs (Years 11-20)
Neely Road Pump Station and Equalization Improvements Project
City of Brevard
Gravity Sewer Option

Inflation Rate Based on Municipal Cost Index: 1.27% EPA Discount Rate: 4.875%

Component	Unit Cost	Unit	Quantity	Present Value of O&M Costs for Year:									
				11	12	13	14	15	16	17	18	19	20
Neely Road PS Pump Overhaul	$20,000	LS	1	$0	$0	$0	$0	$11,837	$0	$0	$0	$0	$9,939
Inspection/Testing of Electrical Gear	$5,000	LS	1	$0	$3,287	$0	$0	$0	$2,858	$0	$0	$0	$2,485
EQ Mixer Rebuild	$30,000	LS	1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$14,908
Odor Control System Media Replacement	$20,000	LS	1	$0	$0	$0	$0	$11,837	$0	$0	$0	$0	$9,939
Drain PS Pump Overhaul	$20,000	LS	1	$0	$0	$0	$0	$11,837	$0	$0	$0	$0	$9,939
CCTV	$17,000	LS	1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$8,448
Jet/Flush/Root Removal	$8,500	LS	1	$0	$0	$0	$0	$5,031	$0	$0	$0	$0	$4,224
Manhole/Cleanout Inspection	$2,833	LS	1	$0	$0	$0	$0	$1,677	$0	$0	$0	$0	$1,408
Neely Road PS Pump Overhaul	($20,000)	LS	1	$0	$0	$0	$0	($11,837)	$0	$0	$0	$0	($9,939)
Inspection/Testing of Electrical Gear	($5,000)	LS	1	$0	($3,287)	$0	$0	$0	($2,858)	$0	$0	$0	($2,485)
Total Present Value of Intermittent Operations & Maintenance Costs (Years 11-20):				**$0**	**$0**	**$0**	**$0**	**$30,382**	**$0**	**$0**	**$0**	**$0**	**$48,865**
Total Present Value of Intermittent Operations & Maintenance Costs (Life of Projects):													**$191,665**

Preferred Alternative – Force Main Option

Table 5.2.17. Capital Costs
Neely Road Pump Station and Equalization Improvements Project
City of Brevard

Complete the areas shown in gray below. Where shown, use pulldown menus to select options. The spreadsheet will calculate the capital costs.

Alternative:	**Preferred Alternative**			
Project Administration ($):	$2,104,870			
Component	**Unit Cost[a]**	**Unit**	**Quantity**	**Total Cost**
4,760 gpm Pump Station	$1,625,000	LS	1	$1,625,000
20" PVC Force Main	$207	LF	11,400	$2,240,000
12" DIP Force Main	$130	LF	100	$13,000
Temporary Pavement Replacement	$46	SY	6,880	$314,000
Full Roadway Replacement	$325,000	EA	1	$325,000
Force Main River Crossing	$650	LF	2,100	$1,365,000
Equalization Tank (4.5 MG)	$2,074,000	LS	1	$2,074,000
Equalization Tank Dome and Odor Control	$542,000	LS	1	$542,000
Coarse Screening	$33,000	LS	1	$33,000
Equalization Tank Mixing	$433,000	LS	1	$433,000
Equalization Tank Drain	$106,000	LS	1	$106,000
Equalization Tank Pump Station	$190,000	LS	1	$190,000
24" RCP Effluent Pipe	$130	LF	400	$52,000
Effluent Pipe Manhole	$4,500	EA	2	$9,000
Rock Excavation	$54	CY	4,585	$248,000
Special Inspections	$60,000	LS	1	$60,000
			Total Construction Cost:	**$9,629,000**
			Construction Contingency Cost:	**$1,926,000**
			Project Administration Cost:	**$2,105,000**
			Total Capital Cost:	**$13,660,000**

[a]Unit costs are in today's dollars, not future dollars.

Table 5.2.18 Replacement Costs Input
Neely Road Pump Station and Equalization Improvements Project
City of Brevard

Alternative: Preferred Alternative

For each component, enter "Y" in the gray area in the year in which replacement, if any, will occur.

					Year Replacement Needed? (Insert Y in year where replacement is needed.)																			
Component	**Unit Cost**	**Unit**	**Quantity**	**Replacement Needed? (Years 1-20)**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
4,760 gpm Pump Station	$1,625,000	LS	1																					
20" PVC Force Main	$207	LF	11,400																					
12" DIP Force Main	$130	LF	100																					
Temporary Pavement Replacement	$46	SY	6,880																					
Full Roadway Replacement	$325,000	EA	1																					
Force Main River Crossing	$650	LF	2,100																					
Equalization Tank (4.5 MG)	$2,074,000	LS	1																					
Equalization Tank Dome and Odor Control	$542,000	LS	1																					
Coarse Screening	$33,000	LS	1																					
Equalization Tank Mixing	$433,000	LS	1																					
Equalization Tank Drain	$106,000	LS	1																					
Equalization Tank Pump Station	$190,000	LS	1																					
24" RCP Effluent Pipe	$130	LF	400																					
Effluent Pipe Manhole	$4,500	EA	2																					
Rock Excavation	$54	CY	4,585																					
Special Inspections	$60,000	LS	1																					

Table 5.2.19. Replacement Costs (Years 1 to 5)
Neely Road Pump Station and Equalization Improvements Project
City of Brevard
Preferred Alternative

Current Inflation Rate based on Construction Cost Index: 2.64% EPA Discount Rate: 4.875%

Component	Unit Cost	Unit	Quantity	Costs in Year: 1	2	3	4	5
4,760 gpm Pump Station	$1,625,000	LS	1	$0	$0	$0	$0	$0
20" PVC Force Main	$207	LF	11,400	$0	$0	$0	$0	$0
12" DIP Force Main	$130	LF	100	$0	$0	$0	$0	$0
Temporary Pavement Replacement	$46	SY	6,880	$0	$0	$0	$0	$0
Full Roadway Replacement	$325,000	EA	1	$0	$0	$0	$0	$0
Force Main River Crossing	$650	LF	2,100	$0	$0	$0	$0	$0
Equalization Tank (4.5 MG)	$2,074,000	LS	1	$0	$0	$0	$0	$0
Equalization Tank Dome and Odor Control	$542,000	LS	1	$0	$0	$0	$0	$0
Coarse Screening	$33,000	LS	1	$0	$0	$0	$0	$0
Equalization Tank Mixing	$433,000	LS	1	$0	$0	$0	$0	$0
Equalization Tank Drain	$106,000	LS	1	$0	$0	$0	$0	$0
Equalization Tank Pump Station	$190,000	LS	1	$0	$0	$0	$0	$0
24" RCP Effluent Pipe	$130	LF	400	$0	$0	$0	$0	$0
Effluent Pipe Manhole	$4,500	EA	2	$0	$0	$0	$0	$0
Rock Excavation	$54	CY	4,585	$0	$0	$0	$0	$0
Special Inspections	$60,000	LS	1	$0	$0	$0	$0	$0
Total Present Value of Replacement Costs (Years 1 to 5):				**$0**	**$0**	**$0**	**$0**	**$0**

Table 5.2.20. Replacement Costs (Years 6 to 10)
Neely Road Pump Station and Equalization Improvements Project
City of Brevard
Preferred Alternative

Current Inflation Rate based on Construction Cost Index: 2.64% EPA Discount Rate: 4.875%

Component	Unit Cost	Unit	Quantity	Costs in Year: 6	7	8	9	10
4,760 gpm Pump Station	$1,625,000	LS	1	$0	$0	$0	$0	$0
20" PVC Force Main	$207	LF	11,400	$0	$0	$0	$0	$0
12" DIP Force Main	$130	LF	100	$0	$0	$0	$0	$0
Temporary Pavement Replacement	$46	SY	6,880	$0	$0	$0	$0	$0
Full Roadway Replacement	$325,000	EA	1	$0	$0	$0	$0	$0
Force Main River Crossing	$650	LF	2,100	$0	$0	$0	$0	$0
Equalization Tank (4.5 MG)	$2,074,000	LS	1	$0	$0	$0	$0	$0
Equalization Tank Dome and Odor Control	$542,000	LS	1	$0	$0	$0	$0	$0
Coarse Screening	$33,000	LS	1	$0	$0	$0	$0	$0
Equalization Tank Mixing	$433,000	LS	1	$0	$0	$0	$0	$0
Equalization Tank Drain	$106,000	LS	1	$0	$0	$0	$0	$0
Equalization Tank Pump Station	$190,000	LS	1	$0	$0	$0	$0	$0
24" RCP Effluent Pipe	$130	LF	400	$0	$0	$0	$0	$0
Effluent Pipe Manhole	$4,500	EA	2	$0	$0	$0	$0	$0
Rock Excavation	$54	CY	4,585	$0	$0	$0	$0	$0
Special Inspections	$60,000	LS	1	$0	$0	$0	$0	$0
Total Present Value of Replacement Costs (Years 6 to 10):				**$0**	**$0**	**$0**	**$0**	**$0**

Table 5.2.21. Replacement Costs (Years 11 to 15)
Neely Road Pump Station and Equalization Improvements Project
City of Brevard
Preferred Alternative

Current Inflation Rate based on Construction Cost Index: 2.64% EPA Discount Rate: 4.875%

Component	Unit Cost	Unit	Quantity	Costs in Year: 11	12	13	14	15
4,760 gpm Pump Station	$1,625,000	LS	1	$0	$0	$0	$0	$0
20" PVC Force Main	$207	LF	11,400	$0	$0	$0	$0	$0
12" DIP Force Main	$130	LF	100	$0	$0	$0	$0	$0
Temporary Pavement Replacement	$46	SY	6,880	$0	$0	$0	$0	$0
Full Roadway Replacement	$325,000	EA	1	$0	$0	$0	$0	$0
Force Main River Crossing	$650	LF	2,100	$0	$0	$0	$0	$0
Equalization Tank (4.5 MG)	$2,074,000	LS	1	$0	$0	$0	$0	$0
Equalization Tank Dome and Odor Control	$542,000	LS	1	$0	$0	$0	$0	$0
Coarse Screening	$33,000	LS	1	$0	$0	$0	$0	$0
Equalization Tank Mixing	$433,000	LS	1	$0	$0	$0	$0	$0
Equalization Tank Drain	$106,000	LS	1	$0	$0	$0	$0	$0
Equalization Tank Pump Station	$190,000	LS	1	$0	$0	$0	$0	$0
24" RCP Effluent Pipe	$130	LF	400	$0	$0	$0	$0	$0
Effluent Pipe Manhole	$4,500	EA	2	$0	$0	$0	$0	$0
Rock Excavation	$54	CY	4,585	$0	$0	$0	$0	$0
Special Inspections	$60,000	LS	1	$0	$0	$0	$0	$0
Total Present Value of Replacement Costs (Years 11 to 15):				**$0**	**$0**	**$0**	**$0**	**$0**

Table 5.2.22. Replacement Costs (Years 16 to 20)
Neely Road Pump Station and Equalization Improvements Project
City of Brevard
Preferred Alternative

Current Inflation Rate based on Construction Cost Index: 2.64% EPA Discount Rate: 4.875%

Component	Unit Cost	Unit	Quantity	Costs in Year: 16	17	18	19	20
4,760 gpm Pump Station	$1,625,000	LS	1	$0	$0	$0	$0	$0
20" PVC Force Main	$207	LF	11,400	$0	$0	$0	$0	$0
12" DIP Force Main	$130	LF	100	$0	$0	$0	$0	$0
Temporary Pavement Replacement	$46	SY	6,880	$0	$0	$0	$0	$0
Full Roadway Replacement	$325,000	EA	1	$0	$0	$0	$0	$0
Force Main River Crossing	$650	LF	2,100	$0	$0	$0	$0	$0
Equalization Tank (4.5 MG)	$2,074,000	LS	1	$0	$0	$0	$0	$0
Equalization Tank Dome and Odor Control	$542,000	LS	1	$0	$0	$0	$0	$0
Coarse Screening	$33,000	LS	1	$0	$0	$0	$0	$0
Equalization Tank Mixing	$433,000	LS	1	$0	$0	$0	$0	$0
Equalization Tank Drain	$106,000	LS	1	$0	$0	$0	$0	$0
Equalization Tank Pump Station	$190,000	LS	1	$0	$0	$0	$0	$0
24" RCP Effluent Pipe	$130	LF	400	$0	$0	$0	$0	$0
Effluent Pipe Manhole	$4,500	EA	2	$0	$0	$0	$0	$0
Rock Excavation	$54	CY	4,585	$0	$0	$0	$0	$0
Special Inspections	$60,000	LS	1	$0	$0	$0	$0	$0
Total Present Value of Replacement Costs (Years 16 to				**$0**	**$0**	**$0**	**$0**	**$0**
Total Present Value of Replacement Costs (Life of Project):								**$0**

Table 5.2.23. Present Value of Operations and Maintenance Costs (Years 1-10)
Neely Road Pump Station and Equalization Improvements Project
City of Brevard
Preferred Alternative

Complete the cells shown in gray below.

Current Inflation Rate Based on Municipal Cost Index: 1.27%

EPA Discount Rate: 4.875%

				Present Value of O&M Costs for Year:									
Component	**Unit Cost**	**Unit**	**Quantity**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Force Main													
ARV/VB	$10,000	LS	1	$9,656	$9,325	$9,004	$8,695	$8,396	$8,108	$7,829	$7,560	$7,300	$7,049
Jet/Flush	$10,000	LS	1	$9,656	$9,325	$9,004	$8,695	$8,396	$8,108	$7,829	$7,560	$7,300	$7,049
CCTV	$4	LF	4,075	$15,740	$15,199	$14,677	$14,173	$13,686	$13,215	$12,761	$12,323	$11,899	$11,490
ARV/VB	($6,000)	LS	1	($5,794)	($5,595)	($5,403)	($5,217)	($5,038)	($4,865)	($4,697)	($4,536)	($4,380)	($4,230)
Jet/Flush	($5,000)	LS	1	($4,828)	($4,662)	($4,502)	($4,347)	($4,198)	($4,054)	($3,914)	($3,780)	($3,650)	($3,525)
CCTV	($4)	LF	4,075	($15,740)	($15,199)	($14,677)	($14,173)	($13,686)	($13,215)	($12,761)	($12,323)	($11,899)	($11,490)
Pipe Repair	($10,000)	EA	2	($19,313)	($18,649)	($18,008)	($17,390)	($16,792)	($16,215)	($15,658)	($15,120)	($14,600)	($14,099)
Neely Road Pump Station													
Pump Operation	$40,000	LS	1	$38,626	$37,298	$36,017	$34,779	$33,584	$32,430	$31,316	$30,240	$29,201	$28,197
Change Oil	$4,500	LS	1	$4,345	$4,196	$4,052	$3,913	$3,778	$3,648	$3,523	$3,402	$3,285	$3,172
Pull/Inspect Pumps	$2,500	LS	1	$2,414	$2,331	$2,251	$2,174	$2,099	$2,027	$1,957	$1,890	$1,825	$1,762
Grease/Scum Pump Out Wet-Well	$1,200	LS	1	$1,159	$1,119	$1,081	$1,043	$1,008	$973	$939	$907	$876	$846
Instrumentation Calibration	$2,500	LS	1	$2,414	$2,331	$2,251	$2,174	$2,099	$2,027	$1,957	$1,890	$1,825	$1,762
Pump Operation	($40,000)	LS	1	($38,626)	($37,298)	($36,017)	($34,779)	($33,584)	($32,430)	($31,316)	($30,240)	($29,201)	($28,197)
Change Oil	($4,500)	LS	1	($4,345)	($4,196)	($4,052)	($3,913)	($3,778)	($3,648)	($3,523)	($3,402)	($3,285)	($3,172)
Pull/Inspect Pumps	($2,500)	LS	1	($2,414)	($2,331)	($2,251)	($2,174)	($2,099)	($2,027)	($1,957)	($1,890)	($1,825)	($1,762)
Grease/Scum Pump Out Wet-Well	($1,200)	LS	1	($1,159)	($1,119)	($1,081)	($1,043)	($1,008)	($973)	($939)	($907)	($876)	($846)
Instrumentation Calibration	($2,500)	LS	1	($2,414)	($2,331)	($2,251)	($2,174)	($2,099)	($2,027)	($1,957)	($1,890)	($1,825)	($1,762)
Sanitary Sewer Overflows													
Equipment	($1,500)	EA	13	($18,830)	($18,183)	($17,558)	($16,955)	($16,372)	($15,810)	($15,266)	($14,742)	($14,235)	($13,746)
Oversight and Clean-up	($1,000)	EA	13	($12,553)	($12,122)	($11,705)	($11,303)	($10,915)	($10,540)	($10,178)	($9,828)	($9,490)	($9,164)
Reporting	($500)	EA	13	($6,277)	($6,061)	($5,853)	($5,652)	($5,457)	($5,270)	($5,089)	($4,914)	($4,745)	($4,582)
Equalization Tank													
EQ Tank Inspection/Cleaning	$12,000	LS	1	$11,588	$11,190	$10,805	$10,434	$10,075	$9,729	$9,395	$9,072	$8,760	$8,459
Mixer Operation	$10,000	LS	1	$9,656	$9,325	$9,004	$8,695	$8,396	$8,108	$7,829	$7,560	$7,300	$7,049
Change Lubricant/Inspect Mixers	$5,500	LS	1	$5,311	$5,129	$4,952	$4,782	$4,618	$4,459	$4,306	$4,158	$4,015	$3,877
Instrumentation Calibration	$3,500	LS	1	$3,380	$3,264	$3,151	$3,043	$2,939	$2,838	$2,740	$2,646	$2,555	$2,467
Odor Control System Operation	$10,000	LS	1	$9,656	$9,325	$9,004	$8,695	$8,396	$8,108	$7,829	$7,560	$7,300	$7,049
Odor Control System Fan Maintenance	$3,000	LS	1	$2,897	$2,797	$2,701	$2,608	$2,519	$2,432	$2,349	$2,268	$2,190	$2,115
Odor Control System Piping/Nozzle Maintenance	$2,500	LS	1	$2,414	$2,331	$2,251	$2,174	$2,099	$2,027	$1,957	$1,890	$1,825	$1,762
Drain PS Pump Operation	$10,000	LS	1	$9,656	$9,325	$9,004	$8,695	$8,396	$8,108	$7,829	$7,560	$7,300	$7,049
Drain PS Pump Pull/Inspect	$2,500	LS	1	$2,414	$2,331	$2,251	$2,174	$2,099	$2,027	$1,957	$1,890	$1,825	$1,762
Drain PS Pump Oil Change	$4,500	LS	1	$4,345	$4,196	$4,052	$3,913	$3,778	$3,648	$3,523	$3,402	$3,285	$3,172
Total Present Value of Yearly O&M Expenses (Years 1-10):				**$13,036**	**$12,588**	**$12,156**	**$11,738**	**$11,335**	**$10,945**	**$10,569**	**$10,206**	**$9,855**	**$9,517**

Table 5.2.24. Present Value of Operations and Maintenance Costs (Years 11-20)
Neely Road Pump Station and Equalization Improvements Project
City of Brevard
Preferred Alternative

Current Inflation Rate Based on Municipal Cost Index: 1.27% EPA Discount Rate: 4.875%

