2021 ANNUAL REPORT

> For the period of July 1, 2020 - June 30, 2021

Prepared by the City of Tulsa Streets and Stormwater Department







Annual Report





OPDES Stormwater Permit #OKS000201 July 1, 2020 to June 30, 2021

Co-Permittees:

Oklahoma Turnpike Authority

Oklahoma Department of Transportation

Table of Contents

TABLE OF CONTENTS

Certification StatementISection 1 – Status of Implementing the Stormwater Management Program11. Structural Controls and Stormwater Collection System Operation12. New Development and Significant Redevelopment23. Roadways44. Flood Control Projects65. Pesticide, Herbicide, and Fertilizer Application86. Illicit Discharge and Improper Disposal97. Spill Prevention and Response238. Industrial and High Risk Runoff249. Construction Site Runoff2510. Public Education2811. Employee Education3612. Monitoring Programs36Section 2 – Proposed Changes to the Stormwater Management Program39Section 3 – Revisions to Assessments of Controls and Fiscal Analysis40Section 5 – Annual Expenditures48Section 6 – Summary of Enforcement Actions, Inspections, and Public Ed.50• Education Eutor Distributed or Used 2020-2021Attachment A• Education Events 2020-2021Attachment A• Education Events 2020-2021Attachment A• Tulsa day camp Education 2020-2021Attachment CSection 7 – Identification of Water Quality Improvements or Degradation53Section 9 – Co-Permittee Reports55• Oklahoma Department of TransportationAppendix A	CONTENTS	PAGE
Section 1 – Status of Implementing the Stormwater Management Program 1 1. Structural Controls and Stormwater Collection System Operation 1 2. New Development and Significant Redevelopment 2 3. Roadways 4 4. Flood Control Projects 6 5. Pesticide, Herbicide, and Fertilizer Application 8 6. Illicit Discharge and Improper Disposal 9 7. Spill Prevention and Response 23 8. Industrial and High Risk Runoff 24 9. Construction Site Runoff 25 10. Public Education 28 11. Employee Education 36 12. Monitoring Programs 36 Section 2 – Proposed Changes to the Stormwater Management Program 39 Section 3 – Revisions to Assessments of Controls and Fiscal Analysis 40 Section 5 – Annual Expenditures 48 Section 6 – Summary of Enforcement Actions, Inspections, and Public Ed. 50 • Education Material Distributed or Used 2020-2021 Attachment A • Education Events 2020-2021 Attachment A • Education of Water Quality Improvements or Degradation 53 Section 7 – Identification of Water Quality Improvements or Degradation 53	Certification Statement	Ι
1. Structural Controls and Stormwater Collection System Operation 1 2. New Development and Significant Redevelopment 2 3. Roadways 4 4. Flood Control Projects 6 5. Pesticide, Herbicide, and Fertilizer Application 8 6. Illicit Discharge and Improper Disposal 9 7. Spill Prevention and Response 23 8. Industrial and High Risk Runoff 24 9. Construction Site Runoff 25 10. Public Education 28 11. Employee Education 36 12. Monitoring Programs 36 Section 2 – Proposed Changes to the Stormwater Management Program 39 Section 3 – Revisions to Assessments of Controls and Fiscal Analysis 40 Section 4 – Summary of the Data 41 Section 5 – Annual Expenditures 48 Section 6 – Summary of Enforcement Actions, Inspections, and Public Ed. 50 • Education Material Distributed or Used 2020-2021 Attachment A • Education Events 2020-2021 Attachment C Section 7 – Identification of Water Quality Improvements or Degradation 53 Section 8 – Watershed Characterization Program 54 Section 9 – Co-Permittee Re	Section 1 – Status of Implementing the Stormwater Management Program	m 1
2. New Development and Significant Redevelopment 2 3. Roadways 4 4. Flood Control Projects 6 5. Pesticide, Herbicide, and Fertilizer Application 8 6. Illicit Discharge and Improper Disposal 9 7. Spill Prevention and Response 23 8. Industrial and High Risk Runoff 24 9. Construction Site Runoff 25 10. Public Education 28 11. Employce Education 36 12. Monitoring Programs 36 Section 2 – Proposed Changes to the Stormwater Management Program 39 Section 3 – Revisions to Assessments of Controls and Fiscal Analysis 40 Section 4 – Summary of the Data 41 Section 5 – Annual Expenditures 48 Section 6 – Summary of Enforcement Actions, Inspections, and Public Ed. 50 • Education Events 2020-2021 Attachment A • Education Events 2020-2021 Attachment C Section 7 – Identification of Water Quality Improvements or Degradation 53 Section 8 – Watershed Characterization Program 54 Section 9 – Co-Permittee Reports 55 • Oklahoma Department of Transportation Appendix A	1. Structural Controls and Stormwater Collection System Operation	tion 1
3. Roadways 4 4. Flood Control Projects 6 5. Pesticide, Herbicide, and Fertilizer Application 8 6. Illicit Discharge and Improper Disposal 9 7. Spill Prevention and Response 23 8. Industrial and High Risk Runoff 24 9. Construction Site Runoff 25 10. Public Education 28 11. Employee Education 36 12. Monitoring Programs 36 Section 2 – Proposed Changes to the Stormwater Management Program 39 Section 3 – Revisions to Assessments of Controls and Fiscal Analysis 40 Section 5 – Annual Expenditures 4 8. Education Material Distributed or Used 2020-2021 Attachment A • Education Events 2020-2021 Attachment B • Tulsa day camp Education 2020-2021 Attachment C Section 7 – Identification of Water Quality Improvements or Degradation 53 Section 8 – Watershed Characterization Program 54 Section 9 – Co-Permittee Reports 55 • Oklahoma Department of Transportation Appendix A	2. New Development and Significant Redevelopment	2
