

M E M O R A N D U M

TO: New Hampshire Department of Transportation

FROM: Kristen Hayden, PE

DATE: July 31, 2018 (Revised April 4, 2019)
(Revised July 03, 2019)
(Revised November 12, 2019)
(Revised April 30, 2020)
(Revised July 10, 2020)

RE: Exit 4A, Derry-Londonderry 13065
Proposed Stormwater Treatment
Fuss & O'Neill Reference No. 20190127.A10

The Towns of Derry and Londonderry and the New Hampshire Department of Transportation (NHDOT), in cooperation with the Federal Highway Administration (FHWA), are advancing an updated Environmental Study for the I-93 Exit 4A Project (Project). The Project consists of a new diamond interchange on I-93 in the Town of Londonderry, approximately one mile north of Exit 4.

The purpose of the Project is to reduce congestion; improve safety along NH 102 from I-93 easterly through downtown Derry; and promote economic vitality in the Derry/Londonderry area.

The new diamond interchange would provide access to the east side of I-93. A one-mile connector roadway would be built on new alignment from the interchange to Folsom Road, near the intersection of North High Street and Madden Road, in the Town of Derry. Folsom Road, and subsequently Tsienneto Road, would be upgraded, and the intersections would be improved. In total, the proposed Project corridor from I-93 to the intersection of Tsienneto Road and NH Route 102/Chester Road would be 3.2 miles.

The Towns of Derry and Londonderry are located within an Urbanized Area and are regulated communities under the Municipal Separate Storm Sewer System General Permit (MS4). The MS4 requires 80% Total Suspended Solids (TSS) removal and 50% phosphorus reduction for redeveloped pavement and 90% TSS removal and 60% phosphorus reduction for newly developed pavement. Based on this criterion and the treatment removal efficiencies of Best Management Practices (BMPs), 100% treatment of both redeveloped and newly developed pavement is required under the MS4 to the maximum extent practicable.

Fuss & O'Neill has developed a conceptual stormwater treatment plan utilizing Infiltration Basins, Wet Extended Detention Basins, Dry Swales, Swales and removal of existing pavement to treat approximately 90% of the redeveloped and newly developed roadway pavement areas for the proposed Exit 4A improvements. In areas where the redeveloped and newly developed roadway pavement could not feasibly be treated, treatment of existing pavement outside of the project footprint was considered. Additional ROW impacts will be required for proposed BMPs as shown on the attached plan.

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Proposed Treatment

The proposed treatment areas and BMPs (depicted on the attached plan, and summarized in the attached tables) consist of the following:

- Existing BMP B1649, constructed under Contract 14633D, was built with additional capacity in an effort to accommodate future treatment of the Exit 4A ramps. Runoff from portions of the Exit 4A NB Off Ramp and SB On Ramp will be directed toward the existing BMP. The design of this BMP will need to be evaluated to determine how much extra capacity is available and if additional modifications will be required to accommodate the additional runoff.
- Existing BMP B1670, constructed under Contract 14633I, was constructed with additional capacity in an effort to accommodate future treatment of the Exit 4A ramps. Runoff from portions of the Exit 4A ramps will be directed toward the existing BMP. *The BMP has been conceptually analyzed to ensure it can treat the additional WQV and detain the additional runoff without increasing flows for the 50-year event to the Trolley Car Lane Stream in the vicinity of the Exit 4A SB On Ramp. The analysis included modifying the grading to enlarge the permanent pool and raising the weir between the forebay and the pond to make sure these are properly sized for the increased WQV. The outlet control structure was also modified. The updated modeling can be found in 2h1_Hycd_14633D&I_Exit 4A Proposed_Conditions HydroCAD.hcp file that has been provided.*
- Potential Proposed B1012 is located adjacent to the Connector Road at approximately 1012+00, RT and will collect runoff from 1008+45 to 1022+50. The soils in this area are 140C, Chatfield-Hollis-Canton complex, and are considered well drained, making this location feasible for infiltration. Infiltration testing should be performed in this area to confirm the feasibility of an infiltration basin at this location. The infiltration basin has been sized to hold the runoff from roadway pavement for the 50-year event. To minimize impacts to the surrounding wetlands and vernal pools, the access road/berm around the basin has been set at an elevation of 370.00 and the bottom of the infiltration basin at 365.00. The easement has been sized to include a forebay that can hold at least 25% of the WQV and the basin has been sized to detain the 50-year event since all of the pavement directed to this BMP is newly developed. The easement has also been sized to provide a maintenance access road from 1016+50, RT. The access road will go from an elevation of 402.00 down to the BMP elevation of 370.00' over 300 feet with a slope of 10.7%. The basin will infiltrate/discharge to the adjacent wetland 68, which is a Palustrine Forested Emergent Wetland (PF01E).
- Potential Proposed B1038 is located to the north of the Collector Road at approximately 1038+00, LT and collects runoff from 1022+50 to 1036+50. The BMP is proposed to be a Wet Extended Detention Basin that will be relatively large in size, as it will be treating new impervious from the proposed Connector Road. The outfall from the roadway closed system is assumed to occur at 1036+50, LT at an elevation of 352.00 and it is anticipated to

