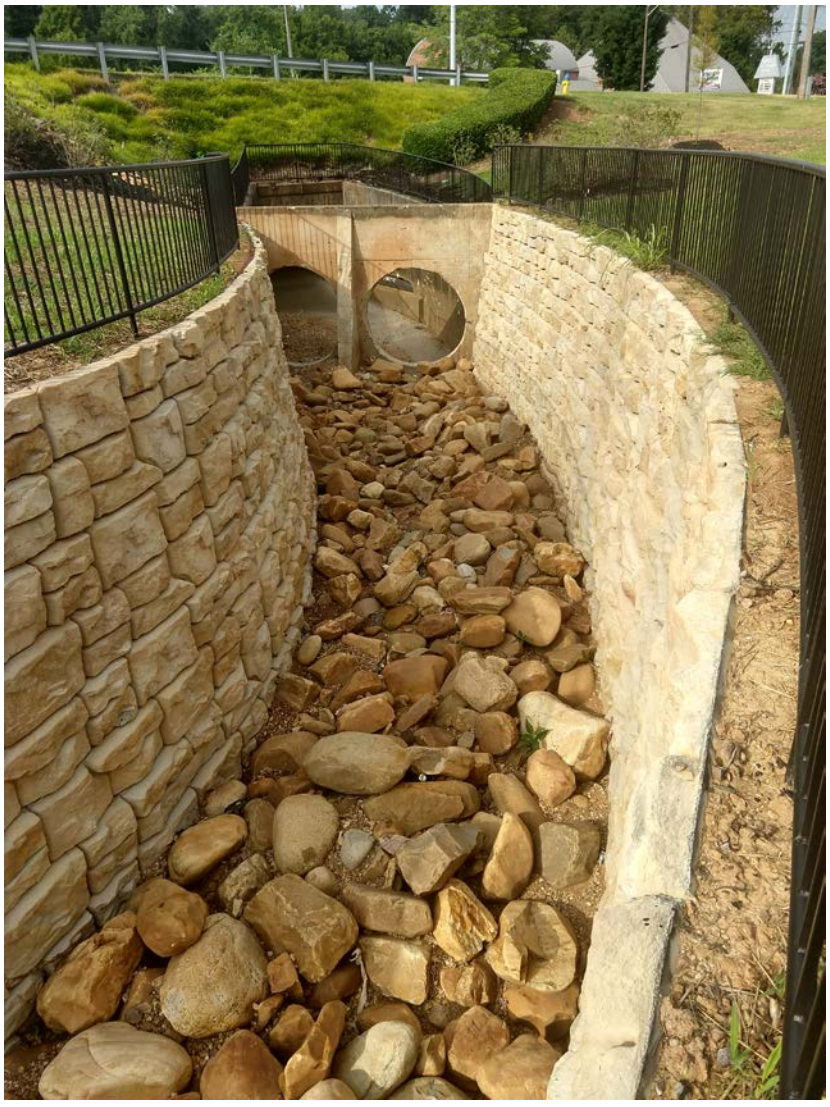
THE CITY OF KNOXVILLE
TENNESSEE

NPDES Permit Annual Report



National Pollutant Discharge Elimination System
Stormwater Discharge Permit TNS068055
July 1, 2019 - June 30, 2020

CITY OF KNOXVILLE

CITY OF KNOXVILLE

Engineering
W. Harold Cannon, Jr., P.E.
Director of Engineering

December 18, 2020

Mr. Vojin Janjic
Tennessee Department of Environment and Conservation
Division of Water Resources
William R. Snodgrass Tennessee Tower, 2nd Floor
312 Rosa L. Parks Ave.
Nashville, TN 37243

RE: City of Knoxville, NPDES MS4 Permit # TNS068055
2019 – 2020 Annual Report

Dear Mr. Janjic:

The City of Knoxville is pleased to submit the annual report for the NPDES permit issued July 1, 2004. This annual report summarizes the NPDES activities during the twelve-month period of July 1, 2019 through June 30, 2020. The annual report was coordinated and prepared by the Engineering Department in conformance with the reporting requirements in the City's NPDES Permit Part VI.

If you have any questions or wish to discuss any of the NPDES Permit programs, please contact David Hagerman by email at dhagerman@knoxvilletn.gov or by phone at (865) 215-3251.

Sincerely,

Patrick Kontovich, P.E., Stormwater Engineering

CC: Ms. McFall

CITY OF KNOXVILLE

Engineering
W. Harold Cannon, Jr., P.E.
Director of Engineering

December 18, 2020

Ms. Valerie McFall
Tennessee Department of Environment and Conservation
Division of Water Resources
Knoxville Environmental Field Office
3711 Middlebrook Pike
Knoxville, TN 37921

RE: City of Knoxville, NPDES MS4 Permit # TNS068055
2019 – 2020 Annual Report

Dear Ms. McFall:

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Sincerely,

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Tennessee Department of
Environment and Conservation
Division of Water Resources
William R. Snodgrass Tennessee Tower,
312 Rosa L. Parks Avenue, 2nd Floor, Nashville,
Tennessee 37243, 615-532-0109 (TDEC)

Phase I Medium Municipal Separate Storm Drain System (MS4) Annual Report

1. MS4 Information

Name of MS4: City of Knoxville	MS4 Permit Number: TNS068055	
Contact Person: David Hagerman, P.E.	Email Address: dhagerman@knoxvilletn.gov	
Telephone: (865) 215-3251	MS4 Program Web Address: www.knoxvilletn.gov	
Mailing Address: P.O. Box 1631, 400 Main Street, Suite 317		
City: Knoxville	State: Tennessee	ZIP code: 37901

Additional Contacts:

W. Harold Cannon, Jr., P.E., Director (865) 215-2148 hcannon@knoxvilletn.gov
Department of Engineering
P.O. Box 1631, Suite 475, 400 Main Street, Knoxville, TN 37901

Chad Weth, Director (865) 215-2060 cweth@knoxvilletn.gov
Public Service Department
P.O. Box 1631, Suite 520A, 400 Main Street, Knoxville, TN 37901

What is the current population of your MS4? **From 2010 Census: 178,874;**
Census.gov estimated 2019 population: 187,603

What is the reporting period for this annual report? **July 1, 2019 to June 30, 2020**

2. Discharges to Water Bodies with Unavailable Parameters or Exceptional Tennessee Waters

A. *Does your MS4 discharge into waters with unavailable parameters (previously referred to as impaired) for pathogens, nutrients, siltation or other parameters related to stormwater runoff from urbanized areas as listed on TN's most current 303(d) list and/or according to the on-line state GIS mapping tool (tdeconline.tn.gov/dwr/)? If yes, attach a list.* ☒ Yes ☐ No

See attached Table 2A.

B. *Are there established and approved TMDLs (https://www.tn.gov/environment/program-areas/wr-water-resources/watershed-stewardship/tennessee-s-total-maximum-daily-load--tmdl--program.html) with waste load allocations for MS4 discharges in your jurisdiction? If yes, attach a list.* ☒ Yes ☐ No

When the current permit was issued, the following TMDLs had been approved:

- **Fecal Coliform in First, Second, Third, and Goose Creek (Fort Loudoun Lake Watershed - HUC 06010201), and;**
- **Fecal Coliform in Baker, Fourth, and Williams Creek (Fort Loudoun Lake Watershed HUC 06010201).**

The following TMDLs have been approved since the current permit was issued:

- **Siltation and Habitat Alteration in the Ft. Loudon Lake Watershed (HUC 06010201), approved in 2006, and;**
- **E. Coli in the Fort Loudon Lake Watershed (HUC 06010201), approved in 2017.**

Additionally, in 2010 a proposed TMDL was approved and titled *Proposed Total Maximum Daily Loads (TMDLs) for Polychlorinated Biphenyls (PCBs) in the Fort Loudon Lake Reservoir, Fort Loudon Lake Watershed (HUC 06010201)*.

C. *Does your MS4 discharge to any Exceptional TN Waters (ETWs - http://environment-online.tn.gov:8080/pls/enf_reports/f?p=9034:34304:4880790061142)? If yes, attach a list.*
☐ Yes ☒ No

D. *Are you implementing a specific Stormwater Management Plan (SWMP) to control pollutant discharges to waterbodies with unavailable parameters or ETWs? If yes, describe the specific practices:* ☒ Yes ☐ No

The City of Knoxville continues to implement and comply with the SWMP issued in the 2004 NPDES permit (TNS068055). The specific task elements of the SWMP are shown on attached Table 2D.

3. Public Education/Outreach and Involvement/Participation

A. Have you developed a Public Information and Education plan (PIE)? ☒ Yes ☐ No

B. *Is your public education program targeting specific pollutants and sources, such as Hot Spots? If yes, describe the specific pollutants and/or sources targeted by your public education program:*
☒ Yes ☐ No

- **The Special Pollution Abatement Permit (SPAP) program targets specific hot spots known to produce pollutants not covered by first flush requirements, such as floatable debris and oil/grease.**
- **The Tennessee Stormwater Association's (TNSA) Tennessee Facebook ad campaign consists of 24 static ads that change monthly, related to the season and activities for that month. The ads target pollutant producing activities such as car washing, pressure washing, fertilizing, disposing of used oil, and many other household activities.**
- **Signs have been installed at strategic locations throughout the City that are designed to educate the public on the water quality concerns, specifically fecal coliform and E. coli bacteria, that can result from pet waste or feeding wild birds.**
- **Education programs for pesticides, herbicides, and fertilizer use have been implemented in conjunction with City public education programs for collection and recycling of household hazardous waste (HHW).**
- **The 311 call center is advertised to increase the public's awareness of the City's role in water quality issues and to create a quick and anonymous method for citizens to report water quality concerns, like illicit dumping or industrial discharges.**

C. *Do you have a webpage dedicated to your stormwater program? If yes, provide a link/URL:*
☒ Yes ☐ No

http://www.knoxvilletn.gov/stormwater

D. *Summarize how you advertise and publicize your public education, outreach, involvement and participation opportunities:*

- **The City advertises the 311 call center through stormwater pollution prevention educational handouts (e.g. magnets, koozies, and brochures), as well as presentations, business cards, vehicles, signage, and correspondence with residents.**
- **The City advertises volunteer opportunities on the volunteer opportunities website (http://knoxvilletn.gov/residents/volunteer_opportunities) and on a shared website with other agencies.**
- **The City developed and maintains the Best Management Practices (BMP) Manual and the Land Development Manual (LDM). Both are updated on an as needed basis and are available on the stormwater engineering website. The BMP Manual explains requirements for stormwater pollution prevention and erosion control for homeowners and both commercial and industrial sites. The LDM was created to assist developers with meeting all design and construction requirements.**

- **The City has a standard that requires a "No Dumping, Drains to River" message to be cast in all new curb irons, solid stormwater manhole/junction box covers, and manhole lids for stormwater treatment devices.**
- **Stormwater Engineering's water quality projects are often highlighted on the City's blog and Public Improvement Projects webpage, found at knoxvilletn.gov/blog and knoxvilletn.gov/projects, respectively.**

E. *Summarize the public education, outreach, involvement and participation activities you completed during this reporting period:*

- **The City continued to improve the long standing Adopt-A-Stream program to provide supervision, training, tools, gear, Personal Protective Equipment (PPE), trash pick-up, and coordination between volunteers for cleanup activities in watersheds throughout the City. New groups adopted stream segments that have not previously been adopted. Multiple one time clean up events were organized with groups seeking to volunteer for community service hours.**
- **Hundreds of hours were spent by staff at the Fountain City Lake educating the public on the negative effects on water quality that can result from feeding wild birds. These efforts included physical removal of invasive aquatic plants, permanent signage, updates on the City blog and Facebook page about the progress/struggles at the lake, and was a source of significant media attention. During this time employees interacted with citizens garnering a spirit of community and willingness to volunteer.**
- **No dumping signs were updated and many new sign locations were added.**
- **The City coordinated with Knox County Health Department and Ijams Nature Center to test bacteria levels at the cave effluent and swimming area of Mead's Quarry. Ijams staff were educated on the impact and concerns related to high bacteria levels in recreational waters. A continued effort to monitor bacteria level fluctuations due to seasonal and precipitation factors is ongoing.**
- **The bacteria sampling frequency in Second Creek, adjacent to highly concentrated homeless encampments, was increased to evaluate the negative impact of the homeless population on the stream.**

F. *Summarize any specific successful outcome(s) (e.g., citizen involvement, pollutant reduction, water quality improvement, etc.) fully or partially attributable to your public education and participation program during this reporting period:*

- **The Citizens near Edgewood Park continue to be active and inquisitive regarding the stream restoration project completed to channelize the previously culverted spring as the channel is adjusted and monitoring of the new stream continues. City staff have adjusted the invert of the channel to eliminate stagnant sections and ensure flow. Macroinvertibrates now inhabit the channel and salamanders have been seen. As the stream comes to life many of the citizens are seen enjoying the wildlife, and children enjoy playing in and around the feature. The creation of the stream has brought significant attention to water quality and an area for children to be inquisitive about streams.**

- **The City installed signage at both Fountain City Lake and Lake Ottosee in Chilhowee Park to educate the public on the negative impact that feeding bread, cat food, and grain to ducks has on water quality. The public responded with a notable drop in abusive feeding practices. Some citizens have also begun routinely volunteering to pick up litter and debris, rake leaves, and trim hedges. TWRA noticed increased fishing in Fountain City Lake and expanded their stocking program. The water quality of the lake has noticeably improved and as a result water quality complaints have been nearly eliminated.**
- **The efforts of both the City and the public to revitalize Fountain City Lake resulted in TWRA stocking the lake with over 1050 rainbow trout from December to February for the second time. Urban winter trout fishing was so successful TWRA added catfish in June for the first time.**

4. Illicit Discharge Detection and Elimination, CFR 122.26 (d)(2)(iv)(B)

A. *Have you developed and do you continue to update a storm drain system map that shows the location of system outfalls where the municipal storm drain system discharges into waters of the state?* ☒ Yes ☐ No

See attached NPDES Permit Program Inventory Map.

B. *If yes, does the map include inputs into the storm drain collection system, such as the inlets, catch basins, drop structures or other defined contributing points to the drainage area of that outfall, and general direction of stormwater flow?* ☒ Yes ☐ No

The detailed inventory, along with LIDAR data and break points is maintained and managed by the Knoxville Geographic Information System (KGIS), which is funded by the City of Knoxville in partnership with Knox County and the Knoxville Utilities Board. The individual structures are mapped but not visible on the printed NPDES Permit Program Inventory Map due to scale.

C. *How many outfalls have you identified in your storm drain system?* **1,367**

D. *Do you have an ordinance, or other regulatory mechanism, that prohibits non-stormwater discharges into your storm sewer system?* ☒ Yes ☐ No

E. *Have you implemented a plan to detect, identify and eliminate non-stormwater discharges, including illegal disposal, throughout the storm sewer system? If yes, provide a summary:* ☒ Yes ☐ No

In 1996, the City of Knoxville began implementation of the Illicit Discharge and Improper Disposal Program as a part of the overall SWMP. The program has been designed to detect and remove illicit and improper discharges to the Municipal Storm Drain System (MS4) as required by 40 CFR 122.26(d)(2)(iv)(B). The program includes the following sections:

- **The Stormwater and Street Ordinance (effective June 20, 1997)**

  Specifically prohibits non-stormwater discharges and authorizes penalties up to $5000 per day, and provides water quality regulations for new development.

- **Field Screening**

  Since 1996, the Dry Weather Screening Program has been used to evaluate both randomly selected outfalls and high-risk outfalls. At least 150 outfalls are screened annually. Screening consists of four site visits per outfall over a 1 year period. If flow is present the water is tested for indicator pollutants using a field test kit. A summary table of the results of outfalls that had flow at the time of screening is included as Table 4E. A map showing the location of all screened outfalls is included as the NPDES Permit Program Inventory Map. This program has successfully located and removed many illicit discharges and illegal cross connections.

- **Investigation of the Storm Drain Mapping System**

  The procedure for mapping, field surveys, and upstream source identification were developed and included in the Part 2 Application in Section 5.3.5. The City continues to utilize and continually update the procedure to maintain the effectiveness of the Illicit Discharge and Improper Disposal Program.

- **Spill Response Program**

  The City's Stormwater Division coordinates with the Knoxville Emergency Management Agency (KEMA), Knoxville Fire Department (KFD) Hazmat, and TDEC during emergency situations, including after hours and weekends. Each agency has specific roles to play during an emergency event. When discharges enter the MS4, the Stormwater Division assists with information gathering, investigations, GIS support, containment, remediation, follow-up monitoring, and enforcement when necessary.

- **Reporting of Illicit Discharges**

  The City actively encourages citizens to report water quality concerns to the 311 call center. The City advertises the 311 call center through stormwater pollution prevention educational handouts (e.g. magnets, koozies, and brochures), as well as presentations, business cards, vehicles, signage, and routine correspondence with residents. In addition to 311 giving citizens the opportunity to report illicit discharges, the City also promotes several educational programs, such as, the River Rescue, Adopt-A-Stream, an educational booth at the Neighborhood Conference, and routine training of Public Service, Engineering, and City Fleet departments.

- **Used Oil and Toxic Materials Program**

  The City operates multiple recycling centers as well as the permanent Solid Waste Management Facility (SWMF), which serves to divert reusable products, collect and reuse or solidify oil-based paint, collect car batteries and fluids, divert selected acids and bases to wastewater treatment, bulk flammable materials, and pack miscellaneous materials for safe shipment and disposal.

F. *How many illicit discharge related complaints were received this reporting period?*

165 illicit discharge complaints were received during the reporting year. 80 were received as an illicit discharge complaint and 85 were received as a new construction erosion control complaint.

Due to a migration from the stormwater specific Work Manager database software to the City wide Accela Civic Platform software, more precise information regarding the type of illicit discharge cannot easily be determined during this reporting year. The City's Information Service's (IS) Department is working to correct this problem for the next reporting year.

G. *How many illicit discharge investigations were performed this reporting period?* **All illicit discharge complaints that were received resulted in an investigation and 204 outfalls were systematically screened through the Dry Weather Screening Program.**

H. *Of those investigations performed, how many resulted in valid illicit discharges that were addressed and/or eliminated?* **The illicit discharge complaints in the Accela Civic Platform database cannot at this time be queried to determine how many of the complaints were valid. However, valid complaints were addressed and eliminated as part of the initial field investigation. The database problem is being addressed with the City's IS Department. Of the 204 outfalls that were screened through the Dry Weather Screening Program, 26 illicit discharges were detected and addressed.**

5. Construction Site Stormwater Runoff Pollutant Control, CFR 122.26 (D)(2)(IV)(D)

A. Do you have an ordinance or other regulatory mechanism requiring:
Construction site operators to implement appropriate erosion prevention and sediment control BMPs consistent with those described in the TDEC EPSC Handbook? ☒ Yes ☐ No

Construction site operators to control wastes such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste? ☒ Yes ☐ No

Design storm and special conditions for unavailable parameters waters or exceptional Tennessee waters consistent with those of the current Tennessee Construction General Permit (TNR100000)? ☒ Yes ☐ No

B. *Do you have specific procedures for construction site plan (including erosion prevention and sediment BMPs) review and approval?* ☒ Yes ☐ No

C. *Do you have sanctions to enforce compliance?* ☒ Yes ☐ No

D. *Do you hold pre-construction meetings with operators of priority construction activities and inspect priority construction sites at least monthly?* ☒ Yes ☐ No

E. *How many permits were issued for construction sites disturbing at least one acre or greater in your jurisdiction this reporting period?* **20**

F. *How many permits were issued for construction sites disturbing less than one acre or greater in your jurisdiction this reporting period?* **1544**

G. *How many construction inspections were inspected this reporting period?* **8852**

H. *How many construction related complaints were received this reporting period?* **85**

6. Permanent Stormwater Management of Source Controls, CFR 122.26 (d)(2)(iv)(a)

A. *Do you have a regulatory mechanism (e.g. ordinance) requiring permanent stormwater pollutant removal for development and redevelopment projects? If no, have you submitted an Implementation Plan to the Division?* ☒ Yes ☐ No

The 1997 Stormwater and Street Ordinance, updated January 2018 and the accompanying LDM.

