THE CITY OF KNOXVILLE
TENNESSEE

NPDES Permit Annual Report

National Pollutant Discharge Elimination System
Stormwater Discharge Permit TNS068055
July 1, 2020 - June 30, 2021

CITY OF KNOXVILLE

Tennessee Department of
Environment and Conservation
Division of Water Resources
William R. Snodgrass Tennessee Tower,
312 Rosa L. Parks Avenue, Nashville,
Tennessee 37243, 888-891-8332

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

1. MS4 Information

Name of MS4: City of Knoxville	MS4 Permit Number: TNS068055	
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City: Knoxville	State: Tennessee	ZIP code: 37901

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What is the current population of your MS4? **From 2020 Census: 190,740**

What is the reporting period for this annual report? **July 1, 2020 to June 30, 2021**

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.**
- **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.**
- **Educational programs for pesticides, herbicides, and fertilizer use have been implemented in conjunction with City's 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, pet waste bag dispensers, 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:*

Due to the ongoing COVID-19 pandemic, many of the City's usual opportunities to present to the public in person, via conference and community meeting, were canceled or unavailable for the 2020/2021 reporting year.

- **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 had historically remained un-adopted. Adoptions and one time volunteer clean ups have increased significantly.**
- **The City operated an educational virtual booth at the Knoxville 2021 Neighborhood Conference. Information regarding water quality and stormwater pollution prevention for homeowners was presented to the public.**
- **A local news station aired a two-part story on trash and litter in the City of Knoxville. Both the Public Service Department and the Stormwater Engineering Department were featured and were able to speak about what the City does to prevent and remove litter, as well as what the public can do to prevent and remove litter.**
- **Both City staff and volunteers continued to educate the public on the negative effects on water quality that result from feeding wild birds at Fountain City Lake. Educational efforts include permanent signage and updates on the City blog and Facebook page about the progress and struggles at the lake. Updated signage is expected to be installed during the current permit year.**
- **No dumping signs were updated and many new sign locations were added.**
- **The City continued coordination with 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. Ijams actively look for signs that might point to high bacteria levels and report any concerns to the City for further investigation.**
- **The bacteria sampling in Second Creek continued adjacent to highly concentrated homeless encampments in order to continue to evaluate the negative impact of the homeless population on the stream. City staff provided education to those receptive and encouraged them not to use the water to bathe, perform other hygiene practices, or eliminate waste.**
- **The City published several articles on social media regarding water quality efforts, monitoring, and sampling completed by Stormwater Engineering staff. Including one specific to the revised monitoring program titled: *#KnoxvilleJobWellDone: Stormwater Crosses the Streams for Quality*.**

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 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 rainbow trout and catfish. This was the third year in a row TWRA has stocked the lake for the urban winter fishing program.**
- **Microinvertebrate surveys in Mary James Park and the Baker Creek forest drew significant attention from citizens that were present during the investigations. Stormwater staff explained habitat, water quality indicators, shared images of aquatic insects in real time through microscope viewing, and engaged the public as a regular occurrence during the sampling events.**

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 is maintained by City staff 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 not provided on the printed NPDES Permit Program Inventory Map due to scale.

C. *How many outfalls have you identified in your storm drain system?* **1,370**

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 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. During this reporting year, The City made 130 mapping corrections and revisions to the storm drain mapping system.

- **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, documentation, 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, pet waste bag dispensers, 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 paints, 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?*

164 illicit discharge complaints were received during the reporting year. 98 were received as an illicit discharge complaint and 66 were received as a new construction erosion control complaint.

G. *How many illicit discharge investigations were performed this reporting period?* **All illicit discharge complaints that were received resulted in an investigation and 223 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?* **All valid complaints were addressed and eliminated as part of the initial field investigation. Of the 223 outfalls that were screened through the Dry Weather Screening Program, 12 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?* **1689**

G. *How many construction inspections were inspected this reporting period?* **8292**

H. *How many construction related complaints were received this reporting period?* **66**

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?* **2917**

E. *How many development and redevelopment project plans were issued permits?* **1709**

F. *How many enforcement actions were taken to address improper installation or maintenance?*

217 Notices of Violation (NOVs) were issued for active construction site BMPs, 10 for active SPAP site BMPs, and 9 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?* **309 SPAP inspections and 210 stormwater pond inspections were performed during the reporting year. As a result of the COVID-19 pandemic and Engineering Technicians spending more time in the field, rather than in the office, an increased number of permanent, post-construction stormwater quality related inspections were performed compared to previous years.**

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. **Three 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 that biological and habitat assessments are a better measure of program effectiveness and water quality than chemical monitoring at this point. 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 new monitoring program allows more mobility and overall creek assessments in areas that were not included in the chemical monitoring of past years. The 2020/2021 monitoring year is the first complete year of alternate monitoring the City of Knoxville completed under the new monitoring protocols.

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

The Comprehensive Monitoring Program (MN) Pilot Year Implementation

- **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 creek flow/depth measurements.**
  - **Select "designated" creek/watersheds for in depth monitoring. Baker Creek selected for first full year of revised watershed monitoring 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 (4) strategically located sampling locations selected along the designated creek segment. Four locations where selected, an additional location was identified after initial sampling began, included as Hot Spot for identified bacterial pollution. See Appendix A for Baker 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. See tables 10A.1a thru 10A.1e for parameters and location results.**
  - **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.2a through 10A.2f for locations and results.**
  - **Creek Hot Spot sampling and monitoring locations to be identified and investigated as determined necessary.**
- **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 as a guideline. See appendix A for reach map. See appendix B for COK stream survey field sheets and example reach photos.**
  - **For the designated stream, biological sampling and habitat assessment 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 as a guideline. Identifications to be made by COK staff. Macroinvertebrate sampling will occur monthly in combination with sonde/bacteria sampling at and/or near monitoring locations, seasonally. Microinvertabrate sampling to occur spring through fall (typically March thru October). No macroinvertebrate sampling to take place in winter. See Appendix C for COK Habitat Assessment Field Sheet and example macroinvertebrate photos. Full photo report and itemized COK biorecon sheets available upon request.**
- **Training Program & Analysis (MN-4)**
  - **Maintain the Training Program for Staff and/or Volunteers.**
  - **A hydraulic model may be created for a designated watershed and/or portion of said watershed.**
- **Annual Reporting (MN-5)**
  - **Annual reporting to TDEC concerning the progress of this program.**

Findings and Conclusions from the Comprehensive Monitoring Program:

Second Creek and First Creek continue to be 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. This significant pollution source has been identified in multiple watersheds throughout the city. However, First and Second Creek continue to be the most impacted. Further monitoring, coordination with other agencies/departments, and remediation efforts will continue and hopefully expand in the future.

Baker Creek was selected as the first creek to monitor under the new monitoring program. Initial monitoring/sampling schedules were revised from the original scope outlined in last year's report. 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. Four strategic sampling locations were determined, see Appendix A for maps.

Water Quality Monitoring Summary:

The water quality monitoring was completed using Hydrolab Sondes and bacteria testing initially at four strategic locations. This allowed for a comprehensive overview of the water quality in Baker Creek. This monitoring in tandem with the creek walk survey revealed a problem area, which expanded sampling to six locations. The fifth and sixth both being in Mary James Park, up and downstream on a sewage seepage. The problem sanitary overflow manifests itself in a stormwater infiltration basin near Mary James Park. In coordination with the City, KUB located and repaired multiple sanitary sewer system leakages (public and private) in an attempt to eliminate the bacteria. However, these repairs did not fully eliminate the contamination. Therefore, the temporary sewer bypass that was installed is still in place pending the completion of a larger KUB sewer rehabilitation project. The bypass routes the majority of the bacteria pollution to a sanitary manhole and prevents discharge into the creek, which the continued monitoring verified. When the project is completed, monitoring will confirm the source has been eliminated prior to removal of the temporary bypass.

Strategic bacteria testing was performed along reach 7 to isolate and identify potential bacteria sources. The sonde data collected at Baker Creek revealed only slightly elevated levels of NO3- (1-2mg/L higher than recommended) throughout the reaches. All other parameters sampled via Hydrolab Sonde were within accepted healthy limits, however, the creek does test above fishable/swimmable bacteria levels. See page 13 for sonde parameters, ranges, and explainations:

Sonde Parameter	Units	Acceptable Range
Specific Conductivity	mS/cm	.15 - .50 (Conductivity @ 25°C)
Raw Conductivity	µS/cm	This is used to get Specific Conductivity (Conductivity @ measured temp)
DO	%SAT	>60
DO	mg/L	>5
TDS	g/L	<.5
Density kg/m3	kg/m3	Weight of water
Salinity	psu	<.5
Turbidity #	NTU	<100 Lower is better
NH4+	mg/L-N	<1
NO3-	mg/L-N	>0, <1
NH3 Total	mg/L-N	<1
Cl- mg/L	mg/L	<230
NH3	mg/L-N	<1

Conductivity - Indicator of water quality, can determine concentration of solutions, detect contaminants and determine the purity of water (mS/cm x1000 = µS/cm)

Density - Weight of the water in Kg per cubic meter

Salinity - Concentration of salts in the water

Turbidity - Water clarity, can be higher after rain events

NH3 + NH4 = NH3 Total - Lower is better

Cl - Measure of chloride in the water, mostly comes from road salts, less is better.

TDS – Total Dissolved Solids, Measured in the field.

TSS – Total Suspended Solids, TSS = TDS + filtered solids

Stream Survey Summary:
Lower reaches of the creek are impacted by sediment, in some locations severely. The banks have sections of erosive soils. The majority of surrounding land use is residential. Several large debris dams were found on private property. A beaver dam was found and removed near the fire department, restoring flow. The lower reaches display much of the same characteristics. The upper portion of reach 4 has been channelized excessively, on both banks. This seems to be a historic alteration. Reach 5 is located almost totally within the Baker Creek Preserve. However, it is also highly channelized similar to reach 4, and at the upper limits is shallow or without defined bed/bank in a heavily sedimented marsh area. Reach 6 is spring fed. Upper reach 7 contains some saturated area without defined bed and bank and the headwater appears as a spring from the hillside. See Appendix A for maps. See Appendix B for stream survey field sheets and some representative photos. Additional photos of all reaches surveyed available upon request.

Invertebrate and Habitat Summary:
Invertebrate surveys were performed at one low gradient and three high gradient locations. The samples at all locations contained a variety of obligate and tolerant species, from most orders, varied family species. Mayflies, Caddisflies, and True flies were abundant throughout, with one exception. Beetles, Damselflies, and Dragon flies were common throughout, with one exception. City staff did not identify any mayflies, dragonflies, or damselflies at Mary James Park. Megaloptera (Adler fly, Dobson fly, Fish fly) were not identified by City staff in Baker Creek at the sampling locations. An individual stonefly was identified in the low gradient segment surveyed. Less desirable insects such as scuds, flat worms, and water mites were also present in most locations, but not common. Salamanders and crayfish were common throughout the high gradient stream segments sampled. Heavily sedimented locations were not part of the invertebrate survey locations. See Appendix A for maps. See Appendix C for habitat assessment field forms and representative invertebrate photos. Additional photos and completed biorecon data sheets for all sampling events available upon request.

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.

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	# 217	# 10	# 9	X	Yes		No
Administrative Penalties	# 3	#	#	X	Yes		No
Stop Work Orders	# 12	#	#	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, 2020 to June 30, 2021 monitoring period, a total average of 44.7 inches of rainfall was recorded. The City's five ISCO monitoring stations, two ISCO rain gauges, and one Weatherlink weather station recorded daily rainfall. Data is available on the City's Stormwater website: https://knoxvilletn.gov/government/city_departments_offices/engineering/stormwater_engineering_division/rainfall_data

In lieu of quarterly composite wet weather and quarterly ambient grab samples at each monitoring location, Baker Creek was monitored and sampled as described in The Comprehensive Monitoring Program (MN). See Tables 10A.1a through 10A.1e for results and parameters. See tables 10A.2a through 10A.2f for bacteria results.

The City collected wet weather grab samples from 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.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 and remedial 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, 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 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.

Hot spots are also identified through the water quality monitoring program, as discovered through field investigation, sampling, and complaint response.

- **TMDL Implementation**

The City continues to address homeless encampments as a signification source of bacteria pollution. To further determine the impacts on watersheds, Engineering continues investigating and monitoring several creeks containing homeless encampments, including First Creek and Second Creek. Second Creek bacteria testing results are available in Table 10A.2f. 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. Last year private contractors were hired to remove trash, bulky items (creating flooding and habitat damage), and biohazards (needles and drug paraphernalia) from the creek and riparian buffer. Approximately $185,000.00 of emergency funds were spent on these remediation services, with an additional uncalculated sum associated with City services. City Staff provided support in conjunction with the removal contractors including labor, coordination with other agencies, and debris disposal. Over 85 tons of material is estimated to have been removed from the creeks. The City continues to monitor bacteria levels and habitat damage to evaluate the effectiveness of implemented programs and facilities. Changes will be incorporated on an as needed basis.

Dilapidated metal stormwater pipes are continually identified and remediated using cured in place pipe (CIPP) lining technology. This technology allows the City to repair the dilapidated metal pipes without the need to dig and replace. This results in eliminating the risk of sediment discharge during construction, as well as eliminating sediment discharges from the rusted pipe that occur during storms. During this reporting period, the City lined 456 feet of dilapidated pipe.

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 were identified and eliminated. Recent test results have revealed lower bacteria counts and indicate an improvement in water quality for the lake overall. Additional monitoring and investigation will continued 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. TWRA's stocking schedule can be found here: https://www.tn.gov/content/dam/tn/twra/documents/fishing/trout/winter-trout-schedule.pdf

- **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 perform the maintenance at the property owners expense. If the owner does not reimburse the City, the City may place a lien against the property for double the cost. 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	**FY21 Actual**	**Proposed Funding FY22**
Stormwater Engineering	$1,072,209	$1,609,409
Civil Engineering*	$18,454,489	$26,139,035
Operating Funds	**FY21 Actual**	**FY22 Budget**
Stormwater Engineering	$2,708,903	$3,010,330
PSD – Stormwater Related	$4,993,614	$5,100,000**
Household Hazardous Waste Facility and Recycling	$2,346,432	$2,600,000

* - 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

Printed Name and Title

Signature

12/20/2021

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 L	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 Other Anthropogenic Substrate Alterations 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 L	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, 2020 through June 30, 2021

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
00-100-0236														
20/21	09/02/2020 09:25	1	Yes	+5GPM	7	0	0	0	0	0	Clear	No	No	No
20/21	09/02/2020 13:40	2	Yes	+5GPM	7	0	0	0	0	0	Clear	No	No	No
20/21	01/20/2021 11:15	3	Yes	+5GPM	7	0	0	0	0	0	Clear	No	No	No
20/21	01/20/2021 15:25	4	Yes	+5GPM	7	0	0	0	0	0	Clear	No	No	No
01-100-0830														
20/21	07/21/2020 11:05	1	Yes	5gpm	7	0	0	0	0	0	Clear	No	No	No
20/21	07/21/2020 15:05	2	Yes	5gpm	7	0	0	0	0	0	Clear	No	No	No
20/21	03/12/2021 10:50	3	Yes	5gpm	7	0	0	0	0	0	Clear	No	No	No
20/21	03/12/2021 14:50	4	Yes	5gpm	7	0	0	0	0	0	Clear	No	No	No
01-300-0109														
20/21	07/21/2020 09:15	1	Yes	Low Creek Flow	7	0	0	0	0	0	Clear	No	No	No
20/21	07/21/2020 13:20	2	Yes	Low Creek Flow	7.5	0	0	0	0	0	Clear	No	No	No
20/21	03/08/2021 15:20	3	Yes	Low Creek Flow	7.5	0	0	0	0	0	Clear	No	No	No
20/21	03/09/2021 08:20	4	Yes	Low Creek Flow	7	0	0	0	0	0	Clear	No	No	No
01-300-0395														
20/21	09/22/2020 10:25	1	Yes	10gpm +	7	0	0	0	0	0	Clear	No	No	No
20/21	09/22/2020 14:35	2	Yes	10gpm +	7	0	0	0	0	0	Clear	No	No	No
20/21	03/10/2021 10:15	3	Yes	10gpm+	7	0	0	0	0	0	Clear	No	No	No
20/21	03/10/2021 14:15	4	Yes	10gpm+	7	0	0	0	0		Clear	No	No	No
01-400-0470														
20/21	07/21/2020 10:00	1	Yes	.5gpm	6.5	0	0	0	0	0	Clear	No	No	No
20/21	07/21/2020 14:10	2	Yes	.5gpm	6.5	0	0	0	0	0	Clear	No	No	No
20/21	03/12/2021 09:45	3	Yes	.5gpm	7	0	0	0	0	0	Clear	No	No	No
20/21	03/12/2021 13:45	4	Yes	.5gpm	7	0	0	0	0	0	Clear	No	No	No
01-400-0812														
20/21	09/22/2020 11:10	1	Yes	3gpm	7	0	0	0	0	0	Clear	No	No	No
20/21	09/22/2020 15:10	2	Yes	3gpm	7	0	0	0	0	0	Clear	No	No	No
20/21	03/12/2021 10:25	3	Yes	3gpm	7	0	0	0	0	0	Clear	No	No	No
20/21	03/12/2021 14:25	4	Yes	3gpm	7	0	0	0	0	0	Clear	No	No	No