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be a 24 inch pipe. The access road berm has been set at an elevation of 352.00 and the top of the permanent pool has been set at 347.00 and the basin has been sized to hold the runoff from roadway pavement for the 50-year event. The basin will discharge to a non-perennial tributary of Shields Brook. It should be noted that the connection from wetland 35, a PF01E, to the non-perennial tributary will need to be regraded to go around the BMP or will need to be piped. Today, wetland 35 is conveyed to the non-perennial tributary via a drive pipe.

- Potential Proposed B1052 is located adjacent to the Connector Road at approximately 1052+00, LT and will collect runoff from 1036+50 to 1053+25 and runoff from 602+75 to 609+50 of the proposed bike path. The BMP is proposed to be a Wet Extended Detention Basin. Runoff will be conveyed to the BMP through an 18 inch pipe from the Connector Road at 1053+25 and a 24 inch pipe from the bike path at 606+95. The BMP is located on an existing commercial site, proposed to be acquired by the project due to roadway impacts. The existing commercial building and impervious parking lot are in the anticipated area of the BMP; heavily compacted soils may need to be excavated and replaced. The access road berm has been set at an elevation of 287.00 and the top of the permanent pool has been set at 282.00. The BMP has two locations where it could potentially be accessed, either from the bike path at 607+00, which can be accessed at 14+00, LT off of High Street or an access driveway can be graded from the Connector Road at approximately 1053+00. It will need to be confirmed that maintenance equipment can fit through the bike path structure. The BMP has been sized to hold the runoff from the roadway and bike path pavement for the 50-year event. The BMP will discharge directly into Shields Brook.
- Potential Proposed B15 is expected to be located to the east of North High Street at approximately 17+00, LT and collects runoff from 10+75 to 18+75 on North High Street and 599+75 to 602+75 on the bike path. It is anticipated that the BMP will be a Wet Extended Detention Basin. The outfall from the roadway closed system is assumed to be an 18 inch pipe at 19+00, LT. The access road berm has been set an elevation of 273.00 and the top of the permanent pool has been set at 268.00. Access to the BMP is proposed to be along an existing sewer easement at the end of Ferland Drive. The basin has been sized to hold the runoff from the roadway pavement for the 50-year event. The BMP will discharge into Shields Brook before it reaches Hoods Pond. There appears to be an existing BMP for the adjacent condo facility in the same vicinity, but B15 has been designed to avoid impacts to it. Coordination between the existing sewer pipe and the outfall pipe from this BMP will be required.
- Potential Proposed B11 is located to the east of Ferland Dr. at approximately 11+00, LT and collects runoff from approximately 10+50 to 12+00, LT on Ferland Dr. and from 1053+25 to 1054+25 on the Connector. The BMP is located on an existing residential parcel proposed to be acquired by the project due to roadway impacts. Runoff will be conveyed to the BMP from a catch basin located along the left side of the roadway. The BMP is anticipated to be a dry swale with a 0.5% slope and an underdrain. The swale is

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proposed to be 125 feet in length, 5 feet wide with 4:1 side slopes and 1.5 feet deep. This will achieve a WQF of less than 4 inches and a 10 minute hydraulic residence time, while maintaining a foot of freeboard during the peak elevation of a 10-year storm event. The swale outfalls to Shields Brook. The amount of runoff that can be collected for treatment at this location is limited due to the Shields Brook bridge under the Connector Road. It is assumed that a forebay will not be required and that deep sump catch basins will provide pre-treatment.