B. Does the ordinance or other regulatory mechanism require:

Site plan review and approval of new and re-development projects? ☒ Yes ☐ No

A process to ensure stormwater control measures (SCMs) are properly installed and maintained?

☒ Yes ☐ No

Permanent water quality riparian buffer zones? If yes, specify requirements: ☒ Yes ☐ No

The Stormwater and Street Ordinance requires a riparian buffer zone (RBZ) of 60 ft for drainage areas of greater than 1 square mile. A RBZ of 30 ft is allowed for drainage areas that are less than 1 square mile. The RBZ is measured from the top of the bank and extends perpendicularly for the length of the water body. If a plat is required, the natural streamside buffer zone must be shown. The Ordinance does not allow any actively eroding creek banks to remain after development is complete. This may require the stream bank to be stabilized as part of the construction project. If stabilization is necessary, hard armor may only be used when bioengineering alternatives are not technologically feasible. The RBZ must be preserved post development.

C. What is the threshold for development and redevelopment project plans plan review (e.g., all projects, projects disturbing greater than one acre, etc.)?

All construction sites greater than 10,000 ft^2 must submit an Erosion and Sediment Control Plan (ESC) that has been stamped by a registered professional engineer.

D. *How many development and redevelopment project plans were reviewed for this reporting period?* **2821**

E. *How many development and redevelopment project plans were issued permits?* **1564**

F. *How many enforcement actions were taken to address improper installation or maintenance?*
295 Notices of Violation (NOVs) were issued for active construction site BMPs, 14 for active SPAP site BMPs, and 13 for illicit discharges. Verbal notifications are a routine part of our inspection process and are not included in this total.

G. *How many permanent, post-construction stormwater quality related inspections were performed during this reporting period?* **201 SPAP inspections and 195 stormwater pond inspections were performed during the reporting year.**

H. *Do you have a system to inventory and track the status of all public and private SCMs installed on development and redevelopment projects?* ☒ Yes ☐ No

Both public and private SCMs that were installed before 1997 are mapped using the KGIS database. Private SCMs that are installed after 1997 are mapped using the KGIS database, recorded using permanent maintenance agreements and/or covenants, and tracked using the SPAP program (used for Hot Spots only) and the Accela database. All Public SCMs installed after 1997 are mapped using KGIS and tracked using the Accela database.

I. *Does your program include an off-site stormwater mitigation or payment into public stormwater fund? If yes, specify.* ☐ Yes ☒ No

The City has proposed to create and implement a stormwater mitigation bank in the new permit term as a way to support development where volume control, RBZs, and/or other requirements cannot be met onsite.

7. Stormwater Management for Municipal Operations, CFR 122.26(d)(2)(iv)(C)

A. As applicable, have annual visual inspections been performed at least once a year on each of the municipal industrial facilities (MIFs) listed below:

Solid Waste Management Facility (SWMF) on Elm Street?	☒ Yes	☐ No
The Fleet Truck and Heavy Equipment garage on Loraine Street?	☒ Yes	☐ No
The Fleet and Police Garage at Prosser Road?	☒ Yes	☐ No
The Knoxville Area Transit (KAT) bus station on Magnolia Avenue?	☒ Yes	☐ No
The KAT Transfer Station on Church Street?	☒ Yes	☐ No

B. *Do you have a training program for employees responsible for municipal operations at facilities within the jurisdiction that handle, generate and/or store materials which constitute a potential pollutant of concern for MS4s?* ☒ Yes ☐ No

If yes, are new applicable employees trained within six months, and existing applicable employees trained and/or retrained within the permit term? ☒ Yes ☐ No

8. Reviewing and Updating Stormwater Management Programs

A. *Describe any revisions to your program implemented during this reporting period including but not limited to: Modifications or replacement of an ineffective activity/control measure.*

The 2004 NPDES Permit required a "Water Quality Hotline" to be maintained for public reporting. Shortly after the new 2004 permit was issued, the City implemented a 311 Call Center for all types of calls. Hotline calls were advertised and answered separately but that created an inefficient use of resources and possible confusion for the public. During this permit term, the City phased out the promotion of the separate 865-215-4147 phone number altogether on brochures, business cards, signs, websites, PSAs, vehicles, etc. The hotline number is now forwarded directly to the live operators at 311 and all promotions are for the 311 call center directly.

In an effort to increase efficiency of both reporting and review, the City adopted a modified version of TDEC's Phase II standardized annual report format for the July 1, 2017 to June 30, 2018 reporting year. Some sections continue to be added or edited to accurately reflect the tasks and programs that are different from the Phase II permit. This new format will serve a basis for the new format expected in the highly anticipated new NPDES permit.

Changes to the program as required by the division to satisfy permit requirements. **None**

Information (e.g. additional acreage, outfalls, BMPs) on newly annexed areas and any resulting updates to your program. **Two previously unknown outfalls were identified on existing City property and added to the current inventory.**

B. *In preparation for this annual report, have you performed an overall assessment of your stormwater management program effectiveness? If yes, summarize the assessment results, and any modifications and improvements scheduled to be implemented in the next reporting period.*
☒ Yes ☐ No

The City of Knoxville proposed many changes in both the 2008 and the 2016 reapplication for permit TNS068055 to modify the current SWMP. One significant proposed change is to reduce the amount of chemical monitoring (not including bacteriological) and focus on biological assessments in order to determine fishable and swimmable conditions in the waterways. The biological assessments (e.g. RBPIIIs & IBIs) are part of the current permit but were waived as part of the QLP process. The City believes the biological assessments are a better measure of program effectiveness than the chemical monitoring. In retrospect, the intent of the chemical monitoring appears to have been a one-time project for the original permit application back in 1990-1993 rather than an ongoing program. The City of Knoxville has received written permission from TDEC to move forward with a pilot project that will result in transitional changes during the 2019/2020 reporting year or when the new permit is approved. Pilot program monitoring changes began the fourth quarter of this permit year.

The new Comprehensive Monitoring Program (MN) is as follows:

The Comprehensive Monitoring Program (MN)

- **Ambient and Wet Weather Monitoring (MN-1)**
  - **Revise and maintain the Standard Operating Procedures (SOP) for the sampling program.**
  - **Maintain at least five automatic monitoring stations to collect rainfall data, including at least three that collect creek flow/depth measurements.**
  - **Coordinate with TDEC Knoxville Field Office to select "designated" creek/watersheds. Second Creek selected as Q4 test watershed pilot implementation.**
  - **Analyze samples with a hand held sonde (Hydrolab HL4 and HL7) within designated watershed for parameters including pH, temperature, dissolved oxygen, specific conductivity, raw conductivity, TDS, density, salinity, turbidity, ammonium, nitrate, total ammonia, ammonia, and chloride. A minimum of four strategically located sampling locations to be identified along the designated creek segment. See Appendix A for Second Creek sample locations. Sample collection will be targeted the same week of the given month and year. Watersheds will be rotated annually. Collect samples monthly, a minimum of twelve per quarter. Additional parameters (total phosphorus and ortho phosphate) may be tested in future years with field sampling kits to accompany sonde readings. See tables 10A.1b and 10A.1c for pilot parameters tested.**
  - **Collect and analyze full suite grab samples of: oil and grease, volatiles, pesticides, acids, base/neutrals, toxic metals, cyanide, and total phenols. (See Appendix D)**
  - **Collect and analyze a bacteria samples (fecal coliform and *E.coli*) within designated watershed. One sample per designated sampling location per sampling event. See table 10A.1d for locations and results.**
- **Dry Weather Screening & Industrial/Commercial Site Monitoring (MN-2)**
  - **Dry weather screening as described in ILL-2**
  - **Implement Commercial/Industrial Monitoring Program as described in IN-3.**
- **Biological Monitoring (MN-3)**
  - **For the designated stream a creek walk and stream survey will be completed utilizing Tennessee's Consolidated Assessment and Listing Methodology (CALM), including methods outlined in the Quality Assurance Project Plan (QAPP) for 106 Surface Water Monitoring. See appendix B for creek walk map, copy of TDEC-DWR Stream Survey Field Sheet (to be used), and example reach photos.**
  - **For the designated stream, biological sampling will be performed utilizing Tennessee's Consolidated Assessment and Listing Methodology (CALM), including methods outlined in the Quality Assurance Project Plan (QAPP) for 106 Surface Water Monitoring, and Standard Operating Procedure for Macroinvertebrate Stream Survey. Identifications to be made by COK staff. Macroinvertebrate sampling will occur monthly in combination with sonde/bacteria sampling at one location along the creek. Sampling to occur nine times annually from spring through fall. No macroinvertebrate sampling to take place in winter. See Appendix C for Habitat Assessment Field Sheet (appropriate sheet to be used given sample location), Biorecon Field Sheets (to be used), and example macroinvertebrate photos.**
- **Training Program & Analysis (MN-4)**
  - **Maintain the Training Program for Staff and/or Volunteers.**
  - **A hydraulic model may be created for a designated watershed.**
- **Annual Reporting (MN-5)**
  - **Annual reporting to TDEC concerning the progress of this program.**

Findings and conclusions from pilot implementation along Second Creek:

Initial monitoring/sampling schedules were revised from the original scope outlined in last year's permit. These revisions include increased bacteria and macroinvertebrate sampling overall. There will be reduced instances of sonde sampling for smaller watersheds, and increased instances of sonde sampling for larger watersheds. The pilot watershed, Second Creek, began with five (5) sample locations. An additional location was added after the first two sampling events. Limits of sampling were expanded further upstream due to high bacteria readings.

This type of fluid and reactive monitoring/sampling will result in tailoring each creek's needs in order to better locate possible pollutant sources, identify impacted segments, and plan improvements. The overall goal is to identify and remove pollutant sources in order to improve the health and water quality of 303(d) listed streams to the point portions and/or parameters listed will be delisted.

Second Creek is severely impacted due to high numbers of homeless encampments. Impacts include, but are not limited to, high bacteria levels, loss of substrate habitat due to unnatural debris coverage, riparian buffer damage, creek bank instability due to loss of vegetation, biological hazards, needles, nutrients from food waste, chemicals, detergents, garbage dams, methamphetamine manufacturing, and increased flood potential. Second Creek was planned to be monitored to completion during the upcoming permit year. However, due to the dangerous conditions, the creek walk was not completed. The designated watershed was changed in the first quarter. Although the monitoring was temporarily suspended, the goal of the program was achieved. A significant pollutions source was identified and further monitoring will continue after the source has been addressed. See Appendix B for limits of walk. Working with other agencies/departments, Stormwater began the process to evacuate the inhabitants and remediate the creek. This emergency clean-up project will be implemented in the coming permit year.

Enforcement Response Plan

A. *Have you implemented an enforcement response plan that includes progressive enforcement actions to address non-compliance, and allows the maximum penalties specified in TCA 68-221-1106? If no, explain.* ☒ Yes ☐ No

T**he written Enforcement Response plan was developed by the City and reviewed by TDEC as part of the Tennessee Qualifying Local Program (QLP) approval process and can be found in the LDM as Policy 14.**

B. As applicable, identify which of the following types of enforcement actions (or their equivalent) were used during this reporting period; indicate the number of actions, the minimum measure (e.g., construction, illicit discharge, permanent stormwater management), and note those for which you do not have authority:

Action	Construction	Permanent Stormwater	Illicit Discharge	In Your ERP?			
NOVs	# 295	# 8	# 33	X	Yes		No
Administrative Penalties	# 42	#	#	X	Yes		No
Stop Work Orders	# 43	#	#	X	Yes		No

C. *Do you track instances of non-compliance and related enforcement documentation?*
☒ Yes ☐ No

D. What were the most common types of non-compliance instances documented during this reporting period?

Erosion prevention and sediment control at new construction sites were the most common type of violation.

9. Monitoring, Recordkeeping and Reporting

A. *Summarize any analytical monitoring activities (e.g., planning, collection, evaluation of results) performed during this reporting period.*

During the July 1, 2019 to June 30, 2020 monitoring period, a total average of 62.07 inches of rainfall was recorded. The City's five ISCO monitoring stations collected quarterly samples from rain events for a total of twenty wet weather composite samples to comply with Section V of the current NPDES permit. Analytical laboratory data summaries for each of the sampling locations are included as Table 10A.1.

The City collected wet weather grab samples from the MIF outfalls that have pretreatment structures installed. In order to evaluate the effectiveness of the treatment units located at the Fleet Truck and Heavy Equipment garage and the SWMF, both pretreated and post treated grab samples were collected. Analytical laboratory data summaries for each of the sampling locations are included as Table 10A.2.

The City conducts a quarterly ambient sampling program where at least twenty ambient grab samples are collected each year at a rate of one sample per quarter from the same locations as the five monitoring stations. Each ambient sample collected is analyzed for bacteria and 13 routine parameters listed in MN-1. Analytical laboratory data summaries for each of the sampling locations are included as Table 10A.3.

The NPDES permit requires an estimate of the total urban runoff volume discharged by the City of Knoxville annually. The volume estimate is based on total average annual rainfall and the estimated imperviousness of different land uses. To estimate the imperviousness the City utilizes GIS to determine the approximate area of each land use within a watershed. The total average rainfall was determined by averaging the rainfall recorded during the year from the City's stormwater monitoring stations, rain gauge stations, and the National Weather Service data recorded at McGhee Tyson airport. The analysis for each watershed and the entire City is included as Table 10A.4.

B. Summarize any non-analytical monitoring activities (e.g., planning, collection, evaluation of results) performed during this reporting period.

- **Hot Spots**

The City has identified many common discharges from facilities that are not required to be permitted under the TDEC multi-sector general stormwater permit or individual NPDES permit programs. Rather than spend limited resources attempting to duplicate the efforts of TDEC and Environmental Protection Agency (EPA) by monitoring existing permitted facilities, the City added the SPAP program for those specific land-uses that have proven to have the potential to discharge polluted runoff. Section 22.5-37 of the Stormwater and Street Ordinance requires a SPAP on new development and redevelopment of projects for certain land uses, targeting the pollutants of concern for each land use. This program is used to eliminate gaps in the existing State and Federal permit programs through a local inspection program for otherwise non-permitted facilities.

Each of the SPAP facilities is required to have some type of structural stormwater treatment device (e.g., oil/water separator, catch basin inset, sand filter, grass swale) and/or pollution prevention management controls. During the SPAP inspection, the City typically reviews the facilities maintenance records, provides technical advice on proper maintenance scheduling, and updates the City's industrial and commercial facilities database. Inspection of the SPAP facilities occurs systematically to ensure that the structural controls are maintained and the management controls are being followed.

Stormwater Quality compliance inspections for non-SPAP sites are conducted in direct response to specific complaints from citizens or tips from 311 calls. The City decides on a case-by-case basis whether this group of inspections will use education or enforcement to correct any problems found. In some cases, an existing facility that is not "new development" or undergoing "redevelopment" may be required to apply for a SPAP to correct violations.

- **TMDL Implementation**

The City continues to address homeless encampments as a signification source of bacteria pollution. However, pursuant to the Center for Disease Control (CDC) guidelines, the City has not relocated any individuals or camps during the COVID-19 pandemic. This has resulted in increased populations at the encampments. To further determine the impacts on watersheds, Engineering continues investigating and monitoring several locations containing homeless encampments adjacent to First Creek and Second Creek. In addition to trash and debris, varying high bacteria levels were confirmed at locations downstream of the populated areas. The City continues to remediate the pollutant hazard with removal of trash and other materials. A day space, providing a clean and safe alternative to encampments is currently operational, as well as a low barrier shelter for overnight use. The City will continue to monitor bacteria levels to evaluate the effectiveness of implemented programs and facilities. Changes will be incorporated on an as needed basis.

Bacteria levels within Chilhowee Park's Lake Ottosee, draining to Williams Creek, are currently part of an ongoing monitoring and investigation initiative. Several probable sources of nutrients have been identified and eliminated. Additional monitoring and investigation will continue in an effort to allow the lake to become fishable and swimmable while eliminating bacteria contribution to Williams Creek.

In the First Creek Watershed, Fountain City Lake has historically been a source of fecal coliform due to wildlife. The City's efforts to educate the public on the negative impacts of feeding wildlife, as well as the physical removal of invasive aquatic plants, has resulted in water quality improvements that allowed TWRA to stock the lake with trout and catfish.

- **Municipal Industrial Facility Inspection Program**

The City has developed an inspection and pollution prevention program for municipal industrial facilities. Currently only five MIFs are operated by the City. These facilities include:

- **The Solid Waste Management Facility (SWMF) on Elm Street,**
- **The Fleet Truck and Heavy Equipment garage on Loraine Street,**
- **The Fleet and Police Garage at Prosser Road,**
- **The Knoxville Area Transit (KAT) bus station on Magnolia Avenue, and**
- **The KAT Transfer Station on Church Street.**

Each facility is currently evaluated and inspected regularly by Stormwater staff and will continue to be inspected at least annually in the future. The KAT Station is the newest of the MIFs and was built using LEED standards including stormwater quality treatment devices for the runoff.

The inspection and monitoring program has been productive at all of the MIFs in the past. Structural and management BMPs have been installed to control pollution and improve the water quality of runoff from each facility. The SWMF has been retrofitted with structural controls to reduce the solids, sediment, hydrocarbons, and bacteria in the runoff from the paved areas. Additional water quality improvements have been constructed at the SWMF that include new grit/sediment sumps, floatables skimmers, grass swale, and low flow modifications to the detention pond.

- **Industrial Facility Inspection Program**

As part of the NPDES Permit for stormwater discharges associated with industrial activity, applicants are required to monitor, at least bi-annually, representative stormwater outfalls identified in the facilities' SWPPPs. Applicants must monitor in accordance with TDEC Rule 1200-4-10-.04. The Stormwater and Street Ordinance authorizes the City to require additional monitoring from industries not covered under the TDEC programs whenever necessary. This will usually be required in conjunction with some enforcement action after a problem has been observed. The City maintains this information to assess the impact of the monitored discharges on the water quality in the MS4.

If the City determines that additional data needs to be provided in the monitoring program for an industry (e.g., reports on additional parameters), requirements for an expanded program for subsequent monitoring events is coordinated with TDEC and/or the industrial discharger.

- **Permanent Maintenance Agreement Inspection Program**

Since 1997, permanent maintenance agreements and/or covenants have been required for all new stormwater detention facilities and special pollution abatement devices (e.g., oil/water separators and catch basin inserts). A covenant is defined in Section 22.5-34 of the Ordinance as a legal document entitled "Covenant for Permanent Maintenance of Stormwater Facilities," which replaced the original "agreement" referred to in the Part II application and Part IV of the permit. A covenant does not require the Mayor's signature or Council approval, and the end result for water quality protection and flood control is the same. Covenants are recorded in the office of the Knox County Register of Deeds.

The City retains the right to inspect the stormwater facilities to insure they are properly maintained; however, the responsibility for the maintenance of stormwater facilities remains with the property owner unless legally transferred to another person or entity by a properly recorded legal agreement. If the property owner does not maintain the facility properly, the City may authorize the maintenance to be completed and place a lien against the property for the cost plus a ten percent penalty. To ensure access to the facility, a traversable access easement is required.

C. *If applicable, are monitoring records for activities performed during this reporting period submitted with this report.* ☒ Yes ☐ No

10. Fiscal Analysis

The Fiscal Analysis for this annual report lists the permit year budget sources and amounts along with estimates for the following permit year. Due to complexity, all of the support activities such as purchasing, payroll, legal support, information systems, fleet management, and human resources are not reflected. The below table presents the primary sources of funding for the City's stormwater related activities.

Capital Funds	**FY20 Actual**	**Proposed Funding FY21**
Stormwater Engineering	$1,011,771	$1,965,205
Civil Engineering*	$15,568,520	$21,622,520
Operating Funds	**FY20 Actual**	**FY21 Budget**
Stormwater Engineering	$2,824,639	$2,887,960
PSD – Stormwater Related	$3,230,956	$3,500,000**
Household Hazardous Waste Facility and Recycling	$2,002,687	$2,303,070

* - Civil Engineering capital funded projects include stormwater quality and quantity components but also have unrelated expenses.
** - Estimated amount of stormwater related activities which are paid out of PSD general fund account.