Table 4E

Dry Weather Screening Outfalls with Flow
July 1, 2020 through June 30, 2021

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
01-400-0470														
20/21	07/21/2020 10:00	1	Yes	.5gpm	6.5	0	0	0	0	0	Clear	No	No	No
20/21	07/21/2020 14:10	2	Yes	.5gpm	6.5	0	0	0	0	0	Clear	No	No	No
20/21	03/12/2021 09:45	3	Yes	.5gpm	7	0	0	0	0	0	Clear	No	No	No
20/21	03/12/2021 13:45	4	Yes	.5gpm	7	0	0	0	0	0	Clear	No	No	No
01-400-0812														
20/21	09/22/2020 11:10	1	Yes	3gpm	7	0	0	0	0	0	Clear	No	No	No
20/21	09/22/2020 15:10	2	Yes	3gpm	7	0	0	0	0	0	Clear	No	No	No
20/21	03/12/2021 10:25	3	Yes	3gpm	7	0	0	0	0	0	Clear	No	No	No
20/21	03/12/2021 14:25	4	Yes	3gpm	7	0	0	0	0	0	Clear	No	No	No
01-400-0820														
20/21	07/21/2020 10:40	1	Yes	5gpm	7	0	0	0	0	0	Clear	No	No	No
20/21	07/21/2020 14:40	2	Yes	5gpm	7	0	0	0	0	0	Clear	No	No	No
20/21	03/12/2021 10:30	3	Yes	5gpm	7	0	0	0	0	0	Clear	No	No	No
20/21	03/12/2021 14:30	4	Yes	5gpm	7	0	0	0	0	0	Clear	No	No	No
02-300-0371														
20/21	07/22/2020 09:15	1	Yes	2gpm	7	0	0	0	0	0	Clear	No	No	No
20/21	07/22/2020 13:15	2	Yes	2gpm	7	0	0	0	0	0	Clear	No	No	No
20/21	03/23/2021 10:45	3	Yes	3gpm	7	0	0	0	0	0	Clear	No	No	No
20/21	03/23/2021 14:45	4	Yes	3gpm	7	0	0	0	0	0	Clear	No	No	No
03-100-0114														
20/21	10/07/2020 11:10	1	Yes	10gpm	6.5	0	0	0	0	0	Clear	No	No	No
20/21	10/07/2020 15:10	2	Yes	10gpm	6.5	0	0	0	0	0	Clear	No	No	No
20/21	03/24/2021 10:35	3	Yes	10gpm	7	0	0	0	0	0	Clear	No	No	No
20/21	03/24/2021 14:55	4	Yes	10gpm	7	0	0	0	0	0	Clear	No	No	No
03-100-0553														
20/21	10/19/2020 10:15	1	Yes	1 gpm+	7	0	0	0	0	0	Clear	No	No	No
20/21	10/19/2020 15:00	2	Yes	1 gpm+	7	0	0	0	0	0	Clear	No	No	No
20/21	04/05/2021 09:45	3	Yes	1 gpm+	7	0	0	0	0	0	Clear	No	No	No
20/21	04/05/2021 14:00	4	Yes	1 gpm+	7	0	0	0	0	0	Clear	No	No	No

Table 4E

Dry Weather Screening Outfalls with Flow
July 1, 2020 through June 30, 2021

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
03-100-0929														
20/21	10/20/2020 09:30	1	No											
20/21	10/20/2020 13:30	2	No											
20/21	04/06/2021 09:45	3	Yes	3gpm	7	0	0	0	0	0	Clear	No	No	No
20/21	04/06/2021 13:50	4	Yes	3gpm	7	0	0	0	0	0	Clear	No	No	No
03-200-0920														
20/21	08/20/2020 11:20	1	Yes	2-3gpm	7	0	0	0	0	0	Clear	No	No	No
20/21	08/20/2020 15:30	2	Yes	2-3gpm	7	0	0	0	0	0	Clear	No	No	No
20/21	04/06/2021 09:30	3	Yes	2-3gpm	6.5	0	0	0	0	0	Clear	No	No	No
20/21	04/06/2021 13:35	4	Yes	2-3gpm	6.5	0	0	0	0	0	Clear	No	No	No
03-300-0660														
20/21	07/23/2020 11:15	1	Yes	10gpm +	7	0	0	0	0	0	Clear	No	No	No
20/21	07/23/2020 15:15	2	Yes	10gpm +	7	0	0	0	0	0	Clear	No	No	No
20/21	04/05/2021 10:35	3	Yes	10gpm+	7	0	0	0	0	0	Clear	No	No	No
20/21	04/05/2021 14:50	4	Yes	10gpm+	7	0	0	0	0	0	Clear	No	No	No
03-300-0675														
20/21	07/22/2020 10:45	1	Yes	2Gpm	7.5	0	0	0	0	0	Clear	No	No	No
20/21	07/22/2020 14:45	2	Yes	2Gpm	7.5	0	0	0	0	0	Clear	No	No	No
20/21	04/05/2021 10:50	3	Yes	2gpm	7	0	0	0		0	Clear	No	No	No
20/21	04/05/2021 15:20	4	Yes	2gpm	7	0	0	0	0	0	Clear	No	No	No
04-300-0345														
20/21	08/19/2020 11:10	1	Yes	5gpm	7	2ppm	0	0	0	0	Clear	Yes	No	No
20/21	08/19/2020 15:25	2	Yes	5gpm	7	2ppm	0	0	0	0	Clear	Yes	No	No
20/21	04/07/2021 09:55	3	Yes	5gpm	7	1-2ppm	0	0	0	0	Clear	Yes	No	No
20/21	04/07/2021 13:55	4	Yes	5gpm	7	1-2ppm	0	0	0	0	Clear	Yes	No	No
05-300-0035														
20/21	10/20/2020 09:10	1	Yes	3gpm	7	0	0	0	0	0	clear	No	No	No
20/21	10/20/2020 14:30	2	Yes	3gpm	7	0	0	0	0	0	clear	No	No	No
20/21	01/20/2021 10:10	3	Yes	3gpm	7	0	0	0	0	0	clear	No	No	No
20/21	01/20/2021 13:40	4	Yes	3gpm	7	0	0	0	0	0	clear	No	No	No

Table 4E

Dry Weather Screening Outfalls with Flow
July 1, 2020 through June 30, 2021

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
05-300-0185														
20/21	08/19/2020 08:50	1	Yes	5gpm	7	0	0	0	0	0	Clear	No	No	No
20/21	08/19/2020 13:30	2	Yes	5gpm	7	0	0	0	0	0	Clear	No	No	No
20/21	04/08/2021 11:45	3	Yes	3gpm	7	0	0	0	0	0	clear	No	No	No
20/21	04/08/2021 14:35	4	Yes	3gpm	7	0	0	0	0	0	clear	No	No	No
05-500-0110														
20/21	10/08/2020 11:20	1	Yes	1gpm	8	.3	0	0	0	0	clear	No	No	No
20/21	10/08/2020 15:30	2	Yes	1gpm	8	.2	0	0	0	0	0	No	No	No
20/21	04/07/2021 10:25	3	Yes	1gpm	8	0	0	0	0	0	0	No	No	No
20/21	04/07/2021 15:15	4	Yes	1gpm	8	0	0	0	0	0	0	No	No	No
06-100-0133														
20/21	08/19/2020 09:15	1	Yes	3gpm	7	0	0	0	0	0	Clear	No	No	No
20/21	08/19/2020 14:00	2	Yes	3gpm	7	0	0	0	0	0	Clear	No	No	No
20/21	04/08/2021 08:50	3	Yes	3gpm	7	0	0	0	0	0	clear	No	No	No
20/21	04/08/2021 15:30	4	Yes	3gpm	7	0	0	0	0	0	clear	No	No	No
06-400-0080														
20/21	08/19/2020 09:40	1	Yes	Low Creek flow	7.5	0	0	0	0	0	Clear	No	No	No
20/21	08/19/2020 14:30	2	Yes	Low creek flow	7.5	0	0	0	0	0	Clear	No	No	No
20/21	04/08/2021 09:20	3	Yes	Low creek flow	7	0	0	0	0	0	clear	No	No	No
20/21	04/08/2021 14:25	4	Yes	Low creek flow	7	0	0	0	0	0	clear			
07-100-0055														
20/21	08/20/2020 09:10	1	Yes	10gpm +	7	0	0	0	0	0	Clear	No	No	No
20/21	08/20/2020 13:10	2	Yes	10gpm +	7	0	0	0	0	0	Clear	No	No	No
20/21	04/08/2021 08:55	3	Yes	Creek flow	7	0	0	0	0	0	Clear	No	No	No
20/21	04/08/2021 13:35	4	Yes	Creek flow	6.5	0	0	0	0	0	Clear	No	No	No
07-200-0015														
20/21	08/20/2020 08:45	1	Yes	5gpm	7	0	0	0	0	0	Clear	No	No	No
20/21	08/20/2020 13:10	2	Yes	5gpm	7	0	0	0	0	0	Clear	No	No	No
20/21	04/08/2021 08:35	3	Yes	Low creek flow	7	0	0	0	0	0	Clear	No	No	No
20/21	04/08/2021 13:15	4	Yes	Low Creek flow	6.5	0	0	0	0	0	Clear	No	No	No

Table 4E

Dry Weather Screening Outfalls with Flow
July 1, 2020 through June 30, 2021

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
12-200-0751														
20/21	11/03/2020 11:10	1	No											
20/21	11/03/2020 15:10	2	No											
20/21	04/05/2021 13:45	3	Yes	5gpm	0	0	0	0	0	0	clear	No	No	No
20/21	04/06/2021 09:40	4	Yes	5gpm	0	0	0	0	0	0	Clear	No	No	No
13-100-0240														
20/21	11/06/2020 10:25	1	Yes	3gpm	6.5	0	0	0	<.25	0	Clear	No	No	No
20/21	11/06/2020 14:25	2	Yes	3gpm	6.5	0	0	0	<.25	0	Clear	No	No	No
20/21	04/16/2021 09:20	3	No											
20/21	04/16/2021 13:30	4	No											
13-200-0255														
20/21	11/06/2020 10:50	1	Yes	15gpm	6.5	0	0	0	0	0	Clear	No	No	No
20/21	11/06/2020 14:50	2	Yes	15gpm	6.5	0	0	0	0	0	Clear	No	No	No
20/21	04/16/2021 09:30	3	Yes	10gpm+	6.5	0	0	0	0	0	Clear	No	No	No
20/21	04/16/2021 13:45	4	Yes	10gpm+	6.5	0	0	0	0	0	Clear	No	No	No
13-300-0150														
20/21	11/05/2020 10:30	1	Yes	5gpm	7	0	0	0	.25	0	Clear	No	No	No
20/21	11/05/2020 14:30	2	Yes	5gpm	7	0	0	0	.25	0	Clear	No	No	No
20/21	04/15/2021 10:00	3	Yes	5gpm	7	0	0	0	0	0	Clear	No	No	No
20/21	04/15/2021 15:00	4	Yes	5gpm	7	0	0	0	0	0	Clear	No	No	No
13-300-0305														
20/21	11/06/2020 11:15	1	Yes	15gpm	7	0	0	0	0	0	Clear	No	No	No
20/21	11/06/2020 15:15	2	Yes	15gpm	7	0	0	0	0	0	Clear	No	No	No
20/21	04/16/2021 09:55	3	Yes	15gpm	7	0	0	0	0	0	Clear	No	No	No
20/21	04/16/2021 14:15	4	Yes	15gpm	7	0	0	0	0	0	Clear	No	No	No
13-300-0350														
20/21	11/09/2020 10:00	1	Yes	1gpm	7	0	0	0		0	Clear	No	No	No
20/21	11/09/2020 14:00	2	Yes	1gpm	0	0	0	0	0	0	Clear	No	No	No
20/21	04/16/2021 10:25	3	Yes	2gpm	6.5	0	0	0	0	0	Clear	No	No	No
20/21	04/16/2021 14:35	4	Yes	2gpm	6.5	0	0	0	0	0	Clear	No	No	No

Table 4E

Dry Weather Screening Outfalls with Flow
July 1, 2020 through June 30, 2021

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
13-300-0355														
20/21	11/09/2020 10:20	1	No											
20/21	11/09/2020 14:20	2	No											
20/21	04/16/2021 10:40	3	Yes	5gpm	7	0	0	0	0	0	Clear	No	No	No
20/21	04/16/2021 14:50	4	Yes	5gpm	7	0	0	0	0	0	Clear	No	No	No
18-100-0700														
20/21	11/09/2020 10:50	1	No											
20/21	11/09/2020 14:50	2	No											
20/21	04/06/2021 10:00	3	Yes	10gpm	7	0	0	0	T	0	clear	No	No	No
20/21	04/07/2021 08:15	4	Yes	10gpm	7	0	0	0	T	0	clear	No	No	No
31-100-0500														
20/21	01/26/2021 10:55	1	Yes	4gpm	7	0	0	0	0	0	clear	No	No	No
20/21	01/19/2021 15:25	2	Yes	4gpm	7	0	0	0	0	0	clear	No	No	No
20/21	03/09/2021 09:40	3	Yes	3gpm	7	0	0	0	0	0	clear	No	No	No
20/21	03/09/2021 14:45	4	Yes	3gpm	7	0	0	0	0	0	clear	No	No	No
53-100-0075														
20/21	11/10/2020 10:15	1	Yes	10gpm	6.5	0	0	0	0	0	Clear	No	No	No
20/21	11/10/2020 14:15	2	Yes	10gpm	6.5	0	0	0	0	0	Clear	No	No	No
20/21	04/19/2021 10:40	3	Yes	10gpm	6.5	0	0	0	0	0	Clear	No	No	No
20/21	04/19/2021 14:40	4	Yes	10gpm	6.5	0	0	0	0	0	Clear	No	No	No
53-100-0085														
20/21	11/10/2020 10:25	1	Yes	15gpm +	7	0	0	0	0	0	Clear	No	No	No
20/21	11/10/2020 14:25	2	Yes	15gpm +	7	0	0	0	0	0	Clear	No	No	No
20/21	04/19/2021 10:50	3	Yes	15gpm +	7	0	0	0	0	0	Clear	No	No	No
20/21	04/19/2021 15:10	4	Yes	15gpm +	7	0	0	0	0	0	Clear	No	No	No
53-100-0128														
20/21	08/20/2020 09:45	1	Yes	10gpm +	7	0	0	0	0	0	Clear	No	No	No
20/21	08/20/2020 14:00	2	Yes	10gpm +	7	0	0	0	0	0	Clear	No	No	No
20/21	04/20/2021 09:30	3	Yes	15gpm +	7.5	0	0	0	0	.25ppm	Clear	No	No	No
20/21	04/20/2021 13:30	4	Yes	15gpm +	7.5	0	0	0	0	.25ppm	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														
20/21	08/20/2020 10:15	1	Yes	2gpm	7	0	0	0	0	0	Clear	No	No	No
20/21	08/20/2020 14:25	2	Yes	2gpm	7	0	0	0	0	0	Clear	No	No	No
20/21	04/20/2021 10:00	3	Yes	2gpm	7	0	0	0	0	0	Clear	No	No	No
20/21	04/20/2021 14:00	4	Yes	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

Water Quality Monitoring Program (HL4 & HL7 Sonde) Analysis Summary - Baker Creek