				Present Value of O&M Costs for Year:									
Component	**Unit Cost**	**Unit**	**Quantity**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Force Main													
ARV/VB	$10,000	LS	1	$6,807.10	$6,573.20	$6,347.33	$6,129.23	$5,918.62	$5,715.25	$5,518.87	$5,329.24	$5,146.12	$4,969.29
Jet/Flush	$10,000	LS	1	$6,807.10	$6,573.20	$6,347.33	$6,129.23	$5,918.62	$5,715.25	$5,518.87	$5,329.24	$5,146.12	$4,969.29
CCTV	$4	LF	4,075	$11,095.57	$10,714.31	$10,346.15	$9,990.65	$9,647.36	$9,315.86	$8,995.76	$8,686.66	$8,388.17	$8,099.94
ARV/VB	($6,000)	LS	1	($4,048.26)	($3,943.92)	($3,808.40)	($3,677.54)	($3,551.17)	($3,429.15)	($3,311.32)	($3,197.54)	($3,087.67)	($2,981.57)
Jet/Flush	($5,000)	LS	1	($3,403.55)	($3,286.60)	($3,173.67)	($3,064.62)	($2,959.31)	($2,857.63)	($2,759.44)	($2,664.62)	($2,573.06)	($2,484.65)
CCTV	($4)	LF	4,075	($11,095.57)	($10,714.31)	($10,346.15)	($9,990.65)	($9,647.36)	($9,315.86)	($8,995.76)	($8,686.66)	($8,388.17)	($8,099.94)
Pipe Repair	($10,000)	EA	2	($13,614.19)	($13,146.39)	($12,694.67)	($12,258.46)	($11,837.25)	($11,430.51)	($11,037.74)	($10,658.47)	($10,292.23)	($9,938.58)
Neely Road Pump Station													
Pump Operation	$40,000	LS	1	$27,228.39	$26,292.79	$25,389.34	$24,516.93	$23,674.50	$22,861.02	$22,075.48	$21,316.95	$20,584.47	$19,877.16
Change Oil	$4,500	LS	1	$3,063.19	$2,957.94	$2,856.30	$2,758.15	$2,663.38	$2,571.86	$2,483.49	$2,398.16	$2,315.75	$2,236.18
Pull/Inspect Pumps	$2,500	LS	1	$1,701.77	$1,643.30	$1,586.83	$1,532.31	$1,479.66	$1,428.81	$1,379.72	$1,332.31	$1,286.53	$1,242.32
Grease/Scum Pump Out Wet-Well	$1,200	LS	1	$816.85	$788.78	$761.68	$735.51	$710.23	$685.83	$662.26	$639.51	$617.53	$596.31
Instrumentation Calibration	$2,500	LS	1	$1,701.77	$1,643.30	$1,586.83	$1,532.31	$1,479.66	$1,428.81	$1,379.72	$1,332.31	$1,286.53	$1,242.32
Pump Operation	($40,000)	LS	1	($27,228.39)	($26,292.79)	($25,389.34)	($24,516.93)	($23,674.50)	($22,861.02)	($22,075.48)	($21,316.95)	($20,584.47)	($19,877.16)
Change Oil	($4,500)	LS	1	($3,063.19)	($2,957.94)	($2,856.30)	($2,758.15)	($2,663.38)	($2,571.86)	($2,483.49)	($2,398.16)	($2,315.75)	($2,236.18)
Pull/Inspect Pumps	($2,500)	LS	1	($1,701.77)	($1,643.30)	($1,586.83)	($1,532.31)	($1,479.66)	($1,428.81)	($1,379.72)	($1,332.31)	($1,286.53)	($1,242.32)
Grease/Scum Pump Out Wet-Well	($1,200)	LS	1	($816.85)	($788.78)	($761.68)	($735.51)	($710.23)	($685.83)	($662.26)	($639.51)	($617.53)	($596.31)
Instrumentation Calibration	($2,500)	LS	1	($1,701.77)	($1,643.30)	($1,586.83)	($1,532.31)	($1,479.66)	($1,428.81)	($1,379.72)	($1,332.31)	($1,286.53)	($1,242.32)
Sanitary Sewer Overflows													
Equipment	($1,500)	EA	13	($13,273.84)	($12,817.73)	($12,377.30)	($11,952.00)	($11,541.32)	($11,144.75)	($10,761.80)	($10,392.01)	($10,034.93)	($9,690.12)
Oversight and Clean-up	($1,000)	EA	13	($8,849.23)	($8,545.16)	($8,251.53)	($7,968.00)	($7,694.21)	($7,429.83)	($7,174.53)	($6,928.01)	($6,689.95)	($6,460.08)
Reporting	($500)	EA	13	($4,424.61)	($4,272.58)	($4,125.77)	($3,984.00)	($3,847.11)	($3,714.92)	($3,587.27)	($3,464.00)	($3,344.98)	($3,230.04)
Equalization Tank													
EQ Tank Inspection/Cleaning	$12,000	LS	1	$8,168.52	$7,887.84	$7,616.80	$7,355.08	$7,102.35	$6,858.30	$6,622.65	$6,395.08	$6,175.34	$5,963.15
Mixer Operation	$10,000	LS	1	$6,807.10	$6,573.20	$6,347.33	$6,129.23	$5,918.62	$5,715.25	$5,518.87	$5,329.24	$5,146.12	$4,969.29
Change Lubricant/Inspect Mixers	$5,500	LS	1	$3,743.90	$3,615.26	$3,491.03	$3,371.08	$3,255.24	$3,143.39	$3,035.38	$2,931.08	$2,830.36	$2,733.11
Instrumentation Calibration	$3,500	LS	1	$2,382.48	$2,300.62	$2,221.57	$2,145.23	$2,071.52	$2,000.34	$1,931.60	$1,865.23	$1,801.14	$1,739.25
Odor Control System Operation	$10,000	LS	1	$6,807.10	$6,573.20	$6,347.33	$6,129.23	$5,918.62	$5,715.25	$5,518.87	$5,329.24	$5,146.12	$4,969.29
Odor Control System Fan Maintenance	$3,000	LS	1	$2,042.13	$1,971.96	$1,904.20	$1,838.77	$1,775.59	$1,714.58	$1,655.66	$1,598.77	$1,543.84	$1,490.79
Odor Control System Piping/Nozzle Maintenance	$2,500	LS	1	$1,701.77	$1,643.30	$1,586.83	$1,532.31	$1,479.66	$1,428.81	$1,379.72	$1,332.31	$1,286.53	$1,242.32
Drain PS Pump Operation	$10,000	LS	1	$6,807.10	$6,573.20	$6,347.33	$6,129.23	$5,918.62	$5,715.25	$5,518.87	$5,329.24	$5,146.12	$4,969.29
Drain PS Pump Pull/Inspect	$2,500	LS	1	$1,701.77	$1,643.30	$1,586.83	$1,532.31	$1,479.66	$1,428.81	$1,379.72	$1,332.31	$1,286.53	$1,242.32
Drain PS Pump Oil Change	$4,500	LS	1	$3,063.19	$2,957.94	$2,856.30	$2,758.15	$2,663.38	$2,571.86	$2,483.49	$2,398.16	$2,315.75	$2,236.18
Total Present Value of Yearly O&M Expenses (Years 11-20):				**$9,189.58**	**$8,873.82**	**$8,568.90**	**$8,274.46**	**$7,990.14**	**$7,715.59**	**$7,450.48**	**$7,194.47**	**$6,947.26**	**$6,708.54**
Total Present Value of Annual O&M Costs (Life of Project)													**$190,857.73**

Table 5.2.25 Intermittent Operations and Maintenance Costs
Neely Road Pump Station and Equalization Improvements Project
City of Brevard

Alternative: Preferred Alternative

Enter any intermittent O&M activities, associated unit and cost information, and the quantity.

				Year O&M Needed? (Insert Y in year where O&M is needed.)																			
Component	**Unit Cost**	**Unit**	**Quantity**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Neely Road PS Pump Overhaul	$20,000	LS	1					Y					Y					Y					Y
Inspection/Testing of Electrical Gear	$5,000	LS	1				Y				Y				Y				Y				Y
EQ Mixer Rebuild	$30,000	LS	1										Y										Y
Odor Control System Media Replacement	$20,000	LS	1					Y					Y					Y					Y
Drain PS Pump Overhaul	$20,000	LS	1					Y					Y					Y					Y
Neely Road PS Pump Overhaul	($20,000)	LS	1					Y					Y					Y					Y
Inspection/Testing of Electrical Gear	($5,000)	LS	1				Y				Y				Y				Y				Y

Table 5.2.26. Present Value of Intermittent Operations and Maintenance Costs (Years 1-10)
Neely Road Pump Station and Equalization Improvements Project
City of Brevard
Preferred Alternative

Current Inflation Rate Based on Municipal Cost Index: 1.27% EPA Discount Rate: 4.875%

Component	Unit Cost	Unit	Quantity	Present Value of O&M Costs for Year: 1	2	3	4	5	6	7	8	9	10
Neely Road PS Pump Overhaul	$20,000	LS	1	$0	$0	$0	$0	$16,792	$0	$0	$0	$0	$14,099
Inspection/Testing of Electrical Gear	$5,000	LS	1	$0	$0	$0	$4,347	$0	$0	$0	$3,780	$0	$0
EQ Mixer Rebuild	$30,000	LS	1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$21,148
Odor Control System Media Replacement	$20,000	LS	1	$0	$0	$0	$0	$16,792	$0	$0	$0	$0	$14,099
Drain PS Pump Overhaul	$20,000	LS	1	$0	$0	$0	$0	$16,792	$0	$0	$0	$0	$14,099
Neely Road PS Pump Overhaul	-$20,000	LS	1	$0	$0	$0	$0	($16,792)	$0	$0	$0	$0	($14,099)
Inspection/Testing of Electrical Gear	-$5,000	LS	1	$0	$0	$0	($4,347)	$0	$0	$0	($3,780)	$0	$0
Present Value of Intermittent Operations & Maintenance Costs (Years 1-10):				**$0**	**$0**	**$0**	**$0**	**$33,584**	**$0**	**$0**	**$0**	**$0**	**$49,345**

Table 5.2.27 Present Value of Intermittent Operations and Maintenance Costs (Years 11-20)
Neely Road Pump Station and Equalization Improvements Project
City of Brevard
Preferred Alternative

Current Inflation Rate Based on Municipal Cost Index: 1.27% EPA Discount Rate: 4.875%

Component	Unit Cost	Unit	Quantity	Present Value of O&M Costs for Year: 11	12	13	14	15	16	17	18	19	20
Neely Road PS Pump Overhaul	$20,000	LS	1	$0	$0	$0	$0	$11,837	$0	$0	$0	$0	$9,939
Inspection/Testing of Electrical Gear	$5,000	LS	1	$0	$3,287	$0	$0	$0	$2,858	$0	$0	$0	$2,485
EQ Mixer Rebuild	$30,000	LS	1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$14,908
Odor Control System Media Replacement	$20,000	LS	1	$0	$0	$0	$0	$11,837	$0	$0	$0	$0	$9,939
Drain PS Pump Overhaul	$20,000	LS	1	$0	$0	$0	$0	$11,837	$0	$0	$0	$0	$9,939
Neely Road PS Pump Overhaul	($20,000)	LS	1	$0	$0	$0	$0	($11,837)	$0	$0	$0	$0	($9,939)
Inspection/Testing of Electrical Gear	($5,000)	LS	1	$0	($3,287)	$0	$0	$0	($2,858)	$0	$0	$0	($2,485)
Total Present Value of Intermittent Operations & Maintenance Costs (Years 11-20):				**$0**	**$0**	**$0**	**$0**	**$23,674**	**$0**	**$0**	**$0**	**$0**	**$34,785**
Total Present Value of Intermittent Operations & Maintenance Costs (Life of Project):													**$141,389**

5.2.1 Total Present Worth

Table 5.2.28. Total Present Worth for Feasible Alternatives
Neely Road Pump Station and Equalization Improvements Project
City of Brevard

	Capital Costs	Replacement Costs Present Worth	O&M Costs Present Worth			Total Present Worth
			Annual	Intermittent	Total	
Gravity Sewer Option	$14,732,000	$0	($166,824)	$191,665	$24,841	$14,756,841
Preferred Alternative	$13,660,000	$0	$190,858	$141,389	$332,247	$13,992,247

As discussed in Section 5.2 O&M costs for the No-Action alternative were presented to show the net change in O&M costs between what the City spends to perform the required O&M activities (i.e. No-Action alternative) versus the alternative being considered. Additionally, the No-Action alternative was found to be infeasible. As such, the total present worth for this alternative is not shown in the above table.

5.3 Alternatives Analysis Summary

Table 5.3.1. Alternatives Analysis Summary
Neely Road Pump Station and Equalization Improvements Project
City of Brevard

		Alternative Name				
		No-Action Alternative (Do Nothing)	**Alternative 2 (Optimum Performance of Existing Facilities)**	**Alternative 3 (Pump Configuration)**	**Alternative 4 (Gravity Option)**	**Preferred Alternative (Force Main Option)**
Capital Cost		N/A	N/A	N/A	$14,732,000	$13,660,000
Present Worth		N/A	N/A	N/A	$14,756,841	$13,992,247
Feasibility		Feasible ☒ Infeasible	Feasible ☒ Infeasible	Feasible ☒ Infeasible	☒ Feasible ☐ Infeasible	
Impact Analysis	**Capital Costs**	Less than Preferred ☒ Greater than Preferred ☐ Same as Preferred	Less than Preferred ☒ Greater than Preferred ☐ Same as Preferred	Less than Preferred ☒ Greater than Preferred ☐ Same as Preferred	Less than Preferred ☒ Greater than Preferred ☐ Same as Preferred	
	Present Worth	N/A	N/A	N/A	Less than Preferred ☒ Greater than Preferred ☐ Same as Preferred	
	Environmental	Less than Preferred ☒ Greater than Preferred ☐ Same as Preferred	Less than Preferred ☒ Greater than Preferred ☐ Same as Preferred	Less than Preferred ☒ Greater than Preferred ☐ Same as Preferred	Less than Preferred ☒ Greater than Preferred ☐ Same as Preferred	
Rationale for Rejection/Acceptance		Potential environmental impacts from continued SSOs, does not meet SOC conditions between City and EMC	Facility optimization does not address hydraulic limitations at the existing Neely Road pump station, will not address SSOs	Pumping configuration does not address limitations associated with the undersized Neely Road force main, will not address SSOs	Costs approximately $0.76M (present worth cost) more to accomplish same outcome as Preferred Alternative, potential inaccessibility due to location in floodway, potential schedule impacts from easement acquisition	Provides the most environmental benefit, eliminates need for easements, addresses applicable portions of the SOC, and most cost effective in long term

5.4 Proposed Project Description

5.4.1 Proposed Project Overview

The City of Brevard currently experiences excessive I/I due to the age and condition of their wastewater collection system. Additionally, portions of the collection and conveyance system are undersized for wet-weather flows. The City is negotiating a SOC with EMC to bring operation of the system back in compliance with applicable permits. As such, the City is currently undertaking several projects, described below, to address these problems.

This proposed project will address capacity limitations associated with the Neely Road pump station and associated force main, as well as the WWTP. The project proposes the following:

- Construction of a 4,760 gpm pump station to replace the existing Neely Road pump station
- Construction of 13,500 LF of 20" PVC force main to convey sanitary flows from the new Neely Road pump station to the WWTP
- Construction of a 4.5 MG equalization tank at the WWTP to handle flows in excess of current treatment capacities
- Relocation of 400 LF of 24" RCP effluent discharge pipe at the WWTP

5.4.2 Proposed Project Location

The proposed project will occur within the City of Brevard, located in Transylvania County, as shown on Figure 1-1. Ultimately, the project will affect all sewersheds as shown in Figure 2-1. The southern sewersheds (Brushy Creek, Jumping Branch, Singing Branch, Gallimore, Elm Bend, Kings Creek, and Lambo Creek) are incorporated into the project as a result of construction of the new Neely Road force main. The northern sewersheds (Lambs Creek, Pisgah Forest, Turkey Creek, and Davidson River) will be part of the project based on the construction of the equalization tank at the WWTP.

5.4.3 Interrelated Projects

As mentioned previously, excessive I/I was found to be a major cause of SSOs within the collection system. The City is working to address I/I in the following sewersheds:

- Brushy Creek
- Jumping Branch
- Singing Branch
- Gallimore
- Kings Creek

The City has plans to undertake several rehabilitation projects to address I/I within the sewersheds listed above. Additionally, the City has been approved for CWSRF funding for FY 2014 collection system rehabilitation improvements in the Kings Creek sewershed.

5.4.4 Proposed Project Impacts

In total, the proposed project will cause approximately 7.0 acres of land disturbance. The majority of this disturbance will result from construction of the force main and will occur within NCDOT easements along Neely Road, Old Highway 64, and Wilson Road. The proposed project will add limited impermeable surfaces to the project area. The proposed alignment crosses three streams (Lamb Creek, Lambo Creek, and Gilbreath Creek), two of which (Lamb Creek and Lambo Creek) are Class C, Trout Sensitive Waters. Additionally, the alignment crosses the French Broad River near the Wilson Road pump station. The project proposes crossing all waterways except Gilbreath Branch, via trenchless methods to avoid impacts. The proposed installation across Gilbreath Branch would be via open cut construction. All four crossings are shown on Figure 5-2.

Wetland impacts are anticipated as part of the proposed project. The impacts can be divided into temporary and permanent and are anticipated as follows:

- Temporary impacts – Are anticipated along the force main alignment between the French Broad River and the WWTP. Additional impacts are anticipated to result from relocation of the WWTPs effluent discharge pipe and construction activities associated with the equalization tank. In total, temporary impacts are anticipated to impact less than 0.40 acres of wetlands, which will be restored to pre-construction conditions.

- Permanent impacts – Are anticipated to result from construction activities associated with the equalization tank. Due to the limited footprint available for the tank and City height ordinances, construction activities are expected to necessitate filling in less than 0.10 acres of wetlands.

5.4.5 Proposed Project Site Improvements

Construction activities associated with installation of the force main are not expected to increase the impermeable area along the proposed alignment. Paving activities will only serve to replace or repair existing pavement that is disturbed as a result of construction activities.

Approximately 13,250 square feet (0.30 acres) of impermeable area will result from construction of the equalization tank. Additionally, approximately 2,500 square feet (0.06 acres) of impermeable area will be added to the project from construction of the Neely Road pump station. It is also important to note that the proposed project eliminates impermeable area within the floodway, via demolition of the existing pump station.

Section 6

Environmental Information Document (EID)

This section contains the Environmental Information Document (EID) for the City of Brevard Neely Road Pump Station and Equalization Improvements project. Because this project includes a pump station and force main with a proposed permitted capacity of more than 1,750 gallons per minute, a Major EID is required.

6.1 Topography and Floodplains

6.1.1 Existing Conditions

The City of Brevard Neely Road Pump Station and Force Main project is located in the Blue Ridge (Mountains) physiographic province in Transylvania County. Elevations in the project area range from approximately 2092 feet to 2164 feet MSL. According to the 2008 report An Inventory of the Natural Areas of Transylvania County, NC by Edward Schwartzman, the Brevard Fault divides Transylvania County into two distinct geological zones, the Piedmont Terrane and the Blue Ridge. Areas southeast of the fault, including the project area, are lower in elevation and have a more gentle topography.