11. Certification

This report must be signed by a ranking elected official or by a duly authorized representative of that person. See signatory requirements in sub-part VII (K) of the permit.

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Indya Kincannon Mayor for City of Knoxville

Printed Name and Title

Signature

12/16/2020

Date

Annual reports must be submitted within 6 months after the end of the permit year to the Environmental Field Office (EFO) located at 3711 Middlebrook Pike, Knoxville TN 37921.

Approved as to Form:

Charles W. Swanson
Law Director

Table 2A

City of Knoxville Waters with Unavailable Parameters

Waterbody ID	Impacted Waterbody	County	Miles/Acres Impaired	Reason for Imairment/TMDL Priority	Pollutant Source
TN06010104 001_0100	LOVE CREEK	Knox	9.7 Miles	Nitrate+Nitrite L Sediment/Siltation L Other Anthropogenic Habitat Alterations L Escherichia coli NA	Urbanized High Density Area
TN06010104 001_1400	SWANPOND CREEK	Knox	16.3 Miles	Escherichia coli NA	Urbanized High Density Area
TN06010201 020_1000	FORT LOUDOUN RESERVOIR	Knox Loudon	14066 acres	PCBs Low	Contaminated Sediment
TN06010201 020_2000	FORT LOUDOUN RESERVOIR	Knox	534 acres	Mercury L PCBs NA	Atmospheric Deposition Contaminated Sediment
TN06010201 066_1000	STOCK CREEK	Knox	3.77 Miles	Escherichia coli NA	Pasture Grazing
TN06010201 066_2000	STOCK CREEK	Knox	1.98 Miles	Escherichia coli NA	Pasture Grazing
TN06010201 067_0100	EAST FORK THIRD CREEK	Knox	2.78 Miles	Sediment/Siltation NA Other Anthropogenic Habitat Alterations NA Escherichia coli NA	Urbanized High Density Area Collection System Failure
TN06010201 067_1000	THIRD CREEK	Knox	17.86 Miles	Nitrate+Nitrite L Sediment/Siltation NA Other Anthropogenic Habitat Alterations NA Escherichia coli NA	Land Development or Redevelopment Urbanized High Density Area Collection System Failure
TN06010201 080_0100	WHITES CREEK	Knox	10.2 Miles	Other Anthropogenic Habitat Alterations NA Escherichia coli NA	Urbanized High Density Area Streambank Modification
TN06010201 080_1000	FIRST CREEK	Knox	16.1 Miles	Nitrate+Nitrite L Sediment/Siltation NA Other Anthropogenic Habitat Alterations NA Escherichia coli NA	Urbanized High Density Area Collection System Failure
TN06010201 097- 1000	SECOND CREEK	Knox	12.8 Miles	Other Anthropogenic Habitat Alterations NA Nitrate+Nitrite L Sediment/Siltation NA Escherichia coli NA	Urbanized High Density Area Collection System Failure
TN06010201 1330_1000	SINKING CREEK	Knox	4.1 Miles	Escherichia coli NA	Urbanized High Density Area
TN06010201 1334_0100	TEN MILE CREEK	Knox	12.74 Miles	Alteration in Stream-Side or Littoral Vegetative Covers L Sediment/Siltation L Escherichia coli NA	Urbanized High Density Area

Table 2A

City of Knoxville Waters with Unavailable Parameters

Waterbody ID	Impacted Waterbody	County	Miles/Acres Impaired	CAUSE / TMDL Priority	Pollutant Source
TN06010201 340_1000	TURKEY CREEK	Knox	15.8 Miles	Sediment/Siltation NA Escherichia coli NA	Urbanized High Density Area
TN06010201 697_1000	FOURTH CREEK	Knox	14.9 Miles	Physical Substrate Habitat Alterations NA Escherichia coli NA	Urbanized High Densit Area Channelization
TN06010201 719_1000	WILLIAMS CREEK	Knox	2.8 Miles	Nitrate+Nitrite L Other Anthropogenic Habitat Alterations NA Escherichia coli NA	Urbanized High Density Area Collection System Failure
TN06010201 721_1000	BAKER CREEK	Knox	3.3 Miles	Nitrate+Nitrite L Other Anthropogenic Habitat Alterations NA Escherichia coli NA	Urbanized High Density Area Collection System Failure
TN06010201 723_1000	GOOSE CREEK	Knox	4.9 Miles	Sediment/Siltation NA Other Anthropogenic Habitat Alterations NA PCBs L Escherichia coli NA	Collection System Failure Urbanized High Density Area RCRA Hazardous Waste
TN06010207 011_0600	KNOB FORK	Knox	8.1 Miles	Nitrate+Nitrite L Sediment/Siltation NA Habitat loss due to other anthropogenic substrate L Alteration in stream-side or littoral vegetative cover L Escherichia coli NA	Urbanized High Density Area
TN06010207 011_0700	GRASSY CREEK	Knox	8.2 Miles	Sediment/Siltation NA Escherichia coli NA	Urbanized High Density Area
TN06010207 011_2000	BEAVER CREEK	Knox	13.7 Miles	Escherichia coli NA Sediment/Siltation NA Physical Substrate Habitat alterations NA	Pasture Grazing Discharges from MS4 Area Collection System Failure

Notes:
MS4 - Municipal Separate Storm Drain System
L - Low Priority
M - Medium Priority
H - High Priority
NA - Not Applicable

Table 2D

City of Knoxville SWMP

SCHEDULE FOR MAINTENANCE AND IMPLEMENTATION OF SWMP ELEMENTS AND PROGRAMS

PROGRAM OF STRUCTURAL AND SOURCE CONTROLS FOR REDUCING POLLUTANTS TO THE MUNICIPAL SEPARATE STORM SEWER SYSTEM

122.26 (d)(2)(iv)(A)

The Residential and Commercial Program (RC)

Code	Activity	Schedule
RC-1	*Maintenance Activities for Structural Controls*	
	-Continue existing maintenance programs from Part 2 application, pp.5-5 thru 5-8.	Ongoing
	-Develop improved stream restoration and channel maintenance program.	12 Months
	-Implement improved stream restoration and channel maintenance program.	24 Months
	-Require Standard Maintenance Agreement for on-site facilities.	Ongoing
	-Continue to coordinate with other agencies/organizations to develop, install, and maintain structural controls that prevent floating pollution (litter/oils/foam/etc) from entering the TN River	Ongoing
	-Require routine / major maintenance of BMP facilities.	Ongoing
RC-2	*Planning for New Development*	
	-Review original Stormwater & Streets Ordinance to evaluate possible improvements to existing water quality and quantity requirements for new development.	Immediately
	-Require "No Dumping" message cast into all curb irons and solid stormwater catch basin covers installed on new developments.	Immediately
	-Plan and site location for regional BMP facilities for area of new development.	Ongoing
	-Continue to review, update, and maintain guidance criteria for BMP's on City web page (http://www.ci.knoxville.tn.us/engineering/)	Ongoing
RC-3	*Maintenance for Public Streets, Roads, and Highways*	
	-Continue street maintenance activities outlined in Part 2 application, p.5-8	Ongoing
	-Evaluate current deicing program and study alternatives and improvements.	Ongoing
RC-4	*Evaluation of Flood Management Projects*	
	-Continue to evaluate regional BMP facilities for water quality retrofits.	Ongoing
	-Maintain existing GIS inventory of on-site BMP facilities, including newly constructed facilities.	Ongoing
RC-5	*Monitoring of Solid Waste Facilities*	
	-See City's management program for industrial areas.	See Code IN-3
RC-6	*Management of Pesticides, Herbicides, and Fertilizer*	
	- Evaluate possible improvements to existing public education program as part of illicit connection and improper disposal program. Educate City staff, public, etc.	12 Months
	- Reevaluate effect of fertilizers as part of the City's ongoing monitoring program.	60 Months
RC-7	*Annual Reporting*	
	- Annual reporting to TDEC concerning the progress of this program.	Within 6 months after the end of each year.

Table 2D

City of Knoxville SWMP

SCHEDULE FOR MAINTENANCE AND IMPLEMENTATION OF SWMP ELEMENTS AND PROGRAMS

PROGRAM TO DETECT AND REMOVE ILLICIT AND
IMPROPER DISCHARGES TO THE MUNICIPAL STORM SEWER SYSTEM
122.26 (d)(2)(iv)(B)

The Illicit Discharges and Improper Disposal Program (ILL)

Code	Activity	Schedule
ILL-1	*Ordinances*	
	-Evaluate the prohibitions and exemptions of non-stormwater discharges in the original Stormwater & Streets Ordinance. Maintain authority for $5000 penalty.	Immediately
	-Implement any new revisions to the Stormwater & Streets Ordinance.	6 Months
ILL-2	*Field Screening*	
	-Perform follow-up analysis at all high risk screening sites.	Ongoing
	-Investigate 150 field sites four times per year . (Including the repeat high parameter sites above.)	Ongoing
ILL-3	*Investigation of Storm Drain System*	
	- Implement procedures for mapping, field surveys and upstream source identification.	Ongoing
	-Evaluate and update enforcement procedures, policies, monitoring and inspections.	Ongoing
	- Inspect stormdrain system and update features on GIS.	Ongoing
ILL-4	*Spill Response Program*	
	- Coordinate with Knoxville Emergency Response Team (KERT) and Tennessee Department of Environment and Conservation (TDEC).	Ongoing
ILL-5	*Reporting of Illicit Discharges and Public Education Program*	
	- Continue to maintain and monitor the "Water Quality Hotline" for public reporting.	Ongoing
	- Maintain public education program.	Ongoing
ILL-6	*Used Oil & Toxic Materials Program*	
	- Continue coordination of recyling program (managed by Solid Waste Division (SWD)).	Ongoing
	- Maintain and Operate household hazardous waste facility (managed by SWD).	Ongoing
ILL-7	*Annual Reporting*	
	- Annual reporting to TDEC concerning the progress of this program.	Within 6 months after the end of each year.

Table 2D

City of Knoxville SWMP

SCHEDULE FOR MAINTENANCE AND IMPLEMENTATION OF SWMP ELEMENTS AND PROGRAMS

PROGRAM TO MONITOR AND CONTROL RUNOFF FROM TSD AND INDUSTRIAL FACILITIES SUBJECT TO SARA III, SECTION 313 122.26(d)(2)(iv)(C)

The Industrial and Related Facilities Program (IN)

Code	Activity	Schedule
IN-1	***Ordinances***	
	- Evaluate possible revisions to the prohibitions and exemptions of non-stormwater discharges in the existing Stormwater & Streets Ordinance	Immediately
	- Implement any new revisions to the Stormwater & Streets Ordinance.	6 Months
IN-2	***Inspection Element***	
	- Develop inspection program for non-permitted commercial facilities (i.e. restaurants, services stations, grocery stores, car lots, ets.)	12 Months
	- Collect and analyze NOI's from Industrial Permit applicants.	Ongoing
	- Identify potential industrial discharges through Illicit Connection and Improper Disposal Program. (Both SW and non-SW discharges)	Ongoing
	- Review and update inspection program as part of Pollution Prevention Plans for Municipal Industrial Facilities. Coduct annual inspections at municipal industrial facilities.	12 Months
IN-3	***Monitoring Element***	
	- Collect monitoring data from industrial stormwater dischargers and/or from TDEC. Assess impacts to storm sewer system.	Ongoing
	- Develop an ongoing monitoring program at non-permitted commercial facilities using guidelines pursuant to 40 CFR 122.26(d)(2)(iv)(c)(2). Identify industrial pollutants & sources as applicable.	12 Months
	- Implement the ongoing monitoring program at non-permitted commercial facilities and analyze the results from ongoing commercial monitoring program.	Begin after 12 Months
	-Maintain adequate legal authority to require monitoring and reports from TSDs and Industrial facilities subject to SARA Title III, Section 313. Request monitoring reports as necessary.	Ongoing
	-Evaluate and update the monitoring program for Municipal Industrial Facilities (MIFs) in each annual report.	Annually
	- Manage and conduct monitoring program at Municipal Industrial Facilities.	12 Months
IN-4	***Annual Reporting***	
	- Annual reporting to TDEC concerning the progress of this program.	Within 6 months after the end of each year

Table 2D

City of Knoxville SWMP

SCHEDULE FOR MAINTENANCE AND IMPLEMENTATION OF SWMP ELEMENTS AND PROGRAMS

PROGRAM TO IMPLEMENT AND MAINTAIN BMP PLANS TO REDUCE CONSTRUCTION SITE RUNOFF TO THE MUNICIPAL STORM SEWER 122.26(d)(2)(iv)(D)

The Construction Site Runoff Program (CS)

Code	Activity	Schedule
CS-1	***Site Planning***	
	- Review and update the original Stormwater & Streets Ordinance which requires construction sites greater than 10,000 sq.ft. to submit Erosion & Sediment (E&S) control plans.	Immediately
	- Require site plans submittals per the City of Knoxville BMP manual.	Immediately
	- Review & update minimum criteria for plan review and inspection checklist.	Immediately
	- Continue Preconstruction Assistance Meetings with developer/contractors.	Immediately
CS-2	***BMP Requirements***	
	- Require Construction BMP's from the City of Knoxville BMP manual or equivalent.	Immediately
	- Evaluate additional BMP requirements and design modifications. Maintain the updated BMP requirements on the City's web page.	2nd half of each year
	- Continue to require construction site "good housekeeping" practices.	Immediately
CS-3	***Inspection / Enforcement***	
	- Continue expanded inspections to include smaller construction sites (single family); where feasible.	Ongoing
	- Implement routine site inspections on commercial and subdivision developments (e.g. rough grading, E&S control installation, final grading, and final stabilization.	Ongoing
	- Continue to require post-construction Development Certifications from licensed professional Engineers, and/or the appropriate design professional before bond release to insure the stormwater facilities were built as planned.	Ongoing
	- Maintain enforcement procedures, policies, and follow-up monitoring/inspections.	Ongoing
CS-4	***Training Programs***	
	- Co-sponsor E & S Control Practice Seminars for all participants.	Annually
	- Continue to provide training for City plan review staff and inspectors.	Annually
CS-5	***Annual Reporting***	
	- Annual reporting to TDEC concerning the progress of this program.	Within 6 months after the end of each year

Table 2D

City of Knoxville SWMP

SCHEDULE FOR MAINTENANCE AND IMPLEMENTATION OF SWMP ELEMENTS AND PROGRAMS

PROGRAM TO COLLECT QUANTITATIVE DATA TO DETERMINE THE IMPACTS OF URBAN STORMWATER ON THE NATURAL ENVIRONMENT
122.26(d)(2)(iii)(A)

The Comprehensive Monitoring Program (MN)

Code	Activity	Schedule
MN-1	***Seasonal Storm Event Monitoring***	
	- Maintain the Standard Operating Procedures (SOP) for the seasonal sampling program.	Annually
	-Maintain at least five (5) automatic monitoring stations at locations approved by TDEC.	Ongoing
	- Collect and analyze a minimum of twenty (20) flow weighted composite samples as listed below in accordance with 40 CFR 136 for all parameters except pH, which will be determined in the field at the time of sample collection. Parameters include: BOD5, COD5, suspended residue, dissolved residue, nitrate + nitrite N, ammonia, total kjeldahl N, total organic N, total phosphate, lead, zinc, and ph (field).	Minimum of one per quarter per station annually.
	- Collect and analyze five (5) wet weather bacteria samples (fecal coliform and *E.coli*).	One sample/year/station
	- Collect and analyze five (5) full-suite grab samples of: oil & grease, the pollutants listed in Tables II & III of 40 CFR Part 122 Appendix D (Volatiles, Pesticides, Acids, Base/Neutrals, Toxic Metals, Cyanide, and Total Phenols).	One station per year.
MN-2	***Dry Weather Screening & Industrial/Commercial Site Monitoring***	
	- Dry weather screening as described in ILL-2.	Annually
	- Implement Commercial/Industrial Monitoring Programs as described in IN-3.	Varies
MN-3	***Ambient & Biological Monitoring***	
	- Continue Ambient sampling program at the five designated monitoring stations. All routine parameters shall be tested once per quarter per station.	Quarterly
	- Maintain the Biological Monitoring program that supplements the program administered by TVA. This program focuses on habitat assessments, bioassessments, etc.	Ongoing
MN-4	***Training Programs***	
	- Maintain the Training Program for Staff and/or Volunteers.	Ongoing
MN-5	***Annual Reporting***	
	- Annual reporting to TDEC concerning the progress of this program.	Within 6 months after the end of each year

Table 4E

Dry Weather Screening Outfalls with Flow
July 1, 2019 through June 30, 2020

Outfall/Permit Year	Visit Date	Visit #	Flow Yes/No	Flow Rate	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Color	Odor Yes/No	Surface Scum Yes/No	Oil Sheen Yes/No
00-100-0300														
19/20	09/25/19	1	No											
19/20	09/25/19	2	No											
19/20	11/06/19	3	Yes	20gpm	6.5	0	0	0	.5	.4	Off clear	No	Yes	Yes
19/20	11/06/19	4	Yes	20gpm	6.5	0	0	0	.75	.6	Off clear	No	Yes	Yes
01-100-0830														
19/20	07/26/19	1	Yes	15gpm	7	0	0	0	0	0	Clear	No	No	No
19/20	07/26/19	2	Yes	15gpm	7	0	0	0	0	0	Clear	No	No	No
19/20	10/03/19	3	Yes	5gpm +	7	0	0	0	0	.01	Clear	No	No	No
19/20	10/03/19	4	Yes	5gpm +	7	0	0	0	0	<.01	clear	No	No	No
01-100-0860														
19/20	07/26/19	1	Yes	10gpm +	7	0	0	0	0	0	Clear	No	No	No
19/20	07/26/19	2	Yes	10gpm +	7	0	0	0	0	0	Clear	No	No	No
19/20	10/02/19	3	No											
19/20	10/02/19	4	No											
01-300-0109														
19/20	08/19/19	1	Yes	Low creek flow	7	0	0	0	0	0	Clear	No	No	No
19/20	08/19/19	2	Yes	Low creek flow	7	0	0	0	0	0	Clear	No	No	No
19/20	05/04/20	3	Yes	Low creek flow	6.5	0	0	0	0	0	Clear	No	No	No
19/20	05/04/20	4	Yes	Low creek flow	6.5	0	o	0	o	0	Clear	No	No	No
01-300-0200														
19/20	08/09/19	1	Yes	5gpm	7	0	0	0	0	0	Clear	No	No	No
19/20	08/09/19	2	Yes	5gpm	7	0	0	0	0	0	Clear	No	No	No
19/20	11/05/19	3	Yes	2gpm	6.5	0	0	0	0	0	Clear	No	No	No
19/20	11/05/19	4	Yes	2gpm	6.5	0	0	0	0	0	Clear	No	No	No
01-400-0470														
19/20	07/29/19	1	Yes	1gpm	7	0	0	0	0	0	Clear	No	No	No
19/20	07/29/19	2	Yes	1gpm	7	0	0	0	0	0	Clear	No	No	No
19/20	11/11/19	3	Yes	1gpm	6.5	0	0	0	0	0	Clear	No	No	No
19/20	11/11/19	4	Yes	1gpm	6.5	0	0	0	0	0	Clear	No	No	No