4. Flood Control Projects 6 5. Pesticide, Herbicide, and Fertilizer Application 8 6. Illicit Discharge and Improper Disposal 9 7. Spill Prevention and Response 23 8. Industrial and High Risk Runoff 24 9. Construction Site Runoff 25 10. Public Education 28 11. Employee Education 36 12. Monitoring Programs 36 Section 2 – Proposed Changes to the Stormwater Management Program 39 Section 3 – Revisions to Assessments of Controls and Fiscal Analysis 40 Section 4 – Summary of the Data 41 Section 5 – Annual Expenditures 48 Section 6 – Summary of Enforcement Actions, Inspections, and Public Ed. 50 • Education Events 2020-2021 Attachment A • Education Events 2020-2021 Attachment C Section 7 – Identification of Water Quality Improvements or Degradation 53 Section 8 – Watershed Characterization Program 54 Section 9 – Co-Permittee Reports 55 • Oklahoma Department of Transportation Appendix A	3. Roadways	4
5. Pesticide, Herbicide, and Fertilizer Application 8 6. Illicit Discharge and Improper Disposal 9 7. Spill Prevention and Response 23 8. Industrial and High Risk Runoff 24 9. Construction Site Runoff 25 10. Public Education 28 11. Employee Education 36 12. Monitoring Programs 36 Section 2 – Proposed Changes to the Stormwater Management Program 39 Section 3 – Revisions to Assessments of Controls and Fiscal Analysis 40 Section 4 – Summary of the Data 41 Section 5 – Annual Expenditures 48 Section 6 – Summary of Enforcement Actions, Inspections, and Public Ed. 50 • Education Events 2020-2021 Attachment A • Education Events 2020-2021 Attachment C Section 7 – Identification of Water Quality Improvements or Degradation 53 Section 8 – Watershed Characterization Program 54 Section 9 – Co-Permittee Reports 55 • Oklahoma Department of Transportation Appendix A	4. Flood Control Projects	6
6. Illicit Discharge and Improper Disposal97. Spill Prevention and Response238. Industrial and High Risk Runoff249. Construction Site Runoff2510. Public Education2811. Employee Education3612. Monitoring Programs36Section 2 – Proposed Changes to the Stormwater Management Program39Section 3 – Revisions to Assessments of Controls and Fiscal Analysis40Section 4 – Summary of the Data41Section 5 – Annual Expenditures48Section 6 – Summary of Enforcement Actions, Inspections, and Public Ed.50• Education Material Distributed or Used 2020-2021Attachment A• Education Events 2020-2021Attachment B• Tulsa day camp Education 2020-2021Attachment CSection 7 – Identification of Water Quality Improvements or Degradation53Section 9 – Co-Permittee Reports55• Oklahoma Department of TransportationAppendix A	5. Pesticide, Herbicide, and Fertilizer Application	8
7. Spill Prevention and Response238. Industrial and High Risk Runoff249. Construction Site Runoff2510. Public Education2811. Employee Education3612. Monitoring Programs36Section 2 – Proposed Changes to the Stormwater Management Program39Section 3 – Revisions to Assessments of Controls and Fiscal Analysis40Section 4 – Summary of the Data41Section 5 – Annual Expenditures48Section 6 – Summary of Enforcement Actions, Inspections, and Public Ed.50• Education Material Distributed or Used 2020-2021Attachment A• Education Events 2020-2021Attachment CSection 7 – Identification of Water Quality Improvements or Degradation53Section 8 – Watershed Characterization Program54Section 9 – Co-Permittee Reports55• Oklahoma Department of TransportationAppendix A	6. Illicit Discharge and Improper Disposal	9
8. Industrial and High Risk Runoff 24 9. Construction Site Runoff 25 10. Public Education 28 11. Employee Education 36 12. Monitoring Programs 36 Section 2 – Proposed Changes to the Stormwater Management Program 39 Section 3 – Revisions to Assessments of Controls and Fiscal Analysis 40 Section 4 – Summary of the Data 41 Section 5 – Annual Expenditures 48 Section 6 – Summary of Enforcement Actions, Inspections, and Public Ed. 50 • Education Material Distributed or Used 2020-2021 Attachment A • Education Events 2020-2021 Attachment B • Tulsa day camp Education 2020-2021 Attachment C Section 7 – Identification of Water Quality Improvements or Degradation 53 Section 8 – Watershed Characterization Program 54 Section 9 – Co-Permittee Reports 55 • Oklahoma Department of Transportation Appendix A	7. Spill Prevention and Response	23
9. Construction Site Runoff 25 10. Public Education 28 11. Employee Education 36 12. Monitoring Programs 36 Section 2 – Proposed Changes to the Stormwater Management Program 39 Section 3 – Revisions to Assessments of Controls and Fiscal Analysis 40 Section 4 – Summary of the Data 41 Section 5 – Annual Expenditures 48 Section 6 – Summary of Enforcement Actions, Inspections, and Public Ed. 50 • Education Material Distributed or Used 2020-2021 Attachment A • Education Events 2020-2021 Attachment B • Tulsa day camp Education 2020-2021 Attachment C Section 7 – Identification of Water Quality Improvements or Degradation 53 Section 8 – Watershed Characterization Program 54 Section 9 – Co-Permittee Reports 55 • Oklahoma Department of Transportation Appendix A	8. Industrial and High Risk Runoff	24
10. Public Education2811. Employee Education3612. Monitoring Programs36Section 2 – Proposed Changes to the Stormwater Management Program39Section 3 – Revisions to Assessments of Controls and Fiscal Analysis40Section 4 – Summary of the Data41Section 5 – Annual Expenditures48Section 6 – Summary of Enforcement Actions, Inspections, and Public Ed.50• Education Material Distributed or Used 2020-2021Attachment A• Education Events 2020-2021Attachment B• Tulsa day camp Education 2020-2021Attachment CSection 7 – Identification of Water Quality Improvements or Degradation53Section 9 – Co-Permittee Reports55• Oklahoma Department of TransportationAppendix A	9. Construction Site Runoff	25