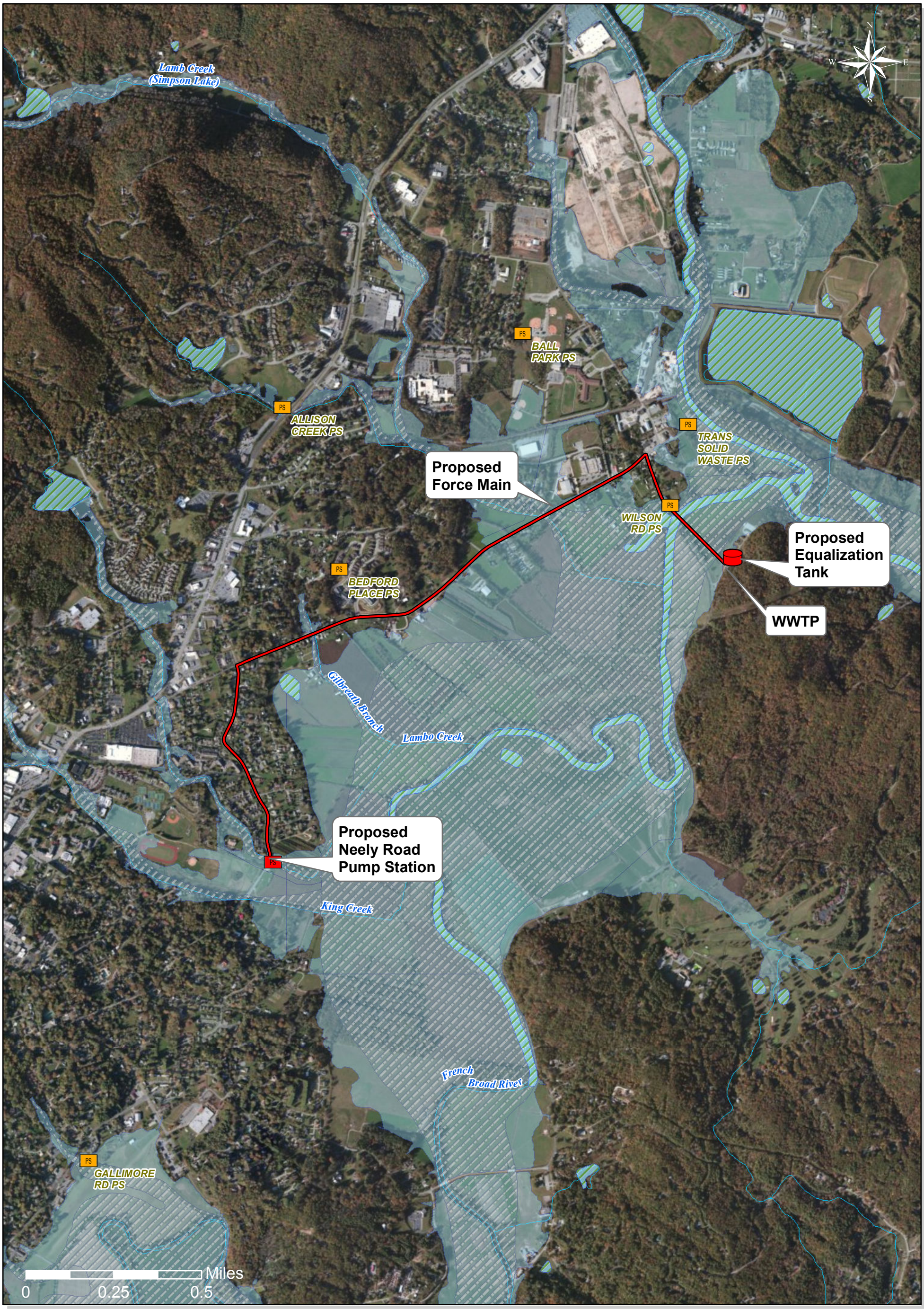
The force main crosses the 100-year floodplain and the floodway associated with Lambo Creek, Gilbreath Branch, Lamb Creek, and the French Broad River. The proposed flow equalization tank at the Brevard Wastewater Treatment Plant (WWTP) and the pump station on Neely Road are both located in the 100-year floodplain. The 100-year floodplain and floodway areas are shown on **Figure 6-1**.

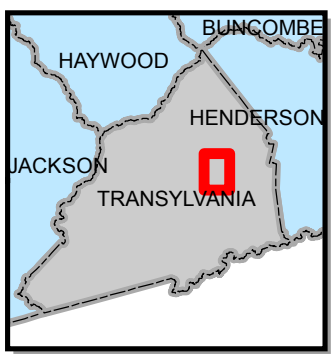
6.1.2 Direct Impacts

The force main will be installed below ground, and existing topography will be restored. Construction will temporarily impact the topography; however, there will be no permanent impact on topography, floodplains, or the floodway caused by the force main. The flow equalization tank will have a permanent impact on the floodplain caused by fill material and the tank itself being placed in the floodplain. It is anticipated that the impact of the tank and fill material will be insignificant; however, a no-rise certification will be completed to document the impact.

The equalization tank will be constructed at the WWTP on a site that has previously been filled. Alternatives to this location would require the City to purchase additional property, which is not a practicable alternative. Two alternative sites at the WWTP were identified. One would require grading and rock removal into a steep hill on the south side of the WWTP. This alternative is not practicable due to the steepness (1:1) of the hill slope, which would require purchasing additional property as well as significant grading. The other alternative site at the WWTP is adjacent to Wilson Road but is also within the 100-year floodplain.

The Neely Road Pump Station will not be constructed in the 100-year floodplain or floodway. A small portion of the pump station site is located within the 100-year floodplain adjacent to Lambo Creek; however, impacts in this area will be limited to minor grading if needed with no permanent loss of floodplain area anticipated. A no-rise certification will be completed to document the impacts if required by the City Floodplain Administrator. We met with the City Floodplain Administrator at the beginning of the project and will continue to coordinate with him during design. Both the flow





CDM Smith

LEGEND

- Floodway
- 100 Year Flood
- NWI Wetland
- Force Main Improvements
- Equalization Improvements
- Existing Pump Station
- Neely Rd Pump Station
- Surface Water

Figure 6-1
Environmental Features Map
Neely Road Pump Station
and Equalization
Improvements Project

BREVARD, NORTH CAROLINA

equalization tank and pump station will be constructed to prevent water from flooding from entering the structures during the 100-year design storm.

6.1.3 Secondary and Cumulative Impacts

Secondary and cumulative changes to topography, floodplains, and floodways in the project area and expanded service area could be caused by growth. These impacts will be mitigated by the City of Brevard's flood hazard ordinance (City of Brevard Code of Ordinances, Part II, Chapter 34, Article III, see Appendix I). This ordinance requires flood protection for structures constructed in flood hazard areas. In addition, the ordinance states that development of land within special flood hazard areas cannot occur without a determination that the construction will not cause flooding.

6.2 Soils

6.2.1 Existing Conditions

Soils in the project area vary from frequently flooded soils along the surface waters to the extremely steep Unaka-Porters complex on the south side of the WWTP. Frequently flooded loams are typical along streams and do not pose a problem for construction of the force main. The flow equalization tank will be constructed at the WWTP on Toxaway loam and Saunook loam. The location of the tank was selected to avoid the extremely steep and rocky slope of the Unaka-Porters soil complex, which would require difficult construction. The pump station will be constructed near Lambo Creek on frequently flooded Rosman and Toxaway loams.

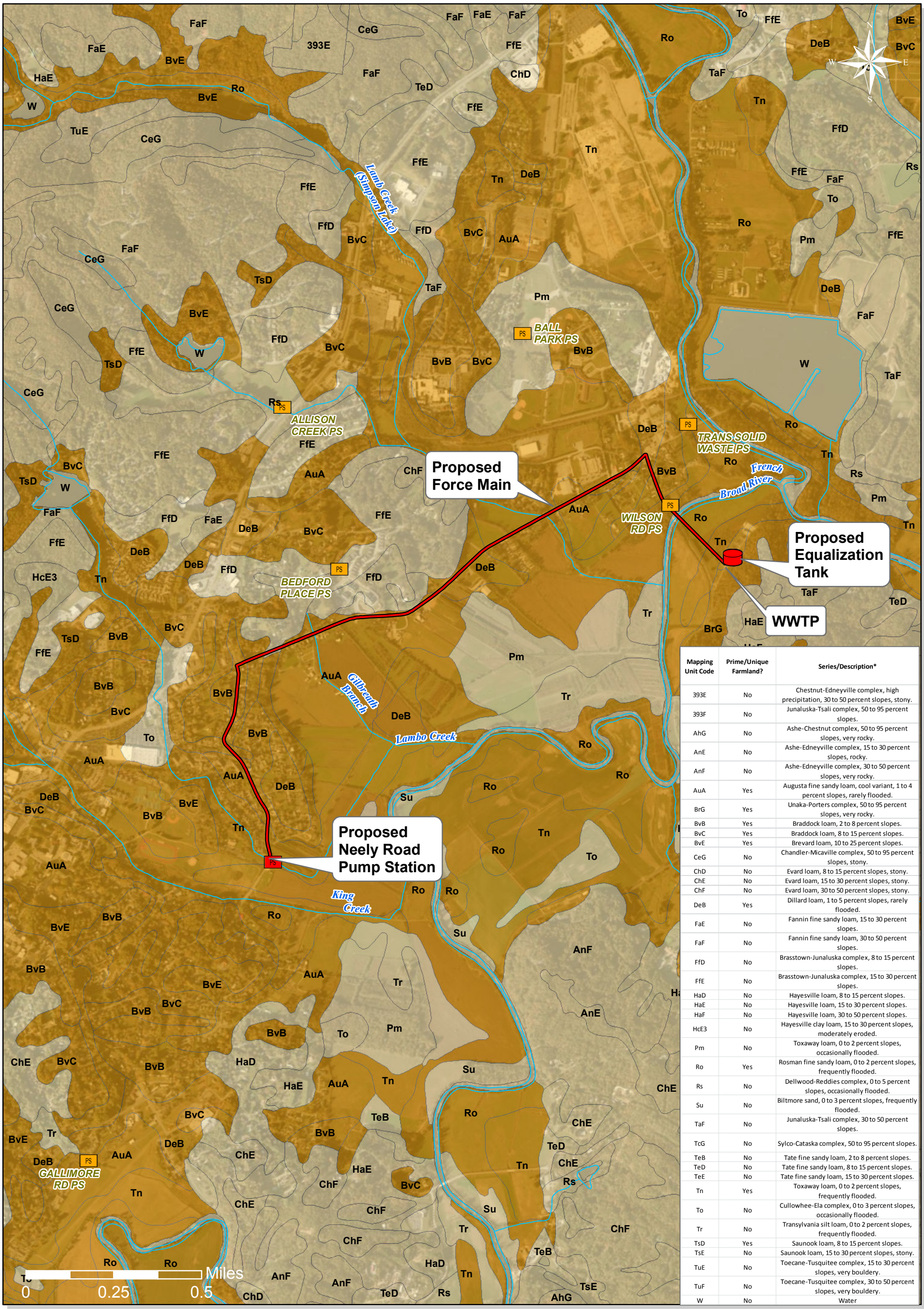
Table 6-1 lists soils in the project area. **Figure 6-2** depicts the location of each soil type within the project area.

Table 6-1. Soils in Project Area

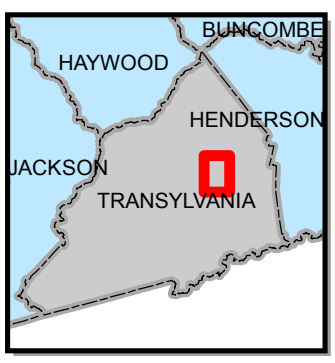
Mapping Unit Code	Series/Description*
Ro	Rosman fine sandy loam, 0 to 2 percent slopes, frequently flooded
Tn	Toxaway loam, 0 to 2 percent slopes, frequently flooded
AuA	Augusta fine sandy loam, cool variant, 1 to 4 percent slopes, rarely flooded
BvB	Braddock loam, 2 to 8 percent slopes
BvC	Braddock loam, 8 to 15 percent slopes
BvE	Brevard loam, 10 to 25 percent slopes
DeB	Dillard loam, 1 to 5 percent slopes, rarely flooded
TsD	Saunook loam, 8 to 15 percent slopes
BrG	Unaka-Porters complex, 50 to 95 percent slopes, very rocky

* From NRCS's Web Soil Survey for Transylvania County

There are three areas of potential soil contamination within 500 feet of the project area. The NC Division of Waste Management's Regional Underground Storage Tank (RUST) database lists two underground storage tanks incident and release reports along the proposed force main on Old Highway 64 (Old Hendersonville Highway/SR 1504). There is also one inactive hazardous waste site listed. The US EPA lists records of the spill of sodium hydrosulfide and other contaminants at the



Mapping Unit Code	Prime/Unique Farmland?	Series/Description*
393E	No	Chestnut-Edneyville complex, high precipitation, 30 to 50 percent slopes, stony.
393F	No	Junaluska-Tsali complex, 50 to 95 percent slopes.
AhG	No	Ashe-Chestnut complex, 50 to 95 percent slopes, very rocky.
AnE	No	Ashe-Edneyville complex, 15 to 30 percent slopes, rocky.
AnF	No	Ashe-Edneyville complex, 30 to 50 percent slopes, very rocky.
AuA	Yes	Augusta fine sandy loam, cool variant, 1 to 4 percent slopes, rarely flooded.
BrG	Yes	Unaka-Porters complex, 50 to 95 percent slopes, very rocky.
BvB	Yes	Braddock loam, 2 to 8 percent slopes.
BvC	Yes	Braddock loam, 8 to 15 percent slopes.
BvE	Yes	Brevard loam, 10 to 25 percent slopes.
CeG	No	Chandler-Micaville complex, 50 to 95 percent slopes, stony.
ChD	No	Evard loam, 8 to 15 percent slopes, stony.
ChE	No	Evard loam, 15 to 30 percent slopes, stony.
ChF	No	Evard loam, 30 to 50 percent slopes, stony.
DeB	Yes	Dillard loam, 1 to 5 percent slopes, rarely flooded.
FaE	No	Fannin fine sandy loam, 15 to 30 percent slopes.
FaF	No	Fannin fine sandy loam, 30 to 50 percent slopes.
FfD	No	Brasstown-Junaluska complex, 8 to 15 percent slopes.
FfE	No	Brasstown-Junaluska complex, 15 to 30 percent slopes.
HaD	No	Hayesville loam, 8 to 15 percent slopes.
HaE	No	Hayesville loam, 15 to 30 percent slopes.
HaF	No	Hayesville loam, 30 to 50 percent slopes.
HcE3	No	Hayesville clay loam, 15 to 30 percent slopes, moderately eroded.
Pm	No	Toxaway loam, 0 to 2 percent slopes, occasionally flooded.
Ro	Yes	Rosman fine sandy loam, 0 to 2 percent slopes, frequently flooded.
Rs	No	Dellwood-Reddies complex, 0 to 5 percent slopes, occasionally flooded.
Su	No	Biltmore sand, 0 to 3 percent slopes, frequently flooded.
TaF	No	Junaluska-Tsali complex, 30 to 50 percent slopes.
TcG	No	Sylco-Cataska complex, 50 to 95 percent slopes.
TeB	No	Tate fine sandy loam, 2 to 8 percent slopes.
TeD	No	Tate fine sandy loam, 8 to 15 percent slopes.
TeE	No	Tate fine sandy loam, 15 to 30 percent slopes.
Tn	Yes	Toxaway loam, 0 to 2 percent slopes, frequently flooded.
To	No	Cullowhee-Ela complex, 0 to 3 percent slopes, occasionally flooded.
Tr	No	Transylvania silt loam, 0 to 2 percent slopes, frequently flooded.
TsD	Yes	Saunook loam, 8 to 15 percent slopes.
TsE	No	Saunook loam, 15 to 30 percent slopes, stony.
TuE	No	Toecane-Tusquitee complex, 15 to 30 percent slopes, very bouldery.
TuF	No	Toecane-Tusquitee complex, 30 to 50 percent slopes, very bouldery.
W	No	Water



CDM Smith

LEGEND

- Non Prime/Unique Farmland
- Prime/Unique Farmland
- Force Main Improvements
- Equalization Improvements
- Existing Pump Station
- Neely Rd Pump Station
- Surface Water

Figure 6-2
Soils Map
Neely Road Pump Station and Equalization Improvements Project

BREVARD, NORTH CAROLINA

former Ecusta site in 2008. US EPA also reports contamination at the Pisgah Laboratories site on the Old Hendersonville Highway. These areas of potential contamination are listed in Table 6-2.

Table 6-2. Areas of Potential Contamination in Project Area*

ID Number	Database/Reference	Address
Incident #22610	RUST	Gaynell Brewer Property, 1004 Old Hendersonville Highway
Incident #28317	RUST	One Stop #5, Old Highway 64 and Ecusta Road
EPA ID NCD980502827	Inactive Hazardous Sites	Brown #1, SR 1504 Vanderbilt Road (Ecusta Road)
EPA ID NCD986188134	US EPA	Pisgah Laboratories Inc., 795 Old Hendersonville Highway

* Within 500 feet of project area

6.2.2 Direct Impacts

Installation of the proposed improvements will temporarily impact soils, as they will be disturbed during construction. The amount of soil to be disturbed is estimated to be approximately 16,700 cubic yards. Most of the soil removed for construction of the force main will be replaced in the trench. Any excess material will be removed to an appropriate location.

The pump station and flow equalization tank represent a permanent change to soils in the immediate area where the structures will be located. No soil will be contaminated by the proposed project. Excess soil will be generated by excavation and installation of the flow equalization tank and pump station. The contractor will be required to remove any excess soils to an appropriate location.

As recommended in correspondence from the NC Division of Waste Management Special Remediation Branch, although it is not anticipated that the sites with potential contamination will affect the proposed project or vice versa, site files will be reviewed so that proper health and safety precautions can be taken if needed.

6.2.3 Secondary and Cumulative Impacts

The primary purpose of this project is to increase capacity of the wastewater collection system to address system overflows. However, the improved system will be sized to accommodate the City's planned, modest growth, which will change some land use in the area over time. The City will avoid significant secondary and cumulative impacts to soils by guiding growth as outlined in its 2014 Draft Comprehensive Plan (Appendix I), which emphasizes protecting and preserving natural resources and encourages infill type redevelopment projects. Soil will be protected during future growth and development through sediment and erosion control permitting.

6.3 Prime and Unique Farmland

6.3.1 Existing Conditions

Several soil map units found in the project area are designated as prime or unique farmland. These designations are listed in **Table 6-3** and shown on Figure 6-2.

6.3.2 Direct Impacts

Installation of the proposed improvements will temporarily impact soils that are designated as prime or unique farmland, as they will be disturbed during construction. However, the force main will be installed primarily within existing roads and will have no direct impact on prime or unique farmlands.