Table 4E

Dry Weather Screening Outfalls with Flow
July 1, 2019 through June 30, 2020

Outfall/Permit Year	Visit Date	Visit #	Flow Yes/No	Flow Rate	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Color	Odor Yes/No	Surface Scum Yes/No	OIL SHEEN YES/NO
01-400-0820														
19/20	09/30/19	1	Yes	5gpm	8	0	0	0	0	.01	Clear	No	No	No
19/20	09/30/19	2	Yes	5gpm	8	0	0	0	0	.01	Clear	No	No	No
19/20	11/11/19	3	Yes	5gpm	7	0	0	0	0	.0	Clear	No	No	No
19/20	11/11/19	4	Yes	5gpm	7	0	0	0	0	0	Clear	No	No	No
02-300-0371														
19/20	07/30/19	1	Yes	2gpm	7	0	0	0	0	0	Clear	No	No	No
19/20	07/30/19	2	Yes	2gpm	7	0	0	0	0	0	Clear	No	No	No
19/20	12/06/19	3	Yes	4gpm	6.5	0	0	0	0	0	Clear	No	No	No
19/20	12/06/19	4	Yes	4gpm	6.5	0	0	0	0	0	Clear	No	No	No
02-400-0290														
19/20	07/31/19	1	Yes	1gpm	7	0	0	0	0	0	Clear	No	No	No
19/20	07/31/19	2	Yes	1gpm	7	0	0	0	0	0	Clear	No	No	No
19/20	11/04/19	3	Yes	1gpm	7	0	0	0	0	0	Clear	No	No	No
19/20	11/04/19	4	Yes	1gpm	7	0	0	0	0	0	Clear	No	No	No
02-500-0535														
19/20	07/30/19	1	Yes	1gpm	7	0	0	0	0	0	Clear	No	No	No
19/20	07/30/19	2	Yes	1gpm	7	0	0	0	0	0	Clear	No	No	No
19/20	12/06/19	3	Yes	2gpm	6.5	0	0	0	0	0	Clear	No	No	No
19/20	12/06/19	4	Yes	2gpm	6.5	0	0	0	0	0	Clear	No	No	No
03-100-0114														
19/20	02/04/19	1	Yes	5gpm	7	0	0	0	<.1	0	Clear	No	No	No
19/20	02/04/19	2	Yes	5gpm	7	0	0	0	<.1	0	Clear	No	No	No
19/20	05/08/19	3	Yes	5gpm	7	0	0	0	<.1	0	Clear	No	No	No
19/20	05/08/19	4	Yes	5gpm	7	0	0	0	<.1	0	Clear	No	No	No
03-200-0409														
19/20	09/09/19	1	Yes	4gpm	7	0	0	0	0	0	Clear	No	No	No
19/20	09/09/19	2	Yes	4gpm	7	0	0	0	0	0	Clear	No	No	No
19/20	11/15/19	3	Yes	4gpm	7	0	0	0	0	.1	Clear	No	No	No
19/20	11/15/19	4	Yes	4gpm	7	0	0	0	0	.1	Clear	Yes	No	No

Table 4E

Dry Weather Screening Outfalls with Flow
July 1, 2019 through June 30, 2020

Outfall/Permit Year	Visit Date	Visit #	Flow Yes/No	Flow Rate	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Color	Odor Yes/No	Surface Scum Yes/No	OIL SHEEN YES/NO
03-200-0920														
19/20	09/03/19	1	Yes	2gpm	7	0	0	0	0	0	Clear	No	No	No
19/20	09/03/19	2	Yes	2gpm	7	0	0	0	0	0	Clear	No	No	No
19/20	01/10/20	3	Yes	5gpm	7	0	0	0	0	0	Clear	No	No	No
19/20	01/10/20	4	Yes	5gpm	7	0	0	0	0	0	Clear	No	No	No
03-300-0660														
19/20	09/04/19	1	Yes	15gpm	7	0	0	0	0	0	Clear	No	No	No
19/20	09/04/19	2	Yes	15gpm	7	0	0	0	0	0	Clear	No	No	No
19/20	11/18/19	3	Yes	10gpm	6.5	0	0	0	0	.1	Clear	No	No	No
19/20	11/18/19	4	Yes	10gpm	6.5	0	0	0	0	.1	Clear	No	No	No
03-300-0675														
19/20	09/04/19	1	Yes	2gpm	7	0	0	0	0	0	Clear	No	No	No
19/20	09/04/19	2	Yes	2gpm	7	0	0	0	0	0	Clear	No	No	No
19/20	11/18/19	3	Yes	2gpm	6.5	0	0	0	0	0	Clear	No	No	No
19/20	11/18/19	4	Yes	2gpm	6.5	0	0	0	0	0	Clear	No	No	No
04-300-0345														
19/20	09/10/19	1	Yes	15gpm	7	2	0	0	0	0	Clear	No	No	No
19/20	09/10/19	2	Yes	15gpm	7	2	0	0	0	0	Clear	No	No	No
19/20	10/25/19	3	Yes	15gpm	6.5	2	0	0	0	0	Clear	No	No	No
19/20	10/25/19	4	Yes	15gpm	6.5	2	0	0	0	0	Clear	No	No	No
05-300-0185														
19/20	09/12/19	1	Yes	5gpm	7.5	0	0	0	0	0	Clear	No	No	No
19/20	09/12/19	2	Yes	5gpm	7.5	0	0	0	0	0	Clear	No	No	No
19/20	04/07/20	3	Yes	5gpm	6.5	0	0	0	0	0	Clear	No	No	No
19/20	04/07/20	4	Yes	5gpm	6'5	0	0	0	0	0	Clear	No	No	No
06-100-0133														
19/20	09/25/19	1	Yes	2gpm	7	0	0	0	0	<.1	Clear	No	No	No
19/20	09/25/19	2	Yes	2gpm	7	0	0	0	0	<.1	Clear	No	No	No
19/20	04/06/20	3	Yes	2gpm	6.5	0	0	0	0	0	Clear	No	No	No
19/20	04/06/20	4	Yes	2gpm	6.5	0	0	0	0	0	Clear	No	No	No

Table 4E

Dry Weather Screening Outfalls with Flow
July 1, 2019 through June 30, 2020

Outfall/Permit Year	Visit Date	Visit #	Flow Yes/No	Flow Rate	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Color	Odor Yes/No	Surface Scum Yes/No	OIL SHEEN YES/NO
06-400-0080														
19/20	09/25/19	1	Yes	5gpm	6.5	0	0	0	0	0	Clear	No	No	No
19/20	09/25/19	2	Yes	5gpm	6.5	0	0	0	0	0	Clear	No	No	No
19/20	04/06/20	3	Yes	5gpm	7	0	0	0	0	0	Clear	No	No	No
19/20	04/06/20	4	Yes	5gpm	7	0	0	0	0	0	Clear	No	No	No
07-100-0055														
19/20	09/23/19	1	Yes	10gpm +	6.5	0	0	0	0	0	Clear	No	No	No
19/20	09/23/19	2	Yes	10gpm +	6.5	0	0	0	0	0	Clear	No	No	No
19/20	04/09/20	3	Yes	Creek										
19/20	04/09/20	4	Yes	Creek										
07-200-0015														
19/20	09/23/19	1	Yes	5gpm +	6	0	0	0	0	0	Clear	No	No	No
19/20	09/23/19	2	Yes	5gpm +	6	0	0	0	0	0	Clear	No	No	No
19/20	04/09/20	3	Yes	Creek										
19/20	04/09/20	4	Yes	Creek										
31-500-0510														
19/20	09/19/19	1	Yes	.1	7	.1	0	0	.25	.1	Clear	No	No	No
19/20	09/19/19	2	Yes	.1	7	.1	0	0	<.25	.1	Clear	No	No	No
19/20	06/03/20	3	No											
19/20	06/03/20	4	No											
51-100-0900														
19/20	09/19/19	1	Yes	.5gpm	7.5	0	0	0	0	<.1	Clear	No	No	No
19/20	09/19/19	2	Yes	.5gpm	7.5	0	0	0	0	<.1	Clear	No	No	No
19/20	06/03/20	3	Yes	.5gpm	7.5	0	0	0	0	0	Clear	No	No	No
19/20	06/03/20	4	Yes	.5gpm	7.5		0	0	0	0	Clear	No	No	No
53-100-0128														
19/20	09/18/19	1	Yes	10gpm +	7	0	0	0	0	<.1	Clear	No	No	No
19/20	09/18/19	2	Yes	10gpm +	7	0	0	0	0	<.1	Clear	No	No	No
19/20	04/08/20	3	Yes	10gpm +	7	0	0	0	0	0	Clear	Yes	No	No
19/20	04/08/20	4	Yes	10gpm +	7	0	0	0	0	0	Clear	No	No	No

Table 4E

Dry Weather Screening Outfalls with Flow
July 1, 2019 through June 30, 2020

Outfall/Permit Year	Visit Date	Visit #	Flow Yes/No	Flow Rate	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Color	Odor Yes/No	Surface Scum Yes/No	OIL SHEEN YES/NO
53-500-0185														
19/20	09/18/19	1	Yes	1-2gpm	7	0	0	0	0	0	Clear	No	No	No
19/20	09/18/19	2	Yes	1-2gpm	7	0	0	0	0	0	Clear	No	No	No
19/20	04/08/20	3	Yes	1-2gpm	7	0	0	0	0	0	Clear	No	No	No
19/20	04/08/20	4	Yes	1-2gpm	7	0	0	0	0	0	Clear	No	No	No

Notes:

gpm - gallons per minute

su - standard unit

ppm - parts per million

mpn - most probable number

ml - mililiter

Table 10A.1a

Laboratory Analysis Summary - Seasonal Storm Sampling Program

July 1, 2019 through June 30, 2020

Site	Quarter	pH	Average Sampled Volume	Rainfall per Event	BOD	COD	Total Suspended Solids (TSS)	Total Dissolved Solids (TDS)	Nitrate + Nitrite nitrogen	Ammonia nitrogen	Total Kjeldahl nitrogen	Total organic nitrogen	Lead	Zinc	Total Phosphorus	Ortho Phosphate
Units			cu-ft	inches	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
KAT First Creek	Sum '19	6.0	0.1	1.32	ND	ND	14.4	198.0	1.280	ND	0.263	0.263	ND	ND	0.122	ND
	Fall '19	6.0	0.1	0.20	9.60	40.1	ND	73.0	0.486	ND	0.354	0.354	ND	0.1660	ND	0.0390
	Wtr '20	5.5	0.1	0.25	12.80	23.9	12.6	146.0	0.725	ND	1.880	1.880	ND	0.0918	ND	0.0950
	Spr '20	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Average:		**5.8**	**0.1**		**11.20**	**32.0**	**13.5**	**139.0**	**0.830**	**ND**	**0.832**	**0.832**	**ND**	**0.1289**	**0.122**	**0.0670**
Love Creek	Sum '19	6.5	0.1	0.21	25.70	41.4	6.3	267.0	1.110	ND	ND	ND	ND	ND	ND	ND
	Fall '19	6.0	0.1	0.81	ND	20.4	12.0	148.0	1.100	ND	ND	ND	ND	ND	ND	ND
	Wtr '20	6.0	0.1	0.24	ND	ND	ND	252.0	1.030	ND	ND	ND	ND	ND	ND	ND
	Spr '20	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Average:		**6.2**	**0.1**		**25.70**	**30.9**	**9.1**	**222.3**	**1.080**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**
Third Creek	Sum '19	6.5	0.1	1.02	21.50	48.0	93.5	146.0	0.905	0.180	1.060	0.880	0.01050	0.0935	0.186	0.1060
	Fall '19	6.5	0.1	0.94	ND	27.6	23.0	147.0	1.210	ND	8.730	8.730	ND	ND	ND	ND
	Wtr '20	5.5	0.1	0.26	ND	ND	ND	223.0	1.360	ND	ND	ND	ND	ND	ND	0.0930
	Spr '20	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Average:		**6.2**	**0.1**		**21.50**	**37.8**	**58.3**	**172.0**	**1.158**	**0.180**	**4.895**	**4.805**	**0.01050**	**0.0935**	**0.186**	**0.0995**
Walden Drive Fourth Creek	Sum '19	7.0	0.1	0.20	39.20	67.8	8.3	245.0	1.100	ND	0.356	0.356	ND	ND	0.105	ND
	Fall '19	7.0	0.1	0.91	ND	15.5	37.5	75.0	0.479	0.128	0.391	0.263	ND	ND	ND	ND
	Wtr '20	6.5	0.1	0.31	ND	ND	6.9	218.0	1.070	0.148	1.390	1.240	ND	ND	ND	ND
	Spr '20	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Average:		**6.8**	**0.1**		**39.20**	**41.7**	**17.6**	**179.3**	**0.883**	**0.138**	**0.712**	**0.620**	**ND**	**ND**	**0.105**	**ND**
Williams Creek	Sum '19	6.0	0.1	1.23	4.80	47.5	317.0	126.0	0.890	ND	0.624	0.624	0.01490	0.0555	0.262	0.0450
	Fall '19	6.5	0.1	0.73	ND	25.4	27.0	153.0	0.766	ND	2.090	2.090	0.00767	ND	ND	0.0280
	Wtr '20	6.0	0.1	0.22	ND	ND	6.1	268.0	1.580	ND	ND	ND	ND	ND	ND	ND
	Spr '20	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Average:		**6.2**	**0.1**		**4.80**	**36.5**	**116.7**	**182.3**	**1.079**	**ND**	**1.357**	**1.357**	**0.01129**	**0.0555**	**0.262**	**0.0365**
National NURP Study Average					11.90	90.8	NA	NA	NA	NA	NA	3.31	0.18000	0.1760	0.160	
Characteristics of Urban Stormwater Range					1 - 700	5 - 3,100	2 - 11,300	200 - 14,600	NA	0.1 - 2.5	0.01 - 4.5	NA	0.0 - 1.9	NA	0.1 - 125	

-Winter (Jan., Feb., and March); Spring (April, May, and June); Summer (July, Aug., and Sept.); Fall (Oct., Nov., and Dec.)

-The Characteristics of Urban Stormwater and National NURP Study Average data was taken from tables 4-1 and 4-2 of the Stormwater Management for Maine: BMPS

- ND: Anlayte was not detected, or no data available.
- All samples taken as grab samples for Q4
- *: No data available
- NS: Not Sampled, Implimented pilot monitoring program, see tables 10A.1(b) through 10A.1(d)
- NA: Not Applicable

Table 10A.1b

Pilot Monitoring Program Q4 Laboratory Analysis Summary - Second Creek

June 1, 2020 through June 30, 2020 (Spring '20)

Site	Date	pH	Average Sampled Volume	Last Rain	BOD	COD	Total Suspended Solids (TSS)	Total Dissolved Solids (TDS)	Nitrate + Nitrite nitrogen	Ammonia nitrogen	Total Kjeldahl nitrogen	Total organic nitrogen	Lead	Zinc	Total Phosphorus	Ortho Phosphate
Units			cu-ft	Date	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
UT	6/4/2020	7.0	0.1	5/26/20	ND	ND	ND	249.0	2.180	ND	ND	ND	ND	ND	ND	0.0460
	6/11/2020	6.0	0.1	6/10/20	ND	ND	ND	219.0	1.330	ND	ND	ND	ND	ND	0.136	0.0560
Average:		**6.5**	**0.1**	**NA**	**ND**	**ND**	**ND**	**234.0**	**1.755**	**ND**	**ND**	**ND**	**ND**	**ND**	**0.136**	**0.0510**
Inskip BP	6/4/2020	7.0	0.1	5/26/20	ND	ND	ND	245.0	1.870	ND	ND	ND	ND	ND	ND	ND
	6/11/2020	6.0	0.1	6/10/20	ND	ND	ND	231.0	1.790	ND	ND	ND	ND	ND	ND	ND
Average:		**6.5**	**0.1**	**NA**	**ND**	**ND**	**ND**	**238.0**	**1.830**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**
National NURP Study Average					11.90	90.8	na	na	na	na	2.35	3.31	0.18000	0.1760	0.160	
Characteristics of Urban Stormwater Range					1 - 700	5 - 3,100	2 - 11,300	200 - 14,600	na	0.1 - 2.5	0.01 - 4.5	na	0.0 - 1.9	na	0.1 - 125	

-Spring (April, May, and June)

-6/10/20 rain event = 0.25in average, 2020 accumulation below average

-6/18/20 and 6/25/20 testing: HL7 sonde replaced laboratory testing

-The Characteristics of Urban Stormwater and National NURP Study Average data was taken from tables 4-1 and 4-2 of the Stormwater Management for Maine: BMPS

- ND: Anlayte was not detected, or no data available.

- * No data available

Table 10A.1c

Pilot Monitoring Program Q4 (HL4 & HL7 Sonde) Analysis Summary - Second Creek
June 1, 2020 through June 30, 2020 (Spring '20)

Site	Date	Last Rain	Temp	pH	Specific Conductivity	Raw Conductivity	DO	DO	TDS	Density kg/m3	Salinity	Turbidity #	NH4+ *	NO3- *	NH3 Total *	Cl- mg/L *	NH3 *
Units			°C		mS/cm	µS/cm	%SAT	mg/L	g/L	kg/m3	psu	NTU	mg/L-N	mg/L-N	mg/L-N	mg/L	mg/L-N
UT	6/4/20	5/26/20	20.6	8.09	0.54	492.8	101.4	8.8	0.344	998.281	0.261	118.379	ND	ND	ND	ND	ND
	6/11/20	6/10/20	21.3	8.00	0.43	397.4	96.9	8.4	0.274	998.091	0.210	18.279	ND	ND	ND	ND	ND
	6/18/20	6/15/20	19.4	8.15	0.51	459.8	101.2	9.1	0.329	998.530	0.250	3.982	0.25773	2.5696	0.274	26.5141	0.020
	6/25/20	6/23/20	20.6	8.20	0.5	466.4	96.2	8.4	0.3	998.3	0.3	1.0	0.2	2.7	0.2	26.7	0.020
Average:			**20.5**	**8.11**	**0.50**	**454.1**	**98.9**	**8.7**	**0.318**	**998.295**	**0.243**	**35.398**	**0.23143**	**2.6421**	**0.247**	**26.6318**	**0.020**
McGhee	6/4/20	5/26/20	20.2	7.85	0.52	468.1	90.3	7.9	0.330	998.372	0.250	0.795	ND	ND	ND	ND	ND
	6/11/20	6/10/20	21.1	7.70	0.40	366.7	84.4	7.3	0.254	998.130	0.190	3.237	ND	ND	ND	ND	ND
	6/18/20	6/15/20	19.4	7.95	0.50	444.0	95.8	8.6	0.318	998.530	0.240	2.133	0.22045	2.4101	0.230	24.7067	0.010
	6/25/20	6/23/20	20.3	7.89	0.5	451.0	81.4	7.2	0.3	998.3	0.2	1.7	0.2	2.4	0.2	21.2	0.010
Average:			**20.2**	**7.85**	**0.48**	**432.4**	**88.0**	**7.7**	**0.305**	**998.342**	**0.231**	**1.965**	**0.22541**	**2.4260**	**0.235**	**22.9739**	**0.010**
Davanna	6/4/20	5/26/20	19.3	8.03	0.47	423.2	95.5	8.5	0.304	998.526	0.230	0.938	ND	ND	ND	ND	ND
	6/11/20	6/10/20	20.7	7.87	0.38	348.6	89.5	7.8	0.243	998.200	0.180	2.753	ND	ND	ND	ND	ND
	6/18/20	6/15/20	18.8	8.14	0.47	412.0	99.0	9.0	0.299	998.635	0.225	1.182	0.20009	2.3196	0.215	19.5435	0.010
	6/25/20	6/23/20	19.9	8.02	0.5	421.5	87.6	7.8	0.3	998.4	0.2	0.6	0.2	2.2	0.2	19.7	0.010
Average:			**19.7**	**8.01**	**0.45**	**401.3**	**92.9**	**8.3**	**0.286**	**998.445**	**0.215**	**1.362**	**0.21505**	**2.2602**	**0.227**	**19.6001**	**0.010**
Tenn Ave	6/4/20	5/26/20	19.2	7.89	0.47	417.9	82.7	7.4	0.301	998.550	0.230	0.310	ND	ND	ND	ND	ND
	6/11/20	6/10/20	21.1	7.68	0.40	367.1	51.3	4.4	0.254	998.123	0.190	1.472	ND	ND	ND	ND	ND
	6/18/20	6/15/20	19.5	7.90	0.46	412.5	64.5	5.7	0.295	998.487	0.223	1.048	1.05943	2.1687	1.098	21.8072	0.040
	6/25/20	6/23/20	19.8	7.81	0.5	410.0	46.3	4.1	0.3	998.4	0.2	0.7	0.4	1.7	0.4	18.1	0.010
Average:			**19.9**	**7.82**	**0.45**	**401.9**	**61.2**	**5.4**	**0.285**	**998.397**	**0.216**	**0.877**	**0.70594**	**1.9255**	**0.730**	**19.9555**	**0.025**
Inskip	6/4/20	5/26/20	18.0	7.59	0.43	374.1	65.8	6.0	0.277	998.770	0.211	2.857	ND	ND	ND	ND	ND
	6/11/20	6/10/20	19.9	7.38	0.36	323.6	47.8	4.2	0.230	998.368	0.170	7.652	ND	ND	ND	ND	ND
	6/18/20	6/15/20	16.8	7.38	0.44	373.5	64.4	6.0	0.282	998.888	0.215	1.626	0.13330	2.5165	0.134	12.3433	0.000
	6/25/20	6/23/20	16.5	7.26	0.4	376.9	54.0	5.1	0.3	999.0	0.2	5.2	0.1	2.4	0.1	11.4	0.000
Average:			**17.8**	**7.40**	**0.42**	**362.0**	**58.0**	**5.3**	**0.269**	**998.765**	**0.204**	**4.330**	**0.13038**	**2.4419**	**0.132**	**11.8595**	**ND**
Merchants	6/18/20	6/15/20	16.8	7.37	0.40	340.1	48.7	4.6	0.257	998.970	0.195	1.574	0.19000	1.5965	0.190	14.0957	0.000
	6/25/20	6/23/20	17.6	7.35	0.40	340.5	41.2	3.8	0.253	998.823	0.195	1.542	0.15055	1.6417	0.157	12.8547	0.000
Average:			**17.2**	**7.36**	**0.40**	**340.3**	**45.0**	**4.2**	**0.255**	**998.896**	**0.195**	**1.558**	**0.17028**	**1.6191**	**0.173**	**13.4752**	**ND**