July 1, 2020 through June 30, 2021

Island Home

Site	Date	Last Rain	72 Hour Precip**	Temp	pH	Specific Conductivity	Raw Conductivity	DO	DO	TDS	Density kg/m3	Salinity	Turbidity #	NH4+ *	NO3- *	NH3 Total *	Cl- mg/L *	NH3 *
Units			in	°F		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
Q1	7/29/20	7/29/20	RAIN	68.9	7.79	0.43	391.5	81.5	7.2	0.274	998.267	0.210	5.004	0.09000	1.9715	0.090	10.7998	0.000
	8/26/20	8/25/20	WET	67.8	7.84	0.44	395.8	78.6	7.0	0.281	998.400	0.210	4.890	0.12441	1.7877	0.130	11.8522	0.004
	9/24/20	9/24/20	RAIN	62.5	7.87	0.43	361.8	80.0	7.6	0.273	998.943	0.211	4.269	0.09000	2.3132	0.090	22.0394	0.000
Average:				**66.4**	**7.83**	**0.43**	**383.0**	**80.1**	**7.3**	**0.276**	**998.536**	**0.210**	**4.721**	**0.10147**	**2.0241**	**0.103**	**14.8971**	**0.001**
Q2	10/22/20	10/11/20	DRY	64.1	7.70	0.44	382.6	73.4	7.0	0.283	998.804	0.218	21.434	0.12009	1.8316	0.127	17.1282	0.000
	11/19/20	11/11/20	DRY	53.7	7.67	0.43	325.6	91.9	9.8	0.275	999.665	0.210	0.000	0.14108	3.0552	0.145	27.3590	0.000
	12/17/20	12/16/20	WET	51.0	7.83	0.46	333.8	81.8	8.9	0.292	999.832	0.220	0.011	0.13000	2.5157	0.130	37.6963	0.000
Average:				**56.3**	**7.73**	**0.44**	**347.3**	**82.4**	**8.6**	**0.284**	**999.434**	**0.216**	**7.148**	**0.13039**	**2.4675**	**0.134**	**27.3945**	**ND**
Q3	1/21/21	1/21/21	RAIN	49.2	7.86	0.39	281.0	82.6	9.2	0.252	999.896	0.190	1.063	0.14009	2.5284	0.141	38.5718	0.000
	2/18/21	2/18/21	RAIN	45.2	7.64	0.29	197.2	87.6	10.3	0.187	1000.010	0.140	37.553	0.14640	11.4334	0.150	33.0421	0.000
	3/25/21	3/18/21	RAIN	56.9	7.94	0.46	360.1	82.1	8.2	0.291	999.445	0.220	1.402	0.10000	4.1455	0.100	15.7712	0.000
Average:				**50.4**	**7.82**	**0.38**	**279.4**	**84.1**	**9.2**	**0.243**	**999.784**	**0.183**	**13.339**	**0.12883**	**6.0357**	**0.130**	**29.1284**	**ND**
Q4	4/22/21	4/10/21	WET	50.4	8.08	0.44	322.4	95.6	10.5	0.285	999.860	0.220	0.023	0.07673	4.7417	0.080	337.8694	0.000
	5/20/21	5/10/21	DRY	62.1	8.04	0.45	377.7	76.0	7.3	0.287	999.005	0.220	0.045	0.08838	2.5222	0.090	67.8351	0.000
	6/24/21	6/22/21	WET	65.7	8.11	0.45	395.1	76.8	7.0	0.287	998.637	0.220	0.319	0.10000	2.2702	0.101	13.1535	0.000
Average:				**59.4**	**8.07**	**0.45**	**365.1**	**82.8**	**8.3**	**0.286**	**999.167**	**0.220**	**0.129**	**0.08837**	**3.1780**	**0.090**	**139.6193**	**ND**

- ND: Anlayte was not detected, or no data available
- #: HL4 parameter only
- *: HL7 parameter only
- Mapped sampling locations available in Appendix A
- **: Rain= Rain during sampling, Wet= Rain in previous 72 hours, Dry= No rain in previous 72 hours

Table 10A.1b

Water Quality Monitoring Program (HL4 & HL7 Sonde) Analysis Summary - Baker Creek

July 1, 2020 through June 30, 2021

Knoxville Fire Department

Site	Date	Last Rain	72 Hour Precip**	Temp	pH	Specific Conductivity	Raw Conductivity	DO	DO	TDS	Density kg/m3	Salinity	Turbidity #	NH4+ *	NO3- *	NH3 Total *	Cl- mg/L *	NH3 *
Units				°F		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
Q1	7/29/20	7/29/20	RAIN	67.4	7.81	0.42	381.2	86.7	7.7	0.271	998.433	0.208	4.828	0.08000	1.9544	0.080	12.7966	0.000
	8/26/20	8/25/20	WET	66.3	7.84	0.44	393.6	82.4	7.5	0.284	998.570	0.220	5.508	0.10000	1.8604	0.109	15.0436	0.000
	9/24/20	9/24/20	RAIN	62.3	7.69	0.36	302.3	77.3	7.3	0.229	998.940	0.170	7.507	0.08000	2.5819	0.086	27.9901	0.000
Average:				**65.3**	**7.78**	**0.41**	**359.1**	**82.2**	**7.5**	**0.261**	**998.648**	**0.199**	**5.948**	**0.08667**	**2.1322**	**0.092**	**18.6101**	**ND**
Q2	10/22/20	10/11/20	DRY	63.7	7.77	0.45	387.8	78.5	7.3	0.289	998.842	0.220	0.713	0.10773	1.7737	0.110	17.7007	0.000
	11/19/20	11/11/20	DRY	50.8	7.82	0.45	327.0	82.4	9.1	0.287	999.840	0.220	0.469	0.10078	2.8824	0.104	40.1734	0.000
	12/17/20	12/16/20	WET	52.5	7.80	0.45	339.1	84.4	9.0	0.291	999.750	0.220	0.372	0.09018	2.3323	0.095	50.0300	0.000
Average:				**55.7**	**7.80**	**0.45**	**351.3**	**81.8**	**8.5**	**0.289**	**999.477**	**0.220**	**0.518**	**0.09956**	**2.3295**	**0.103**	**35.9680**	**ND**
Q3	1/21/21	1/21/21	RAIN	50.3	7.75	0.38	271.7	82.3	9.0	0.240	999.840	0.180	5.487	0.08000	2.2956	0.080	45.0685	0.000
	2/18/21	2/18/21	RAIN	45.6	7.60	0.28	192.8	90.3	10.6	0.182	999.984	0.135	41.968	0.13946	8.9722	0.140	47.1388	0.000
	3/25/21	3/18/21	RAIN	57.1	7.82	0.46	367.1	81.9	8.2	0.297	999.440	0.230	0.029	0.09000	3.8282	0.090	19.4443	0.000
Average:				**51.0**	**7.72**	**0.37**	**277.2**	**84.8**	**9.3**	**0.240**	**999.755**	**0.182**	**15.828**	**0.10315**	**5.0320**	**0.103**	**37.2172**	**ND**
Q4	4/22/21	4/10/21	WET	51.7	8.00	0.45	332.6	86.1	9.3	0.288	999.790	0.220	0.062	0.07000	4.1157	0.070	453.6626	0.000
	5/20/21	5/10/21	DRY	60.6	8.04	0.45	373.8	81.7	8.0	0.289	999.140	0.220	3.957	0.08000	2.4087	0.081	94.5049	0.000
	6/24/21	6/22/21	WET	64.3	8.04	0.45	389.9	82.8	7.7	0.288	998.780	0.220	4.580	0.09036	2.1205	0.098	16.1253	0.000
Average:				**58.9**	**8.03**	**0.45**	**365.4**	**83.5**	**8.3**	**0.288**	**999.237**	**0.220**	**2.867**	**0.08012**	**2.8816**	**0.083**	**188.0976**	**ND**

- ND: Anlayte was not detected, or no data available
- #: HL4 parameter only
- *: HL7 parameter only
- Mapped sampling locations available in Appendix A
- **: Rain= Rain during sampling, Wet= Rain in previous 72 hours, Dry= No rain in previous 72 hours

Table 10A.1c

Water Quality Monitoring Program (HL4 & HL7 Sonde) Analysis Summary - Baker Creek

July 1, 2020 through June 30, 2021

South Haven

Site	Date	Last Rain	72 Hour Precip**	Temp	pH	Specific Conductivity	Raw Conductivity	DO	DO	TDS	Density kg/m3	Salinity	Turbidity #	NH4+ *	NO3- *	NH3 Total *	Cl- mg/L *	NH3 *
Units				°F		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
Q1	7/29/20	7/29/20	RAIN	68.2	8.10	0.39	354.8	95.9	8.5	0.250	998.333	0.190	48.097	0.09000	1.8218	0.100	10.2641	0.010
	8/26/20	8/25/20	WET	69.1	8.21	0.38	351.6	88.8	7.8	0.246	998.223	0.189	17.956	0.11266	1.7106	0.122	9.8063	0.010
	9/24/20	9/24/20	RAIN	60.9	8.14	0.36	303.0	92.0	8.8	0.233	999.076	0.180	22.896	0.13000	2.1110	0.140	21.6665	0.010
Average:				**66.1**	**8.15**	**0.38**	**336.5**	**92.2**	**8.4**	**0.243**	**998.544**	**0.186**	**29.650**	**0.11089**	**1.8812**	**0.121**	**13.9123**	**0.010**
Q2	10/22/20	10/11/20	DRY	65.7	8.03	0.25	223.7	80.0	7.3	0.163	998.559	0.123	7.626	0.13027	1.4985	0.139	14.4135	0.010
	11/19/20	11/11/20	DRY	45.7	8.12	0.37	247.7	92.2	11.0	0.234	1000.024	0.180	1.064	0.11044	3.3260	0.120	37.7347	0.000
	12/17/20	12/16/20	WET	43.9	8.20	0.38	249.0	93.3	11.2	0.241	1000.073	0.180	1.562	0.11236	2.6451	0.120	34.8195	0.000
Average:				**51.8**	**8.12**	**0.33**	**240.1**	**88.5**	**9.8**	**0.212**	**999.552**	**0.161**	**3.418**	**0.11769**	**2.4899**	**0.126**	**28.9892**	**0.003**
Q3	1/21/21	1/21/21	RAIN	48.1	8.26	0.33	233.0	88.9	10.0	0.213	999.922	0.160	5.286	0.11855	2.7075	0.120	23.6744	0.000
	2/18/21	2/18/21	RAIN	43.9	7.74	0.28	186.8	89.1	10.7	0.181	1000.040	0.140	83.317	0.15862	14.4574	0.160	24.7442	0.000
	3/25/21	3/18/21	RAIN	55.2	8.09	0.38	291.3	89.2	9.1	0.241	999.538	0.180	11.170	0.10036	4.6938	0.110	14.0178	0.000
Average:				**49.1**	**8.03**	**0.33**	**237.0**	**89.1**	**9.9**	**0.212**	**999.833**	**0.160**	**33.258**	**0.12584**	**7.2863**	**0.130**	**20.8121**	**ND**
Q4	4/22/21	4/10/21	WET	47.8	8.29	0.38	266.2	91.4	10.4	0.244	999.950	0.187	9.006	0.07000	5.7074	0.074	433.0967	0.000
	5/20/21	5/10/21	DRY	63.0	8.49	0.00	0.0	87.5	8.3	0.000	998.762	0.010	9.832	0.09009	2.6867	0.100	69.2560	0.010
	6/24/21	6/22/21	WET	66.2	8.47	0.39	346.3	91.1	8.3	0.250	998.561	0.190	12.452	0.10982	2.4250	0.115	11.0178	0.010
Average:				**59.0**	**8.41**	**0.26**	**204.2**	**90.0**	**9.0**	**0.165**	**999.091**	**0.129**	**10.430**	**0.08997**	**3.6064**	**0.097**	**171.1235**	**0.007**

- ND: Anlayte was not detected, or no data available
- #: HL4 parameter only
- *: HL7 parameter only
- Mapped sampling locations available in Appendix A
- **: Rain= Rain during sampling, Wet= Rain in previous 72 hours, Dry= No rain in previous 72 hours

Table 10A.1d

Water Quality Monitoring Program (HL4 & HL7 Sonde) Analysis Summary - Baker Creek

July 1, 2020 through June 30, 2021

Taylor

Site	Date	Last Rain	72 Hour Precip**	Temp	pH	Specific Conductivity	Raw Conductivity	DO	DO	TDS	Density kg/m3	Salinity	Turbidity #	NH4+ *	NO3- *	NH3 Total *	Cl- mg/L *	NH3 *
Units				°F		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
Q1	7/29/20	7/29/20	RAIN	62.3	7.81	0.39	332.7	94.4	8.9	0.252	998.960	0.190	5.001	0.06321	2.5061	0.070	11.3196	0.000
	8/26/20	8/25/20	WET	62.1	7.91	0.40	334.1	89.6	8.5	0.254	998.980	0.190	6.786	0.07182	2.6585	0.080	12.6314	0.000
	9/24/20	9/24/20	RAIN	60.1	7.87	0.39	317.6	91.2	8.8	0.247	999.160	0.190	5.907	0.07000	2.7762	0.070	38.2765	0.000
Average:				**61.5**	**7.87**	**0.39**	**328.1**	**91.7**	**8.8**	**0.251**	**999.033**	**0.190**	**5.898**	**0.06834**	**2.6470**	**0.073**	**20.7425**	**ND**
Q2	10/22/20	10/11/20	DRY	62.1	7.82	0.40	333.9	83.9	8.0	0.253	998.974	0.190	3.104	0.08191	2.3887	0.088	16.4637	0.000
	11/19/20	11/11/20	DRY	52.1	8.03	0.39	290.7	90.8	9.9	0.251	999.750	0.190	1.071	0.07000	3.8459	0.070	39.1554	0.000
	12/17/20	12/16/20	WET	52.8	8.04	0.39	292.1	91.9	9.8	0.250	999.710	0.190	2.241	0.07000	3.1555	0.070	42.2575	0.000
Average:				**55.7**	**7.96**	**0.39**	**305.6**	**88.8**	**9.2**	**0.251**	**999.478**	**0.190**	**2.138**	**0.07397**	**3.1300**	**0.076**	**32.6255**	**ND**
Q3	1/21/21	1/21/21	RAIN	52.0	8.06	0.38	284.1	87.7	9.4	0.245	999.752	0.190	6.187	0.07000	3.1302	0.070	25.7783	0.000
	2/18/21	2/18/21	RAIN	46.3	7.79	0.29	198.6	89.3	10.7	0.186	999.970	0.140	38.370	0.13000	12.7207	0.130	39.1804	0.000
	3/25/21	3/18/21	RAIN	56.3	8.06	0.39	306.4	88.2	8.9	0.250	999.470	0.190	2.457	0.07509	4.5138	0.079	19.0205	0.000
Average:				**51.5**	**7.97**	**0.35**	**263.0**	**88.4**	**9.6**	**0.227**	**999.731**	**0.173**	**15.671**	**0.09170**	**6.7882**	**0.093**	**27.9930**	**ND**
Q4	4/22/21	4/10/21	WET	52.8	8.11	0.40	296.5	89.6	9.5	0.253	999.700	0.190	0.659	0.06000	5.0183	0.060	1005.8615	0.000
	5/20/21	5/10/21	DRY	59.5	8.16	0.40	326.6	86.9	8.6	0.256	999.212	0.190	1.591	0.07000	3.1387	0.070	110.2666	0.000
	6/24/21	6/22/21	WET	61.0	8.18	0.40	334.7	90.3	8.7	0.257	999.079	0.196	0.186	0.08000	2.7190	0.081	16.1392	0.000
Average:				**57.8**	**8.15**	**0.40**	**319.3**	**88.9**	**8.9**	**0.255**	**999.330**	**0.192**	**0.812**	**0.07000**	**3.6253**	**0.070**	**377.4224**	**ND**

- ND: Anlayte was not detected, or no data available
- #: HL4 parameter only
- *: HL7 parameter only
- Mapped sampling locations available in Appendix A
- **: Rain= Rain during sampling, Wet= Rain in previous 72 hours, Dry= No rain in previous 72 hours

Table 10A.1e

Water Quality Monitoring Program (HL4 & HL7 Sonde) Analysis Summary - Baker Creek