Table 6-3 Prime and Unique Farmland in Project Area

Mapping Unit Code	Farmland Designation
Ro	Prime farmland if protected from flooding or not frequently flooded during the growing season
Tn	Prime farmland if drained and protected from flooding or not frequently flooded during growing season
AuA	Prime farmland if drained
BvB	Prime farmland
BvC	Farmland of statewide importance
BvE	Farmland of local importance
DeB	Prime farmland
TsD	Farmland of statewide importance
BrG	Not prime farmland

* From NRCS's Web Soil Survey for Transylvania County

The pump station and flow equalization tank represent a permanent change to areas that contain soils that are designated prime or unique farmland; however, the areas are not currently used as farmland. The equalization tank will be installed at the WWTP. The pump station will be installed near farmed areas with soil that is designated as prime farmland, but the site is currently used as a gravel equipment storage area.

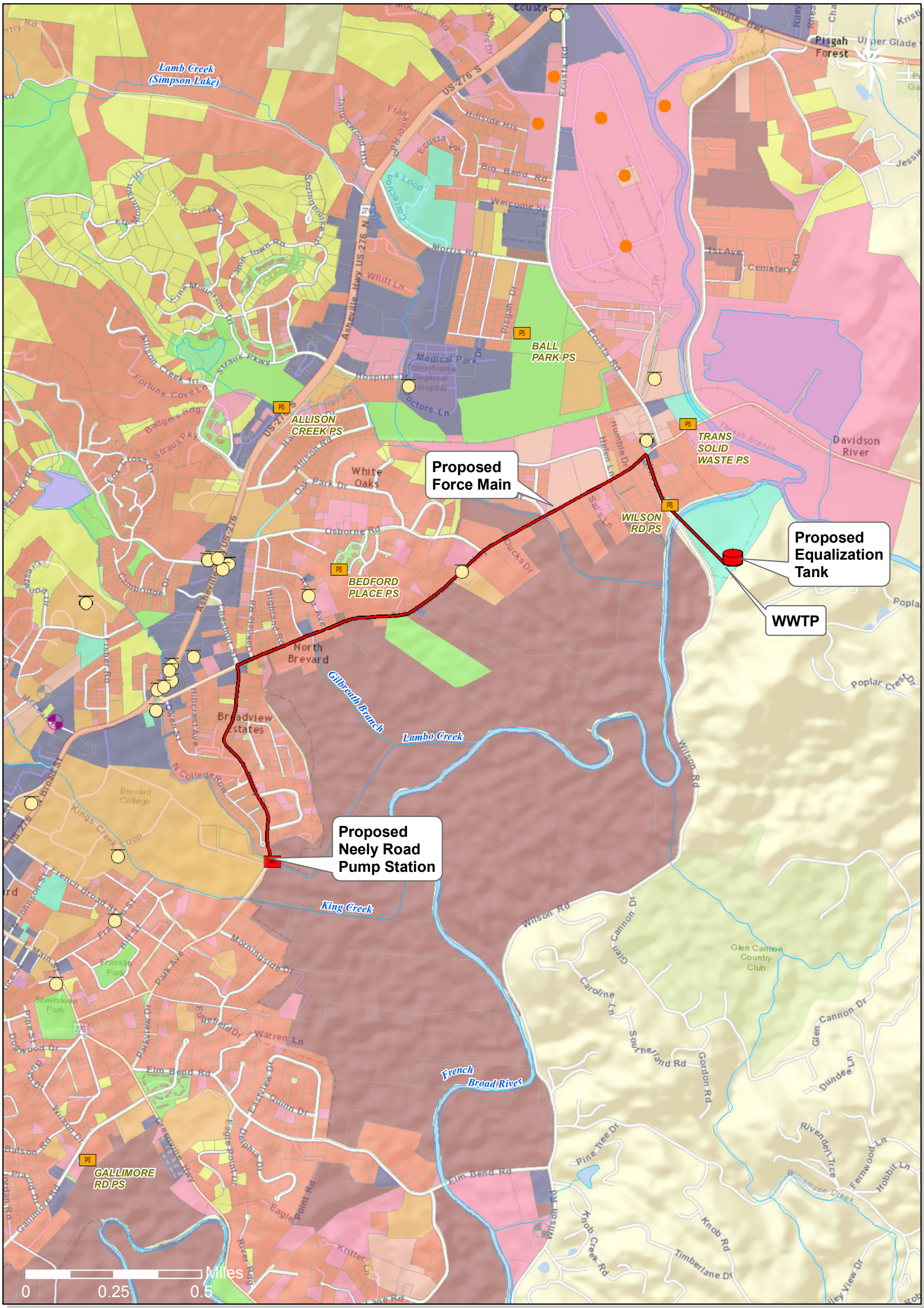
6.3.3 Secondary and Cumulative Impacts

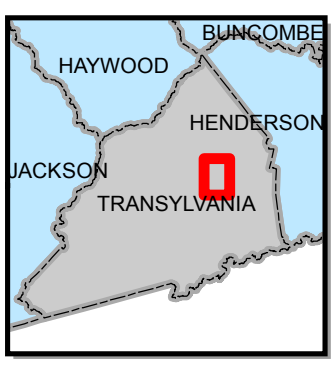
The primary purpose of this project is to increase capacity of the wastewater collection system to address system overflows. However, the improved system will be sized to accommodate the City's planned, modest growth, which will change some land use including prime farmland in the area over time. The City will avoid significant secondary and cumulative impacts to prime farmland by guiding growth as outlined in its 2014 Draft Comprehensive Plan (Appendix I), which emphasizes protecting and preserving natural resources and agricultural areas and encourages infill type redevelopment projects. The growth and development that does occur will be subject to the Unified Development Ordinance (Appendix I), ensuring that these sensitive areas are preserved and growth occurs in a planned way.

6.4 Land Use

6.4.1 Existing Conditions

The flow equalization tank will be installed on City of Brevard property on a portion of the WWTP site that was previously used as a police training area but is currently not used. The pump station will be located adjacent to the existing Neely Road Pump Station at Neely Road and Lambo Creek. The site of the new pump station is currently used as a gravel storage area for equipment. The land adjacent to the pump station is farmland. The force main will be installed between the new pump station and the new equalization tank at the WWTP primarily along existing roads. The force main will follow Neely Road, Old Hendersonville Highway, and Wilson Road. The force main will be installed within the pavement of the roads. Land use adjacent to the force main route includes farmland, residential uses including mobile homes and single family homes, high density residential uses associated with Brevard College, commercial, light industrial, medical, and undeveloped areas. Land use in the project area is shown on **Figure 6-3**.





CDM Smith

LEGEND

- Agriculture
- Cemeteries
- Commercial
- Conservation
- Developed Recreation
- Government
- Institutional
- Manufacturing
- Residential
- Uncatagorized
- Undeveloped
- Vacant
- Water
- Force Main Improvements
- Equalization Improvements
- Existing Pump Station
- Neely Rd Pump Station
- Surface Water
- Brownfields
- Hazardous Waste Sites
- Inactive Hazardous Sites
- Regional Underground Storage Tanks

Figure 6-3
Land Use Map
Neely Road Pump Station
and Equalization
Improvements Project

BREVARD, NORTH CAROLINA

6.4.2 Direct Impacts

Direct impacts to land use as a result of this project will be minimal. The flow equalization tank will be constructed at the Brevard WWTP, on the same parcel as the existing WWTP facilities. The site is zoned office/institutional. The force main will be installed within existing roads, and few if any easements will be required. Land use after construction will remain the same. The pump station will be constructed next to the existing pump station on an already-cleared site that is used for the same purpose and is zoned residential.

6.4.3 Secondary and Cumulative Impacts

The primary purpose of this project is to increase capacity of the wastewater collection system to address system overflows. However, the improved system will be sized to accommodate the City's planned, modest growth, which will change some land use in the area over time. The City will avoid significant secondary and cumulative impacts to land use by guiding growth as outlined in its 2014 Draft Comprehensive Plan (Appendix I), which emphasizes protecting and preserving natural resources and encourages infill type redevelopment projects. As stated in the Draft Comprehensive Plan, growth in Brevard will be constrained by steep slopes, extensive floodplains, and sensitive or conservation land that cannot be developed. The growth and development that does occur will be subject to the Unified Development Ordinance (Appendix I), ensuring that these sensitive areas are preserved and growth occurs in a planned way.

6.5 Forest Resources

6.5.1 Existing Conditions

Forest resources in the project area consist of mixed hardwoods and pines along the streams and French Broad River crossed by the proposed force main and ornamental trees in front of homes and businesses along the roads. The pump station will be constructed on a cleared area adjacent to Lambo Creek. The equalization tank will be constructed on a cleared portion of the WWTP site.

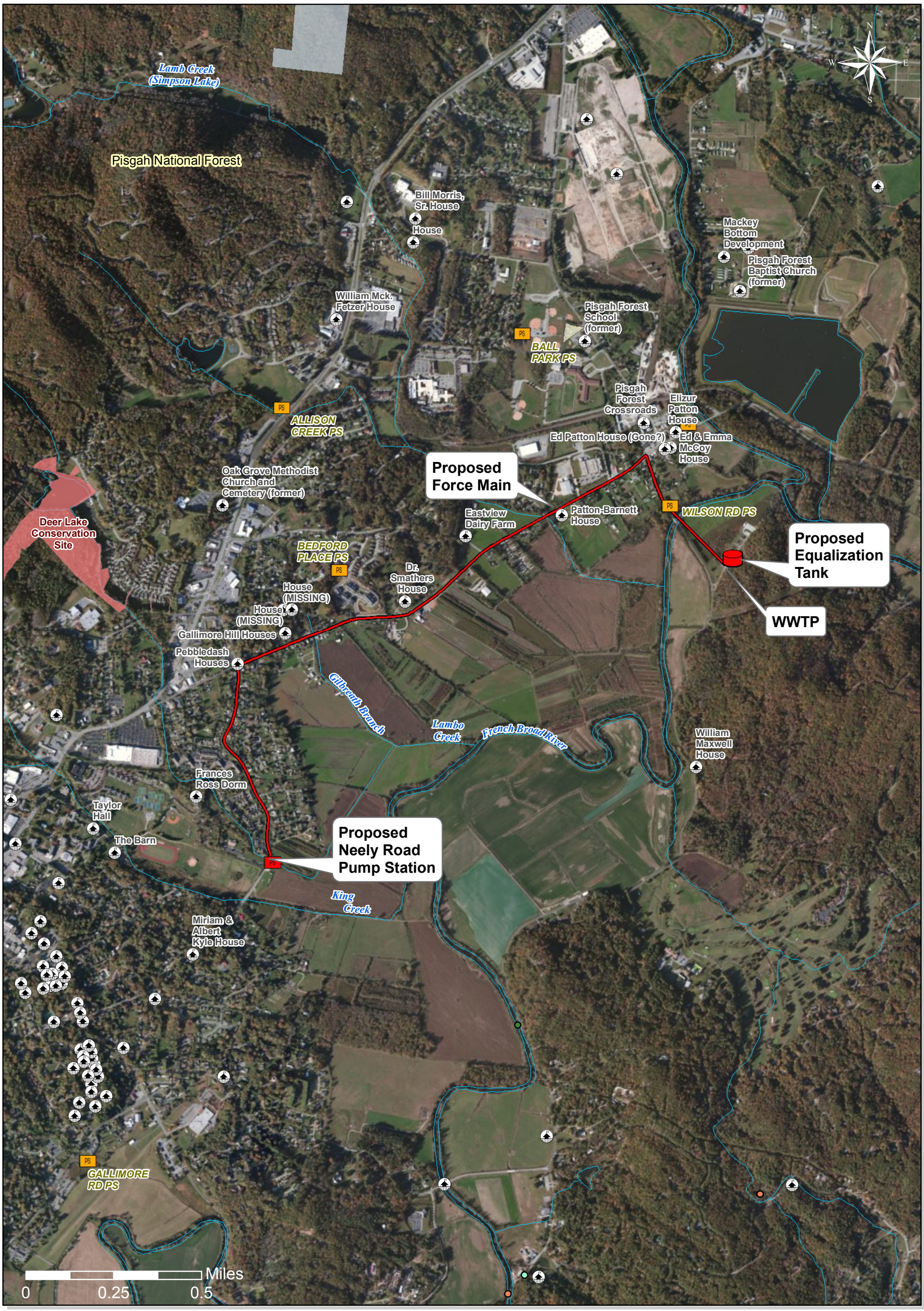
The City of Brevard is surrounded by protected forests, including the Nantahala National Forest, Pisgah National Forest, Gorges State Park, Toxaway Game Land, and Dupont State Forest. However, these areas are outside the project area, as shown on **Figure 6-4**.

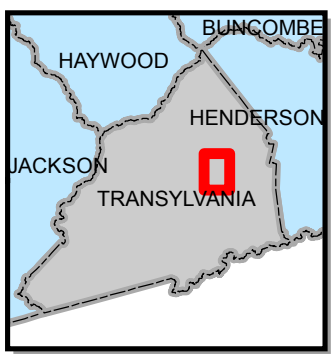
6.5.2 Direct Impacts

Direct impacts to forest resources are expected to be minimal. The pump station and equalization tank sites are both already cleared. The force main will be installed within the road pavement. Some trees may need to be removed on the WWTP site to accommodate piping to the tank and a portion of the effluent pipeline that will be rerouted as part of this project. Trees around the streams may need to be removed for installation of the force main. Tree clearing will be minimized.

6.5.3 Secondary and Cumulative Impacts

The primary purpose of this project is to increase capacity of the wastewater collection system to address system overflows. However, the improved system will be sized to accommodate the City's planned, modest growth, which will change some land use in the area over time and could affect forested areas. The City will avoid significant secondary and cumulative impacts to forest resources by guiding growth as outlined in its 2014 Draft Comprehensive Plan (Appendix I), which emphasizes protecting and preserving natural resources and encourages infill type redevelopment projects. As stated in the Draft Comprehensive Plan, growth in Brevard will be constrained by steep slopes, extensive





CDM Smith

LEGEND

Natural Heritage Element
- Animal Assemblage
- Invertebrate Animal
- Natural Community
- Nonvascular Plant
- Vascular Plant
- Vertebrate Animal
- Historical Feature
- Significant Natural Heritage Area

- Force Main Improvements
- Equalization Improvements
- Existing Pump Station
- Neely Rd Pump Station
- Surface Water
- State Land
- Federal Land
- Land Trust Conservation Property

Figure 6-4
Public Lands, Natural Areas and Protected Species Map
Neely Road Pump Station and Equalization Improvements Project

BREVARD, NORTH CAROLINA

floodplains, and sensitive or conservation land that cannot be developed. The growth and development that does occur will be subject to the Unified Development Ordinance (Appendix I), ensuring that these sensitive areas are preserved and growth occurs in a planned way. The national forests, game land, and forested conservation areas surrounding the Brevard area are protected from development.

6.6 Wetlands and Streams

6.6.1 Existing Conditions

The project area includes several streams – Lambo Creek, Gilbreath Branch, Lamb Creek, the French Broad River, and several unnamed tributaries. US Fish and Wildlife Service National Wetland Inventory mapping indicates that there is a seasonally flooded scrub-shrub wetland with broad-leaf deciduous trees near the French Broad River. The mapping also classifies the French Broad River as an upper perennial riverine system. Field delineations indicate that the floodplain areas on the south side of the French Broad River just north of the WWTP site are wetlands. CDM Smith held a pre-submittal meeting with representatives of the US Army Corps of Engineers (USACE), NC Wildlife Resources Commission (WRC), and US Fish and Wildlife Service (USFWS) in October 2014. USACE verified the wetland delineation at the WWTP site and the stream jurisdictional determinations. Wetland and stream designations in the project area are shown on **Figures 6-5** and **6-6**.

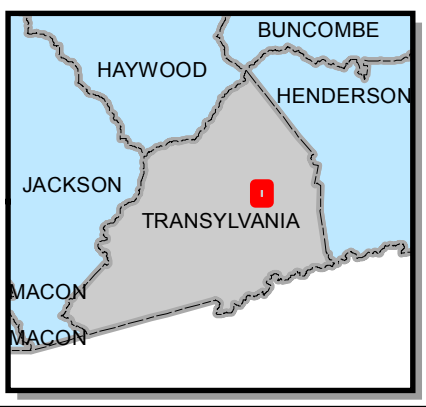
6.6.2 Direct Impacts

CDM Smith has delineated the streams and wetlands in the project area. Representatives of the US Army Corps of Engineers (USACE) verified the wetland delineation and stream determinations on October 21, 2014. Construction of the pump station will not impact wetlands or streams. Construction of the flow equalization tank will impact a small amount (less than 0.10 acre) of wetlands at the WWTP site. Installation of the force main will several streams, the French Broad River, and wetlands adjacent to the river and on the WWTP site. **Table 6-4** lists streams that were investigated in the project area with a description of the proposed impacts to each. Streams identified as S4, S6, S7, and S8 are listed as zero impact, because the force main will cross these streams under the existing road culverts, which are being replaced as part of a separate NCDOT project. Wetland impacts are summarized in **Table 6-5**.