- ND: Anlayte was not detected, or no data available
- #: HL4 parameter only
- #: HL7 parameter only: 6/18/20 and 6/25/20 sampling events
- Mapped sampling locations available in Appendix A

Table 10A.1d

Pilot Monitoring Program Bacteria Analysis Summary
Second Creek - Q4

June 1, 2020 through June 30, 2020 (Spring '20)

Site	Date	Last Rain	Average Rainfall Per Event	Temp	pH	E. Coli	Fecal Colif.
Units			inches	°C		mpn/ 100mL	cfu/ 100 mL
UT	6/4/20	5/26/20	*	20.6	8.09	1986.00	2200.0
	6/11/20	6/10/20	0.25	21.3	8.00	>2,420	5600.0
	6/18/20	6/15/20	0.11	19.4	8.15	921.00	900.0
	6/25/20	6/23/20	0.26	20.6	8.20	727.0	1455.0
McGhee	6/4/20	5/26/20	*	20.2	7.85	980.00	1909.0
	6/11/20	6/10/20	0.25	21.1	7.70	>2,420	5800.0
	6/18/20	6/15/20	0.11	19.4	7.95	1203.00	1500.0
	6/25/20	6/23/20	0.26	20.3	7.89	727.0	2700.0
Davanna	6/4/20	5/26/20	*	19.3	8.03	1733.00	1182.0
	6/11/20	6/10/20	0.25	20.7	7.87	>2,420	3000.0
	6/18/20	6/15/20	0.11	18.8	8.14	613.00	550.0
	6/25/20	6/23/20	0.26	19.9	8.02	866.0	1000.0
Tenn Ave	6/4/20	5/26/20	*	19.2	7.89	1733.00	2900.0
	6/11/20	6/10/20	0.25	21.1	7.68	>2,420	7273.0
	6/18/20	6/15/20	0.11	19.5	7.90	1203.00	1900.0
	6/25/20	6/23/20	0.26	19.8	7.81	770.0	727.0
Inskip	6/4/20	5/26/20	*	18.0	7.59	147.00	162.0
	6/11/20	6/10/20	0.25	19.9	7.38	1733.00	13000.0
	6/18/20	6/15/20	0.11	16.8	7.38	155.00	153.0
	6/25/20	6/23/20	0.26	16.5	7.26	921.0	909.0
Merchants	6/18/20	6/15/20	0.11	16.8	7.37	86.00	118.0
	6/25/20	6/23/20	0.26	17.6	7.35	1986.00	57000.0

- ND: Anlayte was not detected, or no data available

- *: Average rainfall only reported if within 72 hours of sampling

Table 10A.2

Laboratory Analysis Summary - Municipal Industrial Facility Wet Weather Program

July 1, 2019 through June 30, 2020

Point Source Sample Site	Period/Unit	Date	Type	pH	BOD	COD	Suspended Solids (TSS)	Dissolved Solids (TDS)	Nitrate + Nitrite Nitrogen	Ammonia Nitrogen	Total Kjeldahl Nitrogen	Total Organic Nitrogen	Lead	Zinc	Total Phosphorus	Ortho Phosphate	Oil/ Grease	E. Coli	Fecal Colif.
Units					mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mpn/ 100mL	cfu/ 100mL
	ANNUAL																		
KAT	Treated Outfall	10/30/19	G	5.0	4.40	35.80	6.2	33	ND	ND	ND	ND	ND	ND	ND	0.0250	ND	**	**
	E. Fifth	10/30/19	G	-	5.60	37.10	42.0	50	0.221	ND	0.458	0.458	0.0056	0.0953	ND	0.0660	ND	**	**
	Church (Bus)	06/19/20	G	6.5	12.20	50.7	10.0	91	0.399	0.558	1.270	0.712	ND	ND	0.130	ND	ND	**	**
Loraine Street Treatment Units	Pretreated	10/16/19	G	5.0	5.70	62.6	26.0	45	0.115	0.11	0.565	0.455	ND	0.0842	ND	0.0600	ND	**	**
	East Suntree	10/16/19	G	5.0	3.80	31.5	12.6	23	0.230	ND	0.352	0.352	ND	ND	ND	0.0730	ND	**	**
	West Baysaver	10/16/19	G	5.0	5.50	34.0	13.2	29	0.152	ND	0.698	0.698	ND	0.0518	ND	0.0480	ND	**	**
	Yard East	06/23/20	G	6.5	ND	25.6	8.1	828	1.020	ND	0.367	0.367	ND	ND	0.272	0.2410	ND	**	**
Transfer Station	Pretreated	10/07/19	G	5.5	32.90	123.0	116.0	206	0.347	ND	2.230	2.230	0.0408	0.3500	0.421	ND	ND	32,550	100,000
	Treated	10/07/19	G	5.5	19.00	105	58	181	0.514	ND	1.700	1.700	0.0234	0.2130	0.356	0.2230	ND	16,070	81,818
	Catch Basin	10/16/19	G	6.0	139.00	720.0	773.0	311	0.326	ND	3.330	3.330	0.3290	1.2700	1.660	1.5000	6.5	**	**
Prosser Rd	Treated Outfall	10/30/19	G	5.5	3.60	ND	8.0	16	ND	ND	0.325	0.325	ND	0.1240	ND	ND	ND	**	**
Average:				**5.6**	**23.17**	**122.5**	**97.6**	**165**	**0.369**	**0.334**	**1.130**	**1.063**	**0.0997**	**0.3126**	**0.568**	**0.2795**	**6.5**	**24310.0**	**90909.0**
***National NURP Study Average**					11.9	90.8	N/A	N/A	N/A	N/A	2.350	3.310	0.18	0.176	0.16	N/A	N/A	N/A	N/A
***Characteristics of Urban Stormwater Range**					1 - 700	5 - 3,100	2 - 11,300	200 - 14,600	N/A	0.1 - 2.5	0.01 - 4.5	N/A	0.0 - 1.9	N/A	0.1 - 125	N/A	N/A	N/A	N/A

* Data was taken from tables 4-1 and 4-2 of the Stormwater Management for Maine: BMPS.

** Microbiological testing not needed at these locations.

-N/A: Not applicable.

- ND: Anlayte was not detected.

Table 10A.3

Laboratory Analysis Summary - Seasonal Ambient Grab Sampling Program

July 1, 2019 through June 30, 2020

Site	Quarter	pH	BOD	COD	Total Suspended Solids (TSS)	Total Dissolved Solids (TDS)	Nitrate + Nitrite Nitrogen	Ammonia Nitrogen	Total Kjeldahl Nitrogen	Total Organic Nitrogen	Lead	Zinc	Total Phosphorus	Ortho Phosphate	E. Coli	Fecal Colif.
Units			mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mpn/ 100mL	cfu/ 100 mL
First Creek	Sum '19	7.0	ND	11.3	ND	230	3.68	ND	ND	ND	ND	ND	ND	ND		
	Fall '19	6.5	ND	ND	ND	242	1.64	ND	ND	ND	ND	ND	ND	ND		
	Wtr '20	6.0	ND	ND	4.4	226	1.30	ND	ND	ND	ND	ND	ND	ND		
	Spr '20	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Average:		**6.5**	**ND**	**11.3**	**4.4**	**233**	**2.21**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**
Love Creek	Sum '19	6.0	ND	ND	ND	278	1.38	ND	ND	ND	ND	ND	ND	ND		
	Fall '19	7.0	ND	ND	ND	280	1.70	0.12	ND	ND	ND	ND	ND	ND		
	Wtr '20	6.0	ND	ND	ND	262	1.18	0.12	ND	ND	ND	ND	ND	ND		
	Spr '20	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Average:		**6.3**	**ND**	**ND**	**ND**	**273**	**1.42**	**0.1**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**
Third Creek	Sum '19	7.0	ND	11.4	ND	259	1.50	ND	ND	ND	ND	ND	ND	ND		
	Fall '19	6.0	ND	ND	ND	243	1.82	ND	ND	ND	ND	ND	ND	ND		
	Wtr '20	6.0	ND	ND	ND	216	1.35	ND	ND	ND	ND	ND	ND	ND		
	Spr '20	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Average:		**6.3**	**ND**	**11.4**	**ND**	**239**	**1.56**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**
Fourth Creek	Sum '19	7.8	ND	ND	ND	254	6.31	ND	ND	ND	ND	ND	ND	ND		
	Fall '19	6.0	ND	ND	ND	255	1.38	ND	ND	ND	ND	ND	ND	ND		
	Wtr '20	5.5	ND	ND	2.8	249	1.20	ND	ND	ND	ND	ND	ND	ND		
	Spr '20	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Average:		**6.4**	**ND**	**ND**	**2.8**	**253**	**2.96**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**
Williams Creek	Sum '19	6.0	ND	ND	ND	250	1.74	ND	ND	ND	ND	ND	ND	ND		
	Fall '19	6.0	ND	ND	ND	264	1.82	ND	ND	ND	ND	ND	ND	ND		
	Wtr '20	6.0	ND	ND	ND	269	1.55	ND	ND	ND	ND	ND	ND	ND		
	Spr '20	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Average:		**6.0**	**ND**	**ND**	**ND**	**261**	**1.70**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**

* Knoxville Regional Labs not performing Fecal Coliform at time of sampling

-Winter (Jan., Feb., and March); Spring (April, May, and June); Summer (July, Aug., and Sept.); Fall (Oct., Nov., and Dec.)

- ND: Anlayte was not detected, or no data available.

Table 10A.4

Estimated Runoff From Major Watersheds Within the MS4

July 1, 2019 Through June 30, 2020

Watershed	Agricul./ Forest/ Vacant, Public Parks	Vacant (>10)	Rural Res.	Single Family Res.	Private Rec., Public Land	Multi-Family Res., Church	Insti-tutional	Mining, Office/ Service	Manu-facturing/ Whole-sale	Commer., Trans./ Utility/ Commun.	Major Roads/ Hwys/ ROWs	Under Const	Not Loaded	Total Acres in Watershed	Acres in the City Limits	Est. % Imperv-ious	C Value	Total Rainfall during 18/19 (in./yr)	Total Runoff for 18/19 (Mgal/yr)
Baker Cr.	412	2	107	640	90	77	32	1	1	3	269	13	27	1,674	1,674	32	0.41	62.07	1,151
East Fork	313	0	10	475	302	78	73	31	195	235	584	33	180	2,509	2,509	53	0.57	62.07	2,422
First Cr.	724	0	300	3,152	544	501	110	157	127	556	1,412	51	116	7,750	7,750	44	0.50	62.07	6,519
Fourth Cr.	965	57	423	2,026	468	406	93	206	201	568	881	61	414	6,769	5,920	41	0.48	62.07	4,764
Goose Cr.	639	40	126	669	213	67	8	21	77	131	327	34	29	2,381	1,755	35	0.43	62.07	1,265
Grassy Cr.	2,230	176	561	610	215	24	0	14	31	95	211	39	95	4,301	433	17	0.29	62.07	209
Holston R.	2,362	69	371	1,222	417	45	5	2	219	33	805	32	50	5,632	2,455	28	0.37	62.07	1,536
Inman Br.	563	33	214	138	4	12	0	0	0	0	145	0	34	1,143	99	21	0.31	62.07	53
Knob Cr.	1,719	195	481	843	125	84	1	19	1	29	296	4	169	3,966	989	19	0.30	62.07	507
Knob Fork	1,659	26	398	675	182	56	5	93	6	124	257	19	252	3,752	823	22	0.33	62.07	454
Love Cr.	1,735	102	505	1,625	311	212	51	94	178	408	1,038	46	103	6,408	5,090	36	0.44	62.07	3,784
Second Cr.	443	0	90	1,281	346	247	29	107	140	542	1,161	35	82	4,503	4,498	53	0.57	62.07	4,329
Sinking Cr.	1,614	146	459	1,266	284	90	17	33	31	267	881	12	347	5,447	2,434	33	0.41	62.07	1,702
Swanpond Cr.	3,892	303	833	604	121	36	4	79	240	232	457	65	285	7,151	499	19	0.30	62.07	256
Ten Mile Cr.	1,879	0	638	3,421	165	895	55	115	58	615	1,500	24	641	10,006	3,921	38	0.45	62.07	2,977
Third Cr.	1,757	79	436	3,003	406	512	184	124	225	443	1,252	98	220	8,739	8,417	37	0.45	62.07	6,337
TN River	7,197	503	2,269	4,681	2,910	403	187	72	170	238	990	121	1,113	20,854	8,232	22	0.33	62.07	4,541
Toll Cr.	535	69	154	222	42	26	1	0	37	4	93	42	4	1,229	767	22	0.32	62.07	417
Turkey Cr.	3,353	235	603	2,693	264	343	121	104	91	442	1,161	68	738	10,216	1,677	29	0.38	62.07	1,086
Whites Cr.	2,733	154	782	1,298	575	59	31	11	49	126	608	51	578	7,055	1,634	23	0.34	62.07	928
Williams Cr.	358	11	47	561	46	96	125	17	10	61	276	3	30	1,641	1,605	37	0.45	62.07	1,217
Woods Cr.	1,220	106	281	371	0	26	0	2	140	43	261	1	157	2,608	143	23	0.33	62.07	81
Sink-East	1,226	0		728	9	17	0	17	3	27	0	0	0	2,027	91	12	0.24	62.07	38
Beaver Cr	21,174	0	0	21,230	1,292	845	4	259	283	712	0	160	0	45,959	162	16	0.28	62.07	76
Tuckahoe	4,293	0	0	1,829	18	14	0	8	2	1	0	4	0	6,169	229	8	0.22	62.07	84
Fr.Broad riv	8,954	0	0	2,744	73	40	24	24	497	117	0	166	0	12,639	551	11	0.24	62.07	222
COK Total	73,949	2,306	10,088	58,007	9,422	5,211	1,160	1,610	3,012	6,052	14,865	1,182	5,664	192,528	64,357				**46,955**

The runoff from the major watersheds within the MS4 area was estimated by a formula in Camp Dresser & Mckee's Watershed Management Module. Q = P x C x A

where, P = total precipitation (inches/year) = 62.07 in./yr = 5.1725 ft./yr

C = land use area weighted runoff coefficient = 0.15*pervious% + 0.95*Impervious%

A = drainage area (acres) = acres in watershed x (4.35E4 ft^2/acre) = A_i ft^2

Q = total runoff rate = sum of each watershed's Q_i.

Total estimated runoff for 2018/2019 Reporting Period = 46,955 Mgal/yr

Approximate area and land use for each watershed was determined through the City's GIS. Total yearly rainfall amount was determined by averaging the amount of rain collected from the City's five monitoring stations located throughout the city (refer to map in Appendix E). Runoff coefficient (C) was calculated by adding 15 % of the pervious fraction to 95% of the impervious fraction in each watershed. This assumes that the fraction of rainfall producing runoff is 15% and 95% from pervious and impervious surfaces respectively. The summary of the runoff calculations are provided in the table above. Calculations for some of the watersheds were left out due to the insignificant amount of runoff that would be produced.

NPDES PERMIT PROGRAM INVENTORY
Fiscal Year 2019-20

City of Knoxville
Permit # TNS068055

SEE "INSET A"

INSET A

CITY OF KNOXVILLE
DEPARTMENT OF ENGINEERING
Stormwater Division
Suite 480
City-County Building
400 Main Street
Knoxville, Tennessee 37902
(865) 215-2148
www.knoxvilletn.gov

- Dry
- Wet
- Not Sampled
- Sampling Station
- Rain Gauge
- Knoxville Corporate Limits
- Watershed Basins
- Public Lands
- Waterbodies
- Creeks & Streams
- Knox County Boundary

N
W E
S

0 0.5 1
Miles

0 2,000 4,000 6,000
Feet

Date Created: 10/30/2020
Created By R. Taylor

MAP DATA TAKEN FROM AERIAL SURVEY OF KNOXVILLE AND KNOX COUNTY. THIS MAP IS INTENDED TO MEET NATIONAL MAP ACCURACY STANDARDS AT THE COMPILATION SCALE

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User: RDTaylor Date: Friday, October 30, 2020 Path: X:\CityEngr\Taylor\Outfalls\NPDES Map\2020\NPDESMAP2020_BML.mxd