July 1, 2020 through June 30, 2021

Mary James Park Downstream of Hotspot

Site	Date	Last Rain	72 Hour Precip**	Temp	pH	Specific Conductivity	Raw Conductivity	DO	DO	TDS	Density kg/m3	Salinity	Turbidity #	NH4+ *	NO3- *	NH3 Total *	Cl- mg/L *	NH3 *
Units				°F		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
Q2	10/22/20	10/11/20	DRY	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	11/19/20	11/11/20	DRY	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	12/17/20	12/16/20	WET	57.5	7.71	0.44	347.5	72.4	7.3	0.279	999.396	0.210	ND	0.32536	2.7868	0.330	25.2420	0.000
Average:				**57.5**	**7.71**	**0.44**	**347.5**	**72.4**	**7.3**	**0.279**	**999.396**	**0.210**	**ND**	**0.32536**	**2.7868**	**0.330**	**25.2420**	**ND**
Q3	1/21/21	1/21/21	RAIN	57.2	7.58	0.46	365.4	69.2	6.9	0.295	999.429	0.220	0.011	0.74527	3.0650	0.753	23.9955	0.010
	2/18/21	2/18/21	RAIN	54.4	7.44	0.39	300.4	76.2	7.9	0.251	999.600	0.190	16.825	0.24473	10.6583	0.247	20.3136	0.000
	3/25/21	3/18/21	RAIN	59.2	7.59	0.45	365.2	73.9	7.2	0.287	999.265	0.220	0.000	0.09046	4.2064	0.092	12.3154	0.000
Average:				**56.9**	**7.54**	**0.43**	**343.7**	**73.1**	**7.4**	**0.278**	**999.432**	**0.210**	**5.612**	**0.36015**	**5.9766**	**0.364**	**18.8749**	**0.003**
Q4	4/22/21	4/10/21	WET	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	5/20/21	5/10/21	DRY	60.6	7.71	0.46	378.0	72.6	7.1	0.292	999.130	0.220	0.000	0.09873	3.0197	0.100	123.9875	0.000
	6/24/21	6/22/21	WET	66.4	7.82	0.43	381.1	74.8	6.8	0.275	998.548	0.210	0.000	0.09882	2.9666	0.100	11.9420	0.000
Average:				**63.5**	**7.76**	**0.44**	**379.6**	**73.7**	**6.9**	**0.283**	**998.839**	**0.215**	**ND**	**0.09877**	**2.9932**	**0.100**	**67.9647**	**ND**

- ND: Anlayte was not detected, or no data available
- #: HL4 parameter only
- *: HL7 parameter only
- Mapped sampling locations available in Appendix A
- **: Rain= Rain during sampling, Wet= Rain in previous 72 hours, Dry= No rain in previous 72 hours

Mary James Park Upstream of Hotspot

Site	Date	Last Rain	72 Hour Precip**	Temp	pH	Specific Conductivity	Raw Conductivity	DO	DO	TDS	Density kg/m3	Salinity	Turbidity #	NH4+ *	NO3- *	NH3 Total *	Cl- mg/L *	NH3 *
Units				°F		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
Q2	10/22/20	10/11/20	DRY	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	11/19/20	11/11/20	DRY	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	12/17/20	12/16/20	WET	59.6	7.54	0.42	346.4	67.0	6.5	0.271	999.220	0.210	ND	0.08000	2.9685	0.080	24.5170	0.000
Average:				**59.6**	**7.54**	**0.42**	**346.4**	**67.0**	**6.5**	**0.271**	**999.220**	**0.210**	**ND**	**0.08000**	**2.9685**	**0.080**	**24.5170**	**ND**
Q3	1/21/21	1/21/21	RAIN	59.1	7.39	0.45	365.3	63.9	6.3	0.288	999.270	0.220	0.003	0.07000	3.0907	0.070	18.1944	0.000
	2/18/21	2/18/21	RAIN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	3/25/21	3/18/21	RAIN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average:				**59.1**	**7.39**	**0.45**	**365.3**	**63.9**	**6.3**	**0.288**	**999.270**	**0.220**	**0.003**	**0.07000**	**3.0907**	**0.070**	**18.1944**	**ND**
Q4	4/22/21	4/10/21	WET	54.4	7.48	0.47	361.7	69.2	7.2	0.303	999.638	0.230	0.000	0.07000	4.2504	0.070	438.6210	0.000
	5/20/21	5/10/21	DRY	61.2	7.61	0.45	375.8	60.6	5.9	0.289	999.092	0.220	0.000	0.08000	2.9040	0.080	142.5694	0.000
	6/24/21	6/22/21	WET	61.7	7.51	0.46	382.2	48.2	4.6	0.291	999.037	0.220	0.000	0.08000	3.0455	0.080	12.0369	0.000
Average:				**59.1**	**7.53**	**0.46**	**373.2**	**59.3**	**5.9**	**0.294**	**999.256**	**0.223**	**ND**	**0.07667**	**3.4000**	**0.077**	**197.7424**	**ND**

- ND: Anlayte was not detected, or no data available
- #: HL4 parameter only
- *: HL7 parameter only
- Mapped sampling locations available in Appendix A
- **: Rain= Rain during sampling, Wet= Rain in previous 72 hours, Dry= No rain in previous 72 hours

Table 10A.2a

Water Quality Monitoring Program Bacteria Analysis Summary
Baker Creek

June 1, 2020 through July 30, 2021

Island Home							
	Date	**Last Rain**	**72 Hour Precip***	**Temp**	**pH**	**E. Coli**	**Fecal Colif.**
Units				°F		mpn/ 100mL	cfu/ 100 mL
Q1	7/29/20	7/29/20	RAIN	69.0	7.70	579.00	900.0
	8/26/20	8/25/20	WET	68.0	7.80	1203.00	1273.0
	9/24/20	9/24/20	RAIN	63.0	7.80	1300.00	1636.0
Q2	10/22/20	10/11/20	DRY	64.0	7.70	1733.00	1400.0
	11/19/20	11/11/20	DRY	53.0	7.70	613.00	250.0
	12/17/20	12/16/20	WET	51.0	7.80	517.00	540.0
Q3	1/21/21	1/21/21	RAIN	49.0	7.80	>2420	4200.0
	2/18/21	2/18/21	RAIN	45.0	7.60	1986.00	1727.0
	3/25/21	3/18/21	RAIN	57.0	7.90	313.00	246.0
Q4	4/22/21	4/10/21	WET	50.0	8.00	548.00	1000.0
	5/20/21	5/10/21	DRY	62.0	8.00	770.00	1000.0
	6/24/21	6/22/21	WET	66.0	8.00	1733.00	2100.0

- ND: Anlayte was not detected, or no data available
- *: Rain= Rain during sampling, Wet= Rain in previous 72 hours, Dry= No rain in previous 72 hours

Table 10A.2b

Water Quality Monitoring Program Bacteria Analysis Summary
Baker Creek

June 1, 2020 through July 30, 2021

KFD							
	Date	**Last Rain**	**72 Hour Precip**	**Temp**	**pH**	**E. Coli**	**Fecal Colif.**
Units				°F		mpn/ 100mL	cfu/ 100 mL
Q1	7/29/20	7/29/20	RAIN	67.0	7.80	308.00	473.0
	8/26/20	8/25/20	WET	66.0	7.80	517.00	727.0
	9/24/20	9/24/20	RAIN	62.0	7.70	>2420	4300.0
Q2	10/22/20	10/11/20	DRY	63.0	7.70	157.00	173.0
	11/19/20	11/11/20	DRY	51.0	7.80	161.00	150.0
	12/17/20	12/16/20	WET	52.0	7.80	727.00	760.0
Q3	1/21/21	1/21/21	RAIN	50.0	7.70	1120.00	860.0
	2/18/21	2/18/21	RAIN	45.0	7.60	1120.00	860.0
	3/25/21	3/18/21	RAIN	57.0	7.80	548.00	2200.0
Q4	4/22/21	4/10/21	WET	52.0	8.00	261.00	246.0
	5/20/21	5/10/21	DRY	60.0	8.00	980.00	1182.0
	6/24/21	6/22/21	WET	64.0	8.00	>2420	660.0

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

- *: Rain= Rain during sampling, Wet= Rain in previous 72 hours, Dry= No rain in previous 72 hours

Table 10A.2c

Water Quality Monitoring Program Bacteria Analysis Summary
Baker Creek

June 1, 2020 through July 30, 2021

South Haven							
	Date	**Last Rain**	**72 Hour Precip**	**Temp**	**pH**	**E. Coli**	**Fecal Colif.**
Units				°F		mpn/ 100mL	cfu/ 100 mL
Q1	7/29/20	7/29/20	RAIN	68.0	8.10	>2420	3400.0
	8/26/20	8/25/20	WET	69.0	8.20	1733.00	1455.0
	9/24/20	9/24/20	RAIN	61.0	8.10	>2420	30000.0
Q2	10/22/20	10/11/20	DRY	66.0	8.00	411.00	518.0
	11/19/20	11/11/20	DRY	46.0	8.10	461.00	636.0
	12/17/20	12/16/20	WET	44.0	8.20	488.00	540.0
Q3	1/21/21	1/21/21	RAIN	48.0	8.30	770.00	960.0
	2/18/21	2/18/21	RAIN	44.0	7.70	1120.00	2200.0
	3/25/21	3/18/21	RAIN	55.0	8.00	613.00	720.0
Q4	4/22/21	4/10/21	WET	48.0	8.30	1986.00	867.0
	5/20/21	5/10/21	DRY	63.0	8.50	2420.00	2800.0
	6/24/21	6/22/21	WET	66.0	8.50	1120.00	1100.0

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

- *: Rain= Rain during sampling, Wet= Rain in previous 72 hours, Dry= No rain in previous 72 hours

Table 10A.2d

Water Quality Monitoring Program Bacteria Analysis Summary
Baker Creek

June 1, 2020 through July 30, 2021

Taylor							
	Date	**Last Rain**	**72 Hour Precip**	**Temp**	**pH**	**E. Coli**	**Fecal Colif.**
Units				°F		mpn/ 100mL	cfu/ 100 mL
Q1	7/29/20	7/29/20	RAIN	62.0	7.80	411.00	418.0
	8/26/20	8/25/20	WET	62.0	7.90	231.00	364.0
	9/24/20	9/24/20	RAIN	60.0	7.90	>2420	28000.0
Q2	10/22/20	10/11/20	DRY	62.0	7.80	166.00	236.0
	11/19/20	11/11/20	DRY	52.0	8.00	548.00	400.0
	12/17/20	12/16/20	WET	52.0	8.00	461.00	520.0
Q3	1/21/21	1/21/21	RAIN	52.0	8.00	1733.00	3800.0
	2/18/21	2/18/21	RAIN	46.0	7.80	816.00	480.0
	3/25/21	3/18/21	RAIN	56.0	8.00	>2420	7000.0
Q4	4/22/21	4/10/21	WET	53.0	8.10	88.00	115.0
	5/20/21	5/10/21	DRY	60.0	8.10	240.00	240.0
	6/24/21	6/22/21	WET	61.0	8.20	321.00	700.0

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

- *: Rain= Rain during sampling, Wet= Rain in previous 72 hours, Dry= No rain in previous 72 hours

Table 10A.2e

Water Quality Monitoring Program Bacteria Analysis Summary
Baker Creek Hot Spots

June 1, 2020 through July 30, 2021

Mary James Park (Upstream)

	Date	Last Rain	72 Hour Precip	Temp	pH	E. Coli	Fecal Colif.
Q2	12/17/20	12/16/20	WET	60.00	7.50	162.00	197.0
Q3	3/25/21	3/18/21	RAIN	58.00	7.70	64.00	66.0
Q4	4/22/21	4/10/21	WET	58.00	7.50	34.00	49.0
	5/20/21	5/10/21	DRY	60.00	7.40	40.00	36.0
	6/24/21	6/22/21	WET	62.00	7.40	105.00	66.0

Mary James Park (Downstream)

	Date	Last Rain	72 Hour Precip	Temp	pH	E. Coli	Fecal Colif.
Q2	12/17/20	12/16/20	WET	57.0	7.70	>2420	4800.0
Q3	1/21/21	1/21/21	RAIN	57.0	7.70	>2400	17000.0
	2/18/21	2/18/21	RAIN	56.0	7.60	1553.00	1182.0
	3/25/21	3/18/21	RAIN	58.0	7.70	>2420	>60000
Q4	5/20/21	5/10/21	DRY	60.0	7.60	548.00	189.0
	6/24/21	6/22/21	WET	63.0	7.70	411.00	420.0

South Haven Tributary

	Date	Last Rain	72 Hour Precip	Temp	pH	E. Coli	Fecal Colif.
Location 1 (South Haven)	4/29/21	4/24/21	DRY	59	7	613	600
Location 2 (Stevens)	4/29/21	4/24/21	DRY	59	8	1733	1273
Location 3 (Mayfair)	4/29/21	4/24/21	DRY	57	8	>2420	2100
Location 4 (Belvedere)	4/29/21	4/24/21	DRY	57	8	613	400
Mayfair	5/20/21	5/10/21	DRY	63.0	8.50	2420.00	2400.0
Mayfair	6/24/21	6/22/21	WET	68.0	8.50	649.00	860.0

Davis Street Spring Box

	Date	Last Rain	72 Hour Precip	Temp	pH	E. Coli	Fecal Colif.
Spring Box	12/10/20	12/4/20	DRY	61	6	>2420	>60000
Spring Box	1/14/21	1/8/21	DRY	59	7.5	>2420	490000
"Clean" SB	1/27/21	1/26/21	WET	65	6.5	>2420	24000
"Dirty" SB	1/27/21	1/26/21	WET	65	7	>2420	20000
Seepage @ Davis	6/24/21	6/22/21	WET	63.0	8.50	>2420	>60000

- *: Rain= Rain during sampling, Wet= Rain in previous 72 hours, Dry= No rain in previous 72 hours

Table 10A.2f

Water Quality Monitoring Program Bacteria Analysis Summary
Misc. Hot Spots

June 1, 2020 through July 30, 2021

Mead Quarry

	Date	Last Rain	72 Hour Precip	Temp	pH	E. Coli	Fecal Colif.
Cave Effluent	7/29/20	7/29/20	RAIN	80.00	8.20	10.00	0.0
Swimming Area	7/29/20	7/29/20	RAIN	84.00	8.20	2.00	40.0

Second Creek SSO Investigation(s)

	Date	Last Rain	72 Hour Precip	Temp	pH	E. Coli	Fecal Colif.
Davanna St.	8/31/20	8/31/20	RAIN	72.0	7.80	>2420	52000
D.S. Woodland	8/31/20	8/31/20	RAIN	72.0	7.80	>2420	60000
RR - Holston Gas	8/31/20	8/31/20	RAIN	72.0	7.80	>2420	24000
McGhee	8/31/20	8/31/20	RAIN	72.0	7.80	>2420	35000
McGhee	12/10/20	12/4/20	DRY	55.0	6.50	548.00	383
Baxter	12/10/20	12/4/20	DRY	54.0	6.50	1120.00	720

Second Creek KUB Investigation

	Date	Last Rain	72 Hour Precip	Temp	pH	E. Coli	Fecal Colif.
Inskip	10/22/20	10/11/20	DRY	63.0	7.60	387	438
Cumberland	10/22/20	10/11/20	DRY	64.0	8.10	365	473
Bernard	10/22/20	10/11/20	DRY	63.0	7.90	461	418

- *: Rain= Rain during sampling, Wet= Rain in previous 72 hours, Dry= No rain in previous 72 hours