11. Employee Education3612. Monitoring Programs36Section 2 – Proposed Changes to the Stormwater Management Program39Section 3 – Revisions to Assessments of Controls and Fiscal Analysis40Section 4 – Summary of the Data41Section 5 – Annual Expenditures48Section 6 – Summary of Enforcement Actions, Inspections, and Public Ed.50• Education Material Distributed or Used 2020-2021Attachment A• Education Events 2020-2021Attachment B• Tulsa day camp Education 2020-2021Attachment CSection 7 – Identification of Water Quality Improvements or Degradation53Section 9 – Co-Permittee Reports55• Oklahoma Department of TransportationAppendix A	10. Public Education	28
12. Monitoring Programs36Section 2 – Proposed Changes to the Stormwater Management Program39Section 3 – Revisions to Assessments of Controls and Fiscal Analysis40Section 4 – Summary of the Data41Section 5 – Annual Expenditures48Section 6 – Summary of Enforcement Actions, Inspections, and Public Ed.50• Education Material Distributed or Used 2020-2021Attachment A• Education Events 2020-2021Attachment B• Tulsa day camp Education 2020-2021Attachment CSection 7 – Identification of Water Quality Improvements or Degradation53Section 9 – Co-Permittee Reports55• Oklahoma Department of TransportationAppendix A	11. Employee Education	36
Section 2 – Proposed Changes to the Stormwater Management Program39Section 3 – Revisions to Assessments of Controls and Fiscal Analysis40Section 4 – Summary of the Data41Section 5 – Annual Expenditures48Section 6 – Summary of Enforcement Actions, Inspections, and Public Ed.50• Education Material Distributed or Used 2020-2021Attachment A• Education Events 2020-2021Attachment B• Tulsa day camp Education 2020-2021Attachment CSection 7 – Identification of Water Quality Improvements or Degradation53Section 9 – Co-Permittee Reports55• Oklahoma Department of TransportationAppendix A	12. Monitoring Programs	36
Section 3 – Revisions to Assessments of Controls and Fiscal Analysis40Section 4 – Summary of the Data41Section 5 – Annual Expenditures48Section 6 – Summary of Enforcement Actions, Inspections, and Public Ed.50• Education Material Distributed or Used 2020-2021Attachment A• Education Events 2020-2021Attachment B• Tulsa day camp Education 2020-2021Attachment CSection 7 – Identification of Water Quality Improvements or Degradation53Section 8 – Watershed Characterization Program54Section 9 – Co-Permittee Reports55• Oklahoma Department of TransportationAppendix A	Section 2 – Proposed Changes to the Stormwater Management Program	39
Section 4 – Summary of the Data41Section 5 – Annual Expenditures48Section 6 – Summary of Enforcement Actions, Inspections, and Public Ed.50• Education Material Distributed or Used 2020-2021Attachment A• Education Events 2020-2021Attachment B• Tulsa day camp Education 2020-2021Attachment CSection 7 – Identification of Water Quality Improvements or Degradation53Section 8 – Watershed Characterization Program54Section 9 – Co-Permittee Reports55• Oklahoma Department of TransportationAppendix A	Section 3 – Revisions to Assessments of Controls and Fiscal Analysis	40
Section 5 – Annual Expenditures48Section 6 – Summary of Enforcement Actions, Inspections, and Public Ed.50• Education Material Distributed or Used 2020-2021Attachment A• Education Events 2020-2021Attachment B• Tulsa day camp Education 2020-2021Attachment CSection 7 – Identification of Water Quality Improvements or Degradation53Section 8 – Watershed Characterization Program54Section 9 – Co-Permittee Reports55• Oklahoma Department of TransportationAppendix A	Section 4 – Summary of the Data	41
Section 6 – Summary of Enforcement Actions, Inspections, and Public Ed.50• Education Material Distributed or Used 2020-2021Attachment A• Education Events 2020-2021Attachment B• Tulsa day camp Education 2020-2021Attachment CSection 7 – Identification of Water Quality Improvements or Degradation53Section 8 – Watershed Characterization Program54Section 9 – Co-Permittee Reports55• Oklahoma Department of TransportationAppendix A	Section 5 – Annual Expenditures	48
 Education Material Distributed or Used 2020-2021 Attachment A Education Events 2020-2021 Attachment B Tulsa day camp Education 2020-2021 Attachment C Section 7 – Identification of Water Quality Improvements or Degradation 53 Section 8 – Watershed Characterization Program 54 Section 9 – Co-Permittee Reports 55 Oklahoma Department of Transportation Appendix A Oklahoma Department of Transportation Appendix A 	Section 6 – Summary of Enforcement Actions, Inspections, and Public E	.d. 50
 Education Events 2020-2021 Attachment B Tulsa day camp Education 2020-2021 Attachment C Section 7 – Identification of Water Quality Improvements or Degradation 53 Section 8 – Watershed Characterization Program 54 Section 9 – Co-Permittee Reports 55 Oklahoma Department of Transportation Appendix A Oklahoma Department of Transportation Appendix A 	• Education Material Distributed or Used 2020-2021	Attachment A
 Tulsa day camp Education 2020-2021 Attachment C Section 7 – Identification of Water Quality Improvements or Degradation 53 Section 8 – Watershed Characterization Program 54 Section 9 – Co-Permittee Reports 55 Oklahoma Department of Transportation Appendix A 	• Education Events 2020-2021	Attachment B
Section 7 – Identification of Water Quality Improvements or Degradation53Section 8 – Watershed Characterization Program54Section 9 – Co-Permittee Reports55• Oklahoma Department of TransportationAppendix A	Tulsa day camp Education 2020-2021	Attachment C
Section 8 – Watershed Characterization Program54Section 9 – Co-Permittee Reports55• Oklahoma Department of TransportationAppendix A	Section 7 – Identification of Water Quality Improvements or Degradation	n 53
Section 9 - Co-Permittee Reports55• Oklahoma Department of TransportationAppendix A	Section 8 – Watershed Characterization Program	54
Oklahoma Department of Transportation Appendix A	Section 9 – Co-Permittee Reports	55
	• Oklahoma Department of Transportation	Appendix A
• Oklahoma Turnpike Authority Appendix B	Oklahoma Turnpike Authority	Appendix B