- Potential Proposed B1062 is located to the north of the Connector Road/Folsom Road and collects runoff from 1063+00 to 1085+00 and 218+75 to 220+00 from NH Route 28. It is anticipated that the BMP will be a Wet Extended Detention Basin. The closed drainage system will need to run through a small high point at 1067+22 resulting in a deep closed system (10' to 15') for 400 to 500 feet. The outfall from the roadway will be a 30 inch pipe at 1063+00. The access road berm has been set an elevation of 286.00 and the top of the permanent pool has been set at 281.00. The BMP has been placed at the rear of the properties to allow the frontage along Folsom Road to remain for future development. In order to place the basin toward the back of the property, the closed drainage system will need to have reduced cover (2 feet) at the low point on Tsienneto Road at 1071+71. If a 0.5% grade is held for the closed system pipes from 1071+71 to 1063+00 (eliminating the 3 inch drop, but still having the top crown of pipes match when the size increases), this will achieve an invert of 284.00' at the outfall to the basin to minimize tailwater on the closed system. Access to the BMP is anticipated to be from the north end of the Franklin Place Condominium parking lot (Town of Derry Assessor's Map 35, Lot 6). Runoff from the proposed development of the Town of Derry Assessor's Map 35, Lot 11-1 parcel has also been taken into consideration in the sizing of the B1062 as the BMP for the proposed development would be impacted by B1062. The basin has been sized to hold the runoff from the roadway pavement and the runoff that is directed to the displaced BMP for the proposed development for the 25-year storm event. The BMP will discharge into an existing wetland/pond located on the Town of Derry Assessor's Map 35, Lot 5-4 parcel, which overflows into Shields Brook. Please note that there is a knoll on the property and significant common and rock excavation will be required in close proximity to surrounding buildings to construct this BMP. Concern with PFOA's from the adjacent property to the northwest has also been noted in this area.
- Potential Proposed B208 is located to the east of NH Route 28 (Crystal Ave.) at approximately 209+00, RT and collects runoff from 210+50 to 217+00. The BMP is anticipated to be a swale. The swale is proposed to be 275 feet in length with a slope of 1.1%. In order to achieve the hydraulic residence time while maintaining less than 4 inches of flow for the WQF, the swale will need to be 8 feet wide with 4:1 side slopes. It will discharge into an existing wetland located on the Town of Derry Assessor's Map 36, Lot 19. It is assumed that a forebay will not be required and that deep sump catch basins will provide pre-treatment.