Appendix A

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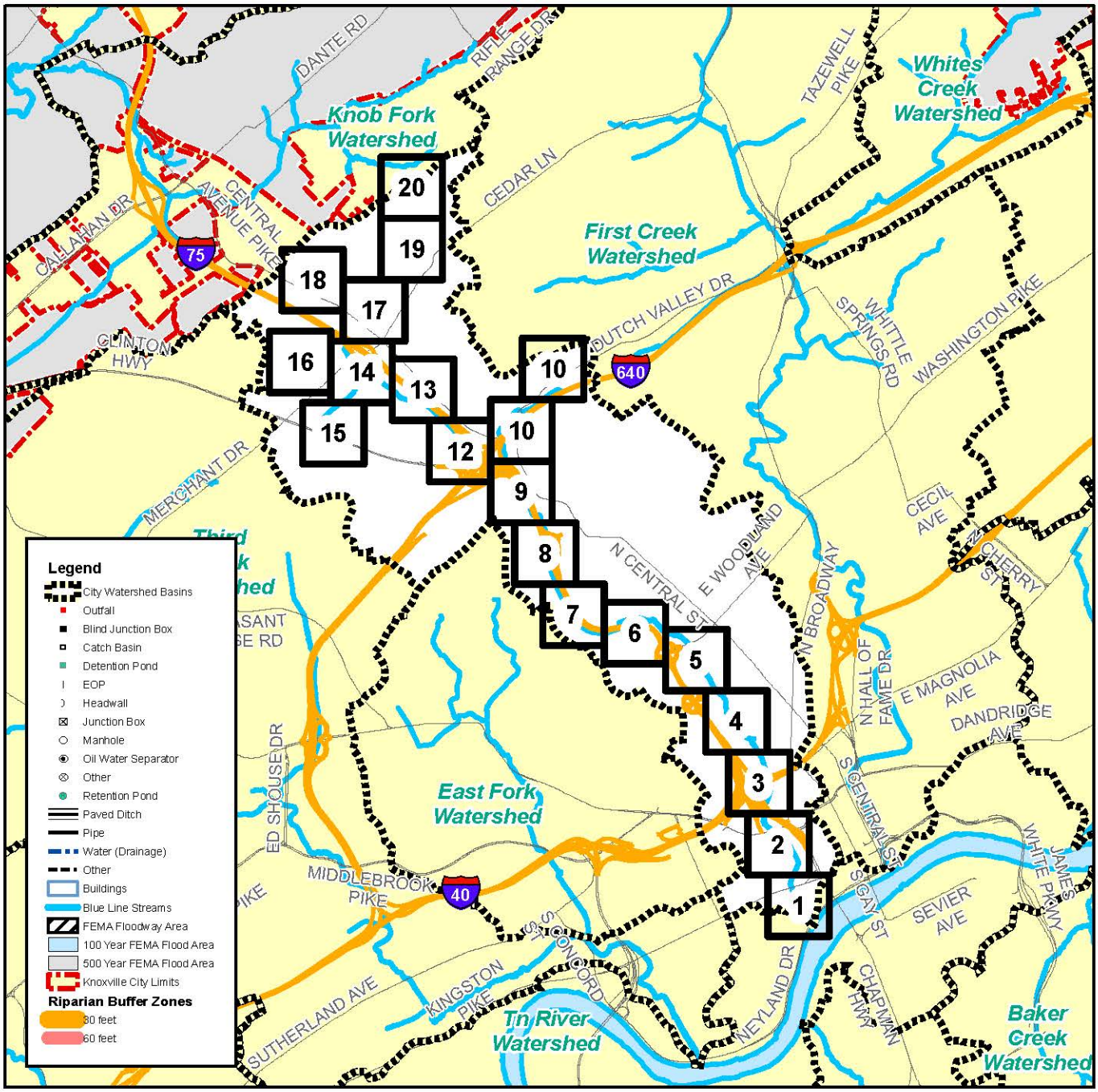
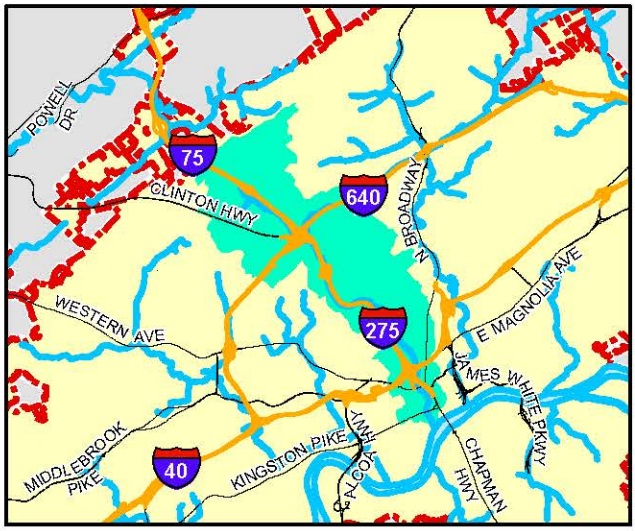
Appendix B





Second Creek Stormwater Outfall Locations Index Sheet

N
W E
S

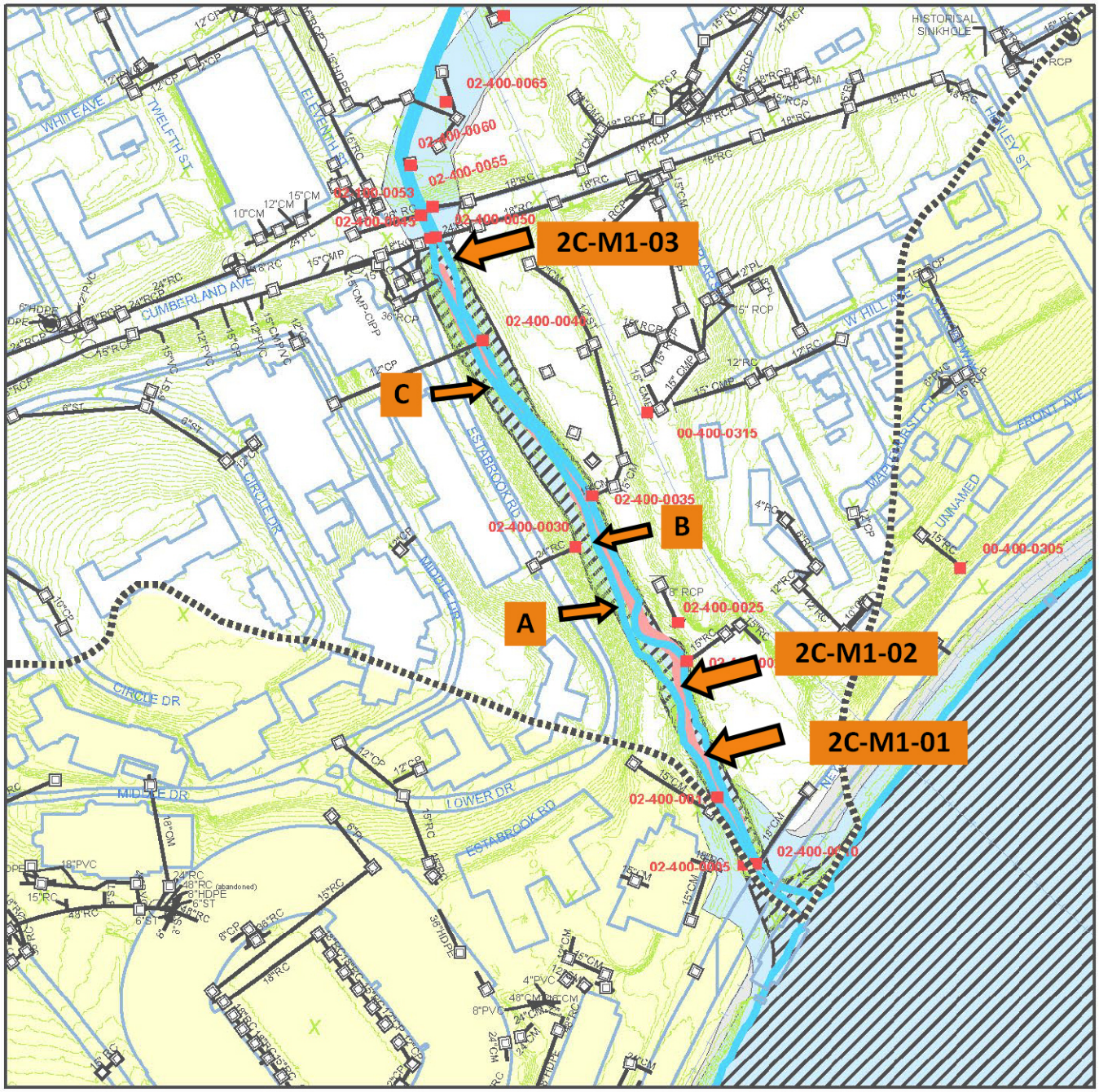
City of Knoxville
Engineering Department
Stormwater Division

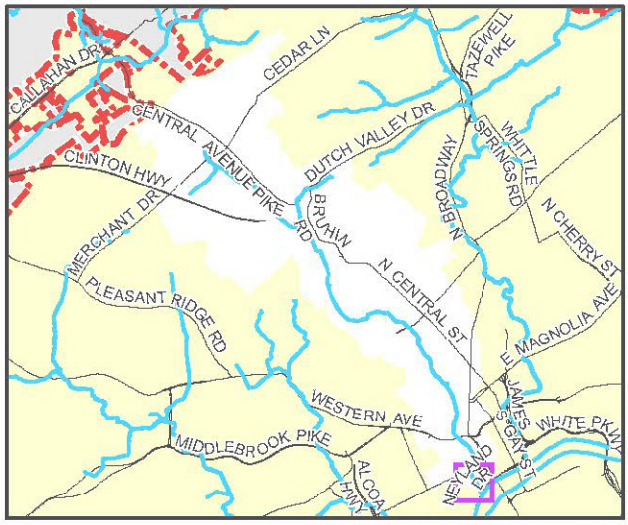
Print Date: Monday, August 31, 2020

SCALE: 1 " = 1/2 MILE (AT FULL SCALE)

0 ½ 1
Miles

X:\CityEngr\GIS Common\Stormwater Engineering\Creek Maps\Second Creek\Second Creek Map Book - Index.mxd





Second Creek
Stormwater Outfall Locations
Sheet 1

N
W E
S

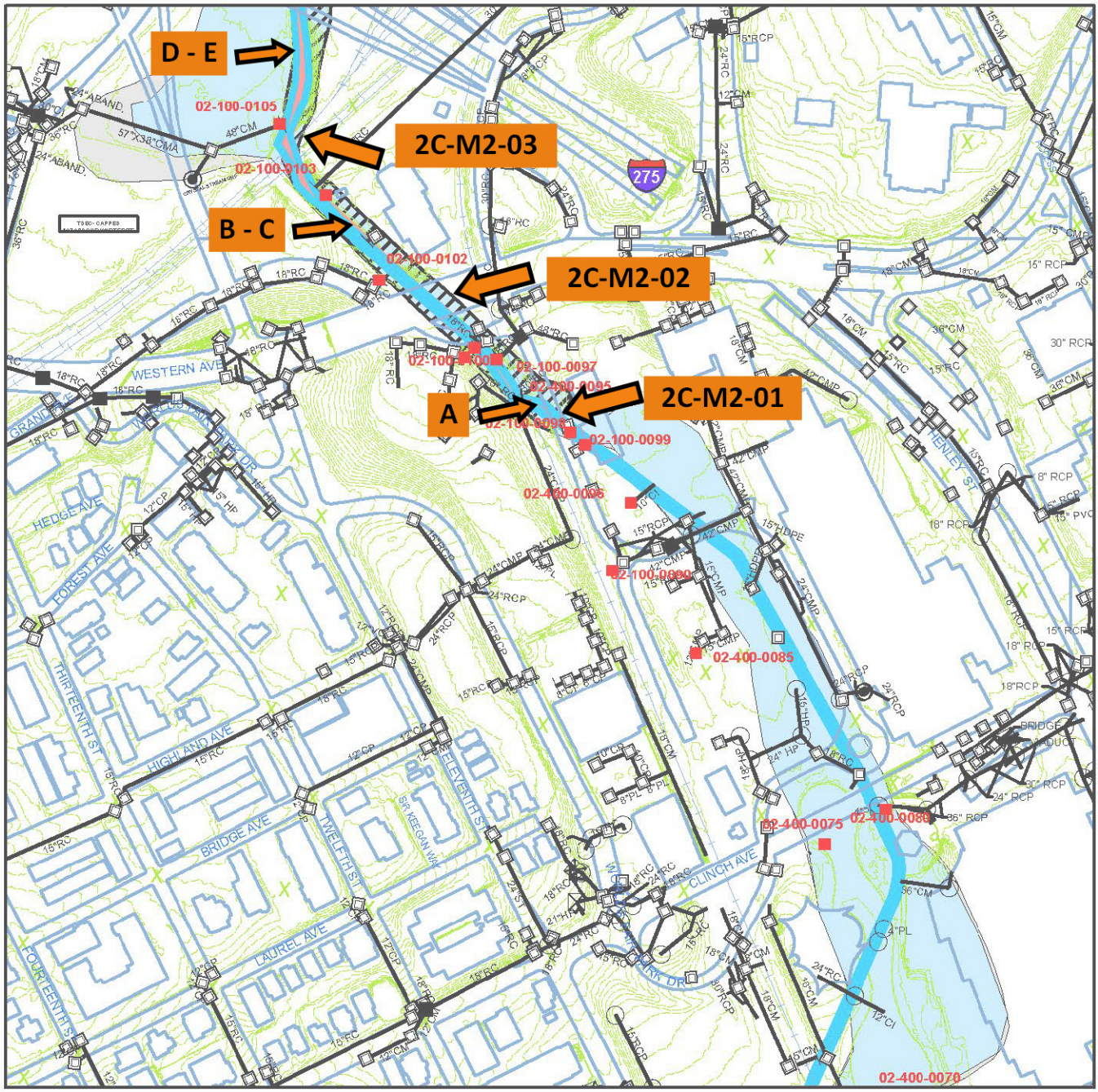
City of Knoxville
Engineering Department
Stormwater Division

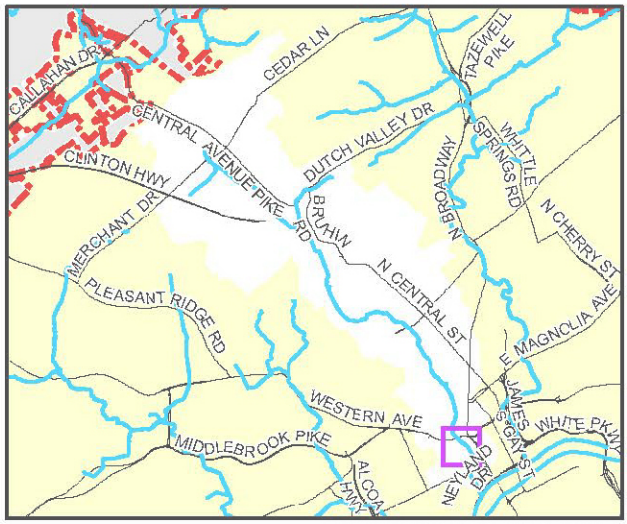
Print Date: Monday, August 31, 2020

SCALE: 1 " = 300' (AT FULL SCALE)

0 300 600
Feet

X:\CityEngr\GIS Common\Stormwater Engineering\Creek Maps\Second Creek\Second Creek Map Book.mxd





Second Creek
Stormwater Outfall Locations
Sheet 2

N
W E
S

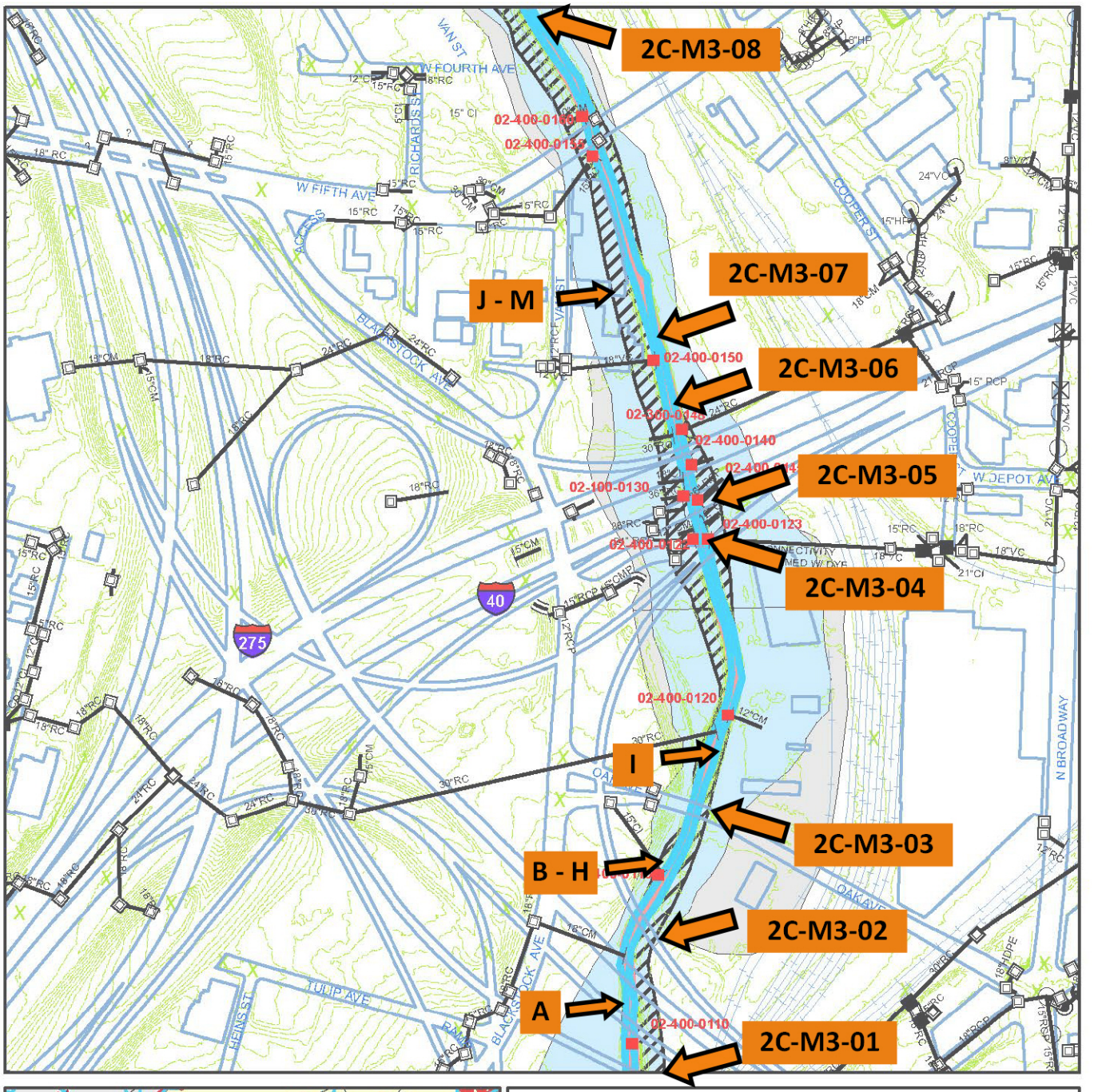
City of Knoxville
Engineering Department
Stormwater Division

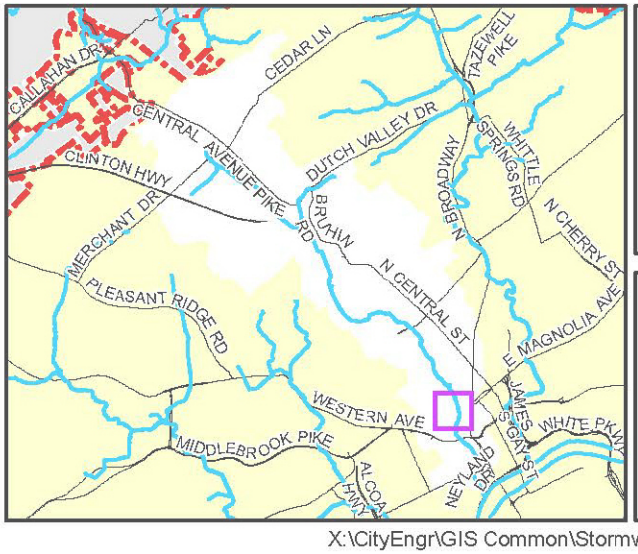
Print Date: Monday, August 31, 2020

SCALE: 1 " = 300' (AT FULL SCALE)

0 300 600
Feet

X:\CityEngr\GIS Common\Stormwater Engineering\Creek Maps\Second Creek\Second Creek Map Book.mxd