CERTIFICATION STATEMENT OPDES Permit No. OKS000201 Review of Stormwater Annual Report

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 gathered and evaluated 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 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 of violations.

Rov N. Teeters

10.13.21

Date

Manager Stormwater Management Division

Section 1

The Status of Implementing the Stormwater Management Program (SWMP)

The Stormwater Management Program (SWMP) of the City of Tulsa's municipal stormwater discharge permit #OKS000201, Part II, consists of 12 separate programs. A brief review of each of the individual programs and tasks performed during the period of July 1, 2020 through June 30, 2021, will result in the effective assessment of permit compliance.

Part II(A)(1) Structural Controls and Stormwater Collection System Operation

Status: Compliant and Ongoing

The City of Tulsa's SWMP provides for the maintenance of both above and below ground structural stormwater controls including detention ponds, inlets, conduits and channels. The primary purpose of this program is to assure proper operation of these structural controls for better control of stormwater quantity. Additionally, stormwater quality benefited from the removal of sediment, floatables, and regular inspections of all structures. The following table is an inventory of the work performed on these structures during this reporting period.

ABOVE GROUND STRUCTURE(S)	INVENTORY (FOR REPORTING PERIOD)	OPERATIONS & MAINTENANCE (O&M) ACTIVITY	O&M ACTIVITY (COMPLETED EACH REPORTING PERIOD)
Channels/ Streams/ Detention Ponds	1,637 acres	Mowing	13 x/year of mowable property (totaling 21,281 acres)
Channels & Streams/ Detention Ponds	2,369 acres	Weed control (Herbicide)	All parcels 1 x/year for broad leaf weed control (totaling 2,369 acres)
Channels & Streams (Hydro Mulch Plus)	425 acres	Weed Control (Herbicide)	All parcels 1 x/year for growth control (totaling 2,370 acres)
Channels & Streams (Inhouse)	263 acres	Weed Control (Herbicide)	All parcels 4.5 x/year for growth control (totaling 1,183 acres)
Wet Ponds	64 acres	Algae Control	All ponds 5 x/year for growth control (totaling 319.5 acres)
Channels/ Streams/ Detention Ponds	1,366 acres	Cleaning/ Sediment Removal (Ponds/Streams)	2,027 cubic yards/period
Roadside Ditches	974 miles	Sediment Removal (Roadside Ditching)	150 linear feet/period