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- Potential Proposed B1085 is located to the north of Tsienneto Road at approximately 1085+00, LT and collects runoff from 1085+00 to 1110+25. It is anticipated the BMP will be a Wet Extended Detention Basin. The outfall from the roadway closed system is anticipated to be a 24 inch pipe at an elevation of 316.00' at 1085+00, LT. The access road berm has been set an elevation of 316.00 and the top of the permanent pool has been set at 311.00. Access to the BMP is anticipated to be from the northeast corner of the Fireye, Inc. parking lot (Town of Derry Assessor's Map 8D, Lot 269). The basin has been sized to hold the 50-year storm event and the grading of this BMP was based on 2-foot aerial mapping contours. It will discharge into existing wetland located in the back of the Fireye property, which is connected to an existing wetland in the west corner of the NH Route 28 and Tsienneto Road intersection, next to the Derry Police Department. The wetlands are connected through an existing drain pipe running underneath NH Route 28.
- Potential Proposed B308 is located to the east of NH Route 28 Bypass (N. Main Street) at approximately 310+00, RT, collecting NH Route 28 Bypass runoff from 310+00 to 333+30 and Tsienneto Road runoff from 1111+00 to 1113+50. Roadside ditches or curbing will need to be added to NH Route 28 Bypass from 320+35 to 333+30 to collect runoff from existing pavement. This portion of NH Route 28 Bypass is currently outside of the project limits. The BMP is proposed to be located in an open area on the Town of Derry Assessor's Map 8C, Lot 71 and is anticipated to be a Wet Extended Detention Basin. The outfall from the roadway closed system is assumed to occur at 311+35, RT at an elevation of 366.00 and it is anticipated to be a 24 inch pipe. The BMP has been set back from the road in an effort to allow for future development of the parcel and to minimize impacts to the trees adjacent to the wetland. The access road berm has been set an elevation of 360.00 and the top of the permanent pool has been set at 356.00. Minimal detention has been provided since the majority of the runoff to this BMP is from existing pavement. Access to the BMP should be determined after the parcel is developed. The BMP will discharge into an existing wetland located on the Town of Derry Assessor's Map 8C, Lot 68.
- Potential Proposed B1117 is located to the south of Tsienneto Road at approximately 1117+25, RT and collects runoff from approximately 1113+50 to 1124+70. The BMP is anticipated to be a dry swale with a 1.0% slope and an underdrain. The swale is proposed to be 300 feet in length, 8 feet wide with 4:1 side slopes and 2.0 feet deep. This will achieve a WQF of less than 4 inches and a 12 minute hydraulic residence time, while maintaining a foot of freeboard during the peak elevation of the 10-year storm event. The swale has been designed to follow the future proposed driveway for Pinkerton Academy. Roadway runoff will be conveyed to the treatment swale via a ditch and drive pipes. The beginning of the ditch is shown going through a portion of a building. Pinkerton Academy is planning on removing this portion of the building with their proposed development. The swale will outfall to an existing pond located on the Town of Derry Assessor's Map 8C, Lot 68. It is assumed that a forebay will not be required and that deep sump catch basins will provide pre-treatment.

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- Potential Proposed B1128 is located south of Tsienneto Road at approximately 1128+00, RT. The BMP is anticipated to be a swale, collecting runoff from 1124+70 to 1134+50. The swale is proposed to be 200 feet in length with a slope of 0.5%. In order to achieve the hydraulic residence time of 11 minutes while maintaining less than 4 inches of flow for the WQF, the swale will need to be 8 feet wide with 4:1 side slopes. It will discharge into an existing pond located towards the back of the Town of Derry Assessor's Map 8C, Lot 66-3. It is assumed that a forebay will not be required and that deep sump catch basins will provide pre-treatment.
- Potential Proposed B1159 is located to the south of Tsienneto Road at approximately 1159+00, RT. The BMP collects runoff from 1134+50 to 1161+80 on Tsienneto Road and portions of Jeff Lane, Scenic Drive, Beaver Road, Horseshoe Drive and Barkland Drive. Runoff from portions of Jeff Lane and Scenic Drive that are curbed today, located outside of the project limits, are conveyed to this BMP. The BMP is anticipated to be a Wet Extended Detention Basin. The outfall from the roadway closed system is presumed to be at 1159+00, RT via a 24 inch pipe. The ground will need to be regraded over the pipe in order to achieve cover. The access road berm has been set at an elevation of 298.00 and the top of the permanent pool has been set at 293.00. Minimal detention should be required at this location, as most of the runoff being conveyed to the BMP is from existing pavement. The BMP will outfall to the wetland located on the Town of Derry Assessor's Map 55, Lot 12-1. The wetland outfalls to Abbott Brook, which feeds into Beaver Lake. The BMP has been graded to avoid impacts to the parcel identified as Map 55, Lot 15 on the Town of Derry Assessor's Map. If the property owner of this parcel is amenable to impacts to their parcel to accommodate additional stormwater treatment, the amount of detention provided in the BMP could be increased.
- Potential Proposed B412 is located to the north of NH Route 102 from approximately 411+50 to 412+50, LT and collects runoff from approximately 411+50 to 412+50, LT. The BMP is anticipated to be a swale with a 0.5% slope. The swale is proposed to be 150 feet in length, 2 feet wide with 4:1 side slopes and 1.5 feet deep. This will achieve a WQF of less than 4 inches and an 18 minute hydraulic residence time, while maintaining a foot of freeboard during the peak elevation of a 10-year storm event. The swale will outfall to wetlands located on the Town of Derry Assessor's Map 55, Lot 21. The wetland outfalls to Abbott Brook, which feeds into Beaver Lake. This location was also evaluated as a dry swale, but the elevation of the receiving water body would be higher than the outfall from the underdrain. The swale is collecting runoff via sheet flow which does not allow for a formal method of pre-treatment, but some level of pre-treatment will be obtained in the foreslopes to the swale.
- Potential Proposed B415 is located to the south of NH Route 102 from approximately 414+50 to 416+50, RT and collects runoff from approximately 414+50 to 416+25, RT. The BMP is anticipated to be a dry swale with a 1.4% slope and an underdrain. The swale is proposed to be 175 feet in length, 4 feet wide with 4:1 side slopes and 1.5 feet deep. This