Table 10A.3

Laboratory Analysis Summary - Municipal Industrial Facility Wet Weather Program

July 1, 2020 through June 30, 2021

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	09/24/20	G	6.0	ND	ND	8.0	52	0.149	ND	0.330	0.330	ND	ND	0.116	ND	ND	**	**
	E. Fifth	09/24/20	G	6.0	ND	20.90	9.8	79	0.597	ND	0.445	0.445	ND	ND	0.135	0.0870	ND	**	**
	Church (Bus)	09/24/20	G	6.0	8.90	22.2	10.4	72	0.158	2.590	3.860	1.270	ND	ND	0.239	0.0950	ND	**	**
Loraine Street Treatment Units	Pretreated	09/17/20	G	7.0	4.20	50.0	10.6	76	ND	ND	0.740	0.740	ND	0.0900	0.259	0.0680	6.0	**	**
	East Suntree	01/25/21	G	4.5	6.30	33.9	18.5	138	0.117	ND	0.311	0.311	ND	ND	ND	ND	ND	**	**
	West Baysaver	09//17/20	G	7.0	6.60	44.5	20.0	67	ND	0.301	1.470	1.170	ND	0.0843	0.312	0.1040	ND	**	**
	Yard East	09/17/20	G	7.0	ND	43.8	45.0	1280	2.200	4.180	4.900	0.718	ND	0.0686	0.168	0.1160	ND	**	**
	CDS	01/25/21	G	5.0	3.50	37.4	36.4	1500	0.127	ND	0.252	0.252	0.0050	0.0500	0.123	ND	ND	**	**
Transfer Station	Pretreated	09/17/20	G	7.0	24.80	95.9	349.0	162	ND	ND	1.110	1.110	0.1680	0.0500	0.599	0.2750	ND	2,420	6,000
	Treated	09/17/20	G	7.0	18.60	82	123	160	ND	ND	0.826	0.826	0.0629	0.3830	0.318	0.1620	ND	2,420	6,000
	Catch Basin	01/21/21	G	5.5	46.40	156.0	97.0	724	0.109	ND	2.130	2.130	0.0442	0.1640	0.205	0.0550	ND	2,420	5,000
Prosser Rd	Treated Outfall	09/17/20	G	6.0	ND	ND	12.6	50	0.112	ND	ND	ND	0.0106	0.8230	ND	ND	ND	**	**
Average:				**6.2**	**14.91**	**58.6**	**61.7**	**363**	**0.446**	**2.357**	**1.489**	**0.846**	**0.0581**	**0.2141**	**0.247**	**0.1203**	**6.0**	**2420.0**	**5666.7**
***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.4

Estimated Runoff From Major Watersheds Within the MS4

July 1, 2020 Through June 30, 2021

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 20/21 (in./yr)	Total Runoff for 20/21 (Mgal/yr)
Baker Cr.	412	2	107	640	90	77	32	1	1	3	269	13	27	1,674	1,674	32	0.41	44.7	829
East Fork	313	0	10	475	302	78	73	31	195	235	584	33	180	2,509	2,509	53	0.57	44.7	1,744
First Cr.	724	0	300	3,152	544	501	110	157	127	556	1,412	51	116	7,750	7,750	44	0.50	44.7	4,695
Fourth Cr.	965	57	423	2,026	468	406	93	206	201	568	881	61	414	6,769	5,920	41	0.48	44.7	3,431
Goose Cr.	639	40	126	669	213	67	8	21	77	131	327	34	29	2,381	1,755	35	0.43	44.7	911
Grassy Cr.	2,230	176	561	610	215	24	0	14	31	95	211	39	95	4,301	433	17	0.29	44.7	150
Holston R.	2,362	69	371	1,222	417	45	5	2	219	33	805	32	50	5,632	2,455	28	0.37	44.7	1,106
Inman Br.	563	33	214	138	4	12	0	0	0	0	145	0	34	1,143	99	21	0.31	44.7	38
Knob Cr.	1,719	195	481	843	125	84	1	19	1	29	296	4	169	3,966	989	19	0.30	44.7	365
Knob Fork	1,659	26	398	675	182	56	5	93	6	124	257	19	252	3,752	823	22	0.33	44.7	327
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	44.7	2,725
Second Cr.	443	0	90	1,281	346	247	29	107	140	542	1,161	35	82	4,503	4,498	53	0.57	44.7	3,118
Sinking Cr.	1,614	146	459	1,266	284	90	17	33	31	267	881	12	347	5,447	2,434	33	0.41	44.7	1,226
Swanpond Cr.	3,892	303	833	604	121	36	4	79	240	232	457	65	285	7,151	499	19	0.30	44.7	184
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	44.7	2,144
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	44.7	4,564
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	44.7	3,270
Toll Cr.	535	69	154	222	42	26	1	0	37	4	93	42	4	1,229	767	22	0.32	44.7	300
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	44.7	782
Whites Cr.	2,733	154	782	1,298	575	59	31	11	49	126	608	51	578	7,055	1,634	23	0.34	44.7	668
Williams Cr.	358	11	47	561	46	96	125	17	10	61	276	3	30	1,641	1,605	37	0.45	44.7	877
Woods Cr.	1,220	106	281	371	0	26	0	2	140	43	261	1	157	2,608	143	23	0.33	44.7	58
Sink-East	1,226	0		728	9	17	0	17	3	27	0	0	0	2,027	91	12	0.24	44.7	27
Beaver Cr	21,174	0	0	21,230	1,292	845	4	259	283	712	0	160	0	45,959	162	16	0.28	44.7	55
Tuckahoe	4,293	0	0	1,829	18	14	0	8	2	1	0	4	0	6,169	229	8	0.22	44.7	60
Fr.Broad riv	8,954	0	0	2,744	73	40	24	24	497	117	0	166	0	12,639	551	11	0.24	44.7	160
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				**33,815**

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) = 44.7 in./yr = 3.7250 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

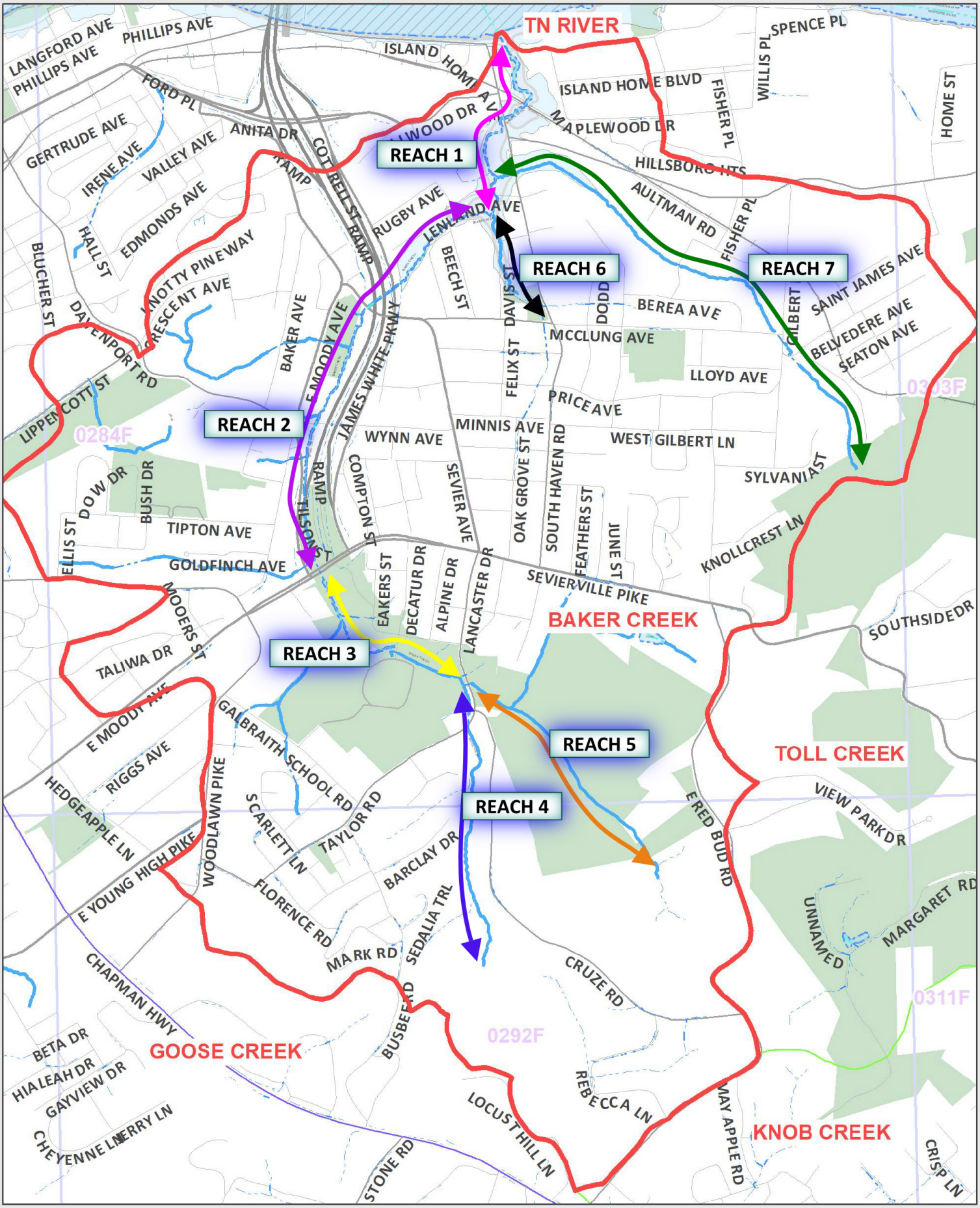
Q = total runoff rate = sum of each watershed's Q_i.

Total estimated runoff for 2020/2021 Reporting Period = 33,815 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.

Appendix A

Baker Creek Map

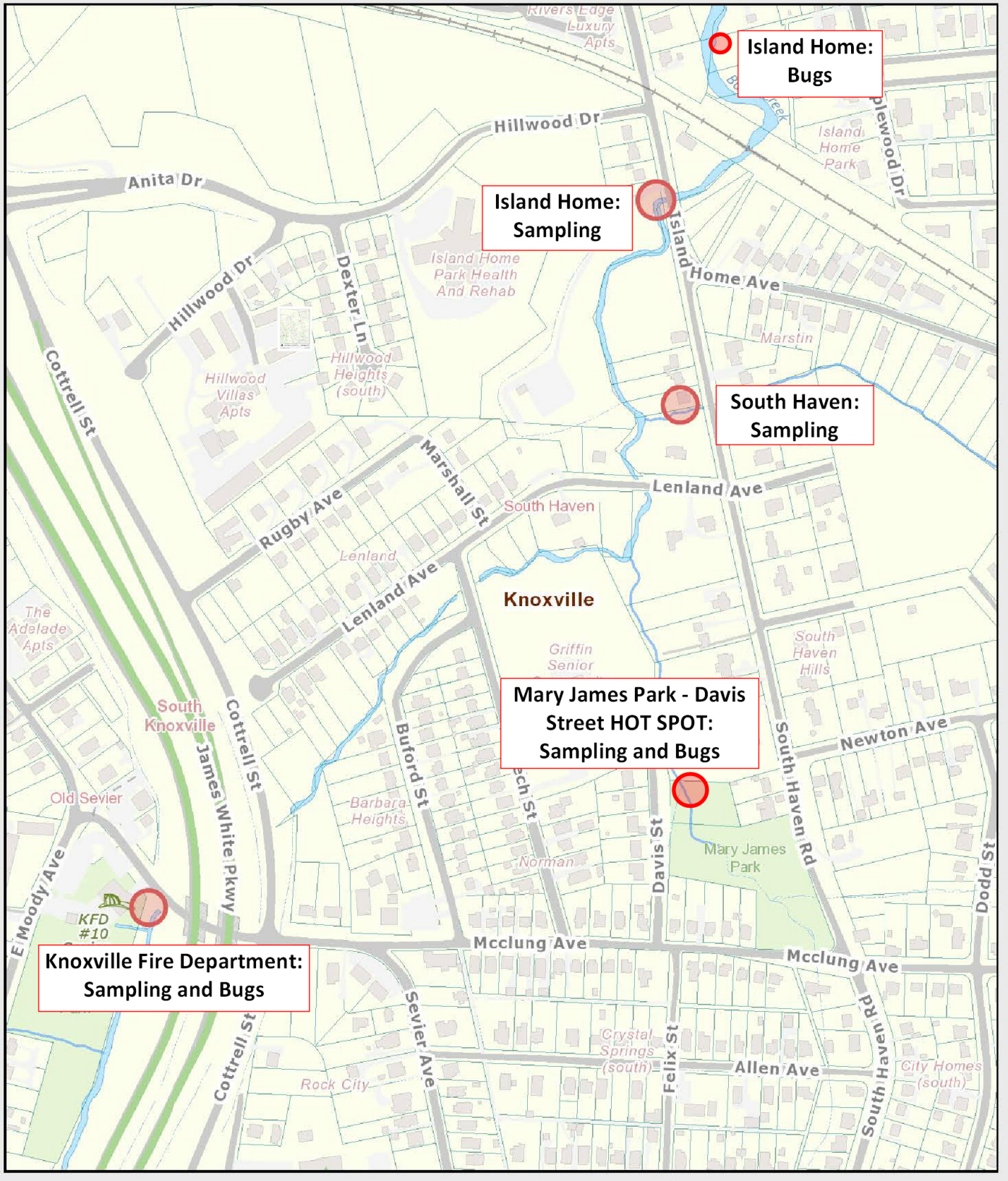


City of Knoxville
Department of Engineering

Date: 11/16/2021

BAKER CREEK
REACH MAP

0 650 1,300 2,600
Feet



Baker Creek - Sample Locations

Island Home Avenue, South Haven Road, Sevier Avenue

0 200 400 800

Feet

Printed: 9/23/2020 4:24:10 PM

Baker Creek - Sample Locations

Play Forest near Taylor Road

0 200 400 800

Feet

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Appendix B

Stream Survey

TDEC-DWR Stream Survey Field Sheet

STREAM SURVEY INFORMATION (Revised COK 7/28/2021)

Project:	WQM 2020 - 2021	**Organization:**	City of Knoxville Stormwater Engineering
Watershed:	Baker Creek	**Activity Type:**	Creek Walk Assessment
HUC12:	60102010204	**Ecoregion:**	67f

REACH:

Name	Reach 1	**Downstream Limits:**	Island Home Avenue
Date:	9/4/2020	**Downstream Elevation:**	810
Time:	8:00 a.m.	**Upstream Limits:**	Mary James Park Tributary
Length:	1307	**Upstream Elevation:**	813
Description/Notes:			

WEATHER:

Previous 48 hour precipitation:	Slight	**Air Temperature (F):**	72
Date of last precipitation:	9/3/2020	**Water Temperature (F):**	
Previous 78 hour precipitation (inches):		**Observed Conditions:**	Sunny and Clear

PHYSICAL CHARACTERISTICS:

Gradient:	Low		**Classification**	**Measured (ft.)**
Slope (ft/ft):	0.0023	**Average Width:**	Small (1.5 - 3 yd.)	4
Slope (%):	0.23%	**Max Depth:**	Deep (0.6 - 1 yd.)	3

LIGHT PENETRATION:

Canopy Cover:	75%	**Notes:**	Wooded and residential, back yards.

STREAM BANK CHARACTERISTICS:

Bank Height (ft):	4.0	**High Water Mark:**	Hard to tell due to varied bank height	
	Characteristic 1	**Characteristic 2**	**Characteristic 3**	**Characteristic 4**
Left Bank Slope:	Undercut	Sloughing		
Right Bank Slope:	Undercut	Sloughing		

CHANNEL CHARACTERISTICS:

Foam/Surface Sheen:	None	**Notes:**		
Turbidity:	Slight	**Notes:**		
Algae:	None	**Notes:**		
Algae Type(s):				
Sediment Deposits:	High	Moderate		
Sediment Type:	Silt	Sand		
Manmade Modifications:	Bridge			

DOMINATE SUBSTRATE: (>25%) Select up to 4

	Dominate 1	**Dominate 2**	**Dominate 3**	**Dominate 4**
Riffle:	Cobble	Gravel	Silt	
Run:	Cobble	Gravel	Sand	Silt
Pool:	Cobble	Sand	Silt	Clay

SURROUNDING LAND USES: (Up to 5 in order of magnitude)

Landuse 1	**Landuse 2**	**Landuse 3**	**Landuse 4**	**Landuse 5**
Residential				

OBSERVED HUMAN DISTURBANCES:

If applicable, choose up to 4 observed human disturbances from the dropdown boxes below the appropirate impact severity.

Observed Disturbance:	**Slight**	**Moderate**	**High**	**Extreme**
Disturbance 1:	Garbage;Trash	Impoundment	Residential	
Disturbance 2:	Urban	Riparian Loss		
Disturbance 3:				
Disturbance 4:				

OTHER STREAM INFORMATION AND STRESSORS:

There are multiple large tree dams along this segment. Small amount of homeless debris.