Maintenance of Above Ground Stormwater Structural Controls

INVENTORY BELOW **OPERATIONS & O&M ACTIVITY** (FOR GROUND (COMPLETED EACH REPORTING **MAINTENANCE (O&M)** REPORTING **STRUCTURE(S)** ACTIVITY **PERIOD**) PERIOD) 4.6 miles/period Inspect Storm Sewer Pipe (all pipe - driveway pipe, 1,178 miles Flush/clean 0.5 miles/period crossover pipe, etc...) Repair or Replace 241 linear feet units/period Inspect & Clean 510 units/period Catch Basin/Inlets 68,453 units 242 units/period Repair Clean interior, Inspect **Pump Station** 14 units 393 maintenance activities & Maintain

Maintenance of Below Ground Stormwater Structural Controls

Additionally, prior to mowing of all stormwater control structures, all trash was collected and disposed of properly. Detention ponds that are multi-use had trash cans for disposal of litter. These cans were emptied on a regular basis.

Compliance shall be based on completion of the O&M ACTIVITY column found in the charts.

Part II(A)(2) Areas of New Development and Significant Redevelopment

Status: Compliant and ongoing

This requirement was met through the continued implementation of the Stormwater Master Drainage Plan, Tulsa Stormwater Management Criteria Manual and ordinances (Title 11-A, Chapter 3, Watershed Development Regulations; Title 11-A, Chapter 5, Pollution; Title 42, Chapter 11, Planned Unit Development) that relate to any new development and significant re-development that occurs in Tulsa. These documents were created in order to reduce flooding due to new development and significant redevelopment. A secondary benefit was to reduce the impact on water quality as a result of construction. The City of Tulsa follows a city-wide Comprehensive Plan. This plan addresses all facets of activities including water quality and has recently (August 2016) undergone an update with guidance from many groups, including Stormwater Quality and Engineering Services - Stormwater Design Section. The City of Tulsa also utilizes the Master Drainage plans, which are planning tools used to determine areas of watersheds that need capital improvements to reduce flooding that is caused from development as well as providing solutions to stormwater drainage, maintenance and management issues

Annual Report FY 2020-2021

Section 1 – Status of Implementing the Stormwater Management Program

which are prioritized based on benefits and costs. These Master Drainage Plans are being updated as funds become available.

The City of Tulsa continues to implement the Tulsa Stormwater Management Criteria Manual – June 2019. This manual, created and adopted in 1994 and updated recently, is a comprehensive manual designed to assist engineers, designers and construction operators in aspects of stormwater runoff control before, during and after construction activities are completed. This includes both water quality and quantity. The Stormwater Design Criteria Manual has several purposes including minimizing water quality degradation by preventing siltation and erosion of the City waterways and preserving environmental quality. This manual is utilized by City of Tulsa staff, as well as site development engineers during the design and review phases of all new developments and significant redevelopment projects that occur within the City of Tulsa. Tulsa has updated this document to reflect more current policies and practices. Additionally, the Watershed Development Regulations (Title 11-A, Chapter 3) lists the current practices regarding regulation of new development and significant redevelopment for the control of stormwater runoff.

Anyone planning to develop or redevelop areas of Tulsa has to follow a process with the Development Services Division of the City of Tulsa. This process requires developers to follow extensive planning, designing, and review. This ensures the area targeted for development meets all City requirements, including reducing the impact of flooding, impacts on city owned utilities, traffic needs, etc., after construction is completed.

The City of Tulsa had recently completed work on a major update of its zoning code. Including a separate rewrite of the Landscaping Chapter which was completed between

March of 2017 and December 2018. A Stormwater Quality representative was involved in the working group and draft updates to ensure Low Impact development (LID) impediments are removed and LID is incentivized to the maximum extent practicable.

PLANITULSA OUR PLAN. OUR FUTURE.

The Subdivision and Development Regulations have also recently undergone an update

completed in May 2018. This effort was a recommended strategy from our Comprehensive Plan, PLANiTULSA, which was approved by City Council in 2010. The guiding principles of this plan include a desire for Tulsa to become a more environmentally and fiscally sustainable city. The City of Tulsa hired a contractor to perform tasks associated with the subdivision regulation update outlined in a Request for Proposals. Stormwater Quality staff had been actively involved in working group to remove barriers and encourage LID.

The Stormwater Design Criteria Manual is currently being updated to include Chapter 1100, now titled Low Impact Development. This Chapter simply references the Low Impact Development Design Manual which has been completed, led by Dr. Jason Vogel

at the University of Oklahoma. Tulsa has taken a big step toward providing guidance on LID projects in our area with the completion of this Manual, and now must turn to promoting its use. The City of Tulsa has also completed with Dr. Vogel a LID Maintenance and Inspection Manual. This process began in early 2018. Online workshops were held with regulators and developers in March to fine-tune these documents before implementation. Further promotion of LID was accomplished by implementation of the following:

- LID was promoted at 29 educational functions, particularly those with key personnel, including engineers and planners.
- Continuous review of Tulsa's development regulations to determine if they are LID friendly.
- Conducted public education events promoting LID, especially with developers/contractors.
- Developed "Guide to Low Impact Development" literature that is distributed at public events.