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will achieve a WQF of less than 4 inches and an 11 minute hydraulic residence time, while maintaining a foot of freeboard during the peak elevation of a 10-year storm event. The swale will have 3 feet of filter material consisting of a layer of sand and a layer of stone. The underdrain will be 2 inches above the bottom of stone. The underdrain will outfall to an existing catch basin on the southeast corner of NH Route 102 and North Shore Road. The cross pipe under North Shore Road will need to be lowered 2 feet to accommodate the proposed underdrain. The cross pipe under NH Route 102 does not need to be modified. The drainage network will outfall to wetlands located on the Town of Derry Assessor's Map 55, Lot 21. The wetland outfalls to Abbott Brook, which feeds into Beaver Lake. The swale is collecting runoff via sheet flow which does not allow for a formal method of pre-treatment, but some level of pre-treatment will be obtained in the foreslopes to the swale.

- Potential Proposed B417 is located to the south of NH Route 102 from approximately 416+50 to 419+00, RT and collects runoff from approximately 416+50 to 419+00, RT and 419+00 to 424+00, LT and RT. Sloped granite curb will need to be added along the shoulder from approximately 419+50 to 424+50, RT. The BMP is anticipated to be a dry swale with a 1.0% slope and an underdrain. The swale is proposed to be 225 feet in length, 4 feet wide with 4:1 side slopes and 2 feet deep. This will achieve a WQF of less than 4 inches and a 10 minute hydraulic residence time, while maintaining a foot of freeboard during the peak elevation of a 10-year storm event. It is divided by a driveway and will require a culvert under the driveway at 417+75, RT, but there is the potential this access could be removed, as the property also has a driveway off of North Shore Road. The swale will have 3 feet of filter material consisting of a layer of sand and a layer of stone. The underdrain will be 2 inches above the bottom of stone. The drainage network currently outfalls to a wetland located on the Town of Derry Assessor's Map 55, Lot 21. The wetland outfalls to Abbott Brook, which feeds into Beaver Lake. The swale is collecting runoff via sheet flow which does not allow for a formal method of pre-treatment, but some level of pre-treatment will be obtained in the foreslopes to the swale.
- Potential Proposed B101 is expected to be located to the north of North Shore Road at approximately 101+00, LT. It collects runoff from North Shore Road outside of the proposed project limits. The BMP is anticipated to be a dry swale with a 2.0% slope and an underdrain. The swale is proposed to be 125 feet in length, 4 feet wide with 4:1 side slopes and 2 feet deep. This will achieve a WQF of less than 4 inches and a 12 min. hydraulic residence, while maintaining a foot of freeboard during the peak elevation of a 10-year event. The swale will have 3 feet of filter material consisting of a layer of sand and a layer of stone. The underdrain will be 2 inches above the bottom of stone. The underdrain is expected to outfall to the same existing catch basin as B417. The swale is collecting runoff via sheet flow which does not allow for a formal method of pre-treatment, but some level of pre-treatment will be obtained in the foreslopes to the swale.
- Pavement Removal: As a result of the re-alignment of existing roadways, approximately 73,500 square feet of pavement removal is expected.

Non-Practicable Treatment Alternatives

- Providing a BMP at the low point located at approximately 1056+00 to the west of Franklin Street Extension and the north of Folsom Road was evaluated. To accomplish this Franklin Street Extension would need to be curbed on both sides of the road in order to collect the runoff from the proposed pavement. The BMP was anticipated to be a swale. Upon further investigation it was determined that there is not enough elevation change or space available to achieve treatment in a swale at this location. The depth of the flow and the hydraulic residence time could not be achieved in the available space. Normandeau Associates, Inc. (NAI) revisited this area and found that there was a stream located in the vicinity, which was not previously shown on the plans, making treatment even less feasible at this location.