Table 6-4 Stream Impacts

Stream ID on Map	Name	Jurisdictional or Non-jurisdictional	Diameter/Type of Line to be Installed	Installation Method	Linear Feet of Impact
S1	Lambo Creek	Jurisdictional	20” PVC Force Main	Open-cut	30 LF
S2	UT	Jurisdictional	20” PVC Force Main	Open-cut	20 LF
S3	Gilbreath Branch	Jurisdictional	20” PVC Force Main	Open-cut	20 LF
S4	UT	Jurisdictional	20” PVC Force Main	Open-cut	0 LF (installed under culvert; part of NCDOT project)
S5	UT	Jurisdictional	20” PVC Force Main	Open-cut	20 LF
S6	UT	Jurisdictional	20” PVC Force Main	Open-cut	0 LF (installed under culvert; part of NCDOT project)
S7	UT	Non-jurisdictional	20” PVC Force Main	Open-cut	0 LF (installed under culvert; part of NCDOT project)
S8	N/A – ditch	Non-jurisdictional	20” PVC Force Main	Open-cut	0 LF (installed under culvert; part of NCDOT project)
S9	UT	Jurisdictional	20” PVC Force Main	Open-cut	20 LF
S10	Lamb Creek	Jurisdictional	20” PVC Force Main	Open-cut	30 LF
S11	French Broad River	Jurisdictional	20” PVC Force Main	Horizontal Directional Drill	N/A – HDD crossing
				Total Impacts	**140 LF**

ID	Name	Location	USACE Jurisdictional or Non-Jurisdictional	Perennial or Intermittent
S1	Lambo Creek	Adjacent to Neely Road Pump Station	Jurisdictional	Perennial
S2	UT	West side of Neely Road	Jurisdictional	Perennial
S3	Gilbreath Branch	West of forked driveway near houses	Jurisdictional	Perennial
S4	UT	West of Broad River Terrace Apt. driveway	Jurisdictional	Intermittent
S5	UT	East of Broad River Terrace Apt. driveway at end of sidewalk (west of Rabbit Run)	Jurisdictional	Perennial downstream of Old Hendersonville Highway; intermittent upstream of Old Hendersonville Highway
S6	UT	East of Rabbit Run	Jurisdictional	Perennial
S7	UT	West of The Family Place beside TURF sign	Non-jurisdictional from Old Hendersonville Highway to white pine tree; jurisdictional downstream of white pine tree	N/A
S8	N/A – ditch	East of The Family Place	Non-jurisdictional	N/A
S9	UT	East of Duck Drive	Jurisdictional	Intermittent
S10	Lamb Creek	Along Old Hendersonville Highway west of Wilson Road	Jurisdictional	Perennial
S11	French Broad River	Adjacent to Wilson Road Pump Station and boat launch	Jurisdictional	Perennial



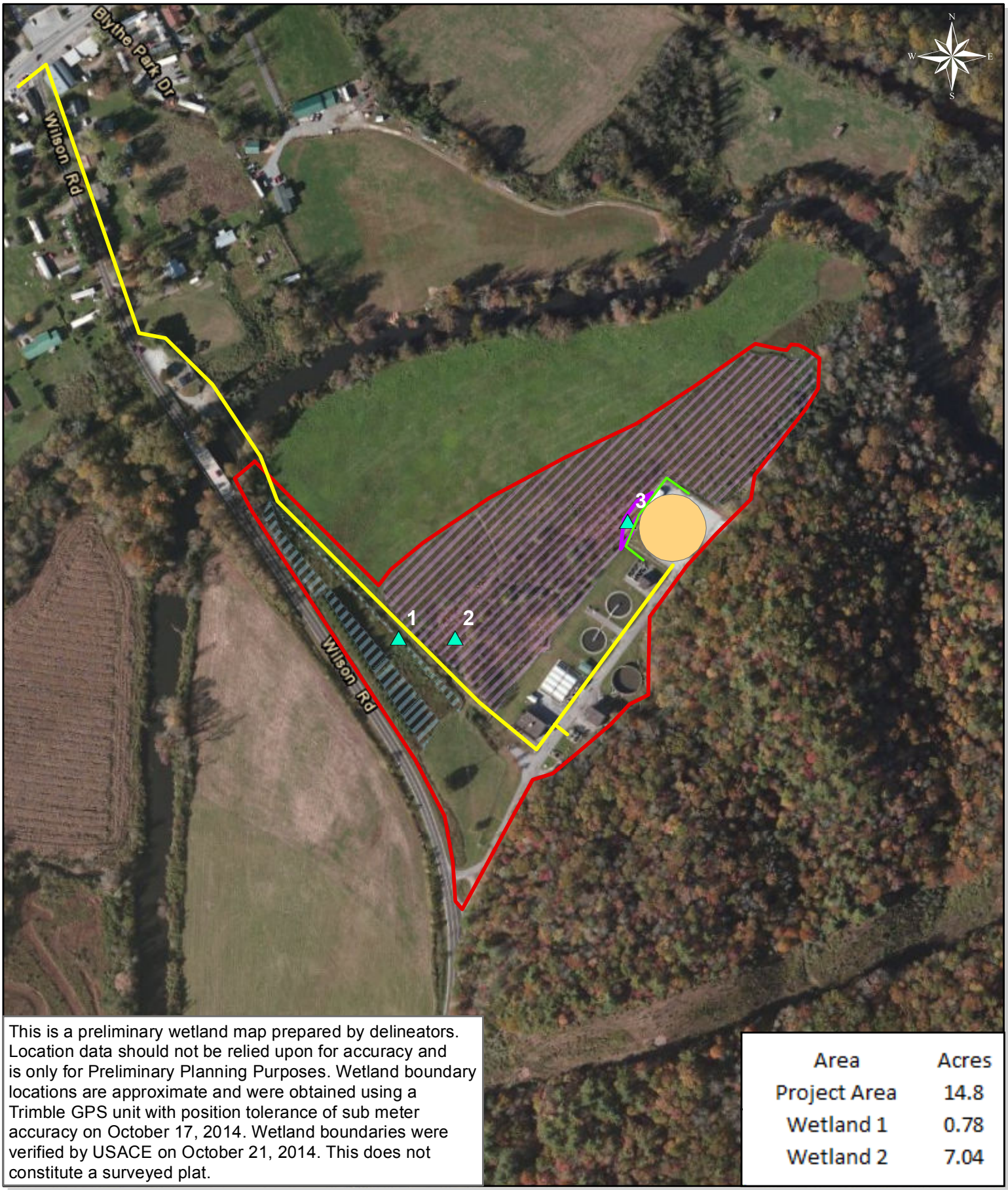
CDM Smith

LEGEND

- Stream Crossing
- Surface Wat

Figure 6-5
Stream Crossings
Neely Road Pump Station and Equalization Improvements Project

BREVARD, NORTH CAROLINA



This is a preliminary wetland map prepared by delineators. Location data should not be relied upon for accuracy and is only for Preliminary Planning Purposes. Wetland boundary locations are approximate and were obtained using a Trimble GPS unit with position tolerance of sub meter accuracy on October 17, 2014. Wetland boundaries were verified by USACE on October 21, 2014. This does not constitute a surveyed plat.

Area	Acres
Project Area	14.8
Wetland 1	0.78
Wetland 2	7.04

Legend

- Approximate Location of Proposed Force Main
- Approximate Location of Relocated Effluent Sewer
- Approximate Location of Proposed Flow Equalization Tank
- Wetland Impact Area
- Wetland 1
- Wetland 2
- Project Area
- Sample Location

0 150 300 600 Feet

1 inch = 300 feet

CDM Smith

Figure 6-6 Proposed Improvements Map Brevard WWTP

BREVARD, NORTH CAROLINA

Table 6-5 Wetland Impacts

ID on Map	Location	Acres of Wetland	Description and Installation Method	Type of Impact	Acres of Permanent Impact
Wetland 1	Brevard WWTP	0.78 ac.	20" PVC force main will be open-cut in wetland; grade will be restored and area revegetated with native material	Temporary	--
Wetland 2	Brevard WWTP	7.04 ac.	24" RCP effluent gravity sewer will be open-cut in wetland for relocation; grade to be restored and revegetated with native material	Temporary	--
			Equalization Tank site will be graded and filled	Permanent	0.07 ac.
				Total Permanent Impacts	0.07 ac.

Tank construction will avoid or minimize impacts to the wetlands as much as practicable. Wetlands were avoided by using the existing fill area as much as possible. Alternatives to this location would require the City to purchase additional property off site, which is not a practicable alternative because of cost. This would also increase the operational complexity. Two alternative sites at the WWTP were identified. One would require grading and rock removal into a steep hill on the south side of the WWTP. This alternative is not practicable due to the steepness (1:1) of the hill slope, which would require purchasing additional property as well as significant grading, rock removal, and possibly retaining walls. The other alternative site at the WWTP is adjacent to Wilson Road but is within the 100-year floodplain and would be too close to Wilson Road.

Wetlands along the pipelines will be revegetated with native vegetation and restored upon completion of construction. Stream banks will be revegetated with live-staked woody vegetation and native herbaceous vegetation as recommended by the NC Wildlife Resources Commission during the site visit.

This project will benefit the area by reducing sanitary sewer overflows, thereby improving water quality for fish and aquatic species in the project area and downstream of the area.

6.6.3 Secondary and Cumulative Impacts

The primary purpose of this project is to increase capacity of the wastewater collection system to address system overflows. However, the improved system will be sized to accommodate the City's planned, modest growth, which could put direct or indirect pressure on streams and wetlands in the area over time. The City will avoid significant secondary and cumulative impacts to streams and wetlands by guiding growth as outlined in its 2014 Draft Comprehensive Plan (Appendix I), which emphasizes protecting and preserving natural resources. The growth and development that does occur will be subject to the Unified Development Ordinance (Appendix I), ensuring that these sensitive areas are preserved and growth occurs in a planned way. For example, the City of Brevard's flood hazard ordinance (City of Brevard Code of Ordinances, Part II, Chapter 34, Article III, see Appendix I) discourages development in floodplains, which often surround and include streams and wetlands, by requiring a determination that the construction will not cause flooding. Wetland and stream impacts from future development will be subject to regulations and permits from USACE and DWR.

6.7 Water Resources

6.7.1 Existing Conditions

Surface waters in the project area include Lambo Creek, Gilbreath Branch, Lamb Creek, and the French Broad River. Classifications and use support ratings are listed in **Table 6-6**. The project is located in the French Broad River Basin. The April 2011 French Broad River Basinwide Water Quality Plan does not provide a use support rating for the French Broad River in the project area; however, it is rated as supporting upstream and downstream of the project area. Surface waters are shown on Figure 6-1.

Table 6-6 Characteristics of Surface Water in Project Area

Surface Water	Classification	Use Support Rating
Lambo Creek	C; Trout Water	Not rated (no data)
Gilbreath Branch	N/A	Not rated (no data)
Lamb Creek	C; Trout Water	Not rated (no data)
French Broad River	B	Not rated (no data) in project area

* From NCDENR DWR Classifications and Standards/Rules Review Branch

The water source for the City of Brevard is Catheys Creek, a tributary of the French Broad River located southwest of the City.

According to the US Department of the Interior Geological Survey and NC Department of Natural and Economic Resources July 1974 report *Public Water Supplies of North Carolina Part 3 Mountains and Western Piedmont*, the type of rock in the Brevard area is Henderson Gneiss, and the French Broad River valley contains unconsolidated deposits of alluvium and weathered rock up to 70 feet deep over bedrock. The report further states that the geology of the Mountain hydrologic area is poorly productive surficial granular material with more productive fractured rock underneath. Well yields for the Henderson Gneiss are area reported to average 33 gallons per minute (gpm) up to 120 gpm. The average depth is reported to be 212 feet. The report characterizes the quality of groundwater in the area as soft, acidic, and with iron concentrations greater than 0.3 mg/L. Turbidity can be a problem in the French Broad River floodplain.

6.7.2 Direct Impacts

Construction of the pump station, force main, and equalization tank could cause sedimentation in the surrounding surface waters. An erosion and sediment control plan will be developed to minimize impacts to the streams. The Erosion and Sediment Control Plan (and Stormwater NPDES Permit) will be submitted to and approved by DENR prior to construction. The force main will be constructed across Gilbreath Branch using open cut construction. The crossing of the French Broad River will be constructed using trenchless construction (directional drilling). This project will benefit the area by reducing sanitary sewer overflows, thereby improving water quality for fish and aquatic species in the project area and downstream of the area. Impacts to groundwater resources during construction will be temporary impacts to surficial groundwater; however these are expected to be minimal based on the depth of construction.

6.7.3 Secondary and Cumulative Impacts

The primary purpose of this project is to increase capacity of the wastewater collection system to address system overflows. However, the improved system will be sized to accommodate the City's planned, modest growth, which could put direct or indirect pressure on water resources in the area

over time. The City will avoid significant secondary and cumulative impacts to water resources by guiding growth as outlined in its 2014 Draft Comprehensive Plan (Appendix I), which emphasizes protecting and preserving natural resources. The growth and development that does occur will be subject to the Unified Development Ordinance (Appendix I), ensuring that these sensitive areas are preserved and growth occurs in a planned way. For example, the City of Brevard's flood hazard ordinance (City of Brevard Code of Ordinances, Part II, Chapter 34, Article III, see Appendix I) discourages development in floodplains, which often surround and include streams and wetlands, by requiring a determination that the construction will not cause flooding.

Surface waters that are classified by DWR as Trout Waters are protected by buffer zones. State regulations require an undisturbed buffer zone 25 feet wide or wide enough to eliminate visible siltation past the 25 percent of the buffer zone nearest the land-disturbing activity, whichever is greater, or approval from the Sedimentation Control Commission that the activity will be temporary and minimal. These stream buffers will provide additional protection of streams with the Trout Water designation as development occurs.

Stream impacts from future development will be subject to regulations and permits from the USACE and DWR.

6.8 Shellfish and Fish and Their Habitats and Protected Aquatic Species

6.8.1 Existing Conditions

There are four surface waters in the project area – Lambo Creek, Lamb Creek, Gilbreath Branch, and the French Broad River. The surface waters in the project area are home to game fish including trout rainbow, brown, and brook), muskellunge (muskie), and smallmouth bass. The headwaters of Lamb Creek in the designated game land area of Pisgah National Forest (outside the project area) are classified by the NC Wildlife Resources Commission as a wild trout water. In the Rosman area (upstream of the project area), the French Broad River is a hatchery-supported trout water. Additional fish species in the area include catfish, bream, perch, shellcrackers and other sunfish.

Table 6-7 lists threatened and endangered fish and shellfish for the two USGS quadrangles (Pisgah Forest and Brevard) in which the project area lies. Protected species are shown on Figure 6-4.

Table 6-7 Protected Aquatic Species in Project Area

Taxonomic Group	Scientific Name	Common Name	State Status	Federal Status	Habitat Comment	Status
Caddisfly	*Matrioptila jeanae*	a caddisfly	SR		known from ten streams and rivers in the mountains and Piedmont; poorly sampled due to occurrence in small streams	Current
Crustacean	*Cambarus reburrus*	French Broad River Crayfish	SR	FSC	streams in upper portions of French Broad drainage, and in one stream in Savannah drainage (endemic to North Carolina)	Current
Dragonfly or Damselfly	*Calopteryx amata*	Superb Jewelwing	SR		cold, shallow, rocky rivers	Historical
Dragonfly or Damselfly	*Macromia margarita*	Mountain River Cruiser	SR	FSC	Rivers	Historical

Taxonomic Group	Scientific Name	Common Name	State Status	Federal Status	Habitat Comment	Status
Freshwater Bivalve	*Alasmidonta raveneliana*	Appalachian Elktoe	E	E	Tennessee drainages	Current
Freshwater Bivalve	*Alasmidonta viridis*	Slippershell Mussel	E		Little Tennessee and upper French Broad/Mills rivers	Current
Freshwater Bivalve	*Fusconaia subrotunda*	Long-solid	SR	FSC	Hiwassee, Little Tennessee, and French Broad systems	Current
Freshwater Bivalve	*Pleurobema oviforme*	Tennessee Clubshell	E	FSC	French Broad, Little Tennessee, and Hiwassee drainages	Current
Freshwater Bivalve	*Strophitus undulatus*	Creeper	T		most river basins in the Coastal Plain and Piedmont, plus French Broad basin in the mountains	Current
Freshwater Fish	*Erimystax insignis eristigma*	Southern Blotched Chub	SR	FSC	primarily French Broad drainage	Current
Freshwater Fish	*Etheostoma jessiae*	Blueside Darter	SC		streams in Mills River system	Historical
Freshwater Fish	*Etheostoma vulneratum*	Wounded Darter	SC	FSC	streams of Little Tennessee and French Broad drainages	Current
Freshwater Fish	*Polyodon spathula*	Paddlefish	E	FSC	French Broad River	Historical

* From NC Natural Heritage Program Database for Brevard and Pisgah Forest Quadrangles, August 29, 2014

Abbreviations:
FSC: Federal Species of Concern
E: Endangered
T: Threatened
SC: Special Concern
SR: Significantly Rare

According to correspondence from the NC Natural Heritage Program (NCNHP), the NCNHP database shows element occurrence records for the French Broad River crayfish, paddlefish, and creeper in the project area. The NCNHP database also contains element occurrence records within 1 mile of the project area for Appalachian elktoe, superb jewelwing, French Broad River crayfish, southern blotched chub, paddlefish, and creeper.

6.8.2 Direct Impacts

No direct impacts to fish, shellfish, or rare, threatened, or endangered aquatic species are expected from this project. The surface water habitats of these species could be impacted by sediment from construction sites; however, an erosion and sedimentation control plan will be developed to avoid sediment entering streams. The Erosion and Sediment Control Plan (and Stormwater NPDES Permit) will be submitted to and approved by DENR prior to construction. The streams that will be open-trenched will be crossed within or directly adjacent to the existing road culverts where habitat for aquatic species has already been impacted. The force main will be installed primarily within the road pavement, where there is no habitat for these species. The force main will cross the French Broad River using trenchless construction, which will result in no direct impact to fish, shellfish, and aquatic species habitat from construction. Sediment and erosion control measures will be used at the launching and receiving pits to prevent sediment from leaving the work site.

6.8.3 Secondary and Cumulative Impacts

The primary purpose of this project is to increase capacity of the wastewater collection system to address system overflows. However, the improved system will be sized to accommodate the City's planned, modest growth, which could put direct or indirect pressure on fish and aquatic species in streams in the area over time. The City will avoid significant secondary and cumulative impacts to fish and aquatic species by guiding growth as outlined in its 2014 Draft Comprehensive Plan (Appendix I), which emphasizes protecting and preserving natural resources. The growth and development that does occur will be subject to the Unified Development Ordinance (Appendix I), ensuring that these sensitive areas are preserved and growth occurs in a planned way. For example, the City of Brevard's flood hazard ordinance (City of Brevard Code of Ordinances, Part II, Chapter 34, Article III, see Appendix I) discourages development in floodplains, which often surround and include streams, by requiring a determination that the construction will not cause flooding.

Surface waters that are classified by DWR as Trout Waters are protected by buffer zones. State regulations require an undisturbed buffer zone 25 feet wide or wide enough to eliminate visible siltation past the 25 percent of the buffer zone nearest the land-disturbing activity, whichever is greater, or approval from the Sedimentation Control Commission that the activity will be temporary and minimal. These stream buffers will provide additional protection of streams with the Trout Water designation as development occurs.

Stream impacts from future development will be subject to regulations and permits from the USACE and DWR.

6.9 Wildlife, Natural Vegetation, and Protected Terrestrial and Vegetative Species

6.9.1 Existing Conditions

The proposed pump station site is a cleared area adjacent to the existing pump station. The site contains a gravel surface and is surrounded by grass, weeds, and other opportunistic species. The force main will be installed in the road pavement, and the roads are bordered by mowed grasses and weeds. Some trees exist along the route in yards of residential areas and along the streams that will be crossed by the force main. The flow equalization tank site is a cleared, gravel site formerly used as a police training area. Larger and more mature forested areas surround the City of Brevard in the national forests, parks, and undeveloped steep slope areas.

Wildlife in the project area is typical of cleared sites and road right-of-way areas surrounded by forests and likely includes mammals such as deer, squirrels, opossum, moles, bats, rabbits, chipmunks, woodchucks, beavers, mice, rats, voles, coyote, foxes, wild turkeys, raccoons, skunks, river otters, and bobcats. The stream and wetland areas are also habitat for amphibians such as salamanders, newts, toads, and frogs and reptiles such as turtles, lizards, skinks, and snakes. The project area and surrounding area also provides habitat for birds.

Table 6-8 lists threatened and endangered terrestrial species for the two USGS quadrangles (Pisgah Forest and Brevard) in which the project area lies. Protected species are shown on Figure 6-4.