TDEC-DWR Stream Survey Field Sheet

STREAM SURVEY INFORMATION (Revised COK 7/28/2021)

Project:	WQM 2020 - 2021	**Organization:**	City of Knoxville Stormwater Engineering
Watershed:	Baker Creek	**Activity Type:**	Creek Walk Assessment
HUC12:	60102010204	**Ecoregion:**	67f

REACH:

Name	Reach 2	**Downstream Limits:**	MJP Trib
Date:	9/4/2020	**Downstream Elevation:**	813
Time:	9:45	**Upstream Limits:**	Sevierville Pike
Length:	4,782	**Upstream Elevation:**	838
Description/Notes:			

WEATHER:

Previous 48 hour precipitation:	Slight	**Air Temperature (F):**	77
Date of last precipitation:	9/3/2020	**Water Temperature (F):**	
Previous 78 hour precipitation (inches):		**Observed Conditions:**	

PHYSICAL CHARACTERISTICS:

Gradient:	Low		**Classification**	**Measured (ft.)**
Slope (ft/ft):	0.0052	**Average Width:**	Small (1.5 - 3 yd.)	4
Slope (%):	0.52%	**Max Depth:**	Deep (0.6 - 1 yd.)	3

LIGHT PENETRATION:

Canopy Cover:	80%	**Notes:**	

STREAM BANK CHARACTERISTICS:

Bank Height (ft):	4.0	**High Water Mark:**	Hard to tell due to varied bank height	
	Characteristic 1	**Characteristic 2**	**Characteristic 3**	**Characteristic 4**
Left Bank Slope:	Undercut	Sloughing		
Right Bank Slope:	Undercut	Sloughing		

CHANNEL CHARACTERISTICS:

Foam/Surface Sheen:	None	**Notes:**		
Turbidity:	Slight	**Notes:**		
Algae:	Slight	**Notes:**		
Algae Type(s):	Green			
Sediment Deposits:	Moderate	Slight		
Sediment Type:	Silt	Sand		
Manmade Modifications:	Bridge	Wall		

DOMINATE SUBSTRATE: (>25%) Select up to 4

	Dominate 1	**Dominate 2**	**Dominate 3**	**Dominate 4**
Riffle:	Cobble	Gravel	Silt	
Run:	Cobble	Gravel	Silt	Sand
Pool:	Cobble	Sand	Silt	Clay

SURROUNDING LAND USES: (Up to 5 in order of magnitude)

Landuse 1	**Landuse 2**	**Landuse 3**	**Landuse 4**	**Landuse 5**
Residential				

OBSERVED HUMAN DISTURBANCES:

If applicable, choose up to 4 observed human disturbances from the dropdown boxes below the appropirate impact severity.

Observed Disturbance:	**Slight**	**Moderate**	**High**	**Extreme**
Disturbance 1:	Riparian Loss		Residential	
Disturbance 2:	Urban			
Disturbance 3:	Impoundment			
Disturbance 4:	Garbage;Trash			

OTHER STREAM INFORMATION AND STRESSORS:

Beaver dam located just downstream of Sevierville Pike

TDEC-DWR Stream Survey Field Sheet

STREAM SURVEY INFORMATION (Revised COK 7/28/2021)

Project:	WQM 2020 - 2021	**Organization:**	City of Knoxville Stormwater Engineering
Watershed:	Baker Creek	**Activity Type:**	Creek Walk Assessment
HUC12:	60102010204	**Ecoregion:**	67f

REACH:

Name	Reach 3	**Downstream Limits:**	Island Home Avenue
Date:	9/4/2020	**Downstream Elevation:**	838
Time:	11:55	**Upstream Limits:**	Mary James Park Tributary
Length:	2,367	**Upstream Elevation:**	855
Description/Notes:			

WEATHER:

Previous 48 hour precipitation:	Slight	**Air Temperature (F):**	83
Date of last precipitation:	9/3/2020	**Water Temperature (F):**	
Previous 78 hour precipitation (inches):		**Observed Conditions:**	

PHYSICAL CHARACTERISTICS:

Gradient:	Low		**Classification**	**Measured (ft.)**
Slope (ft/ft):	0.0072	**Average Width:**	Small (1.5 - 3 yd.)	4
Slope (%):	0.72%	**Max Depth:**	Deep (0.6 - 1 yd.)	3

LIGHT PENETRATION:

Canopy Cover:	65%	**Notes:**	

STREAM BANK CHARACTERISTICS:

Bank Height (ft):	4.0	**High Water Mark:**	Hard to tell due to varied bank height	
	Characteristic 1	**Characteristic 2**	**Characteristic 3**	**Characteristic 4**
Left Bank Slope:	Undercut	Sloughing		
Right Bank Slope:	Undercut	Sloughing		

CHANNEL CHARACTERISTICS:

Foam/Surface Sheen:	None	**Notes:**		
Turbidity:	Slight	**Notes:**		
Algae:	None	**Notes:**		
Algae Type(s):				
Sediment Deposits:	Excessive	Slight		
Sediment Type:	Silt	Sand		
Manmade Modifications:	Bridge			

DOMINATE SUBSTRATE: (>25%) Select up to 4

	Dominate 1	**Dominate 2**	**Dominate 3**	**Dominate 4**
Riffle:	Silt	Boulders		
Run:	Silt	Cobble		
Pool:	Silt	Clay		

SURROUNDING LAND USES: (Up to 5 in order of magnitude)

Landuse 1	**Landuse 2**	**Landuse 3**	**Landuse 4**	**Landuse 5**
Residential	Park			

OBSERVED HUMAN DISTURBANCES:

If applicable, choose up to 4 observed human disturbances from the dropdown boxes below the appropirate impact severity.

Observed Disturbance:	**Slight**	**Moderate**	**High**	**Extreme**
Disturbance 1:	Garbage;Trash		Sedimentation	
Disturbance 2:	Residential			
Disturbance 3:	Impoundment			
Disturbance 4:				

OTHER STREAM INFORMATION AND STRESSORS:

Sections of this reach had heavy sedimentation of silt, approx. 2ft deep.

TDEC-DWR Stream Survey Field Sheet

STREAM SURVEY INFORMATION (Revised COK 7/28/2021)

Project:	WQM 2020 - 2021	**Organization:**	City of Knoxville Stormwater Engineering
Watershed:	Baker Creek	**Activity Type:**	Creek Walk Assessment
HUC12:	60102010204	**Ecoregion:**	67f

REACH:

Name	Reach 4	**Downstream Limits:**	Taylor
Date:	11/24/2020	**Downstream Elevation:**	855
Time:	2:12	**Upstream Limits:**	3929 Cruze Rd
Length:	1,197	**Upstream Elevation:**	871
Description/Notes:			

WEATHER:

Previous 48 hour precipitation:	Slight	**Air Temperature (F):**	58
Date of last precipitation:	11/23/2020	**Water Temperature (F):**	
Previous 78 hour precipitation (inches):		**Observed Conditions:**	

PHYSICAL CHARACTERISTICS:

Gradient:	Low		**Classification**	**Measured (ft.)**
Slope (ft/ft):	0.0134	**Average Width:**	Small (1.5 - 3 yd.)	4
Slope (%):	1.34%	**Max Depth:**	Deep (0.6 - 1 yd.)	3

LIGHT PENETRATION:

Canopy Cover:	80%	**Notes:**	

STREAM BANK CHARACTERISTICS:

Bank Height (ft):	2.0	**High Water Mark:**	Hard to tell due to varied bank height	
	Characteristic 1	**Characteristic 2**	**Characteristic 3**	**Characteristic 4**
Left Bank Slope:	Bluff;Wall	Gentle Slope		
Right Bank Slope:	Bluff;Wall	Gentle Slope		

CHANNEL CHARACTERISTICS:

Foam/Surface Sheen:	None	**Notes:**		
Turbidity:	Slight	**Notes:** Almost clear		
Algae:	Slight	**Notes:** Some on rocks		
Algae Type(s):	Green			
Sediment Deposits:	Slight	Slight		
Sediment Type:	Silt	Sand		
Manmade Modifications:	Wall	Wall		

DOMINATE SUBSTRATE: (>25%) Select up to 4

	Dominate 1	**Dominate 2**	**Dominate 3**	**Dominate 4**
Riffle:	Boulders	Cobble		
Run:	Cobble	Gravel		
Pool:	Silt			

SURROUNDING LAND USES: (Up to 5 in order of magnitude)

Landuse 1	**Landuse 2**	**Landuse 3**	**Landuse 4**	**Landuse 5**
Residential	Park			

OBSERVED HUMAN DISTURBANCES:

If applicable, choose up to 4 observed human disturbances from the dropdown boxes below the appropirate impact severity.

Observed Disturbance:	**Slight**	**Moderate**	**High**	**Extreme**
Disturbance 1:	Riparian Loss	Sedimentation	Channelization	
Disturbance 2:		Substrate Alteration	Habitat Alteration	
Disturbance 3:				
Disturbance 4:				

OTHER STREAM INFORMATION AND STRESSORS:

This section did not have many pools, mostly riffles and runs with slight shallow pools, if any.

TDEC-DWR Stream Survey Field Sheet

STREAM SURVEY INFORMATION (Revised COK 7/28/2021)

Project:	WQM 2020 - 2021	**Organization:**	City of Knoxville Stormwater Engineering
Watershed:	Baker Creek	**Activity Type:**	Creek Walk Assessment
HUC12:	60102010204	**Ecoregion:**	67f

REACH:

Name	Reach 5	**Downstream Limits:**	Taylor Road
Date:	11/24/2020	**Downstream Elevation:**	855
Time:	11:50 a.m.	**Upstream Limits:**	420 E. Redbud Road
Length:	3,563	**Upstream Elevation:**	913
Description/Notes:			

WEATHER:

Previous 48 hour precipitation:	Slight	**Air Temperature (F):**	77
Date of last precipitation:	9/3/2020	**Water Temperature (F):**	
Previous 78 hour precipitation (inches):		**Observed Conditions:**	

PHYSICAL CHARACTERISTICS:

Gradient:	Low		**Classification**	**Measured (ft.)**
Slope (ft/ft):	0.0163	**Average Width:**	Small (1.5 - 3 yd.)	
Slope (%):	1.63%	**Max Depth:**	Shallow (<0.3 yd.)	

LIGHT PENETRATION:

Canopy Cover:	90%	**Notes:**	Goes past the bike forest and then up into the woods.

STREAM BANK CHARACTERISTICS:

Bank Height (ft):	2.0	**High Water Mark:**	Hard to tell due to varied bank height and low land.	
	Characteristic 1	**Characteristic 2**	**Characteristic 3**	**Characteristic 4**
Left Bank Slope:	Bluff;Wall	Gentle Slope		
Right Bank Slope:	Bluff;Wall	Gentle Slope		

CHANNEL CHARACTERISTICS:

Foam/Surface Sheen:	None	**Notes:** Bottom portion is pretty clear, then gets turbid as you go up stream.		
Turbidity:	Muddy	**Notes:**		
Algae:	Slight	**Notes:**		
Algae Type(s):	Green			
Sediment Deposits:	Excessive	Blanket		
Sediment Type:	Silt	Silt		
Manmade Modifications:	Wall	Channelized		

DOMINATE SUBSTRATE: (>25%) Select up to 4

	Dominate 1	**Dominate 2**	**Dominate 3**	**Dominate 4**
Riffle:	Cobble			
Run:	Boulders	Cobble	Silt	
Pool:	Silt			

SURROUNDING LAND USES: (Up to 5 in order of magnitude)

Landuse 1	**Landuse 2**	**Landuse 3**	**Landuse 4**	**Landuse 5**
Forest	Park			

OBSERVED HUMAN DISTURBANCES:

If applicable, choose up to 4 observed human disturbances from the dropdown boxes below the appropirate impact severity.

Observed Disturbance:	**Slight**	**Moderate**	**High**	**Extreme**
Disturbance 1:			Channelization	Sedimentation
Disturbance 2:			Substrate Alteration	
Disturbance 3:				
Disturbance 4:				

OTHER STREAM INFORMATION AND STRESSORS:

Downstream segment has more diversity, after the bike forest it is shallow ditch or channel with mostly runs and no geomorphology variations. Majority of this reach is a shallow ditch with heavy sediment. One section in the forest is wide like a marsh.

TDEC-DWR Stream Survey Field Sheet

STREAM SURVEY INFORMATION (Revised COK 7/28/2021)

Project:	WQM 2020 - 2021	**Organization:**	City of Knoxville Stormwater Engineering
Watershed:	Baker Creek	**Activity Type:**	Creek Walk Assessment
HUC12:	60102010204	**Ecoregion:**	67f

REACH:

Name	Reach 6	**Downstream Limits:**	1840 Lenland Avenue
Date:	9/4/2020 and 11/23/2020	**Downstream Elevation:**	814
Time:	NA	**Upstream Limits:**	1825 McClung Avenue
Length:	1,370	**Upstream Elevation:**	829
Description/Notes:	Rain 48 hours prior to 9/4 was 0.4 inches, with light rain the previous 4 days.		

WEATHER:

Previous 48 hour precipitation:	Slight	**Air Temperature (F):**	88 and 56
Date of last precipitation:	11/22/2020	**Water Temperature (F):**	
Previous 78 hour precipitation (inches):		**Observed Conditions:**	

PHYSICAL CHARACTERISTICS:

Gradient:	Low		**Classification**	**Measured (ft.)**
Slope (ft/ft):	0.0109	**Average Width:**	Very Small (<1.5 yd.)	
Slope (%):	1.09%	**Max Depth:**	Medium (0.3 - 0.6 yd.)	

LIGHT PENETRATION:

Canopy Cover:	60%	**Notes:**	Wooded downstream, but no underbrush at park.

STREAM BANK CHARACTERISTICS:

Bank Height (ft):	4.0	**High Water Mark:**	Hard to tell due to varied bank height	
	Characteristic 1	**Characteristic 2**	**Characteristic 3**	**Characteristic 4**
Left Bank Slope:	Undercut	Sloughing	Gentle Slope	
Right Bank Slope:	Undercut	Sloughing	Gentle Slope	

CHANNEL CHARACTERISTICS:

Foam/Surface Sheen:	None	**Notes:**		
Turbidity:	Slight	**Notes:** Some turbidity just upstream of the dam.		
Algae:	Slight	**Notes:** A lot of vegetation growth in water, but some algae.		
Algae Type(s):	Green			
Sediment Deposits:	Slight			
Sediment Type:	Silt			
Manmade Modifications:	Channelized	Wall	Channelized	

DOMINATE SUBSTRATE: (>25%) Select up to 4

	Dominate 1	**Dominate 2**	**Dominate 3**	**Dominate 4**
Riffle:	Cobble	Gravel	Boulders	
Run:	Cobble	Gravel		
Pool:	Cobble	Silt		

SURROUNDING LAND USES: (Up to 5 in order of magnitude)

Landuse 1	**Landuse 2**	**Landuse 3**	**Landuse 4**	**Landuse 5**
Park	Residential	Impoundment		

OBSERVED HUMAN DISTURBANCES:

If applicable, choose up to 4 observed human disturbances from the dropdown boxes below the appropirate impact severity.

Observed Disturbance:	**Slight**	**Moderate**	**High**	**Extreme**
Disturbance 1:	Channelization	Riparian Loss		
Disturbance 2:	Impoundment	Sedimentation		
Disturbance 3:	Garbage;Trash	Habitat Alteration		
Disturbance 4:				

OTHER STREAM INFORMATION AND STRESSORS:

Bank height has some portions up to 4 feet, but the majority is not over 18 inches.

TDEC-DWR Stream Survey Field Sheet

STREAM SURVEY INFORMATION (Revised COK 7/28/2021)

Project:	WQM 2020 - 2021	**Organization:**	City of Knoxville Stormwater Engineering
Watershed:	Baker Creek	**Activity Type:**	Creek Walk Assessment
HUC12:	60102010204	**Ecoregion:**	67f

REACH:

Name	Reach 7	**Downstream Limits:**	2327 South Haven Road
Date:	11/23/2020	**Downstream Elevation:**	813
Time:	3:20 p.m.	**Upstream Limits:**	2514 Aberdeen Lane
Length:	5,353	**Upstream Elevation:**	886
Description/Notes:			

WEATHER:

Previous 48 hour precipitation:	Slight	**Air Temperature (F):**	52
Date of last precipitation:	11/22/2020	**Water Temperature (F):**	
Previous 78 hour precipitation (inches):		**Observed Conditions:**	

PHYSICAL CHARACTERISTICS:

Gradient:	Low		**Classification**	**Measured (ft.)**
Slope (ft/ft):	0.0136	**Average Width:**	Small (1.5 - 3 yd.)	4
Slope (%):	1.36%	**Max Depth:**	Deep (0.6 - 1 yd.)	3

LIGHT PENETRATION:

Canopy Cover:	50%	**Notes:**	Sections with and without thru yards.