Whether or not this area could be treated in B1062 was also considered, but the approximate roadway closed system outfall is 273.5' at the low point at 1057+85 and the outfall from B1062 to the brook is approximately at 280.00'.

- A BMP was investigated outside of the project limits at approximately 204+00, RT on NH Route 28 (Crystal Ave) behind the McDonalds and Gibbs gas station. The BMP was proposed to be a wet extended detention basin and would have collected runoff from 196+50 to 220+00 on NH Route 28. This BMP did propose to collect runoff from a significant amount of existing pavement that is outside of the project on a roadway that is already curbed with an existing closed drainage system in order to offset some of the areas in the project where treatment of the redeveloped pavement is not feasible. Unfortunately, there is not enough elevation change to provide a wet extended detention basin. A swale was also investigated at this location. The existing catch basin in the roadway has a rim elevation of 290.00'. If cover over the outfall pipe from the roadway is reduced to 2 feet, a 24" diameter outfall pipe from the road that extends under the adjacent parking lot would outfall at approximately 285.20'. The bottom of the adjacent wetland is at 284.00', but the water level in the wetland appears to be at 286.00'. A swale at this location does not appear to be feasible due to tailwater. As a result a smaller amount of pavement has been treated via B208.
- The treatment of the remainders of Tsienneto Road and portions of NH Route 102 were not considered to be practicable due to the density of the surrounding wetlands and a lack of vertical separation from the wetlands to provide treatment. The following alternatives were considered:
 - The treatment of NH Route 102 in B1159 was considered, but there was no way to cross the treatment under the existing brook.
 - Collecting runoff from Tsienneto Road (1163+50 to 1169+40) and NH Route 102 (415+00 to 427+40) and constructing a BMP basin at 92 Tsienneto Road was considered, but the elevations did not work. The outfall from the roadway into the

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basin would need to be at an elevation of 292.00' and the surrounding wetland is at an elevation of 295.00'.

- Although roadside ditches are not considered stormwater treatment, we are proposing to add treatment swales along portions of NH Route 102 where they do not exist today. This will be an improvement to the existing condition, as today runoff flows along the gravel shoulders of the roadway.
- Treatment of many of the small side road connections were not considered feasible, as they are not curbed today and curbing them or providing roadside ditches to collect runoff would result in significant impacts while providing minimal additional treatment. Many of the connecting side roads flow away from the project, making treatment of these areas a challenge.

The Project has approximately 1,722,700 square feet of redeveloped and newly developed pavement areas that require treatment. Of the 1,722,700 square feet, we are proposing to treat approximately 1,543,000 square feet or 90% of the required amount. Existing pavement that will be redeveloped by this project accounts for 827,700 square feet of the pavement requiring treatment. Currently, none of that pavement has treatment; therefore the implementation of the proposed stormwater treatment should provide a significant improvement in the water quality of the existing watershed. Considering the constraints of the project area and the proposed improvement to the existing condition, stormwater treatment has been provided to the maximum extent practicable.

KAH:jr
AWV

cc: Keith Cota - NHDOT
Mark Hemmerlein - NHDOT
Marc Laurin - NHDOT
John Butler - NHDOT
Wayne Brooks - NHDOT
JoAnn Fryer - Fuss & O'Neill
Nicole Fox - Fuss & O'Neill

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|---------------------------------------|--------------|
| Roadway Impervious Area to be Treated | 1,722,720 SF |
|---------------------------------------|--------------|