Table 6-8 Protected Terrestrial Species in Project Area

Taxonomic Group	Scientific Name	Common Name	State Status	Federal Status	Habitat Comment	Status
Amphibian	*Aneides aeneus*	Green Salamander	E	FSC	damp, shaded crevices of cliffs or rock outcrops in deciduous forests (southern mountains)	Current
Amphibian	*Cryptobranchus alleganiensis*	Hellbender	SC	FSC	large and clear fast-flowing streams	Current
Amphibian	*Necturus maculosus*	Common Mudpuppy	SC		rivers and large streams in New, French Broad, and Little Tennessee drainages	Current
Bird	*Certhia americana*	Brown Creeper	SC		high elevation forests, favoring spruce-fir mixed with hardwoods [breeding season only]	Current
Bird	*Falco peregrinus*	Peregrine Falcon	E		cliffs (for nesting); coastal ponds and mudflats (for foraging in winter) [nesting evidence; regular wintering sites]	Current
Bird	*Thryomanes bewickii altus*	Appalachian Bewick's Wren	E	FSC	woodland borders or openings, farmlands or brushy fields, at high elevations [breeding season only]	Historical
Butterfly	*Euphydryas phaeton*	Baltimore Checkerspot	SR		bogs, marshes, wet meadows; rarely in upland woods; host plants -- turtlehead (*Chelone*) and false foxglove (*Aureolaria*)	Historical
Butterfly	*Polygonia faunus*	Green Comma	SR		spruce, fir, or hemlock forests, where mixed with hardwoods; host plants -- mainly birches (*Betula*)	Historical
Grasshopper or Katydid	*Trimerotropis saxatilis*	Lichen Grasshopper	SR		lichen-covered rock outcrops	Current
Mammal	*Microtus chrotorrhinus carolinensis*	Southern Rock Vole	SC	FSC	rocky areas at high elevations, forests or fields	Current
Mammal	*Myotis septentrionalis*	Northern Myotis	SR	FSC, PE	roosts in hollow trees and buildings (warmer months), in caves and mines (winter); mainly in the mountains	Historical
Mammal	*Spilogale putorius*	Eastern Spotted Skunk	SR-G		forests with rocks, cliffs, and other den sites	Historical

Taxonomic Group	Scientific Name	Common Name	State Status	Federal Status	Habitat Comment	Status
Reptile	*Glyptemys muhlenbergii*	Bog Turtle	T	T(S/A)	bogs, wet pastures, wet thickets	Current
Reptile	*Plestiodon anthracinus*	Coal Skink	SR		rocky slopes, wooded hillsides, roadbanks	Current

* From NC Natural Heritage Program Database for Brevard and Pisgah Forest Quadrangles, August 29, 2014

Abbreviations:
FSC: Federal Species of Concern
E: Endangered
T: Threatened
SC: Special Concern
SR: Significantly Rare
SR-G: Significantly Rare – Game animal or furbearer (by law cannot be listed for State protection as E, T, or SC)
PE: Proposed Endangered
T(S/A): Threatened due to similarity of appearance

According to correspondence from the NC Natural Heritage Program (NCNHP), the NCNHP database contains element occurrence records within 1 mile of the project area for the hellbender, bog turtle, and common mudpuppy.

Table 6-9 lists threatened and endangered vegetative species for the two USGS quadrangles (Pisgah Forest and Brevard) in which the project area lies.

Table 6-9 Protected Vegetative Species and Natural Communities in Project Area

Taxonomic Group	Scientific Name	Common Name	State Status	Federal Status	Habitat Comment	Status
Moss	*Bryoxiphium norvegicum*	Sword Moss	SR-O		rocks in humid gorges, spray zones of waterfalls	Current
Moss	*Entodon sullivantii*	Sullivant's Entodon	SR-O		on rocks or bark in humid gorges and cove forests	Historical
Vascular Plant	*Aconitum reclinatum*	Trailing Wolfsbane	SR-T		rich coves, seepage slopes, boulderfields, rocky stream banks, mainly associated with mafic rocks	Current
Vascular Plant	*Arethusa bulbosa*	Bog Rose	E		Bogs	Current
Vascular Plant	*Arisaema stewardsonii*	Bog Jack-in-the-pulpit	SR-P		Bogs	Current
Vascular Plant	*Campanula aparinoides*	Marsh Bellflower	SR-P		bogs and other wet, open sites	Current
Vascular Plant	*Chelone cuthbertii*	Cuthbert's Turtlehead	SC-V	FSC	Bogs	Current
Vascular Plant	*Chelone obliqua*	Red Turtlehead	SR-T		swamp forests, bogs, wet places	Current
Vascular Plant	*Danthonia epilis*	Bog Oatgrass	SR-T	FSC	seepage bogs, wet seepy powerlines	Current
Vascular Plant	*Dendrolycopodium dendroideum*	Prickly Ground-pine	SR-P		openings and balds	Historical
Vascular Plant	*Dendrolycopodium hickeyi*	Pennsylvania Ground-pine	SR-P		openings, balds, bog margins, and high elevation forests	Current
Vascular Plant	*Gaylussacia orocola*	Appalachian Dwarf Huckleberry	SR-L		Bogs	Current

Taxonomic Group	Scientific Name	Common Name	State Status	Federal Status	Habitat Comment	Status
Vascular Plant	*Glyceria laxa*	Lax Mannagrass	SR-P		Seeps	Current
Vascular Plant	*Helonias bullata*	Swamp Pink	T	T	Bogs	Current
Vascular Plant	*Hexastylis rhombiformis*	French Broad Heartleaf	SR-L	FSC	cove forests	Current
Vascular Plant	*Huperzia porophila*	Rock Fir-clubmoss	SR-P		in spray zone of waterfalls	Historical
Vascular Plant	*Isotria medeoloides*	Small Whorled Pogonia	T	T	forests, especially with white pine	Current
Vascular Plant	*Liparis loeselii*	Fen Orchid	E		seeps, bay swamps	Current
Vascular Plant	*Monotropsis odorata*	Sweet Pinesap	SC-V	FSC	dry forests and bluffs	Current
Vascular Plant	*Packera millefolium*	Divided-leaf Ragwort	T	FSC	granitic domes, other outcrops	Current
Vascular Plant	*Phegopteris connectilis*	Northern Beech Fern	E		spray zone of waterfalls, spruce-fir forests, high elevation seepage bogs	Current
Vascular Plant	*Platanthera flava var. herbiola*	Northern Rein Orchid	SR-P		bogs and moist forests	Current
Vascular Plant	*Platanthera peramoena*	Purple Fringeless Orchid	T		bogs, forests	Current
Vascular Plant	*Rhododendron vaseyi*	Pink-shell Azalea	SR-L		high elevation oak forests, heath balds, spruce-fir forests, and rocky areas	Current
Vascular Plant	*Rubus dalibarda*	Robin Runaway	E		bogs and moist woods under rhododendrons	Current
Vascular Plant	*Sarracenia jonesii*	Mountain Sweet Pitcher Plant	E	E	Bogs	Current
Vascular Plant	*Sarracenia purpurea var. montana*	Southern Appalachian Purple Pitcherplant	SR-L	FSC	mountain bogs, seepage bogs	Current
Vascular Plant	*Senecio suaveolens*	Sweet Indian-plantain	SC-H		Bottomlands	Historical
Vascular Plant	*Solidago uliginosa*	Bog Goldenrod	SR-P		bogs, seeps	Historical
Vascular Plant	*Thalictrum macrostylum*	Small-leaved Meadowrue	SR-T	FSC	bogs and wet woods	Current
Vascular Plant	*Thermopsis fraxinifolia*	Ash-leaved Golden-banner	SC-V		dry ridges	Current
Vascular Plant	*Vaccinium macrocarpon*	Cranberry	T		bogs, seeps, pocosins	Current
Vascular Plant	*Woodsia appalachiana*	Appalachian Cliff Fern	SR-P		cliffs, rock outcrops	Current

* From NC Natural Heritage Program Database for Brevard and Pisgah Forest Quadrangles, August 29, 2014

Abbreviations:
FSC: Federal Species of Concern
E: Endangered
T: Threatened
SR-T: Significantly Rare – Throughout (rare throughout range; fewer than 100 populations total)

SR-P: Significantly Rare – Peripheral (periphery of range in NC; more common elsewhere in range)
SR-L: Significantly Rare – Limited (range limited to NC and adjacent states (endemic or near endemic)
SR-O: Other (range of the species is sporadic or cannot be described by the other Significantly Rare categories)
SC-H: Special Concern – Historical
SC-V: Special Concern – Vulnerable

According to correspondence from the NC Natural Heritage Program (NCNHP), the NCNHP database contains element occurrence records within 1 mile of the project area for the prickly ground-pine, French Broad heartleaf, and sweet Indian-plantain.

Table 6-10 lists natural communities for the two USGS quadrangles (Pisgah Forest and Brevard) in which the project area lies.

Table 6-10 Natural Communities in Project Area

Ecological Grouping	Natural Community Name	Subtype
Bogs, Swamp-Forests, and Seeps	French Broad Valley Bog	N/A
	Low Elevation Seep	Floodplain
	Low Elevation Seep	Montane
	Montane Floodplain Slough Forest	N/A
	Rich Montane Seep	N/A
	Southern Appalachian Bog	Low Elevation
	Swamp Forest--Bog Complex	Typic
High Elevation Communities	High Elevation Red Oak Forest	Rich, Typic Herb
	High Elevation Rocky Summit	Typic
Low and Mid-Elevation Dry-Mesic Forests and Woodlands	Chestnut Oak Forest	Dry Heath, Herb, Mesic
	Montane Oak--Hickory Forest	Acidic, Basic, Low Dry
	Pine--Oak/Heath	Typic
Low Elevation Mesic Forests	Acidic Cove Forest	Typic
	Canada Hemlock Forest	Typic
	Carolina Hemlock Forest	Pine
	Rich Cove Forest	Montane Intermediate, M. Rich
River Floodplains	Floodplain Pool	N/A
	Montane Alluvial Forest	Small River
	Piedmont/Mountain Semipermanent Impoundment	Montane Marsh
	Rocky Bar and Shore	Twisted Sedge
Rock Outcrop Communities	Low Elevation Granitic Dome	N/A
	Montane Cliff	Acidic Herb, Mafic
	Spray Cliff	N/A

* From NC Natural Heritage Program Database for Brevard and Pisgah Forest Quadrangles, August 29, 2014 and *An Inventory of the Natural Areas of Transylvania County, NC* by Edward Schwartzman (2008)

6.9.2 Direct Impacts

No direct impacts to natural communities are expected as a result of this project, because the facilities will not be constructed in natural communities. Construction of the facilities will temporarily impact some wildlife habitat and vegetation in the immediate project area; however, impacts to protected species are not expected, because the facilities will be constructed on cleared, gravel sites and within road pavement. Construction areas will be reseeded upon completion of construction, and wildlife is expected to return to the area after construction activities. As requested in correspondence from US Fish and Wildlife Service, sediment and erosion control measures will be used prior to ground disturbance. The sediment and erosion control plan for the project will include temporary and permanent herbaceous material including native annual small grains and herbs appropriate for the

season to control erosion immediately following any ground disturbing activity. Fescue based mixtures will not be allowed, and fertilizers and pesticides will not be allowed near streams.

The majority of the force main will be located in road pavement and the road right-of-way. The force main will be installed within the road pavement except for three of the stream crossings, where a small amount of additional easement may be acquired. The habitat of the protected species listed in Table 6-7, 6-8, and 6-9 does not include road right-of-ways. Land use adjacent to the force main route includes farmland, residential uses including mobile homes and single family homes, high density residential uses associated with Brevard College, commercial, light industrial, medical, and undeveloped areas. The roadside areas are mowed and maintained and are not likely to provide habitat for protected species.

The flow equalization tank will be installed on City of Brevard property on a portion of the WWTP site that was previously used as a police training area but is currently not used. This cleared area consists of gravel and does not provide habitat for protected species.

The pump station will be located adjacent to the existing Neely Road Pump Station at Neely Road and Lambo Creek. The site of the new pump station is currently used as a gravel storage area for equipment. The land adjacent to the pump station is farmland. The cleared site does not provide habitat for protected species.

The streams that will be open-trenched will be crossed within or directly adjacent to the existing road culverts where habitat has already been impacted. The force main will be installed primarily within the road pavement, where there is no habitat for these species. Sediment and erosion control measures will be used at the launching and receiving pits at the French Broad River trenchless crossing to prevent sediment from leaving the work site.

Representatives of the US Fish and Wildlife Service and the NC Wildlife Resources Commission visited the pump station and equalization tank sites and force main route in October 2014 to determine whether any protected species may be affected by the project. No protected species habitat was noted in any of the project area.

6.9.3 Secondary and Cumulative Impacts

The primary purpose of this project is to increase capacity of the wastewater collection system to address system overflows. However, the improved system will be sized to accommodate the City's planned, modest growth, which could put direct or indirect pressure on wildlife habitat and natural vegetation in the area over time. The City will avoid significant secondary and cumulative impacts to these resources by guiding growth as outlined in its 2014 Draft Comprehensive Plan (Appendix I), which emphasizes protecting and preserving natural resources. The growth and development that does occur will be subject to the Unified Development Ordinance (Appendix I), ensuring that these sensitive areas are preserved and growth occurs in a planned way.

6.10 Public Lands and Scenic, Recreational, and State Natural Areas

6.10.1 Existing Conditions

Although this project will be constructed outside public lands and scenic, recreational, and state natural areas, several of these resources are located in the surrounding area. The Pisgah National

Forest is located to the north of the City of Brevard, as shown on Figure 6-4, and the Nantahala National Forest, Gorges State Park, and Toxaway Game Land are southwest of Brevard. The Dupont State Forest is southeast of the project area. North of the project area, the Carolina Mountain Land Conservancy maintains the 36-acre Deerlake Conservation Area (see Figure 6-4), which is protected to preserve habitat, water quality, and scenic views. The NC Natural Heritage Program database shows a conservation easement managed by the North Carolina Ecosystem Enhancement Program along King Creek, south of the proposed Neely Road pump station.

6.10.2 Direct Impacts

This project will not directly impact any public lands or scenic, recreational, or state natural areas, because none of these resources is within the immediate project area. The project will not impact the conservation easement along King Creek or the Deerlake Subdivision. This project is likely to directly benefit aquatic species by reducing sanitary sewer overflows into these streams, thereby improving water quality for fish and aquatic species in the project area and downstream of the area.

6.10.3 Secondary and Cumulative Impacts

The primary purpose of this project is to increase capacity of the wastewater collection system to address system overflows. However, the improved system will be sized to accommodate the City's planned, modest growth, which could put direct or indirect pressure on public lands and scenic, recreational, and state natural areas. The City will avoid significant secondary and cumulative impacts to these resources by guiding growth as outlined in its 2014 Draft Comprehensive Plan (Appendix I), which emphasizes protecting and preserving natural resources. The growth and development that does occur will be subject to the Unified Development Ordinance (Appendix I), ensuring that these sensitive areas are preserved and growth occurs in a planned way.

6.11 Areas of Archaeological or Historical Value

6.11.1 Existing Conditions

According to the NC Historic Preservation Office's HPOWEB tool, there are several historic properties along the force main route that have been studied for historical value; however, none of these sites has been designated a resource of significance. These sites are listed in **Table 6-11** and shown on Figure 6-4.

Table 6-11 Archaeological and Historic Resources in Project Area

Site	Name	Classification
TV0223	Pebbledash Houses	Surveyed only
TV0365	Gallimore Hill Houses	Surveyed only, no designation
TV0374	Dr. Smathers House	Surveyed only
TV0470	Patton-Barnett House	Surveyed only

Source: NC Historic Preservation Office HPOWEB mapping tool

There are no other sites of known archaeological or historic significance in the project area. The area within a 5-mile radius of the project site contains additional sites that have been designated as significant, including several sites in the central business district of the City of Brevard.

6.11.2 Direct Impacts

This project will not result in any direct impacts to areas of archaeological of historical value. The pump station and equalization tank sites do not contain these resources. The sites that have been studied along the force main routes will not be affected by the project, because the force main will be installed within the road pavement and within the existing road right-of-way. Proper sediment and erosion control measures will further reduce any construction impacts from disturbed land. As requested in correspondence from the NC Department of Cultural Resources State Historic Preservation Office (SHPO), if any significant landscape features such as retaining walls, fences, or mature plantings are affected, SHPO will be notified.

6.11.3 Secondary and Cumulative Impacts

The primary purpose of this project is to increase capacity of the wastewater collection system to address system overflows. However, the improved system will be sized to accommodate the City's planned, modest growth. The City will avoid secondary and cumulative impacts to archaeological and historic resources by guiding growth as outlined in its 2014 Draft Comprehensive Plan (Appendix I) and Unified Development Ordinance (Appendix I). Chapter 20 of the City's Code of Ordinances specifies rules for protection of historic districts and landmarks.

6.12 Air Quality

6.12.1 Existing Conditions

Brevard is located within the NC Division of Air Quality's (DAQ) Asheville Valleys air quality monitoring region. The NC DAQ in conjunction with the Western NC Regional Air Quality Agency monitors levels of the six national criteria pollutants (ground-level ozone, particulate matter, nitrogen dioxide, carbon monoxide, sulfur dioxide, and lead). Air quality is reported using the Air Quality Index (AQI). According to the NC DAQ *2011 Ambient Air Quality Monitoring Report*, the Asheville area experienced 0 "unhealthy" or "unhealthy for sensitive groups" AQI days, 54 "moderate" AQI days, and 310 "good" AQI days.

Air emissions in the project area are primarily due to vehicular emissions. The pump station and force main are located along roads. Additionally, USEPA documents one industrial air toxics release source, Pisgah Laboratories Inc., on Old Henderson Highway along the force main route. This source reports fugitive methanol emissions. Two additional industrial air pollution emission sources located within 1 mile of the project area are included in USEPA's records. The Ecusta Business Development Center LLC on Ecusta Road approximately 1 mile north of the project area held a Title V permit but has been permanently closed, and the site is noted as "in compliance" in USEPA records. The Ring Industrial Group on Old Henderson Highway approximately 1 mile east of the project area held a Synthetic Minor permit but has also been permanently closed and is noted as "in compliance" (USEPA Envirofacts database search, December 16, 2014).

6.12.2 Direct Impacts

Construction of the pump station, force main, equalization tank may cause short-term localized air quality impacts such as increases in suspended particulate matter due to dust emissions from the construction site and exhaust emissions from diesel and gasoline powered equipment. Equipment exhaust emissions typically include nitrogen oxides, hydrocarbons, carbon monoxide, and particulate matter. These temporary, localized impacts will be minimized by proper measures to minimize dust and vehicular emissions during construction. Construction equipment will be required to have air

quality/emission reduction devices installed in proper operational condition. Dust on the WWTP and pump station site will be controlled by spraying the area with water when necessary. Temporary gravel construction entrances will also be used to control dust.

An emergency generator will be installed at the Neely Road Pump Station for backup power. The diesel-powered generator will be used only for emergencies and will meet the NC Division of Air Quality (DAQ)'s requirements for a permit exemption in accordance with 15A NCAC 02Q .0807 (i.e., use of less than 322,000 gallons per year of diesel fuel for diesel-powered generators). In accordance with the rule, the City will maintain 3 years of records of fuel use and will notify DAQ within 1 week of any exceedances of the requirements.

The proposed project will not result in any significant long-term effects on air quality.

6.12.3 Secondary and Cumulative Impacts

The primary purpose of this project is to increase capacity of the wastewater collection system to address system overflows. However, the improved system will be sized to accommodate the City's planned, modest growth. The City will avoid secondary and cumulative air quality impacts by guiding growth as outlined in its 2014 Draft Comprehensive Plan (Appendix I) and Unified Development Ordinance (Appendix I). The NC DAQ and Western NC Regional Air Quality Agency monitor air quality in this area and track compliance and emissions.