STREAM BANK CHARACTERISTICS:

Bank Height (ft):	4.0	**High Water Mark:**	Hard to tell due to varied bank height	
	Characteristic 1	**Characteristic 2**	**Characteristic 3**	**Characteristic 4**
Left Bank Slope:	Bluff;Wall	Deeply Incised	Gentle Slope	
Right Bank Slope:	Bluff;Wall	Deeply Incised	Gentle Slope	

CHANNEL CHARACTERISTICS:

Foam/Surface Sheen:	None	**Notes:**		
Turbidity:	Slight	**Notes:**		
Algae:	Slight	**Notes:**		
Algae Type(s):	Green			
Sediment Deposits:	Moderate	Slight		
Sediment Type:	Silt	Sand		
Manmade Modifications:	Bridge	Wall		

DOMINATE SUBSTRATE: (>25%) Select up to 4

	Dominate 1	**Dominate 2**	**Dominate 3**	**Dominate 4**
Riffle:	Cobble			
Run:	Cobble	Gravel		
Pool:				

SURROUNDING LAND USES: (Up to 5 in order of magnitude)

Landuse 1	**Landuse 2**	**Landuse 3**	**Landuse 4**	**Landuse 5**
Residential	Forest			

OBSERVED HUMAN DISTURBANCES:

If applicable, choose up to 4 observed human disturbances from the dropdown boxes below the appropirate impact severity.

Observed Disturbance:	**Slight**	**Moderate**	**High**	**Extreme**
Disturbance 1:	Sedimentation		Channelization	
Disturbance 2:			Riparian Loss	
Disturbance 3:			Substrate Alteration	
Disturbance 4:			Habitat Alteration	

OTHER STREAM INFORMATION AND STRESSORS:

Near cat house the banks were very tall until you get past Mayfair, then they become lower and less pronounced. Gentle bank slopes in the upstream portion of the reach. End of reach terminated with a spring house and impounded "pond" in the woods. Mostly a creek with runs and some riffles, hardly and pools.

Baker Creek

Stream Survey Reach Photos

Appendix B

BC-M1-02U: Reach 1

BC-M3-05D: Reach 2

BC-M4-C: Reach 3 Sediment

BC-M5-01D: Reach 3

Baker Creek

Stream Survey Reach Photos

Appendix B

BC-M5-02U: Reach 4

BC-M6-01D: Reach 5

BC-M2-08U: Reach 6

BC-M1-03D: Reach 7

Appendix C

Invertebrate Survey

HABITAT ASSESSMENT FIELD SHEET - LOW GRADIENT STREAMS

Complete this habitat assessment if **SQBANK** is collected.

(See Macroinvertrate SOP - Protocol E for detailed descriptions and rank information)

DWR Station ID:	**BAKER CREEK**					**Habitat Assessment By:**	Oglesby-Nennstiel		
Monitoring Location Name:	ISLAND HOME					Date: 9/24/2020	**Time:**		
Monitoring Location:	REACH 1					Field Log No:			
HUC:		WS Group:		Ecoregion:		QC:	☐ Consensus		

Habitat Type: LG

If QA/QC 2 habitats are completed independently, check box above.

See most recent Macroinvertebrate SOP Protocol D-2 for specific instructions for completing this information.

For each habitat parameter, type score or select from blue dropdown box. Add comments if needed in row below score.

		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	**15**	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	**12**	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Comments	Substrate composition likely due to sediment dropping out of water flow due to hitting the river back water																				
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	**14**	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Comments	Deeper than majority of stream, near backwater to river																				
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	**11**	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	**14**	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Comments	This area of the stream backs up when the TN River is up during the summer months.																				

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	**17**	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Comments	Road bridge and train trestle are adjacent to sampling location																				
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	**9**	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)	**7**		10		9		8		7		6	5		4		3	2		1		0
Score (Right Bank)	**7**		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)	**6**		10		9		8		7		6	5		4		3	2		1		0
Score (Right Bank)	**6**		10		9		8		7		6	5		4		3	2		1		0
Comments	Privot and other invasive species present																				
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)	**9**		10		9		8		7		6	5		4		3	2		1		0
Score (Right Bank)	**9**		10		9		8		7		6	5		4		3	2		1		0
Comments	Left side of bank is a manicured grassy lawn, right side is natural vegetation																				
Total Score:	**136**											Ecoregion:					Drainage Area:				

HABITAT ASSESSMENT FIELD SHEET- MODERATE TO HIGH GRADIENT STREAMS

Complete this habitat assessment if **SQKICK** is collected.

(See Macroinvertrate SOP - Protocol E for detailed descriptions and rank information)

DWR Station ID:	**BAKER CREEK**					Habitat Assessment By:	Oglesby-Nennstiel		
Monitoring Location Name:	KNOXVILLE FIRE DEPARTMENT					Date:		Time:	
Monitoring Location:	REACH 2: 8/26/2020 & 5/24/2021					Field Log Number:			
HUC:		WS Group:		Ecoregion:		QC:	☐	Consensus	

Habitat Type: HG

If QA/QC 2 habitats are completed independently, check box above.

See most recent Macroinvertebrate SOP Protocol D-1 for specific instructions for completing this information.

For each habitat parameter, type score or select from blue dropdown box. Add comments if needed in row below score.

		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	**15**	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Comment	Exposed root structures and rocks provide surface area and cover for macroinvertabrates and fish																				
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	**15**	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Comment																					
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	**15**	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Comment	Lacking deep pools																				
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	**10**	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Comment	Other sections of stream are more heavily impacted by sediment																				
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	**15**	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Comment																					

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	**13**	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Comment	Car bridge near sample site																				
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	**17**	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Comment	Lots of turbulance due to rocks																				
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**		10		9		8		7		6	5		4		3	2		1		0
Score (Right Bank)	**8**		10		9		8		7		6	5		4		3	2		1		0
Comment	Light erosion, mostly stable																				
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)	**9**		10		9		8		7		6	5		4		3	2		1		0
Score (Right Bank)	**9**		10		9		8		7		6	5		4		3	2		1		0
Comment	Left bank has manicured grassy lawn right up to edge of stream bank for small section																				
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)	**8**		10		9		8		7		6	5		4		3	2		1		0
Score (Right Bank)	**9**		10		9		8		7		6	5		4		3	2		1		0
Comment	Near edge of park, most of Riparian zone in good order																				
Total Score:	**153**											Ecoregion:					Drainage Area:				

HABITAT ASSESSMENT FIELD SHEET- MODERATE TO HIGH GRADIENT STREAMS

Complete this habitat assessment if **SQKICK** is collected.

(See Macroinvertrate SOP - Protocol E for detailed descriptions and rank information)

DWR Station ID:	**BAKER CREEK**					Habitat Assessment By:	Oglesby-Nennstiel		
Monitoring Location Name:	TAYLOR ROAD					Date:		Time:	
Monitoring Location:	REACH 3: 7/29/2020 & 5/24/2021					Field Log Number:			
HUC:		WS Group:		Ecoregion:		QC:	☐	Consensus	

Habitat Type: HG

If QA/QC 2 habitats are completed independently, check box above.

See most recent Macroinvertebrate SOP Protocol D-1 for specific instructions for completing this information.

For each habitat parameter, type score or select from blue dropdown box. Add comments if needed in row below score.

		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	**11**	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Comment																					
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	**10**	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Comment																					
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	**10**	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Comment	No slow-deep or slow shallow regimes present, some eddies behind larger rocks																				
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	**5**	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Comment	Sections of sample area have signifiacnt fine sediment deposits																				
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	**16**	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Comment	Present habitat not exposed, confined channel																				

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	**5**	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Comment	Confined channel, straigh unnatural banks																				
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	**14**	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Comment																					
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)	**5**		10		9		8		7		6	5		4		3	2		1		0
Score (Right Bank)	**5**		10		9		8		7		6	5		4		3	2		1		0
Comment	At top of bank susceptible to erosion																				
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)	**5**		10		9		8		7		6	5		4		3	2		1		0
Score (Right Bank)	**5**		10		9		8		7		6	5		4		3	2		1		0
Comment																					
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)	**9**		10		9		8		7		6	5		4		3	2		1		0
Score (Right Bank)	**9**		10		9		8		7		6	5		4		3	2		1		0
Comment	Large riparian zone due to being in a park/play forest																				
Total Score:	**109**																				

Ecoregion:

Drainage Area:

HABITAT ASSESSMENT FIELD SHEET- MODERATE TO HIGH GRADIENT STREAMS

Complete this habitat assessment if **SQKICK** is collected.

(See Macroinvertrate SOP - Protocol E for detailed descriptions and rank information)

DWR Station ID:	**BAKER CREEK**					Habitat Assessment By:	Oglesby-Nennstiel		
Monitoring Location Name:	MARY JAMES PARK					Date:	MULTIPLE	Time:	
Monitoring Location:	REACH 6: 10/23/2020 AND 5/12/2021					Field Log Number:			
HUC:		WS Group:		Ecoregion:		QC:	☐	Consensus	

Habitat Type: HG

If QA/QC 2 habitats are completed independently, check box above.

See most recent Macroinvertebrate SOP Protocol D-1 for specific instructions for completing this information.

For each habitat parameter, type score or select from blue dropdown box. Add comments if needed in row below score.

Located in a park and large wooded		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	**17**	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Comment	Lots of aquatic vegitation																				
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	**13**	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Comment																					
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	**16**	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Comment	Deep pool with fish present																				
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	**11**	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Comment	Spring fed, sedminent impacts of other parts of the stream not present here																				
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	**16**	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Comment																					

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	**15**	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Comment	Sampling location is in middle of a park																				
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	**16**	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Comment																					
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)	**9**		10		9		8		7		6	5		4		3	2		1		0
Score (Right Bank)	**9**		10		9		8		7		6	5		4		3	2		1		0
Comment																					
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)	**8**		10		9		8		7		6	5		4		3	2		1		0
Score (Right Bank)	**8**		10		9		8		7		6	5		4		3	2		1		0
Comment																					
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**		10		9		8		7		6	5		4		3	2		1		0
Score (Right Bank)	**10**		10		9		8		7		6	5		4		3	2		1		0
Comment	Located in a park and large wooded back yards																				
Total Score:	**158**																				

Ecoregion:

Drainage Area:

Baker Creek

Invertebrate Sampling Example Results

Appendix C

Island Home: 9/24/2020

Island Home: 9/24/2020

KFD: 8/26/2020

KFD: 5/24/2021

Baker Creek

Invertebrate Sampling Example Results

Appendix C

Mary James Park: 10/23/2020

Mary James Park: 5/12/2021

Taylor Road: 7/29/2020

Taylor Road: 5/24/2021

Appendix D

Full Suite Sampling: Love Creek

ANALYTICAL REPORT

June 28, 2021

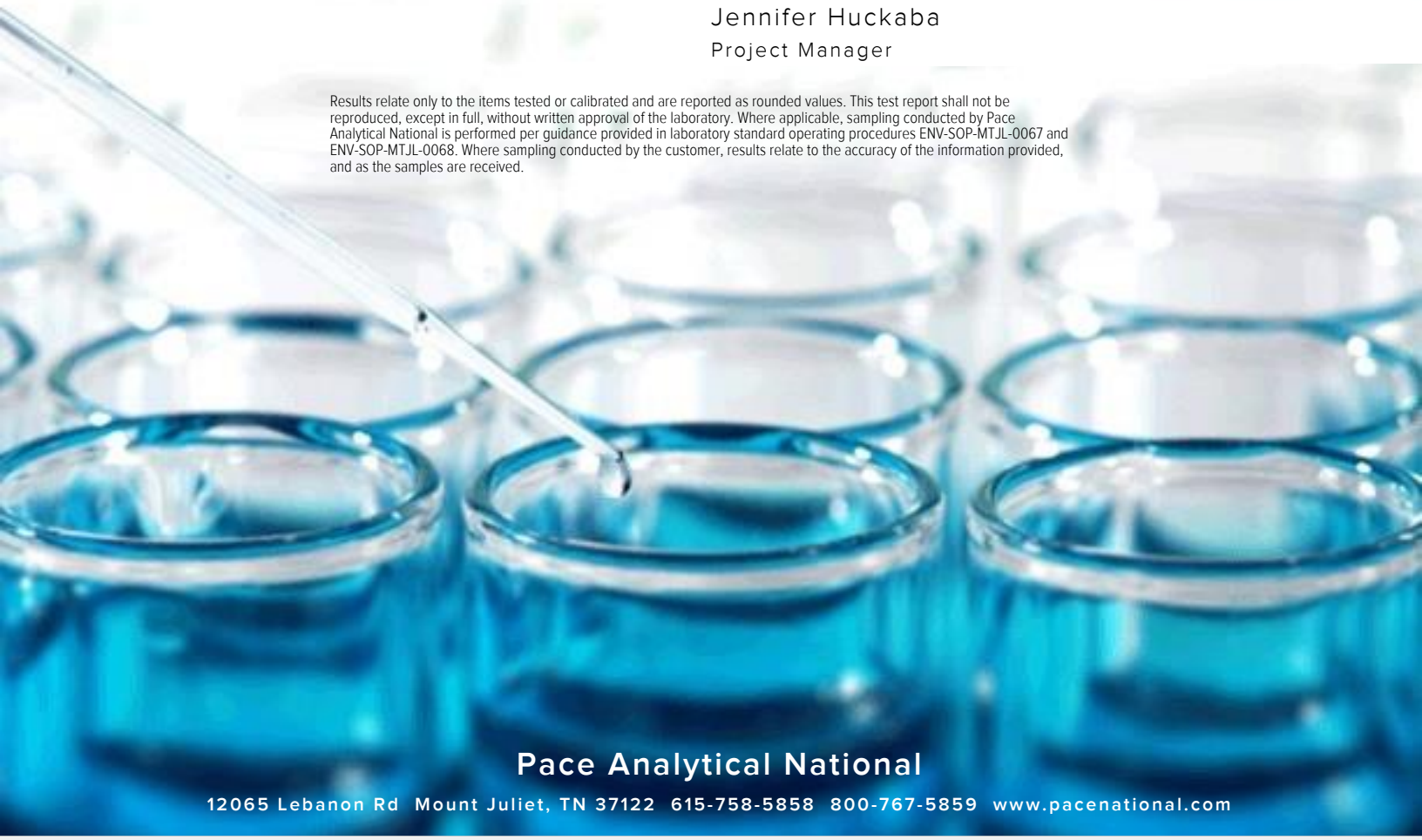
City of Knoxville-SW Management

Sample Delivery Group:	L1362804
Samples Received:	06/08/2021
Project Number:	
Description:	Stormwater Full Suite
Site:	LOVE CREEK
Report To:	Charissa Oglesby City-County Bldg 400 Main St Room 303D Knoxville, TN 37902

Entire Report Reviewed By:

Jennifer Huckaba

Project Manager



Pace Analytical National

12065 Lebanon Rd Mount Juliet, TN 37122 615-758-5858 800-767-5859 www.pacenational.com

SAMPLE SUMMARY

GRAB LOVE CREEK FULL SUITE L1362804-01 WW

Collected by: Trey Nennstiel
Collected date/time: 06/07/21 12:20
Received date/time: 06/08/21 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Gravimetric Analysis by Method 2540 C-2011	WG1686435	1	06/10/21 16:22	06/10/21 17:32	MMF	Mt. Juliet, TN
Gravimetric Analysis by Method 2540 D-2011	WG1685896	1	06/10/21 02:50	06/10/21 06:41	VRP	Mt. Juliet, TN
Wet Chemistry by Method 1664A	WG1687145	1	06/13/21 08:35	06/13/21 18:16	ERK	Mt. Juliet, TN
Wet Chemistry by Method 350.1	WG1691739	1	06/22/21 17:20	06/22/21 17:20	SL	Mt. Juliet, TN
Wet Chemistry by Method 351.2	WG1691477	1	06/18/21 15:08	06/18/21 21:56	SDL	Mt. Juliet, TN
Wet Chemistry by Method 353.2	WG1686903	1	06/12/21 19:36	06/12/21 19:36	SDL	Mt. Juliet, TN
Wet Chemistry by Method 365.4	WG1691251	1	06/18/21 15:08	06/18/21 21:01	SDL	Mt. Juliet, TN
Wet Chemistry by Method 410.4	WG1693918	1	06/23/21 22:00	06/23/21 22:54	LDT	Mt. Juliet, TN
Wet Chemistry by Method 420.4	WG1693727	1	06/24/21 13:48	06/25/21 16:18	JER	Mt. Juliet, TN
Wet Chemistry by Method 4500CN E-2011	WG1690526	1	06/18/21 01:32	06/18/21 15:05	JER	Mt. Juliet, TN
Wet Chemistry by Method 4500P E-2011	WG1684427	1	06/08/21 18:36	06/08/21 18:36	SAC	Mt. Juliet, TN
Wet Chemistry by Method 5210 B-2011	WG1684615	1	06/08/21 11:55	06/13/21 11:30	NAH	Mt. Juliet, TN
Mercury by Method 245.1	WG1685192	1	06/09/21 10:11	06/09/21 16:15	BMF	Mt. Juliet, TN
Metals (ICP) by Method 200.7	WG1690016	1	06/17/21 07:51	06/17/21 18:30	CCE	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 624.1	WG1686070	1	06/10/21 13:36	06/10/21 13:36	DWR	Mt. Juliet, TN
Pesticides (GC) by Method EPA 608.3	WG1684861	1	06/09/21 09:56	06/10/21 14:19	MTJ	Mt. Juliet, TN
Polychlorinated Biphenyls (GC) by Method EPA-608.3	WG1684861	1	06/09/21 09:56	06/10/21 12:07	SSH	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 625.1	WG1684859	1	06/10/21 06:26	06/11/21 03:11	SHG	Mt. Juliet, TN