Stormwater Quality has adopted an already existing City Program to recognize Low Impact Development practices in Tulsa. The program, Partners for A Clean Environment (PACE) is a voluntary, non-regulatory recognition program coordinated by the City of Tulsa's Quality Assurance and Stormwater Quality groups. The focus of the program is to provide recognition to businesses, individuals and groups who go above and beyond environmental regulations in an effort to be better stewards of our land and water. Currently there are 19 members of this program, though more LID

features have been implemented in Tulsa and time should be devoted in the future to promoting membership in this program. The Great Plains LID webpage shows a map that Stormwater Quality staff utilize to document LID in Tulsa. It currently has approximately 60 features with info such as address, brief description, and pictures to aid viewers.

Part II(A)(3) Roadways

Status: Compliant and ongoing

This requirement was met through the City's street sweeping and mowing activities performed and managed by the Streets and Stormwater Department.

Through the utilization of private contractors, Streets and Stormwater swept arterial streets 12 times. Emphasis was placed on sweeping after de-icing material was no longer required as a result of a snow or ice event. Residential streets were swept 4 times. The program's progress is measured in curb miles swept and yds³ of material removed.

Arterial and residential mileage per year may vary due to weather variations as well as contractor issues from one year to the next. BMP's that prevent run-off from deicing material are in place at Tulsa's east and west maintenance yards. All of Tulsa's trucks washing facilities drain to the sanitary sewer, thus avoiding potential contamination in the storm sewer.

Street Sweeping

Туре	Sweeping Requirement	Sweeping completed	O & M Activity (for reporting period)	Material Removed
Arterial	~12x annually	12	7,916 miles	6,482 yds ³
Residential	~4x annually	4	10,520 miles	18,452 yds ³

Contractors have reviewed the MS4 Permit and the Pollution Ordinance, in order to be familiar with the MS4 regulations and requirements, to prevent contamination of the waters of the State. As contracts for sweeping and mowing come up for renewal, addendums were and will continue to be added to include a water quality requirement. This addendum will require the contractor to review and sign off on the SWMP, Pollution Ordinance and the MS4 permit.



During this reporting period, trash removal was also conducted on all street right-of-ways prior to any mowing. This program has faced a decline of participants for a variety of reasons including the pandemic and inmates being routed to other programs. Numbers for inmate work crews are as follows:

Litter Removal from Roadways

Collected by	Amount Collected	
Inmate work crews	10,949 bags	201.6 tons

Tulsa Stadium Improvement District (TSID) conducted concentrated street and sidewalk cleaning efforts in the Central Business District, of the downtown area of Tulsa. This area consists of 1.4 square miles containing 58.37 curb miles.

Central Business District

Type of Activity	Interval
Sidewalk cleaning	3x/week
Storm sewer intake structure and sidewalk cleaning	2x/week
150 trash cans (inspect/clean)	6x/week
14 Pet Waste Stations (refilled)	5x/week

Stormwater Quality continued to warn citizens and companies not to sweep or blow grass/leaves/debris into the street or storm sewer as it is a violation of Tulsa's Ordinance's and could result in a fine. In addition, literature was distributed titled "Landscaping BMP". This literature is given to anyone believed to be disposing of leaves and grass into the MS4 (Municipal Separate Storm Sewer System). It directs the alleged disposer against further disposal of this material into the MS4.

Permit compliance was achieved with the completion of the specified street sweeping and litter removal.

Part II(A)(4) Flood Control Projects

Status: Compliant and ongoing

To address this program requirement, the City of Tulsa has continued to implement the following activities:

- 1. Flood Management Project Design Review
- 2. Utilization of the NPDES Permit Evaluation Study Water Quality Enhancement Assessment of Existing Flood Control Detention Facilities, September 15, 1998.

A discussion of the procedures for each activity is presented below.

Flood Management Project Design Review

To ensure that proposed flood control projects assess the impacts on the water quality of

receiving water bodies, the City has and will perform a project design review for all current and future major flood control projects. The project design review utilizes criteria derived from design considerations included in the Stormwater Design Criteria Manual.

By definition, the purpose of a flood control project is to reduce flood damage. Flood control and water quality management strategies differ greatly. Flood control projects are designed to manage stormwater runoff resulting from large, infrequent storm events. Normally, these projects are designed to quickly convey runoff resulting from up to a 100-year storm event. Conversely, water quality management facilities are designed to handle runoff from much smaller, more frequent storm events (1-2 year storm event). In a given year, 70-90 percent of all runoff (and generally the associated pollutants) typically result from storm events producing less than 2 inches of rainfall. Water quality management facilities attempt to slow stormwater runoff, maximizing hydraulic detention periods to facilitate sedimentation and biological uptake. Therefore, this program element does not attempt to provide comprehensive water quality management utilizing "flood control" structures. The goal is to assure that project impacts to receiving waters are assessed and minimized through the use of sound engineering design principles. Where possible, water quality treatment principles will be incorporated into the design of flood control projects.