6.13 Noise Levels

6.13.1 Existing Conditions

Noise levels in the project area include road noise and other noise typical of residential and commercial areas. The existing pump station creates small amounts of noise from operation of the pumps. Noise at the WWTP occurs from operation of the equipment.

6.13.2 Direct Impacts

Construction of the proposed project will be associated with a short-term noise impact due to operation of the construction equipment. The project specifications will outline the appropriate times that construction is allowed to occur (during daylight hours, unless road restoration or other road closure necessitates partial nighttime work). The construction contractor will be required to comply with the City's noise ordinance (Code of Ordinances Chapter 38, Article II, Division 2 (Appendix I)), including obtaining a permit to exceed allowable noise levels at specific times of the day.

No significant long-term noise increases are expected for this project. Operation of the pumps at the pump station will create noise; however, the new pump station will be located adjacent to an existing pump station, so noise levels are expected to remain similar to current conditions. Operation of the flow equalization tank will not contribute significantly to noise at the WWTP.

6.13.3 Secondary and Cumulative Impacts

Noise in the project area and service area is expected to increase in the future as development occurs. The primary purpose of this project is to increase capacity of the wastewater collection system to address system overflows. However, the improved system will be sized to accommodate the City's planned, modest growth. The City will avoid secondary and cumulative impacts related to noise levels by restricting noise according to the City Code of Ordinances. Chapter 38, Article II, Division 2 of the City's Code of Ordinances (Appendix I) specifies restrictions on "unreasonable loud, disturbing, and

unnecessary" noise and outlines specific decibel values and time periods for which they are disallowed.

6.14 Introduction of Toxic Substances

No toxic substances will be knowingly discharged to the environment during construction or operation of this project. Toxic substances could potentially be released due to leaking fuels or lubricants from construction equipment. However, equipment will be monitored and fixed to avoid release of toxic substances.

As described previously, the force main will be installed in roads adjacent to several sites with potential soil contamination. The project specifications will state that if any contaminated soil or groundwater is encountered during construction, the construction contractor will be required to take safety precautions, test the material, and dispose of it properly.

6.15 Environmental Justice

All federal agencies are required by Executive Order 12898 ("Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations", February 11, 1994) to address disproportionate human health and environmental effects of their programs, policies, and activities on minority and low-income populations.

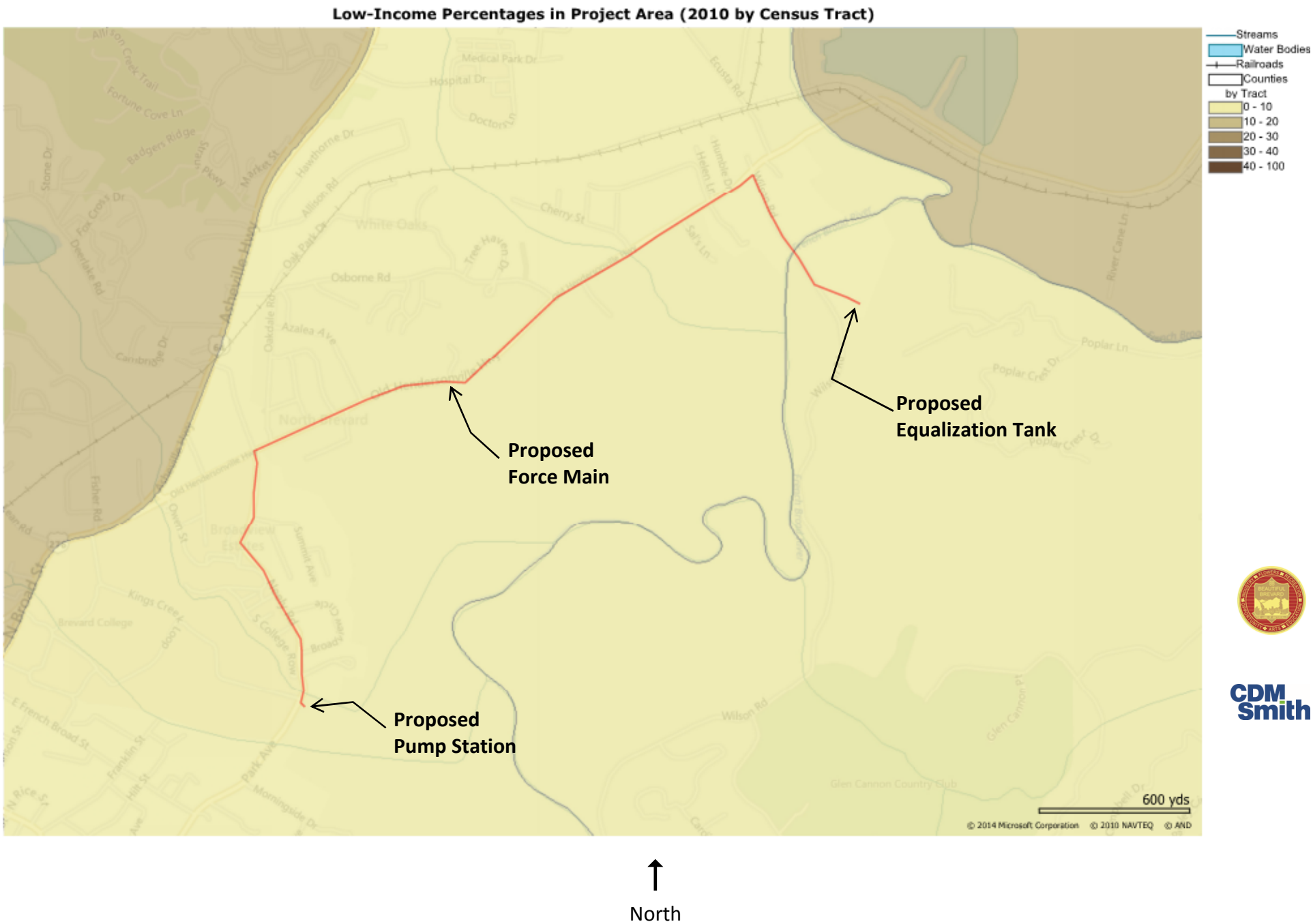
The steps for addressing environmental justice include the following:

- Step 1: Determine whether the project area includes minority and/or low-income populations.
- Step 2: If populations are present, identify beneficial and adverse changes to existing conditions that may result from the proposed project.
- Step 3: Determine whether any significant and adverse impacts are likely to disproportionately affect minority and/or low-income populations.
- Step 4: Develop mitigation measures if any significant adverse impacts are likely to disproportionately affect minority and/or low-income populations.
- Throughout: Provide adequate opportunity for public participation throughout the process.

6.15.1 Existing Conditions

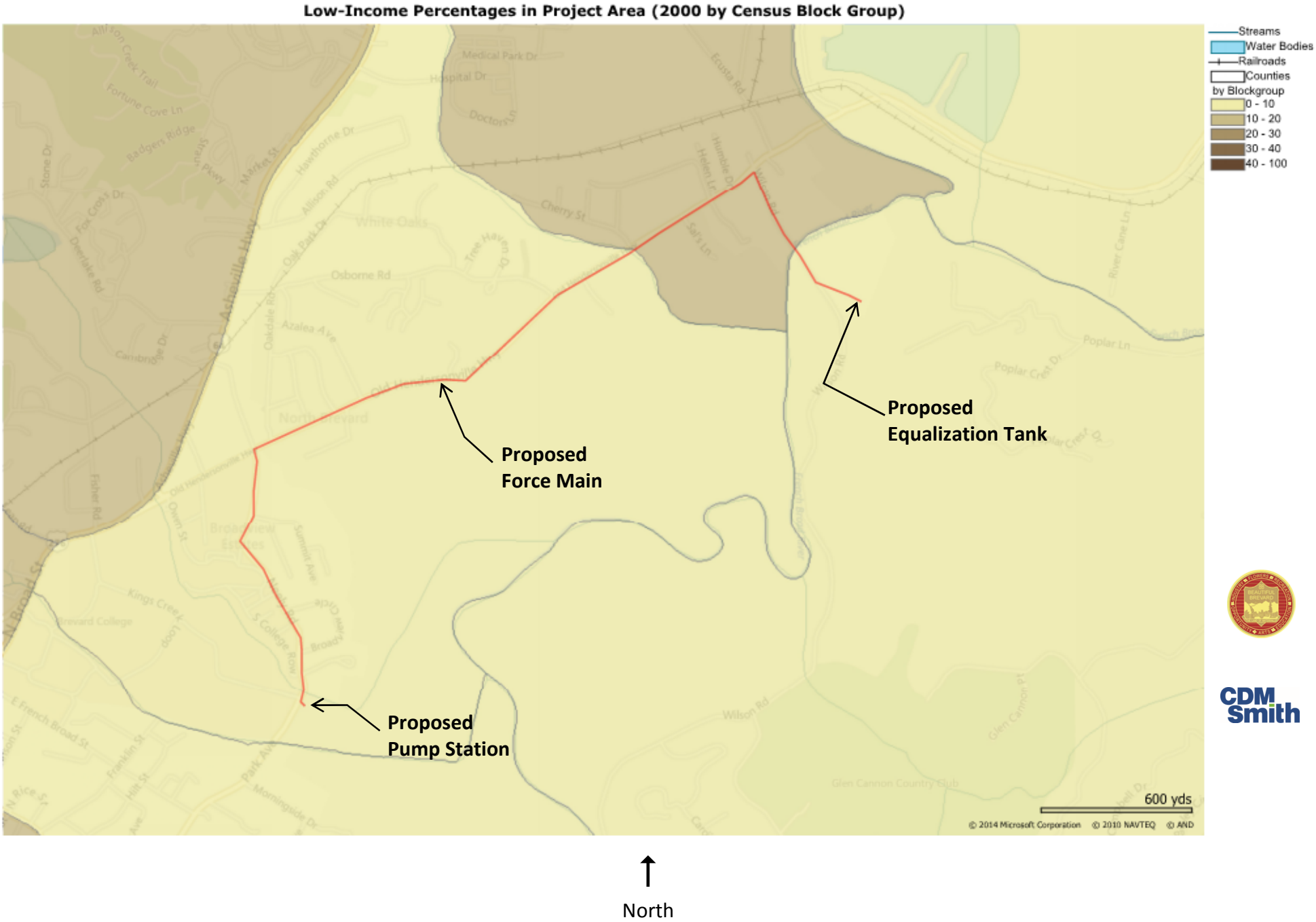
6.15.1.1 Determination of Presence of Low-Income Populations

The presence of low-income populations was determined for the project site using the EPA's EJView mapping tool. **Figure 6-7** depicts 2010 census-tract level low-income data for the project area. As shown on the figure, for the census tract in which the project is located, 0 to 10 percent of the population is considered low-income. **Figure 6-8** shows the 2000 census block-group level low-income data. Block-group level data is more detailed than census-tract level data; however, block-group level data is not available for 2010 through EPA's EJView tool at this time. As shown in Figure 6-8, the project area is located in two block groups. The majority of the project area including the equalization tank (at the WWTP) and the pump station are in a block group in which less than 10 percent of the population is considered low-income. A portion of the force main is located in a block group in which the low-income population is between 10 and 20 percent (10.5 percent) of the total block group population. Based on this analysis, the project is not located in any census tracts or block



City of Brevard
Neely Road Pump Station and Equalization Improvements

Figure 6-7
2010 Low-Income Population Percentages in Project Area



City of Brevard
Neely Road Pump Station and Equalization Improvements

Figure 6-8
2000 Low-Income Population Percentages in Project Area

block group population. Based on this analysis, the project is not located in any census tracts or block groups with a low-income population greater than 50 percent; therefore, the project will not disproportionately affect low-income populations.

6.15.1.2 Determination of Presence of Minority Populations

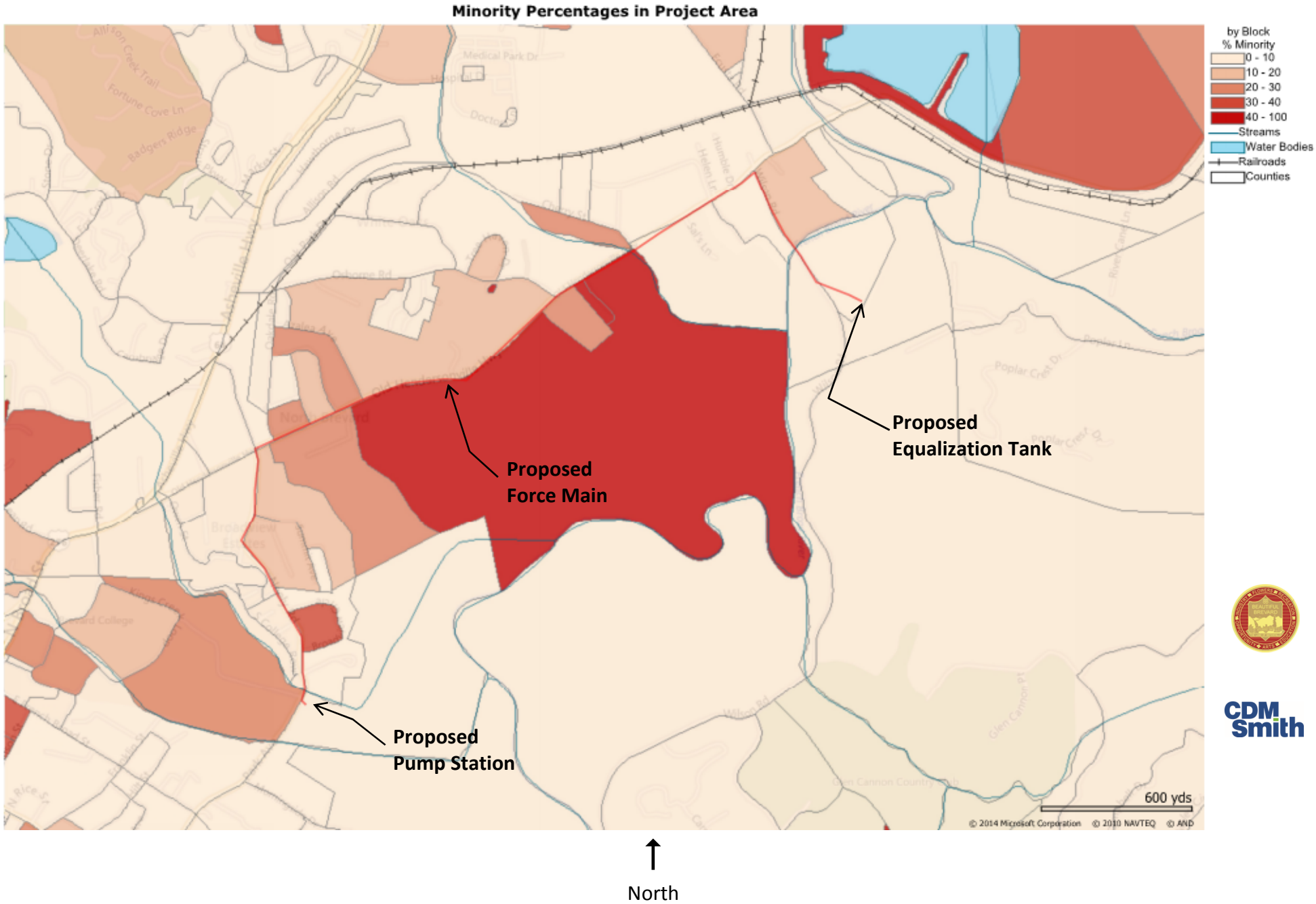
The presence of minority populations was also determined for the project site using the EPA's EJView mapping tool. **Figure 6-9** depicts 2010 census-block level demographic data for the project area. As shown on the figure, the project area is located in several census blocks. The equalization tank (at the WWTP) and the pump station are in a census block in which less than 10 percent of the population is considered minority. The force main crosses blocks in which the population ranges from 0 percent to 46 percent minority. Based on this analysis, the project is not located in any census blocks with a minority population greater than 50 percent; therefore, the project will not disproportionately affect minority populations.

6.15.2 Direct Impacts

The pump station and equalization tank will be located in areas that have very low (or no) minority and low-income populations. The force main crosses some areas with low-income and minority populations (less than 50 percent). Direct impacts to the populations along the force main route include temporary impacts during construction of the force main. These temporary impacts will be mitigated by following an approved Erosion and Sediment Control Plan (and Stormwater NPDES Permit) during construction. Tree clearing will be minimized, and tree protection fencing will be installed. Impacts to wetlands and streams that could affect water quality will be minimized. Noise dampening devices will be installed on construction equipment, and water will be used to control dust. Working hours during construction will be limited to limit noise. Construction equipment will be maintained properly to prevent leaks.

6.15.3 Secondary and Cumulative Impacts

Secondary and cumulative impacts to low-income and minority populations in the service area could occur due to growth and development. These potential impacts will be mitigated by following the NC Sedimentation and Erosion Control Planning and Design Manual; adhering to the City of Brevard 2014 Draft Comprehensive Plan, Code of Ordinances, and Unified Development Ordinance; complying with Federal and State EPA Regulations; adhering to NC State Historic Preservation Office regulations; and complying with DWR and USACE regulations and permits.



City of Brevard
Neely Road Pump Station and Equalization Improvements

Figure 6-9
2010 Minority Population Percentages in Project Area

6.16 Mitigative Measures

Impacts from the proposed project will be mitigated in a variety of ways. **Table 6-12** presents a summary of mitigative measures for direct impacts and secondary and cumulative impacts.

Table 6-12 Mitigative Measures

Resource Category	Potential Direct Impacts	Mitigative Measures for Direct Impacts	Potential SCI*	Mitigative Measures for SCI*
Topography & Floodplains	Temporary excavation and backfill during construction; permanent impact from construction of flow equalization tank in floodplain	Restoration of existing topography along force main route; no-rise certification for work in flood hazard areas	Changes to topography and flood hazard areas due to growth and development in the service area	Adherence to City of Brevard Code of Ordinances and Unified Development Ordinance.
Soils	Temporary excavation and backfill during construction; permanent impact from construction of pump station and flow equalization tank	Sediment and erosion control during construction;	Changes to soils due to growth and development in the service area	North Carolina Sedimentation and Erosion Control Planning and Design Manual.
Prime and Unique Farmland	N/A	N/A	Loss of prime and unique farmland due to growth and development in the service area	City of Brevard 2014 Draft Comprehensive Plan
Land Use	Temporary excavation and backfill during construction; permanent impact from construction of pump station and flow equalization tank	Pump station will be constructed in same area as existing Neely Road Pump Station; flow equalization tank will be constructed at existing WWTP	Changes to land use in the service area due to growth and development	City of Brevard 2014 Draft Comprehensive Plan, Code of Ordinances, and Unified Development Ordinance.
Forest Resources	Minimal tree removal on the WWTP site to accommodate piping and around streams for installation of the force main.	Tree clearing will be minimized.	Loss of forest resources due to growth and development in the service area	City of Brevard 2014 Draft Comprehensive Plan, Code of Ordinances, and Unified Development Ordinance.
Wetlands and Streams	▪ Construction of the flow equalization tank may impact a small amount (less than 0.10 acre) at the WWTP site. ▪ Force main stream crossing that is constructed via open-cut construction will temporarily impact streams. ▪ This project will benefit the area by reducing sanitary sewer overflows, thereby improving water quality for fish and aquatic species in the	▪ Impacts to wetlands and streams will be avoided to the extent practicable. ▪ Sediment and erosion control measures will be used around the work area to protect streams and wetlands outside the work area from sedimentation and runoff. ▪ An Erosion and Sediment Control Plan (and Stormwater NPDES Permit) will be developed and approved by DENR	Loss or degradation of streams and wetlands due to growth and development in the service area	▪ City of Brevard 2014 Draft Comprehensive Plan, Code of Ordinances, and Unified Development Ordinance. ▪ USACE and DWR regulations. ▪ NC Sediment and Erosion Control Planning and Design Manual.