Second Creek
Stormwater Outfall Locations
Sheet 3

N
W E
S

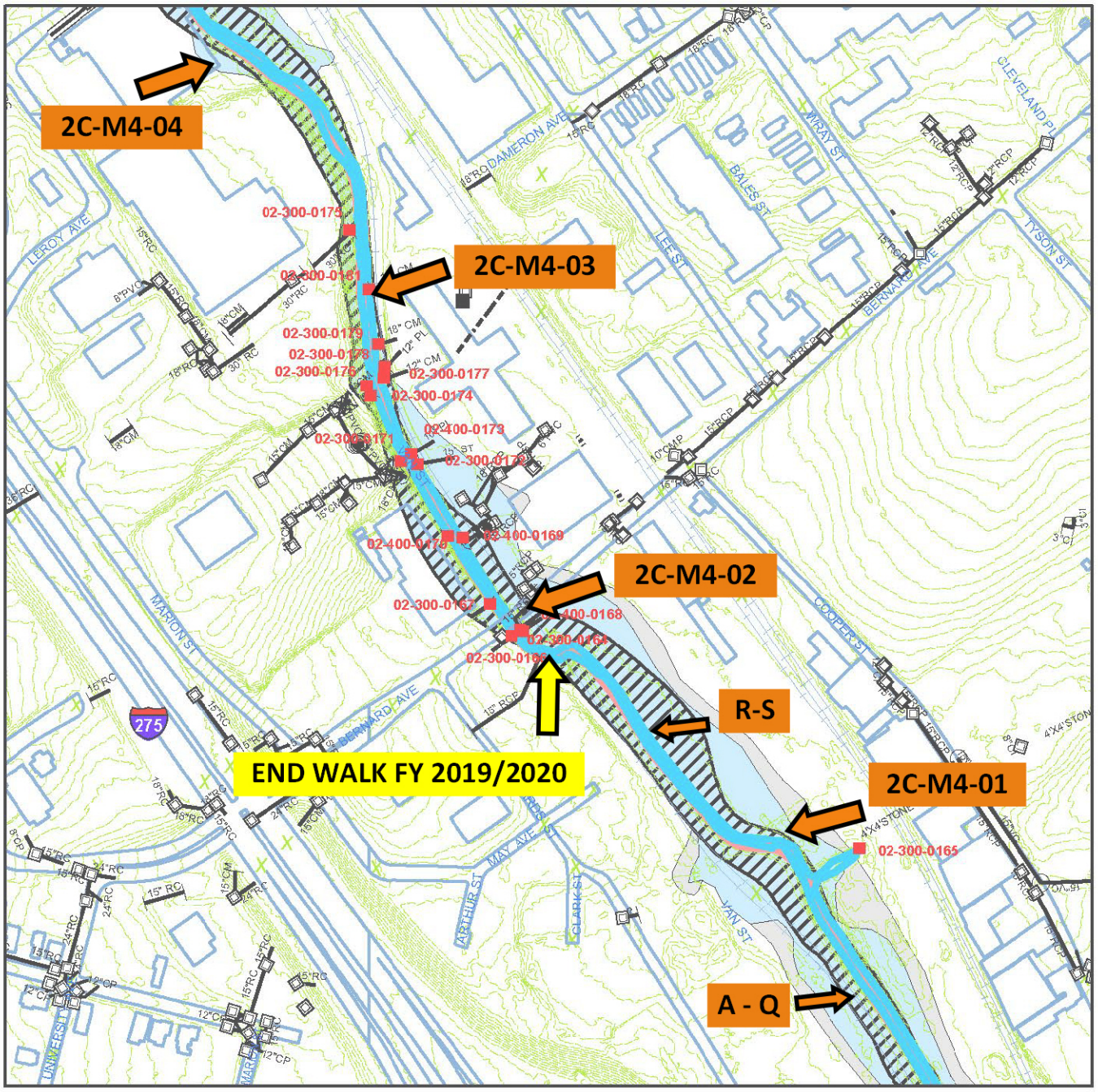
City of Knoxville
Engineering Department
Stormwater Division

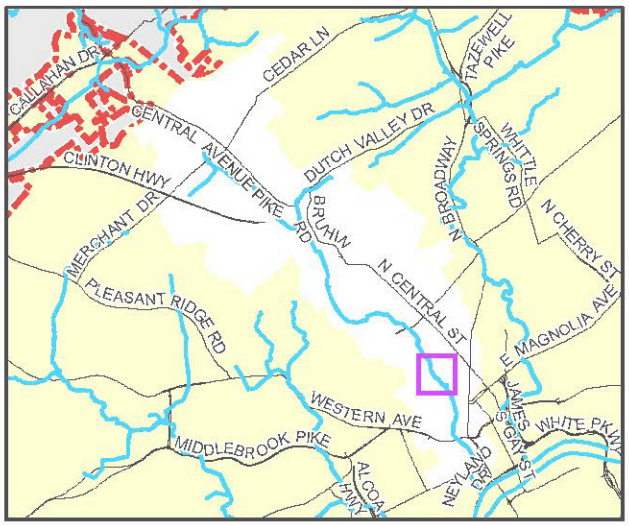
Print Date: Monday, August 31, 2020

SCALE: 1 " = 300' (AT FULL SCALE)

0 300 600
Feet

X:\CityEngr\GIS Common\Stormwater Engineering\Creek Maps\Second Creek\Second Creek Map Book.mxd





Second Creek
Stormwater Outfall Locations
Sheet 4

N
W E
S

City of Knoxville
Engineering Department
Stormwater Division

Print Date: Monday, August 31, 2020

SCALE: 1 " = 300' (AT FULL SCALE)

0 300 600
Feet

X:\CityEngr\GIS Common\Stormwater Engineering\Creek Maps\Second Creek\Second Creek Map Book.mxd

TDEC-DWR Stream Survey Field Sheet

STREAM SURVEY INFORMATION (Revised 7/15/2020)

DWR Station ID:	Date:	Time:
Samplers:	Organization:	
Project Name:	Activity Type:	
Field Log Number:	Ecoregion:	
Monitoring Location Name:		
Monitoring Location:		

Complete blue cells

Green cells optional or additional information.

Sample Status:		If not collected do you plan to revisit?	
Flow Condition:			

Samples Collected: "Yes" if collected:

SQKICK:		SQBANK:		

Field Parameters: (Note: mg/L = ppm) **Meters Used:**

☑ if Validated. Describe meter problems.

	1st	2nd		
pH (su):				
Conductivity (umhos):				
Temperature (C°):				
Dissolved Oxygen (mg/L):				
Dissolved Oxygen %:				
Turbidity (NTU):				
TDS (mg/L):				
Flow (cfs):				

Weather:

Previous 48 hours precipitation:		Approx. Air Temperature (F°):	

Physical Characteristics:

Gradient:		**Avg. Stream Width:**	
		Max. Stream Depth:	

Light Penetration:

% Canopy Cover Estimated for Reach:						%			
% Canopy Cover Measured (mid-reach) with spherical crown densiometer:									
		u/s +		d/s +		LDB +		RDB =	

Channel Characteristics:

Bank Height:	yards	**High Water Mark:**	yards

Stream/Channel Characteristics: In the sections below select all that apply:

	Characteristic 1	Characteristic 2	Characteristic 3	Characteristic 4
LDB Bank Slope:				
RDB Bank Slope:				
Manmade Modifications:				
Sediment Deposits:		Does this match sediment deposition in habitat?		
Sediment Type:				
Turbidity:				
Foam/Surface Sheen:				
Algae:				
Algae Type:				

Dominate Substrate: (≥ 25%) Select up to 4:

	Riffle	Run	Pool
Dominate 1:			
Dominate 2:			
Dominate 3:			
Dominate 4:			

Surrounding Land Uses (Select up to 4):

Landuse 1		Landuse 2		Landuse 3		Landuse 4

If applicable, choose up to 4 disturbances from the dropdown boxes below the appropriate severity of the impact.

Observed Human Disturbances:	Slight	Moderate	High	
Disturbance 1:				
Disturbance 2:				
Disturbance 3:				
Disturbance 4:				

Other Stream Information and Stressors:

Photos and descriptions may be attached below:

Photos Taken?		Photo Description:	

Insert and label pictures below:

Label: _____
Notes: _____

Label: _____
Notes: _____

Label: _____
Notes: _____

Label: _____
Notes: _____

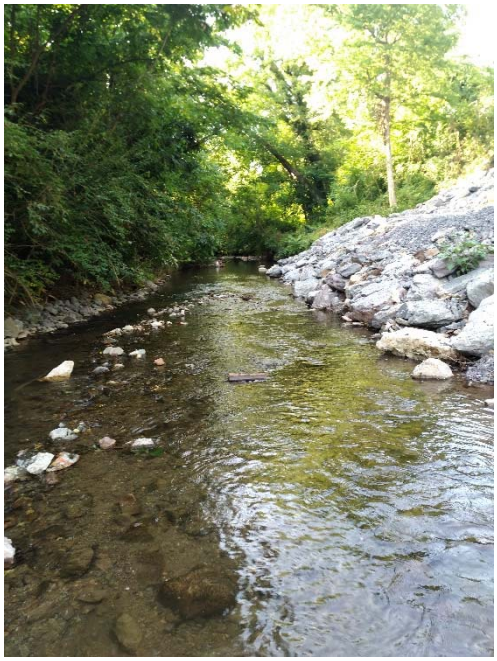
Pilot Sampling Program Q4

Second Creek

Creek Walk Photos

Appendix B

2C-M1-01



2C-M1-03

2C-M2-B

2C-M2-03

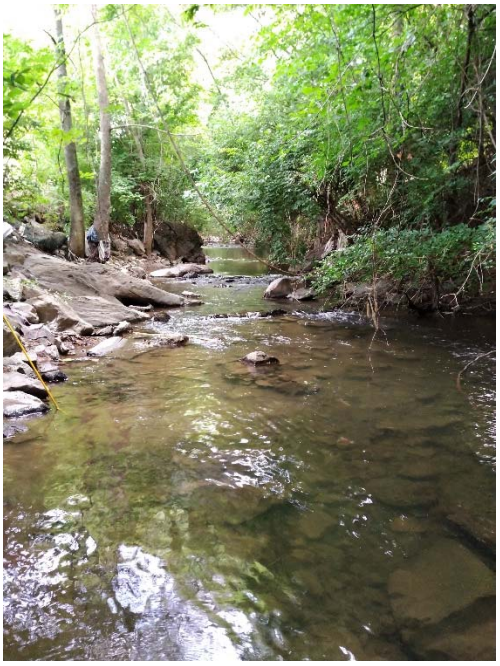
Pilot Sampling Program Q4

Second Creek

Creek Walk Photos

Appendix B

2C-M3-A



2C-M3-03

2C-M4-C

2C-M4-01

Appendix C

HABITAT ASSESSMENT FIELD SHEET- MODERATE TO HIGH GRADIENT STREAMS

(Revised 6/9/2017- See Protocol E for detailed description and rank Information)

DWR Station ID:		**Habitat Assessment By:**	
Monitoring Location Name:		**Date:**	**Time:**
Monitoring Location:		**Field Log Number:**	
HUC:	WS Group:	Ecoregion:	QC: ☐ Duplicate ☐ Consensus

	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal Substrate/ Available Cover	Over 70% of stream reach has natural stable habitat suitable for colonization by fish and/or macroinvertebrates. Four or more productive habitats are present.	Natural stable habitat covers 40-70% of stream reach. Three or more productive habitats present. (If near 70% and more than 3 go to optimal.)	Natural stable habitat covers 20 -40% of stream reach or only 1-2 productive habitats present. (If near 40% and more than 2 go to suboptimal.)	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
Score:	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
Comments:				
2. Embeddedness of Riffles	Gravel, cobble, and boulders 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. If near 25% drop to suboptimal if riffle not layered cobble.	Gravel, cobble and boulders 25-50% surrounded by fine sediment. Niches in bottom layers of cobble compromised. If near 50% & riffles not layered cobble drop to marginal.	Gravel, cobble, and boulder s are 50-75% surrounded by fine sediment. Niche space in middle layers of cobble is starting to fill with fine sediment.	Gravel, cobble, and boulders are more than 75% surrounded by fine sediment. Niche space is reduced to a single layer or is absent.
Score:	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
Comments:				
3. Velocity/ Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow).	Only 3 of the 4 regimes present (if fast-shallow is missing score lower). If slow-deep missing score 15.	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime. Others regimes too small or infrequent to support aquatic populations.
Score:	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
Comments:				
4. Sediment Deposition	Sediment deposition affects less than 5% of stream bottom in quiet areas. New deposition on islands and point bars is absent or minimal.	Sediment deposition affects 5-30% of stream bottom. Slight deposition in pool or slow areas. Some new deposition on islands and point bars. Move to marginal if build-up approaches 30%.	Sediment deposition affects 30-50% of stream bottom. Sediment deposits at obstruction, constrictions and bends. Moderate pool deposition.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
Score:	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
Comments:				
5. Channel Flow Status.	Water reaches base of both lower banks and streambed is covered by water throughout reach. Minimal productive habitat is exposed.	Water covers > 75% of streambed or 25% of productive habitat is exposed.	Water covers 25-75% of streambed and/or productive habitat is mostly exposed.	Very little water in channel and mostly present as standing pools. Little or no productive habitat due to lack of water.
Score:	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
Comments:				

HABITAT ASSESSMENT FIELD SHEET-MODERATE TO HIGH GRADIENT STREAMS (BACK)				
DWR Station ID:	Date:		Assessor:	
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization, dredging rock removal or 4-wheel activity (past or present) absent or minimal; natural meander pattern. NO artificial structures in reach. Upstream or downstream structures do not affect reach.	Channelization, dredging or 4-wheel activity up to 40%. Channel has stabilized. If larger reach, channelization is historic and stable. Artificial structures in or out of reach do not affect natural flow patterns.	Channelization, dredging or 4-wheel activity 40-80% (or less that has not stabilized.) Artificial structures in or out of reach may have slight affect.	Over 80% of reach channelized, dredged or affected by 4-wheelers. Instream habitat greatly altered or removed. Artificial structures have greatly affected flow pattern.
Score:	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
Comments:				
7. Frequency of re-oxygenation zones. Use frequency of riffle or bends for category. Rank by quality.	Occurrence of re-oxygenation zones relatively frequent; ratio of distance between areas divided by average stream width <7:1.	Occurrence of re-oxygenation zones infrequent; distance between areas divided by average stream width is 7 - 15.	Occasional re-oxygenation area. The distance between areas divided by average stream width is over 15 and up to 25.	Generally all flat water or flat bedrock; little opportunity for re-oxygenation. Distance between areas divided by average stream width >25.
Score:	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
Comments:				
8. Bank Stability (score each bank) Determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion. If approaching 30% score marginal if banks steep.	Moderately unstable; 30-60 % of bank in reach has areas of erosion; high erosion potential during floods, If approaching 60% score poor if banks steep.	Unstable; many eroded area; raw areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
Score (Left Bank):	10 9	8 7 6	5 4 3	2 1 0
Score (Right Bank):	10 9	8 7 6	5 4 3	2 1 0
Comments:				
9. Vegetative Protective (score each bank) includes vegetation from top of bank to base of bank. Determine left or right side by facing downstream.	More than 90% of the bank covered by undisturbed vegetation. All 4 classes (mature trees, understory trees, shrubs, groundcover) are represented and allowed to grow naturally. All plants are native.	70-90% of the bank covered by undisturbed vegetation. One class may not be well represented. Disruption evident but not effecting full plant growth. Non-natives are rare (< 30%)	50-70% of the bank covered by undisturbed vegetation. Two classes of vegetation may not be well represented. Non-native vegetation may be common (30-50%).	Less than 50% of the bank covered by undisturbed vegetation or more than 2 classes are not well represented or most vegetation has been cropped. Non-native vegetation may dominate (> 50%)
Score (Left Bank):	10 9	8 7 6	5 4 3	2 1 0
Score (Right Bank):	10 9	8 7 6	5 4 3	2 1 0
Comments:				
10. Riparian Vegetative Zone Width (score each bank.) Zone begins at top of bank.	Average width of riparian zone > 18 meters. Unpaved footpaths may score 9 if run-off potential is negligible.	Average width of riparian zone 12-18 meters. Score high if areas < 18 meters are small or are minimally disturbed.	Average width of riparian zone 6-11 meters. Score high if areas less than 12 meters are small or are minimally disturbed.	Average width of riparian zone <6 meters. Score high if areas less than 6 meters are small or are minimally disturbed.
Score (Left Bank):	10 9	8 7 6	5 4 3	2 1 0
Score (Right Bank):	10 9	8 7 6	5 4 3	2 1 0
Comments:				
Total Score:				
	Comparison to Ecoregion Guidelines: ☐ Above or ☐ Below			
	If score is below guidelines, result of ☐ Natural Condition or ☐ Human Disturbance			
Describe				

HABITAT ASSESSMENT FIELD SHEET- LOW GRADIENT STREAMS

(Revised 6/9/2017- See Protocol E for detailed description and rank Information)

DWR Station ID:		**Habitat Assessment By:**	
Monitoring Location Name:		**Date:**	**Time:**
Monitoring Location:		**Field Log Number:**	
HUC:	WS Group:	Ecoregion:	QC: ☐ Duplicate ☐ Consensus

	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal Substrate/ Available Cover	Over 50% of reach has natural, stable habitat for colonization by macroinvertebrates and/or fish. Three or more productive habitats are present.	Natural stable habitat covers 30-50% of stream reach or less than three habitats are present.	Natural stable habitat 10-30% of stream reach. Availability less than desirable, substrate frequently disturbed or removed. Habitat diversity is reduced.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
Score:	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
Comments:				
2. Channel Substrate Characterization	Good mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud or clay; or substrate is fissured bedrock, some root mats and submerged vegetation present.	All mud, clay, soft sand or fissured bedrock bottom, little or no root mat, no submerged vegetation present.	Hard-pan clay, conglomerate or predominantly flat bedrock; no root mat or submerged vegetation.
Score:	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
Comments:				
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools are large-deep very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
Score:	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
Comments:				
4. Sediment Deposition	Sediment deposition affects less than 20% of stream bottom in quiet areas. New deposition on islands and point bars is absent or minimal.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of bottom affected. Slight deposition in pools.	Moderate deposition of fine material on old and new bars, 50-80% of bottom affected; sediment deposits at obstructions, constrictions and bends; moderate deposition of pools.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
Score:	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
Comments:				
5. Channel Flow Status. If water backed up by obstructions (beaver dam, log jams, bedrock during low flow) move assessment reach above or below affected area or consider postponing sampling until accurate assessment of stream can be achieved.	Water reaches base of both lower banks throughout reach. Streambed is covered. Minimal productive habitat is exposed.	Water covers > 75% of streambed and/or < 25% of productive habitat is exposed.	Water covers 25-75% of streambed and/or stable habitat is mostly exposed.	Very little water in channel and mostly present as standing pools. Little or no productive habitat due to lack of water.
Score:	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
Comments:				

HABITAT ASSESSMENT FIELD SHEET- LOW GRADIENT STREAMS (BACK)				
DWR Station ID:		Date:	Assessor:	
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization, dredging or 4-wheel activity absent or minimal; natural meander pattern. NO artificial structures in reach. Upstream or downstream structures do not affect reach.	Channelization, dredging or 4-wheel activity up to 40%. Channel has stabilized. If larger reach, channelization is historic and stable. Artificial structures in or out of reach do not affect natural flow patterns.	Channelization, dredging or 4-wheel activity 40-80% (or less that has not stabilized.) Artificial structures in or out of reach may have slight affect.	Over 80% of reach channelized, dredged or affected by 4-wheelers. Instream habitat greatly altered or removed. Artificial structures may have greatly affected flow pattern.
Score:	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
Comments:				
7. Channel Sinuosity (Entire meander sequence not limited to sampling reach)	The bends in the stream increase the stream length 3-4 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2-3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
Score:	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
Comments:				
8. Bank Stability (score each bank) Determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems <5% of bank affected.	Moderately stable; infrequent, small areas of erosion o 5-30% of bank eroded. If approaching 30% score marginal if banks steep.	Moderately unstable; 30-60 % of bank in reach has areas of erosion; high erosion potential during floods, If approaching 60% score poor if banks steep.	Unstable; many eroded area; raw areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
Score (Left Bank):	10 9	8 7 6	5 4 3	2 1 0
Score (Right Bank):	10 9	8 7 6	5 4 3	2 1 0
Comments:				
9. Vegetative Protective (score each bank) includes vegetation from top of bank to base of bank. Determine left or right side by facing downstream	More than 90% of the bank covered by undisturbed vegetation. All 4 classes (mature trees, understory trees, shrubs, groundcover) are represented and allowed to grow naturally. All plants are native.	70-90% of the bank covered by undisturbed vegetation. One class may not be well represented. Disruption evident but not effecting full plant growth. Non-natives are rare (< 30%)	50-70% of the bank covered by undisturbed vegetation. Two classes of vegetation may not be well represented. Non-native vegetation may be common (30-50%).	Less than 50% of the bank covered by undisturbed vegetation or more than 2 classes are not well represented or most vegetation has been cropped. Non-native vegetation may dominate (> 50%)
Score (Left Bank):	10 9	8 7 6	5 4 3	2 1 0
Score (Right Bank):	10 9	8 7 6	5 4 3	2 1 0
Comments:				
10. Riparian Vegetative Zone Width (score each bank.) Zone begins at top of bank.	Average width of riparian zone > 18 meters. Unpaved footpaths may score 9 if run-off potential is negligible.	Average width of riparian zone 12-18 meters. Score high if areas < 18 meters are small or are minimally disturbed.	Average width of riparian zone 6-11 meters. Score high if areas less than 12 meters are small or are minimally disturbed.	Average width of riparian zone <6 meters. Score high if areas less than 6 meters are small or are minimally disturbed.
Score (Left Bank):	10 9	8 7 6	5 4 3	2 1 0
Score (Right Bank):	10 9	8 7 6	5 4 3	2 1 0
Comments:				
Total Score				
	Comparison to Ecoregion Guidelines: ☐ Above or ☐ Below			
	If score is below guidelines, result of ☐ Natural Condition or ☐ Human Disturbance			
	Describe:			