Sections 700 and 900 of the City of Tulsa Stormwater Design Criteria Manual document minimum design criteria. These criteria address the following design considerations:

- Channel Design
 - -Maximum velocity -Channel geometry, side slopes -Channel material/stabilization -Side slope vegetation

Additional City review will take into consideration:

- Detention Structure Design
 - -Storage volume to maximize residence time
 - -Outflow structure design to slowly release detained flows
 - without causing flooding
 - -Energy Dissipaters to slow velocity
- Location
 - -Downstream effects
 - -Existing receiving water quality
 - -Maintainability
 - -Proximity in the watershed with respect to impervious areas

Existing Flood Control Structure Evaluation - NPDES Permit Evaluation Study

In September 1998, Tulsa evaluated the feasibility of retrofitting 19 existing flood control structures to provide additional pollutant removal. This study recommended using upper watershed BMP's or control of pollutants at the source rather than retrofitting existing flood control structures. This is currently addressed through the implementation of a

number of stormwater management programs. This includes street sweeping, construction site erosion control and public education. These programs will continue to be utilized.

The City of Tulsa has guidelines for development in the upper 1/3 of drainage basins to have detention. These detention ponds help slow the rate of stormwater runoff as well as improve the quality of runoff by allowing pollutants to settle out.

Compliance will be based upon the assessment of the impact(s) to receiving water quality during the design phase of flood control project. Where possible, water quality treatment principles will be incorporated into the design of these projects.

Part II(A)(5) Pesticide, Herbicide, and Fertilizer Application

Status: Compliant and ongoing

All City of Tulsa personnel, as well as all contract applicators that applied pesticides and herbicides were required to be licensed and subject to all regulations under the Oklahoma Pesticide Applicators Law, including re-certification. City personnel that applied pesticides, herbicides and fertilizers received annual in-house training on specific types of pesticides, herbicides and fertilizers. External training was also held on Nov 2020 at the Oklahoma Turf Grass Conference. All Stormwater Management and Parks employee license records are available upon request.

With the issuance of the Environmental Protection Agency's (EPA) (now Oklahoma Department of Agriculture Food and Forestry's) Pesticide General Permit in October 2011, the City of Tulsa was required to formulate a Pesticide Discharge Management Plan (PDMP) as per the "Weed and Algae Control" category. The primary purpose of the PDMP is to protect water quality from abuse and misuse of pesticides. The City of Tulsa is compliant with all requirements of the PDMP and will continue to remain vigilant in their protection of waterways from pesticide misuse.



The Master Gardeners Program, available through the Oklahoma State University (OSU) Cooperative Extension Service, is a free service that offers expert advice to the

public on all aspects of gardening, including the proper application of pesticides, herbicides and fertilizers as well as other gardening and lawn care tips and information. This service is available to the public either by visiting the extension services at 4116 East 15th, accessing the website <u>www.tulsamastergardeners.org/</u> or utilizing the telephone hotline at (918) 746-3701. The Tulsa Master Gardeners answers



approximately 100,000 garden related questions annually.

These questions are answered by volunteers trained in various horticultural issues including proper application of pesticides, herbicides and fertilizers. This program also distributes "Fact Sheets", which discuss choice of chemicals and application rates for most of the common uses of pesticides and fertilizers in urban areas. Gardening education is further accomplished by various media outlets including TV, radio, print, and online newsletters. This is also accomplished by numerous Home and Garden Shows throughout the year. The Master Gardener Program was also promoted through distribution of the "City Life" newsletter in the month of March 2021. The City of Tulsa further promoted the Master Gardeners Program through the distribution of brochures and on the City of Tulsa's stormwater quality website. See Attachment A for a list of brochures distributed.

In accordance with Part II(13)(5)(b) of Tulsa's current MS4 permit, in FY 14-15, Tulsa sent a letter to 227 pesticide applicators licensed by the Oklahoma Department of Food and Forestry to apply pesticides in Tulsa County. This letter contained information on the importance of proper application of pesticides, herbicides and fertilizers, instructions to not blow grass clippings and/or leaves into the street and advised applicators that non-compliance is a violation of the City of Tulsa's Pollution Ordinance, which could result in a fine.

Tulsa continued to maintain a website that is accessible to the public, which contains guidance for pesticide and fertilizer application for both commercial and residential applicators. This website is located at <u>www.cityoftulsa.org/sos</u> and is regularly promoted. The number of pageviews is unavailable at this time, due to the ransomware attack the City suffered in April 2021.

See Part II(A)(10)(c) "Public Education" for additional public education on the proper use, storage and disposal of pesticides, herbicides and fertilizers by Tulsa during this period.

Part II(A)(6) Illicit Discharge and Improper Disposal

Status: Compliant and ongoing

The location and removal of illicit discharges and improper disposal continued to be an important aspect of the City of Tulsa's SWMP. Many departments within the City of Tulsa maintain various programs that involve locating and removing non-stormwater discharges to the storm sewer system and/or educating the public on proper disposal practices.

a.) Non-stormwater discharges

Tulsa allows the discharge of exempt non-stormwater discharges, as defined by 40 CFR 122.26(d)(2)(iv)(B)(1), to the storm sewer unless these discharges are determined to be contributing significant amounts of pollutants to the storm sewer. When an exempt non-

stormwater discharge is found to be contributing significant amounts of pollutants to the storm sewer, enforcement action will be taken using Tulsa's Pollution Ordinance.