Resource Category	Potential Direct Impacts	Mitigative Measures for Direct Impacts	Potential SCI*	Mitigative Measures for SCI*
	project area and downstream of the area.	prior to construction. ▪ French Broad River force main crossing will be accomplished using trenchless construction. ▪ Wetlands along the pipelines will be revegetated and restored upon completion of construction. ▪ A Section 404 permit will be obtained from USACE, and a 401 Water Quality Certification will be obtained from DWR.		
Water Resources	▪ Force main stream crossing that is constructed via open-cut construction will temporarily impact streams. ▪ This project will benefit the area by reducing sanitary sewer overflows, thereby improving water quality in surface waters in the project area and downstream of the area.	▪ Sediment and erosion control measures will be used around the work area to protect streams around the project area from sedimentation and runoff. ▪ An Erosion and Sediment Control Plan (and Stormwater NPDES Permit) will be developed and approved by DENR prior to construction. ▪ French Broad Riverforce main crossing will be accomplished using trenchless construction.	Loss or degradation of water resources wetlands due to growth and development in the service area	▪ City of Brevard 2014 Draft Comprehensive Plan, Code of Ordinances, and Unified Development Ordinance. ▪ USACE and DWR regulations. ▪ NC Sediment and Erosion Control Planning and Design Manual.
Shellfish and Fish and Their Habitats and Protected Aquatic Species	▪ Force main stream crossing that is constructed via open-cut construction will temporarily impact aquatic species. ▪ This project will benefit the area by reducing sanitary sewer overflows, thereby improving water quality for fish and aquatic species in the project area and	▪ Sediment and erosion control measures will be used around the work area to protect stream habitat around the project area from sedimentation and runoff. ▪ An Erosion and Sediment Control Plan (and Stormwater NPDES Permit) will be developed and	Loss or degradation of streams for fish and aquatic species habitat due to growth and development in the service area	▪ City of Brevard 2014 Draft Comprehensive Plan, Code of Ordinances, and Unified Development Ordinance. ▪ USACE and DWR regulations. ▪ NC Sediment and Erosion Control Planning and Design Manual.

Resource Category	Potential Direct Impacts	Mitigative Measures for Direct Impacts	Potential SCI*	Mitigative Measures for SCI*
	downstream of the area.	approved by DENR prior to construction.		
Wildlife, Natural Vegetation, and Protected Terrestrial and Vegetative Species	Temporary removal of vegetation and wildlife habitat during construction of the facilities.	▪ Currently vegetated areas that are impacted during construction will be reseeded upon completion of construction. ▪ Vegetation will be established within the time frames required in the project's Erosion and Sediment Control Plan. ▪ Sediment and erosion control measures will be used around the work area to protect other vegetation and stream habitat around the project area from sedimentation and runoff. ▪ An Erosion and Sediment Control Plan (and Stormwater NPDES Permit) will be developed and approved by DENR prior to construction.	Loss or degradation of wildlife habitat and vegetation due to growth and development in the service area	▪ City of Brevard 2014 Draft Comprehensive Plan, Code of Ordinances, and Unified Development Ordinance. ▪ NC Sediment and Erosion Control Planning and Design Manual.
Public Lands and Scenic, Recreational, and State Natural Areas	N/A	N/A	Loss or degradation of public lands or scenic, recreational, and state natural areas due to growth and development in the service area	City of Brevard 2014 Draft Comprehensive Plan, Code of Ordinances, and Unified Development Ordinance.
Areas of Archaeological or Historical Value	N/A	N/A	Loss of sites of archaeological or historic value due to growth and development in the service area	▪ NC SHPO Regulations regarding archaeological and historic resources ▪ City of Brevard 2014 Draft Comprehensive Plan, Code of Ordinances, and Unified Development Ordinance.
Air Quality	Short-term localized air quality impacts such as increases in	▪ Construction equipment will be required to have air	Increased air pollution and emissions due to development in the	Adherence to NCDENR DAQ regulations

Resource Category	Potential Direct Impacts	Mitigative Measures for Direct Impacts	Potential SCI*	Mitigative Measures for SCI*
	suspended particulate matter due to dust emissions from the construction site and exhaust emissions from diesel and gasoline powered equipment. Emissions from emergency generator at pump station.	quality/emission reduction devices installed in proper operational condition. ▪ Dust on the WWTP and pump station site will be controlled by spraying the area with water when necessary. ▪ Temporary gravel construction entrances will also be used to control dust. ▪ Emergency generator at pump station will be used only for emergencies, and City will comply with requirements of DAQ emergency generator rules.	service area	
Noise Levels	▪ Construction: short-term noise impact due to operation of the construction equipment. ▪ Operation: noise from operation of pumps at pump station and flow equalization tank at WWTP.	▪ Project specifications will outline the appropriate times that construction is allowed to occur (during daylight hours, unless road restoration or other road closure necessitates partial nighttime work). ▪ Construction contractor will be required to comply with the City's noise ordinance, including obtaining a permit to exceed allowable noise levels at specific times of the day. ▪ Noise dampening devices will be installed on construction equipment.	Increases in noise levels due to growth and development in the service area	City of Brevard Code of Ordinances
Introduction of Toxic Substances	▪ Toxic substances could potentially be released due to leaking fuels or lubricants from construction equipment.	▪ Construction equipment will be monitored and fixed to avoid release of toxic substances. ▪ Project specifications will	N/A	N/A

Resource Category	Potential Direct Impacts	Mitigative Measures for Direct Impacts	Potential SCI*	Mitigative Measures for SCI*
	▪ Contaminated soil or groundwater from hazardous sites could be encountered during construction.	state that if any contaminated soil or groundwater is encountered during construction, the construction contractor will be required to take safety precautions, test the material, and dispose of it properly.		
Environmental Justice	Temporary impacts to minority and low-income populations associated with construction.	▪ Erosion and Sediment Control Plan (and Stormwater NPDES Permit) will be developed, approved, and followed during construction. ▪ Clearing will be minimized, and tree protection fencing will be installed. ▪ Temporary and permanent impacts to wetlands and streams will be minimized. ▪ Noise dampening devices will be installed on construction equipment, and water will be used to control dust. ▪ Working hours will be limited to limit noise. ▪ Equipment will be maintained properly to prevent leaks.	Growth and development in the service area	▪ North Carolina Sedimentation and Erosion Control Planning and Design Manual. ▪ City of Brevard 2014 Draft Comprehensive Plan, Code of Ordinances, and Unified Development Ordinance. ▪ Adherence to Federal and State EPA Regulations ▪ Adherence to North Carolina State Historic Preservation Office regulations ▪ Adherence to NCDENR DWR and USACE regulations

* SCI = Secondary and cumulative impacts

6.17 References

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Section 7

Financial Analysis

Table 7.1. Applicant's/LGUs Financial Condition
Neely Road Pump Station and Equalization Improvements Project
Force Main Option

Provide revenues generated from the most recent complete fiscal year (e.g., FY 2012-2013). Water and sewer expenses should not include depreciation. Existing debt should be debt paid in the previous fiscal year only.

Operating Ratio	
Water and Sewer Revenue:	$3,922,126
Water and Sewer Expenses:	$3,412,970
Existing Debt:	$355,698
Operating Ratio:	1.04

Utility Bill as Percent of Median Household Income

Use the pulldown menu to select the type of rate structure used for water and sewer. If using a rate structure other than uniform, then there is no need to complete the base charge (charge and volume) or volumetric charge.

	Sewer Rate Structure	**Water Rate Structure**
Rate Structure:	Uniform	Uniform
Base Charge:	$13.65	$13.65
Thousands of Gallons in Base Charge:	1.5	1.5
Volumetric Charge per 1,000 gallons:	$7.50	$7.50
Monthly Bill for 5,000 gallons:	$39.90	$39.90
Combined Monthly Water and Sewer Bill for 5,000 gallons:	**$79.80**	
Median Houshold Income:	$45,824	
Monthly Median Household Income for LGU:	$3,819	
Bill as % of Median Household Income:	1.04%	1.04%
Overall Bill as % of Median Household Income:	**2.09%**	

Additional Information if needed (see Section 2.2.7.1, Step 1 of the guidance).

Prior to CWSRF funding approval, water and sewer rates were based on a base charge of $13.65 per 2,000 gallons. The rate structure shown above reflects increases implemented in order to generate revenue to pay back the CWSRF loan.

Table 7.2. Funding Distribution

Neely Road Pump Station and Equalization Improvements Project

City of Brevard

Force Main Option

Enter data into the gray areas. Where applicable, use the pulldown menus as shown by the arrows.

	Funding Source[a]	Amount	Funding Type	Interest Rate (if applicable)	Repayment Period (if applicable)
Main Division Funding[b]:	CWSRF	$13,660,000	Loan	2.210%	20
Funding 1:					
Funding 2:					
Funding 3:					
Funding 4:					
Funding 5:					
Closing/Administrative Fee(s):		$273,200	If Other, list:		
Total Funded Amount (minus applicable closing/administrative fee[s]):		**$13,660,000**			
Total Project Cost (with closing/administrative fee[s]):		**$13,933,200**			

[a]For HUC grants, grant administrative fee is 1.5% of Total grant award.

[b]If principal forgiveness is used, place the principal forgiveness portion of the loan in Funding 1.

Table 7.3. Year 1 Interest and Repayment

Neely Road Pump Station and Equalization Improvements Project

City of Brevard

Force Main Option

	Funding Source	Total Funding Amount	Year 1 Principal Payment	Year 1 Interest Payment - Current Interest Rate	Year 1 Interest Payment - Worst-Case Interest Rate	Year 1 Total Payment - Current Interest Rate	Year 1 Total Payment - Worst Case Interest Rate
Main IFS Funding :	CWSRF	$13,660,000	$683,000	$301,886	$546,400	$984,886	$1,229,400
Funding 1:							
Funding 2:							
Funding 3:							
Funding 4:							
Funding 5:							
[a]Worst case is an interest rate of 4%. Applies to CWSRF, SRL, and SEL only.					**Total Payment @ Current Interest Rate:**	**$984,886**	
					Total Payment @ Worst-Case Interest Rate:		**$1,229,400**

Table 7.4. Cost per 5,000 Gallons to Finance Project

Neely Road Pump Station and Equalization Improvements Project

City of Brevard

Force Main Option

Select Customer Type for Financing Project[c]	Average Water Usage Per Month (gallons)	Number of Connections	Total Monthly Water Usage by Customer Type (gallons)	Total Monthly Water Usage for Customer Base (gallons):	17,603,600
☑ Residential	2,900	2,989	8,668,100	# of 5000 Gallon Units to Finance Project:	3,521
☑ Commercial	14,000	595	8,330,000	Year 1 O&M Expenses Due to Project:	$4,345
☑ Industrial	605,500	1	605,500		

	Funding Source	Year 1 Annual Repayment	Year 1 Annual O&M Costs	Total Year 1 Annual Costs @ Current Interest Rate	Year 1 Annual Cost @ Worst-Case Interest Rate	Year 1 Monthly Costs @ Current Interest Rate	Year 1 Monthly Costs @ Worst-Case Interest Rate	Monthly Cost/ 5,000 Gallons Due to Project @ Current Interest Rate (All Users)	Monthly Cost/5,000 Gallons Due to Project @ Worst-Case Interest Rate (All Users)	Monthly Cost/5,000 Gallons Due to Project @ Current Interest Rate (Residential Users Only)	Monthly Cost/5,000 Gallons Due to Project @ Worst-Case Interest Rate (Residential Users Only)
DWI Main Funding Source:	CWSRF	$984,886	$4,345	$989,231	$1,233,745	$82,436	$102,812	$23.41	$29.20	$47.55	$59.30
Funding Source 1:											
Funding Source 2:											
Funding Source 3:											
Funding Source 4:											
Funding Source 5:											
Total Year 1 Annual Cost @ Current Interest Rate:				**$989,231**							
Total Year 1 Annual Cost @ Worst-Case Interest Rate					**$1,233,745**						
Total Year 1 Monthly Cost @ Current Interest Rate:						**$82,436**					
Total Year 1 Monthly Cost @ Worst-Case Interest Rate:							**$102,812**				
Total Monthly Cost to Treat 5,000 Gallons @ Current Interest Rate:								**$23.41**			
Total Monthly Cost to Treat 5,000 Gallons @ Worst-Case Interest Rate (All Users):									**$29.20**		
Total Monthly Cost to Treat 5,000 Gallons @ Current Interest Rate (Residential Users Only):										**$47.55**	
Total Monthly Cost to Treat 5,000 Gallons @ Worst-Case Interest Rate (Residential Users Only):											**$59.30**

Table 7.5. User Rates Needed to Finance Project
Neely Road Pump Station and Equalization Improvements Project
City of Brevard
Force Main Option

Current Sewer Bill ($/5,000 gallons):	$39.90			Current Water Bill ($/5,000 gallons):	$39.90
	Funding Source	**User Rate Increase Due to Project @ Current Interest Rate (All Users)**	**User Rate Increase Due to Project @ Worst-Case Interest Rate (All Users)**	**User Rate Increase Due to Project @ Current Rate (Residential Users Only)**	**User Rate Increase Due to Project @ Worst-Case Interest Rate (Residential Users Only)**
Main IFS Funding Source:	CWSRF	$23.41	$29.20	$47.55	$59.30
Funding Source 1:					
Funding Source 2:					
Funding Source 3:					
Funding Source 4:					
Funding Source 5:					
Total User Rate Increase Due to IFS Loan(s) ($/5,000 gal.):		**$23.41**	**$29.20**	**$47.55**	**$59.30**
Total Increase Due to All Loans(s) ($/5,000 gal.):		**$23.41**	**$29.20**	**$47.55**	**$59.30**
New Sewer Bill Due to IFS Loan(s) ($/5,000 gal.):		**$63.31**	**$69.10**	**$87.45**	**$99.20**
New Sewer Bill Due to All Loan(s) ($/5,000 gal.):		**$63.31**	**$69.10**	**$87.45**	**$99.20**
Percent Change in Sewer Bill Due to IFS Loan(s):		**58.68%**	**73.19%**	**119.18%**	**148.63%**
Percent Change in Sewer Bill Due to All Loan(s):		**58.68%**	**73.19%**	**119.18%**	**148.63%**
New Sewer & Water Bills Due to IFS Loan(s) ($/5,000 gal.):		**$103.21**	**$109.00**	**$127.35**	**$139.10**
New Water & Sewer Bills Due to All Loan(s) ($/5,000 gal.):		**$103.21**	**$109.00**	**$127.35**	**$139.10**
Percent Change in Sewer & Water Bills Due to IFS Loan(s):		**29.34%**	**29.34%**	**29.34%**	**29.34%**
Percent Change in Sewer & Water Bills Due to All Loan(s):		**29.34%**	**36.59%**	**59.59%**	**74.32%**

[a]Change in User Fee to finance DWI Loan.

[b]Change in User Fee to finance ALL funding sources.

Table 7.6. Impact to Bills Due to Project
Neely Road Pump Station and Equalization Improvements Project
City of Brevard
Force Main Option

	Sewer Bill as % Monthly MHI:	1.04%	Water Bill as % Monthly MHI:		1.04%
	Current Sewer Bill ($/5,000 gal.):	39.90	Current Water Bill ($/5,000 gal.):		$39.90
	Current Sewer & Water Bill ($/5,000 gal.):	79.80	Sewer & Water Bill as % Monthly MHI:		2.09%
	Monthly MHI for LGU:	$3,819			
		Sewer Bill Due to DWI Loans	**Sewer Bill Due to All Loans**	**Water & Sewer Bills Due to DWI Loans**	**Water & Sewer Bills Due to All Loans**
Current Interest Rate (All Users)	New	$63.31	$63.31	$103.21	$103.21
	New %MHI Due to Project	1.66%	1.66%	2.70%	2.70%
	Potentially Significant Impact?	No	No	No	No
Current Interest Rate (Residential Users Only)	New	$69.10	$69.10	$109.00	$109.00
	New %MHI Due to Project	1.81%	1.81%	2.85%	2.85%
	Potentially Significant Impact?	No	No	No	No
Worst-Case Interest Rate (All Users)	New	$87.45	$87.45	$127.35	$127.35
	New %MHI Due to Project	2.29%	2.29%	3.33%	3.33%
	Potentially Significant Impact?	Yes	Yes	No	No
Worst-Case Interest Rate (Residential Users Only)	New	$99.20	$99.20	$139.10	$139.10
	New %MHI Due to Project	2.60%	2.60%	3.64%	3.64%
	Potentially Significant Impact?	Yes	Yes	No	No

If the user fee increases will be significantly increased, discuss why the LGU has determined to proceed with the project.

See Section 7.1

7.1 Financial Analysis Summary

Tables 7.1 through 7.6 provide a snapshot of the City's financial state for the most recently completed fiscal year (FY 13-14). Based upon the analysis presented in the tables, it is shown that the City would need to increase rates by $23.41 based on the current interest rate. It is important to note that this analysis does not take into account net income generated by the City.

As shown in Table 7.1, the City had a net income (net income = revenue – (expenses + debt)) of just over $150,000 in FY 13-14. However, as was also noted in Table 7.1, the City has already raised water and sewer rates to begin generating excess revenue to pay back the CWSRF loan. Based on projected financial information provided by the City Finance Director (see Appendix J), rates will continue to increase over the next 3 fiscal years until base rates do not cover any usage ($13.65 per 0 gallons). Based on this information the projected net income for FY 17-18 is expected to increase to nearly $570,000. It is important to note that the projected net income already includes loan repayment for the CWSRF loan. In other words, after the City makes the loan payment for the CWSRF loan (calculated to be $984,886 per year) as well as other expenses and debt, projections show they will have a net income of nearly $570,000. Hence plans to raise utility rates are more than sufficient to pay back the CWSRF loan.

Table 7.6 indicates that under the worst-case interest rate, user rates would be significantly impacted. As previously mentioned, the calculated user rate increase does not take into account net income, therefore the number is slightly misleading. Based upon the information supplied by the City, the planned rate structure in FY 17-18 would increase water and sewer bills to $51.15 per 5,000 gallons. This does not represent a potentially significant impact.

The financial analysis, presented in this Section, shows that ongoing plans to raise utility rates will allow the City to pay back the CWSRF loan in full in a 20 year period without putting a significant burden on local residents.

Section 8

Public Participation

A public meeting will be held as part of the Neely Road Pump Station and Improvements Project. The meeting will occur once DWI has reviewed this ER/EID and the technical approach of the Preferred Alternative has been established.