| Roadway | Begin Station | End Station | New Impervious (SF) | Existing Impervious (SF) | Total Treatment Area (SF) |
|-----------------------------|---------------|-------------|---------------------|--------------------------|---------------------------|
| Connector | 1001+50 | 1008+42 | 50,074 | | 50,074 |
| Connector (B1012) | 1008+42 | 1022+47 | 96,582 | | 96,582 |
| Connector (B1038) | 1022+47 | 1036+50 | 89,061 | | 89,061 |
| Connector (B1052) | 1036+50 | 1053+25 | 105,292 | 35,385 | 140,677 |
| Connector (B11) | 1053+25 | 1054+25 | 7,288 | 2,160 | 9,448 |
| Connector | 1054+25 | 1063+00 | 66,442 | 16,308 | 82,750 |
| Connector/Tsienneto (B1062) | 1063+00 | 1085+00 | 81,990 | 146,489 | 228,479 |
| Tsienneto (B1085) | 1085+00 | 1110+25 | 39,328 | 119,061 | 158,389 |
| Tsienneto (B308) | 1110+25 | 1113+50 | 5,490 | 19,041 | 24,531 |
| Tsienneto (B1117) | 1113+50 | 1124+70 | 15,132 | 39,367 | 54,499 |
| Tsienneto (B1128) | 1124+70 | 1134+50 | 4,313 | 32,396 | 36,709 |
| Tsienneto (B1159) | 1134+50 | 1161+75 | 10,572 | 93,101 | 103,673 |
| Tsienneto | 1161+75 | 1169+75 | 7,131 | 22,871 | 30,002 |
| Tsienneto Subtotal | | | 578,695 | 526,179 | 1,104,874 |

| | | | | | |
|---------------------|-------|-------|---------|---|---------|
| SB On Ramp (B1649) | 46+15 | 66+50 | 36,721 | | 36,721 |
| SB On Ramp | 66+50 | 73+90 | 22,359 | | 22,359 |
| SB Off Ramp (B1670) | 80+40 | 89+20 | 25,172 | | 25,172 |
| SB Off Ramp | 89+20 | 96+90 | 15,351 | | 15,351 |
| NB On Ramp (B1670) | 40+40 | 51+60 | 36,391 | | 36,391 |
| NB On Ramp | 51+60 | 64+20 | 16,083 | | 16,083 |
| NB Off Ramp (B1649) | 13+00 | 28+10 | 37,302 | | 37,302 |
| NB Off Ramp (B1670) | 28+10 | 35+50 | 20,508 | | 20,508 |
| Ramp Subtotal | | | 209,887 | 0 | 209,887 |

| | | | | | |
|---|--------|--------|---------|---------|---------|
| Madden Road | 10+60 | 19+40 | 13,198 | 5,428 | 18,626 |
| North High Street (B15) | 10+75 | 18+75 | 22,760 | 19,548 | 42,308 |
| Bike Path (B1052) | 602+75 | 609+50 | 4,069 | 1,690 | 5,759 |
| Bike Path (B15) | 599+75 | 602+75 | 2,425 | 493 | 2,918 |
| Ferland Drive | 10+50 | 13+50 | 382 | 5,634 | 6,016 |
| Ferland Drive (B11) | 10+50 | 12+00 | | 2,128 | 2,128 |
| Franklin Street Extension | 30+50 | 34+00 | 4,177 | 9,936 | 14,113 |
| Franklin Street | 28+75 | 21+50 | 9,902 | 19,483 | 29,385 |
| Laconia Ave | 70+60 | 72+50 | 188 | 3,713 | 3,901 |
| Route 28 (Manchester Road) | 220+00 | 220+50 | 657 | 5,000 | 5,657 |
| Route 28 (Crystal Ave)(B208) | 210+50 | 217+00 | 9,109 | 50,241 | 59,350 |
| Route 28 (Crystal Ave) | 208+75 | 210+50 | 675 | 9,813 | 10,488 |
| Pinkerton | 60+50 | 65+00 | 3,351 | 24,007 | 27,358 |
| Route 28 Bypass (Londonderry Tpk)(B308) | 316+30 | 320+40 | 1,350 | 22,026 | 23,376 |
| Route 28 Bypass (N. Main Street)(B308) | 310+00 | 315+60 | 923 | 26,124 | 27,047 |
| Barkland Drive (B1159)(Left) | 10+25 | 12+00 | 29 | 2,203 | 2,232 |
| Barkland Drive (Right) | 10+25 | 12+00 | 100 | 2,266 | 2,366 |
| Fieldstone Drive | 20+15 | 21+40 | 99 | 3,968 | 4,067 |
| Horseshoe Drive (B1159) | 30+25 | 32+75 | 0 | 6,599 | 6,599 |
| Morningside Drive | 40+15 | 42+00 | 144 | 5,676 | 5,820 |
| Scenic Drive (B1159) | 50+25 | 52+40 | 260 | 5,372 | 5,632 |
| Beaver Road (B1159) | 60+15 | 61+60 | 176 | 3,440 | 3,616 |
| Beaver Road | 61+60 | 62+75 | | 1,886 | 1,886 |
| Route 102 | 406+75 | 427+50 | 32,445 | 64,866 | 97,311 |
| Side Road Total | | | 106,419 | 301,540 | 407,959 |