BIORECON FIELD SHEET: (Revised 6/9/17)

DWR Station ID:			**Samplers:**	
Monitoring Location Name:			**Date:**	**Time:**
Monitoring Location:			Ecoregion:	u/s Ecoregion:
HUC:		Watershed Group:	Drainage Area:	
Project Name:		Project ID:	**Field Log Number:**	
Taxonomic Level:	☐ Family	☐ Genera	**Voucher Verification Date:**	**Initials:**
QA/QC:	☐ Duplicate Sample		☐ ID QC	Activity ID:

Habitats sampled:	Riffle/Swift Run	Slow-Run/Pool-Rock	Leaf Habitat	Snags/ Woody Debris	Undercut Bank/Tree Root	Macro-phytes	Fine Sediment	Other	Total
Percent habitat (max 100%):									
No. collections per habitat (max 4):									

Indicate estimated abundance (EA): **1** = Rare (1-3 organisms) **2** = Common (4-9 organisms) **3** = Abundant (10-49 organisms) **4** = Dominate (>50 organisms)

Field Taxa ID	EA	Notes	Field Taxa ID	EA	Notes	Field Taxa ID	EA	Notes
Ephemeroptera			Oligochaeta			Diptera		
			Amphipoda			Chironomidae		
			Decapoda - Cambaridae					
			Isopoda - Asellidae					
			Acarina					
			Odonata					
Plecoptera								
						Mollusca		
			Hemiptera					
Trichoptera								
			Megaloptera					
			Coleoptera			Other		

Pilot Sampling Program Q4

Second Creek Invertebrate Sampling Example Results

Appendix C

Inskip Sampling Site

6/4/20

6/4/20

6/11/20

6/11/20

Pilot Sampling Program Q4

Second Creek Invertebrate Sampling Example Results

Appendix C

UT Sampling Site

6/4/20

6/4/20

6/11/20

6/11/20

Pilot Sampling Program Q4

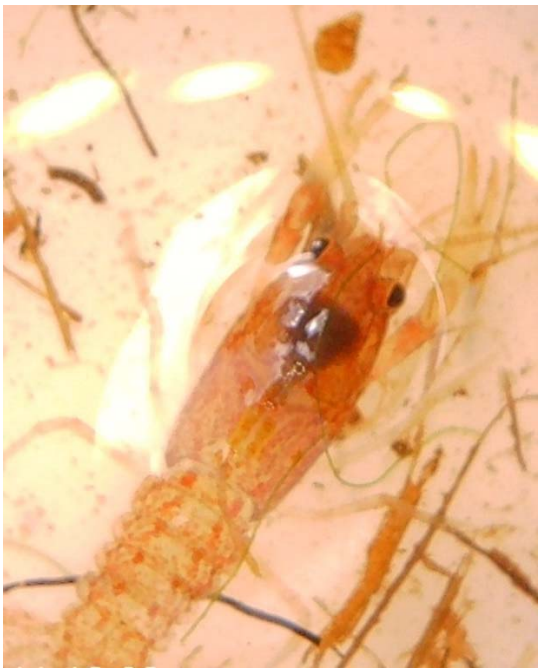
Second Creek Invertebrate Sampling Example Results

Appendix C

Merchants Sampling Site

6/18/20

6/18/20



6/18/20

6/18/20

Appendix D

Additional Information

Analyte	Result	Units
pH (On Site)	7	su
Temperature (on-site)	66	Deg. F

Gravimetric Analysis by Method 2540 C-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Dissolved Solids	234		10.0	1	06/30/2020 21:16	WG1501505

Gravimetric Analysis by Method 2540 D-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Suspended Solids	ND		2.65	1	06/27/2020 12:30	WG1500220

Sample Narrative:

L1232465-01 WG1500220: Reporting limit determined by filtrate volume.

Wet Chemistry by Method 1664A

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Oil & Grease (Hexane Extr)	ND		5.56	1	06/28/2020 13:48	WG1500480

Wet Chemistry by Method 350.1

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Ammonia Nitrogen	ND		0.250	1	06/29/2020 19:16	WG1500538

Wet Chemistry by Method 351.2

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Kjeldahl Nitrogen, TKN	ND		0.250	1	07/01/2020 16:06	WG1502569

Wet Chemistry by Method 353.2

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Nitrate-Nitrite	1.01		0.100	1	07/01/2020 12:35	WG1501767

Wet Chemistry by Method 365.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Phosphorus,Total	ND		0.100	1	07/01/2020 15:16	WG1500273

Wet Chemistry by Method 410.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
COD	ND		20.0	1	06/26/2020 23:37	WG1499864

Wet Chemistry by Method 420.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Total Phenol by 4AAP	ND		0.0400	1	07/01/2020 13:15	WG1501355

Wet Chemistry by Method 4500CN E-2011

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Cyanide	ND		0.00500	1	06/30/2020 22:59	WG1501342

Wet Chemistry by Method 4500P E-2011

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Phosphate,Ortho	ND		0.0300	1	06/24/2020 16:59	WG1498298

Wet Chemistry by Method 5210 B-2011

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
BOD	ND	J-	3.33	1	06/29/2020 09:43	WG1498122

Mercury by Method 245.1

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Mercury	ND		0.000200	1	06/25/2020 12:41	WG1498577

Metals (ICP) by Method 200.7

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Antimony	ND		0.0100	1	06/30/2020 08:42	WG1500581
Arsenic	ND		0.0100	1	06/30/2020 08:42	WG1500581
Beryllium	ND		0.00200	1	06/30/2020 08:42	WG1500581
Cadmium	ND		0.00200	1	06/30/2020 08:42	WG1500581
Chromium	ND		0.0100	1	06/30/2020 08:42	WG1500581
Copper	ND		0.0100	1	06/30/2020 08:42	WG1500581
Lead	ND		0.00500	1	06/30/2020 08:42	WG1500581
Nickel	ND		0.0100	1	06/30/2020 08:42	WG1500581
Selenium	ND		0.0100	1	06/30/2020 08:42	WG1500581
Silver	ND		0.00500	1	06/30/2020 08:42	WG1500581
Thallium	ND		0.0100	1	06/30/2020 08:42	WG1500581
Zinc	ND		0.0500	1	06/30/2020 08:42	WG1500581

Volatile Organic Compounds (GC/MS) by Method 624.1

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Acrolein	ND	J3 J4	0.0500	1	06/25/2020 06:33	WG1498695
Acrylonitrile	ND		0.0100	1	06/25/2020 06:33	WG1498695
Benzene	ND		0.00100	1	06/25/2020 06:33	WG1498695
Bromodichloromethane	ND		0.00100	1	06/25/2020 06:33	WG1498695
Bromoform	ND		0.00100	1	06/25/2020 06:33	WG1498695
Bromomethane	ND		0.00500	1	06/25/2020 06:33	WG1498695
Carbon tetrachloride	ND		0.00100	1	06/25/2020 06:33	WG1498695
Chlorobenzene	ND		0.00100	1	06/25/2020 06:33	WG1498695
Chlorodibromomethane	ND		0.00100	1	06/25/2020 06:33	WG1498695
Chloroethane	ND		0.00500	1	06/25/2020 06:33	WG1498695
2-Chloroethyl vinyl ether	ND	J4	0.0500	1	06/25/2020 06:33	WG1498695
Chloroform	ND		0.00500	1	06/25/2020 06:33	WG1498695
Chloromethane	ND		0.00250	1	06/25/2020 06:33	WG1498695
1,2-Dichlorobenzene	ND		0.00100	1	06/25/2020 06:33	WG1498695
1,3-Dichlorobenzene	ND		0.00100	1	06/25/2020 06:33	WG1498695
1,4-Dichlorobenzene	ND		0.00100	1	06/25/2020 06:33	WG1498695
Dichlorodifluoromethane	ND		0.00500	1	06/25/2020 06:33	WG1498695
1,1-Dichloroethane	ND		0.00100	1	06/25/2020 06:33	WG1498695

Volatile Organic Compounds (GC/MS) by Method 624.1

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
1,2-Dichloroethane	ND		0.00100	1	06/25/2020 06:33	WG1498695
1,1-Dichloroethene	ND		0.00100	1	06/25/2020 06:33	WG1498695
trans-1,2-Dichloroethene	ND		0.00100	1	06/25/2020 06:33	WG1498695
1,2-Dichloropropane	ND		0.00100	1	06/25/2020 06:33	WG1498695
cis-1,3-Dichloropropene	ND		0.00100	1	06/25/2020 06:33	WG1498695
trans-1,3-Dichloropropene	ND		0.00100	1	06/25/2020 06:33	WG1498695
Ethylbenzene	ND		0.00100	1	06/25/2020 06:33	WG1498695
Methylene Chloride	ND		0.00500	1	06/25/2020 06:33	WG1498695
1,1,2,2-Tetrachloroethane	ND		0.00100	1	06/25/2020 06:33	WG1498695
Tetrachloroethene	0.00204		0.00100	1	06/25/2020 06:33	WG1498695
Toluene	ND		0.00100	1	06/25/2020 06:33	WG1498695
1,1,1-Trichloroethane	ND		0.00100	1	06/25/2020 06:33	WG1498695
1,1,2-Trichloroethane	ND		0.00100	1	06/25/2020 06:33	WG1498695
Trichloroethene	ND		0.00100	1	06/25/2020 06:33	WG1498695
Trichlorofluoromethane	ND		0.00500	1	06/25/2020 06:33	WG1498695
Vinyl chloride	ND		0.00100	1	06/25/2020 06:33	WG1498695
Total Xylenes	ND		0.00300	1	06/25/2020 06:33	WG1498695
(S) Toluene-d8	*108*		*80.0-120*		*06/25/2020 06:33*	WG1498695
(S) 4-Bromofluorobenzene	*100*		*80.0-120*		*06/25/2020 06:33*	WG1498695
(S) 1,2-Dichloroethane-d4	*104*		*70.0-130*		*06/25/2020 06:33*	WG1498695

Pesticides (GC) by Method EPA 608.3

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Aldrin	ND		0.0000500	1	06/25/2020 18:56	WG1498398
Alpha BHC	ND		0.0000500	1	06/25/2020 18:56	WG1498398
Beta BHC	ND		0.0000500	1	06/25/2020 18:56	WG1498398
Delta BHC	ND		0.0000500	1	06/25/2020 18:56	WG1498398
Gamma BHC	ND		0.0000500	1	06/25/2020 18:56	WG1498398
Chlordane	ND		0.00500	1	06/25/2020 18:56	WG1498398
4,4-DDD	ND		0.0000500	1	06/25/2020 18:56	WG1498398
4,4-DDE	ND		0.0000500	1	06/25/2020 18:56	WG1498398
4,4-DDT	ND		0.0000500	1	06/25/2020 18:56	WG1498398
Dieldrin	ND		0.0000500	1	06/25/2020 18:56	WG1498398
Endosulfan I	ND		0.0000500	1	06/25/2020 18:56	WG1498398
Endosulfan II	ND		0.0000500	1	06/25/2020 18:56	WG1498398
Endosulfan sulfate	ND		0.0000500	1	06/25/2020 18:56	WG1498398
Endrin	ND		0.0000500	1	06/25/2020 18:56	WG1498398
Endrin aldehyde	ND		0.0000500	1	06/25/2020 18:56	WG1498398
Endrin ketone	ND		0.0000500	1	06/25/2020 18:56	WG1498398
Heptachlor	ND		0.0000500	1	06/25/2020 18:56	WG1498398
Heptachlor epoxide	ND		0.0000500	1	06/25/2020 18:56	WG1498398
Hexachlorobenzene	ND		0.0000500	1	06/25/2020 18:56	WG1498398
Methoxychlor	ND		0.0000500	1	06/25/2020 18:56	WG1498398
Toxaphene	ND		0.000500	1	06/25/2020 18:56	WG1498398
(S) Decachlorobiphenyl	*116*		*10.0-144*		*06/25/2020 18:56*	WG1498398
(S) Tetrachloro-m-xylene	*86.0*		*10.0-135*		*06/25/2020 18:56*	WG1498398

Polychlorinated Biphenyls (GC) by Method EPA-608.3

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
PCB 1016	ND		0.000500	1	06/25/2020 16:52	WG1498398
PCB 1221	ND		0.000500	1	06/25/2020 16:52	WG1498398
PCB 1232	ND		0.000500	1	06/25/2020 16:52	WG1498398
PCB 1242	ND		0.000500	1	06/25/2020 16:52	WG1498398

Polychlorinated Biphenyls (GC) by Method EPA-608.3

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
PCB 1248	ND		0.000500	1	06/25/2020 16:52	WG1498398
PCB 1254	ND		0.000500	1	06/25/2020 16:52	WG1498398
PCB 1260	ND		0.000500	1	06/25/2020 16:52	WG1498398
Total PCBs	ND		0.000500	1	06/25/2020 16:52	WG1498398
(S) Decachlorobiphenyl	*80.1*		*10.0-144*		*06/25/2020 16:52*	WG1498398
(S) Tetrachloro-m-xylene	*88.4*		*10.0-135*		*06/25/2020 16:52*	WG1498398

Semi Volatile Organic Compounds (GC/MS) by Method 625.1

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Acenaphthene	ND		0.00100	1	06/27/2020 12:54	WG1499141
Acenaphthylene	ND		0.00100	1	06/27/2020 12:54	WG1499141
Anthracene	ND		0.00100	1	06/27/2020 12:54	WG1499141
Benzidine	ND		0.0100	1	06/27/2020 12:54	WG1499141
Benzo(a)anthracene	ND		0.00100	1	06/27/2020 12:54	WG1499141
Benzo(b)fluoranthene	ND		0.00100	1	06/27/2020 12:54	WG1499141
Benzo(k)fluoranthene	ND		0.00100	1	06/27/2020 12:54	WG1499141
Benzo(g,h,i)perylene	ND		0.00100	1	06/27/2020 12:54	WG1499141
Benzo(a)pyrene	ND		0.00100	1	06/27/2020 12:54	WG1499141
Bis(2-chlorethoxy)methane	ND		0.0100	1	06/27/2020 12:54	WG1499141
Bis(2-chloroethyl)ether	ND		0.0100	1	06/27/2020 12:54	WG1499141
2,2-Oxybis(1-Chloropropane)	ND		0.0100	1	06/27/2020 12:54	WG1499141
4-Bromophenyl-phenylether	ND		0.0100	1	06/27/2020 12:54	WG1499141
2-Chloronaphthalene	ND		0.00100	1	06/27/2020 12:54	WG1499141
4-Chlorophenyl-phenylether	ND		0.0100	1	06/27/2020 12:54	WG1499141
Chrysene	ND		0.00100	1	06/27/2020 12:54	WG1499141
Dibenz(a,h)anthracene	ND		0.00100	1	06/27/2020 12:54	WG1499141
3,3-Dichlorobenzidine	ND		0.0100	1	06/27/2020 12:54	WG1499141
2,4-Dinitrotoluene	ND		0.0100	1	06/27/2020 12:54	WG1499141
2,6-Dinitrotoluene	ND		0.0100	1	06/27/2020 12:54	WG1499141
1,2-Diphenylhydrazine	ND		0.0100	1	06/27/2020 12:54	WG1499141
Fluoranthene	ND		0.00100	1	06/27/2020 12:54	WG1499141
Fluorene	ND		0.00100	1	06/27/2020 12:54	WG1499141
Hexachlorobenzene	ND		0.00100	1	06/27/2020 12:54	WG1499141
Hexachloro-1,3-butadiene	ND		0.0100	1	06/27/2020 12:54	WG1499141
Hexachlorocyclopentadiene	ND		0.0100	1	06/27/2020 12:54	WG1499141
Hexachloroethane	ND		0.0100	1	06/27/2020 12:54	WG1499141
Indeno(1,2,3-cd)pyrene	ND		0.00100	1	06/27/2020 12:54	WG1499141
Isophorone	ND		0.0100	1	06/27/2020 12:54	WG1499141
Naphthalene	ND		0.00100	1	06/27/2020 12:54	WG1499141
Nitrobenzene	ND		0.0100	1	06/27/2020 12:54	WG1499141
n-Nitrosodimethylamine	ND		0.0100	1	06/27/2020 12:54	WG1499141
n-Nitrosodiphenylamine	ND		0.0100	1	06/27/2020 12:54	WG1499141
n-Nitrosodi-n-propylamine	ND		0.0100	1	06/27/2020 12:54	WG1499141
Phenanthrene	ND		0.00100	1	06/27/2020 12:54	WG1499141
Benzylbutyl phthalate	ND		0.00300	1	06/27/2020 12:54	WG1499141
Bis(2-ethylhexyl)phthalate	ND		0.00300	1	06/27/2020 12:54	WG1499141
Di-n-butyl phthalate	ND		0.00300	1	06/27/2020 12:54	WG1499141
Diethyl phthalate	ND		0.00300	1	06/27/2020 12:54	WG1499141
Dimethyl phthalate	ND		0.00300	1	06/27/2020 12:54	WG1499141
Di-n-octyl phthalate	ND		0.00300	1	06/27/2020 12:54	WG1499141
Pyrene	ND		0.00100	1	06/27/2020 12:54	WG1499141
1,2,4-Trichlorobenzene	ND		0.0100	1	06/27/2020 12:54	WG1499141
4-Chloro-3-methylphenol	ND		0.0100	1	06/27/2020 12:54	WG1499141
2-Chlorophenol	ND		0.0100	1	06/27/2020 12:54	WG1499141
2,4-Dichlorophenol	ND		0.0100	1	06/27/2020 12:54	WG1499141

Semi Volatile Organic Compounds (GC/MS) by Method 625.1

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
2,4-Dimethylphenol	ND		0.0100	1	06/27/2020 12:54	WG1499141
4,6-Dinitro-2-methylphenol	ND		0.0100	1	06/27/2020 12:54	WG1499141
2,4-Dinitrophenol	ND		0.0100	1	06/27/2020 12:54	WG1499141
2-Nitrophenol	ND		0.0100	1	06/27/2020 12:54	WG1499141
4-Nitrophenol	ND	J4	0.0100	1	06/27/2020 12:54	WG1499141
Pentachlorophenol	ND		0.0100	1	06/27/2020 12:54	WG1499141
Phenol	ND		0.0100	1	06/27/2020 12:54	WG1499141
2,4,6-Trichlorophenol	ND		0.0100	1	06/27/2020 12:54	WG1499141
(S) Nitrobenzene-d5	*62.4*		*15.0-314*		*06/27/2020 12:54*	WG1499141
(S) 2-Fluorobiphenyl	*65.6*		*22.0-127*		*06/27/2020 12:54*	WG1499141
(S) p-Terphenyl-d14	*82.9*		*29.0-141*		*06/27/2020 12:54*	WG1499141
(S) Phenol-d5	*17.6*		*8.00-424*		*06/27/2020 12:54*	WG1499141
(S) 2-Fluorophenol	*29.7*		*10.0-120*		*06/27/2020 12:54*	WG1499141
(S) 2,4,6-Tribromophenol	*74.2*		*10.0-153*		*06/27/2020 12:54*	WG1499141