Additional Information - Results for field analyses are not accredited to ISO 17025

Analyte	Result	Units
pH (On Site)	8	su
Temperature (on-site)	70	

Gravimetric Analysis by Method 2540 C-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Dissolved Solids	212		10.0	1	06/10/2021 17:32	WG1686435

Gravimetric Analysis by Method 2540 D-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Suspended Solids	5.99		2.55	1	06/10/2021 06:41	WG1685896

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	06/13/2021 18:16	WG1687145

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	06/22/2021 17:20	WG1691739

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	06/18/2021 21:56	WG1691477

Wet Chemistry by Method 353.2

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Nitrate-Nitrite	0.911		0.100	1	06/12/2021 19:36	WG1686903

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	06/18/2021 21:01	WG1691251

Wet Chemistry by Method 410.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
COD	ND		20.0	1	06/23/2021 22:54	WG1693918

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	06/25/2021 16:18	WG1693727

Wet Chemistry by Method 4500CN E-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	

Wet Chemistry by Method 4500CN E-2011

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Cyanide	ND	J6	0.00500	1	06/18/2021 15:05	WG1690526

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	06/08/2021 18:36	WG1684427

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	06/13/2021 11:30	WG1684615

Mercury by Method 245.1

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Mercury	ND		0.000200	1	06/09/2021 16:15	WG1685192

Metals (ICP) by Method 200.7

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Antimony	ND		0.0100	1	06/17/2021 18:30	WG1690016
Arsenic	ND		0.0100	1	06/17/2021 18:30	WG1690016
Beryllium	ND		0.00200	1	06/17/2021 18:30	WG1690016
Cadmium	ND		0.00200	1	06/17/2021 18:30	WG1690016
Chromium	ND		0.0100	1	06/17/2021 18:30	WG1690016
Copper	ND		0.0100	1	06/17/2021 18:30	WG1690016
Lead	ND		0.00500	1	06/17/2021 18:30	WG1690016
Nickel	ND		0.0100	1	06/17/2021 18:30	WG1690016
Selenium	ND		0.0100	1	06/17/2021 18:30	WG1690016
Silver	ND		0.00500	1	06/17/2021 18:30	WG1690016
Thallium	ND		0.0100	1	06/17/2021 18:30	WG1690016
Zinc	ND		0.0500	1	06/17/2021 18:30	WG1690016

Volatile Organic Compounds (GC/MS) by Method 624.1

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Acrolein	ND		0.0500	1	06/10/2021 13:36	WG1686070
Acrylonitrile	ND		0.0100	1	06/10/2021 13:36	WG1686070
Benzene	ND		0.00100	1	06/10/2021 13:36	WG1686070
Bromodichloromethane	ND		0.00100	1	06/10/2021 13:36	WG1686070
Bromoform	ND		0.00100	1	06/10/2021 13:36	WG1686070
Bromomethane	ND		0.00500	1	06/10/2021 13:36	WG1686070
Carbon tetrachloride	ND		0.00100	1	06/10/2021 13:36	WG1686070
Chlorobenzene	ND		0.00100	1	06/10/2021 13:36	WG1686070
Chlorodibromomethane	ND		0.00100	1	06/10/2021 13:36	WG1686070
Chloroethane	ND		0.00500	1	06/10/2021 13:36	WG1686070
2-Chloroethyl vinyl ether	ND		0.0500	1	06/10/2021 13:36	WG1686070
Chloroform	ND		0.00500	1	06/10/2021 13:36	WG1686070
Chloromethane	ND		0.00250	1	06/10/2021 13:36	WG1686070
1,2-Dichlorobenzene	ND		0.00100	1	06/10/2021 13:36	WG1686070
1,3-Dichlorobenzene	ND		0.00100	1	06/10/2021 13:36	WG1686070
1,4-Dichlorobenzene	ND		0.00100	1	06/10/2021 13:36	WG1686070
Dichlorodifluoromethane	ND		0.00500	1	06/10/2021 13:36	WG1686070
1,1-Dichloroethane	ND		0.00100	1	06/10/2021 13:36	WG1686070

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	06/10/2021 13:36	WG1686070
1,1-Dichloroethene	ND		0.00100	1	06/10/2021 13:36	WG1686070
trans-1,2-Dichloroethene	ND		0.00100	1	06/10/2021 13:36	WG1686070
1,2-Dichloropropane	ND		0.00100	1	06/10/2021 13:36	WG1686070
cis-1,3-Dichloropropene	ND		0.00100	1	06/10/2021 13:36	WG1686070
trans-1,3-Dichloropropene	ND		0.00100	1	06/10/2021 13:36	WG1686070
Ethylbenzene	ND		0.00100	1	06/10/2021 13:36	WG1686070
Methylene Chloride	ND		0.00500	1	06/10/2021 13:36	WG1686070
1,1,2,2-Tetrachloroethane	ND		0.00100	1	06/10/2021 13:36	WG1686070
Tetrachloroethene	ND		0.00100	1	06/10/2021 13:36	WG1686070
Toluene	ND		0.00100	1	06/10/2021 13:36	WG1686070
1,1,1-Trichloroethane	ND		0.00100	1	06/10/2021 13:36	WG1686070
1,1,2-Trichloroethane	ND		0.00100	1	06/10/2021 13:36	WG1686070
Trichloroethene	ND		0.00100	1	06/10/2021 13:36	WG1686070
Trichlorofluoromethane	ND		0.00500	1	06/10/2021 13:36	WG1686070
Vinyl chloride	ND		0.00100	1	06/10/2021 13:36	WG1686070
Total Xylenes	ND		0.00300	1	06/10/2021 13:36	WG1686070
(S) Toluene-d8	*98.1*		*80.0-120*		*06/10/2021 13:36*	WG1686070
(S) 4-Bromofluorobenzene	*104*		*80.0-120*		*06/10/2021 13:36*	WG1686070
(S) 1,2-Dichloroethane-d4	*93.3*		*70.0-130*		*06/10/2021 13:36*	WG1686070

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	06/10/2021 14:19	WG1684861
Alpha BHC	ND		0.0000500	1	06/10/2021 14:19	WG1684861
Beta BHC	ND		0.0000500	1	06/10/2021 14:19	WG1684861
Delta BHC	ND		0.0000500	1	06/10/2021 14:19	WG1684861
Gamma BHC	ND		0.0000500	1	06/10/2021 14:19	WG1684861
Chlordane	ND		0.00500	1	06/10/2021 14:19	WG1684861
4,4-DDD	ND		0.0000500	1	06/10/2021 14:19	WG1684861
4,4-DDE	ND		0.0000500	1	06/10/2021 14:19	WG1684861
4,4-DDT	ND		0.0000500	1	06/10/2021 14:19	WG1684861
Dieldrin	ND		0.0000500	1	06/10/2021 14:19	WG1684861
Endosulfan I	ND		0.0000500	1	06/10/2021 14:19	WG1684861
Endosulfan II	ND		0.0000500	1	06/10/2021 14:19	WG1684861
Endosulfan sulfate	ND		0.0000500	1	06/10/2021 14:19	WG1684861
Endrin	ND		0.0000500	1	06/10/2021 14:19	WG1684861
Endrin aldehyde	ND	J4	0.0000500	1	06/10/2021 14:19	WG1684861
Endrin ketone	ND		0.0000500	1	06/10/2021 14:19	WG1684861
Heptachlor	ND		0.0000500	1	06/10/2021 14:19	WG1684861
Heptachlor epoxide	ND		0.0000500	1	06/10/2021 14:19	WG1684861
Hexachlorobenzene	ND		0.0000500	1	06/10/2021 14:19	WG1684861
Methoxychlor	ND		0.0000500	1	06/10/2021 14:19	WG1684861
Toxaphene	ND		0.000500	1	06/10/2021 14:19	WG1684861
gamma-Chlordane	ND		0.0000500	1	06/10/2021 14:19	WG1684861
alpha-Chlordane	ND		0.0000500	1	06/10/2021 14:19	WG1684861
(S) Decachlorobiphenyl	*102*		*10.0-144*		*06/10/2021 14:19*	WG1684861
(S) Tetrachloro-m-xylene	*91.3*		*10.0-135*		*06/10/2021 14:19*	WG1684861

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	06/10/2021 12:07	WG1684861
PCB 1221	ND		0.000500	1	06/10/2021 12:07	WG1684861
PCB 1232	ND		0.000500	1	06/10/2021 12:07	WG1684861
PCB 1242	ND		0.000500	1	06/10/2021 12:07	WG1684861
PCB 1248	ND		0.000500	1	06/10/2021 12:07	WG1684861
PCB 1254	ND		0.000500	1	06/10/2021 12:07	WG1684861
PCB 1260	ND		0.000500	1	06/10/2021 12:07	WG1684861
Total PCBs	ND		0.000500	1	06/10/2021 12:07	WG1684861
(S) Decachlorobiphenyl	*83.0*		*10.0-144*		*06/10/2021 12:07*	WG1684861
(S) Tetrachloro-m-xylene	*78.0*		*10.0-135*		*06/10/2021 12:07*	WG1684861

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	06/11/2021 03:11	WG1684859
Acenaphthylene	ND		0.00100	1	06/11/2021 03:11	WG1684859
Anthracene	ND		0.00100	1	06/11/2021 03:11	WG1684859
Benzidine	ND		0.0100	1	06/11/2021 03:11	WG1684859
Benzo(a)anthracene	ND		0.00100	1	06/11/2021 03:11	WG1684859
Benzo(b)fluoranthene	ND		0.00100	1	06/11/2021 03:11	WG1684859
Benzo(k)fluoranthene	ND		0.00100	1	06/11/2021 03:11	WG1684859
Benzo(g,h,i)perylene	ND		0.00100	1	06/11/2021 03:11	WG1684859
Benzo(a)pyrene	ND		0.00100	1	06/11/2021 03:11	WG1684859
Bis(2-chlorethoxy)methane	ND		0.0100	1	06/11/2021 03:11	WG1684859
Bis(2-chloroethyl)ether	ND		0.0100	1	06/11/2021 03:11	WG1684859
2,2-Oxybis(1-Chloropropane)	ND		0.0100	1	06/11/2021 03:11	WG1684859
4-Bromophenyl-phenylether	ND		0.0100	1	06/11/2021 03:11	WG1684859
2-Chloronaphthalene	ND		0.00100	1	06/11/2021 03:11	WG1684859
4-Chlorophenyl-phenylether	ND		0.0100	1	06/11/2021 03:11	WG1684859
Chrysene	ND		0.00100	1	06/11/2021 03:11	WG1684859
Dibenz(a,h)anthracene	ND		0.00100	1	06/11/2021 03:11	WG1684859
3,3-Dichlorobenzidine	ND		0.0100	1	06/11/2021 03:11	WG1684859
2,4-Dinitrotoluene	ND		0.0100	1	06/11/2021 03:11	WG1684859
2,6-Dinitrotoluene	ND		0.0100	1	06/11/2021 03:11	WG1684859
1,2-Diphenylhydrazine	ND		0.0100	1	06/11/2021 03:11	WG1684859
Fluoranthene	ND		0.00100	1	06/11/2021 03:11	WG1684859
Fluorene	ND		0.00100	1	06/11/2021 03:11	WG1684859
Hexachlorobenzene	ND		0.00100	1	06/11/2021 03:11	WG1684859
Hexachloro-1,3-butadiene	ND		0.0100	1	06/11/2021 03:11	WG1684859
Hexachlorocyclopentadiene	ND		0.0100	1	06/11/2021 03:11	WG1684859
Hexachloroethane	ND		0.0100	1	06/11/2021 03:11	WG1684859
Indeno(1,2,3-cd)pyrene	ND		0.00100	1	06/11/2021 03:11	WG1684859
Isophorone	ND		0.0100	1	06/11/2021 03:11	WG1684859
Naphthalene	ND		0.00100	1	06/11/2021 03:11	WG1684859
Nitrobenzene	ND		0.0100	1	06/11/2021 03:11	WG1684859
n-Nitrosodimethylamine	ND		0.0100	1	06/11/2021 03:11	WG1684859
n-Nitrosodiphenylamine	ND		0.0100	1	06/11/2021 03:11	WG1684859
n-Nitrosodi-n-propylamine	ND		0.0100	1	06/11/2021 03:11	WG1684859
Phenanthrene	ND		0.00100	1	06/11/2021 03:11	WG1684859
Benzylbutyl phthalate	ND		0.00300	1	06/11/2021 03:11	WG1684859
Bis(2-ethylhexyl)phthalate	ND		0.00300	1	06/11/2021 03:11	WG1684859
Di-n-butyl phthalate	ND		0.00300	1	06/11/2021 03:11	WG1684859
Diethyl phthalate	ND		0.00300	1	06/11/2021 03:11	WG1684859
Dimethyl phthalate	ND		0.00300	1	06/11/2021 03:11	WG1684859
Di-n-octyl phthalate	ND		0.00300	1	06/11/2021 03:11	WG1684859
Pyrene	ND		0.00100	1	06/11/2021 03:11	WG1684859

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

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
1,2,4-Trichlorobenzene	ND		0.0100	1	06/11/2021 03:11	WG1684859
4-Chloro-3-methylphenol	ND		0.0100	1	06/11/2021 03:11	WG1684859
2-Chlorophenol	ND		0.0100	1	06/11/2021 03:11	WG1684859
2,4-Dichlorophenol	ND		0.0100	1	06/11/2021 03:11	WG1684859
2,4-Dimethylphenol	ND		0.0100	1	06/11/2021 03:11	WG1684859
4,6-Dinitro-2-methylphenol	ND		0.0100	1	06/11/2021 03:11	WG1684859
2,4-Dinitrophenol	ND		0.0100	1	06/11/2021 03:11	WG1684859
2-Nitrophenol	ND		0.0100	1	06/11/2021 03:11	WG1684859
4-Nitrophenol	ND		0.0100	1	06/11/2021 03:11	WG1684859
Pentachlorophenol	ND		0.0100	1	06/11/2021 03:11	WG1684859
Phenol	ND		0.0100	1	06/11/2021 03:11	WG1684859
2,4,6-Trichlorophenol	ND		0.0100	1	06/11/2021 03:11	WG1684859
(S) Nitrobenzene-d5	*58.7*		*15.0-314*		*06/11/2021 03:11*	WG1684859
(S) 2-Fluorobiphenyl	*72.2*		*22.0-127*		*06/11/2021 03:11*	WG1684859
(S) p-Terphenyl-d14	*63.3*		*29.0-141*		*06/11/2021 03:11*	WG1684859
(S) Phenol-d5	*16.6*		*8.00-424*		*06/11/2021 03:11*	WG1684859
(S) 2-Fluorophenol	*26.7*		*10.0-120*		*06/11/2021 03:11*	WG1684859
(S) 2,4,6-Tribromophenol	*79.1*		*10.0-153*		*06/11/2021 03:11*	WG1684859

NPDES PERMIT PROGRAM INVENTORY
Fiscal Year 2020-21

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

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- 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: 11/5/2021
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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