TOTAL IMPERVIOUS 895,001 827,719 1,722,720

| | | | |
|-----------------------|------------|----------------------|-----|
| Untreated Impervious: | 179,670 SF | % Impervious Treated | 90% |
|-----------------------|------------|----------------------|-----|

| BMP | BMP Type | Roadway | Begin Station | End Station | Impervious Area Treated (SF) | Town |
|--|-------------------------------------|--|---|---|------------------------------|-------------|
| B1649 (Existing BMP constructed with 14633D) | Wet Extended Detention Basin | NB Off Ramp SB On Ramp | 13+00 46+15 | 28+10 66+50 | 74,020 | Londonderry |
| B1670 (Existing BMP constructed with 14633I) | Wet Extended Detention Basin | Connector Road NB On Ramp NB Off Ramp SB On Ramp SB Off Ramp | 1001+50 40+40 28+10 66+50 80+40 | 1008+45 51+60 35+50 73+90 89+20 | 162,600 | Londonderry |
| B1012 | Infiltration Basin | Connector Road | 1008+45 | 1022+50 | 96,580 | Londonderry |
| B1038 | Wet Extended Detention Basin | Connector Road | 1022+50 | 1036+50 | 89,060 | Londonderry |
| B1052 | Wet Extended Detention Basin | Connector Road Bike Path | 1036+50 602+75 | 1053+25 609+50 | 146,420 | Derry |
| B15 | Wet Extended Detention Basin | North High Street Bike Path | 10+75 599+75 | 18+75 602+75 | 45,220 | Derry |
| B11 | Dry Swale | Ferland Drive Connector Road | 10+50 1053+25 | 12+00 1054+25 | 11,570 | Derry |
| B1062 | Wet Extended Detention Basin | Tsienneto Road Route 28 | 1063+00 218+75 | 1085+00 220+00 | 228,490 | Derry |
| B208 | Swale | Crystal Ave | 210+50 | 217+00 | 59,350 | Derry |
| B1085 | Wet Extended Detention Basin | Tsienneto | 1085+00 | 1110+25 | 158,380 | Derry |
| B308 | Wet Extended Detention Basin | NH 28 Bypass Tsienneto Road | 310+00 1111+00 | 333+30 1113+50 | 128,140 | Derry |
| B1117 | Dry Swale | Tsienneto Road | 1113+50 | 1124+70 | 54,500 | Derry |
| B1128 | Swale | Tsienneto | 1124+70 | 1134+50 | 36,700 | Derry |
| B1159 | Wet Extended Detention Basin | Tsienneto | 1134+50 | 1161+80 | 139,700 | Derry |
| B412 | Swale | Route 102 | 411+50 | 412+50 | 1,680 | Derry |
| B415 | Dry Swale | Route 102 | 414+50 | 416+25 | 6,630 | Derry |
| B417 | Dry Swale | Route 102 | 416+50 | 424+50 | 29,100 | Derry |
| B101 | Dry Swale | North Shore Road | 100+75 | 102+00 | 1,450 | Derry |
| Pavement Removal | Removal of existing impervious area | | | | 73,460 | |

Total Treated Impervious Area 1,543,050 SF



RT. 28 NORTH MAIN STREET

TSIENNETO ROAD

SILVESTRI CIRCLE

NESMITH STREET

CHESTER ROAD

THORTON STREET

NEWELL'S MEADOW LANE

HOOD KROFT DRIVE



LINLEW DRIVE

RT. 28 NORTH MAIN STREET

TSIENNETO ROAD

HOOD KROFT DRIVE

NEWELL'S MEADOW LANE

PINKERTON STREET

RT. 28 NORTH MAIN STREET

SALTMARSH AVE

NESMITH STREET

THORTON STREET

CHESTER ROAD

SILVERSTRI CIRCLE