Other categories of allowable non-stormwater discharges to the MS4 are:

- Car Washing (non-commercial and charity)
- Swimming Pool / Hot Tub
- Outside Washing (pavement washing)

For the above discharges, Tulsa has established BMP's that must be implemented prior to allowing the discharge to the MS4. Failure to implement these measures may result in a violation of the Pollution Ordinance.

Discharges from emergency firefighting activities were monitored during all phases of Tulsa's firefighting activities for potential releases of pollutants. This was accomplished through the continued implementation of Tulsa's Fire Department (TFD) policies. These polices were implemented to ensure public health and safety and reduce the release of pollutants.

During this reporting period 232 investigations were conducted identifying eight illicit discharges to the storm sewers. Tulsa's Pollution Ordinance was adopted November 1995 and continues to be utilized for the removal of non-stormwater discharges (see Section 6). This Ordinance allows the City of Tulsa to recover cleanup cost from the responsible party.

Additionally, the City of Tulsa achieves permit compliance by performing industrial stormwater inspections at City of Tulsa facilities. These inspections are performed to control pollutants that may be discharged into the MS4 system through routine operations and maintenance. These inspections focus on the proper storage of outdoor parts and materials, the condition of tanks and containers that store liquids and processes that may be conducted outdoors. Twenty-two City facility inspections were conducted during this time and are now compliant with Permit objectives.

Once an illicit discharge was identified, the responsible party was required to stop the discharge, redirect the discharge to the sanitary sewer or obtain an OPDES wastewater discharge permit from the Oklahoma Department of



Environmental Quality (ODEQ). This was accomplished using the Pollution Ordinance.

Fliers titled, "Responsible Pet Ownership" and "Stormwater Quality Programs", were distributed at events and activities during this reporting period. These flyers educated the reader on the negative aspects of not collecting and disposing of pet waste properly. These programs were also promoted on the City of Tulsa's Stormwater Quality website.

The City of Tulsa co-sponsored the "Paws and Claws" theme night at the Tulsa Drillers baseball games. "Responsible Pet Ownership" flyers and pet waste bags were passed out to Tulsa area pet owners. The attendance averaged 1,000 per game and were good opportunities to interact with pet owners on responsible ways to clean up after their pet.

In an effort to control runoff from pet waste, 18 Tulsa parks have a total of 30 pet waste signs. Pet stations provide pet waste disposal bags to properly dispose of pet waste in the trash. The stations are checked and refilled 1-2 times per month.



Public reporting of an illicit discharge or illegal disposal by concerned citizens (via the 311call center or directly to the Stormwater Management Division), other City departments and government agencies (ODEQ or the EPA) are regularly promoted on the city's website or at educational events (see Attachment B). Multiple channels for reporting illicit discharges are a valuable part of the City's effort to locate illicit discharges and improper disposals. This year Stormwater Quality staff completed 254 service requests, 114 of these investigations from the 311 call center. Promotion of the proper disposal of leaves, grass and pet waste was accomplished through the utility bill stuffer Aug 2020, Sep 2020, Jan 2021, and March 2021.

Dry weather field screening and dry weather flow follow-up continue to be used, resulting in the location, identification and removal of illicit discharges and improper disposals that occurred during this reporting period (see Part II(A)(6)(e)) and Part II(A)(6)(f)).

Starting this fiscal year, the Stormwater Quality group has been involved in the special event planning process. Information about the City of Tulsa's pollution ordinance and illicit discharges is provided in the Special Permit Event Application. Additionally, special events are regularly inspected by stormwater quality staff to ensure no violations are occurring. Last fiscal year the City of Tulsa processed approximately 159 special event permit applications.

b.) Sanitary sewer overflows

In a continuing effort to eliminate sanitary sewer overflows during this reporting period, the City initiated four sanitary sewer manhole and/or pipeline rehabilitation projects. Two sanitary sewer evaluation studies were initiated during this reporting period. One unsewered area project was completed during this reporting year which reduces the risks of failed septic tank effluent entering the MS4. Excess wet weather flow to the sanitary

sewer was diverted to seven flow equalization basins which reduce the amount of nontarget rainwater from entering the sanitary sewer system.

The City of Tulsa's Working in Neighborhood's Department utilizes two programs that help eliminate sanitary sewer contamination of waterways. The Emergency Repair Grant consists of a \$5,000 maximum grant to very low income residents to make emergency repairs to conditions that threaten the health and safety of the occupants. Areas of service include: electrical, plumbing, roofs, heating, and sewer lines. The Rehabilitation Loan Program is a \$35,000 maximum rehabilitation loan available for moderate to very low income residents to assist citizens with home repairs, weatherization, and energy efficiency. Each residence is given a rigorous inspection to include lead based paint (LBP), electrical/mechanical/plumbing (EMP), structural, and interior repairs. Areas of service include: lead based paint, electrical, plumbing, security (doors and windows), roofs, heating, interior issues, weatherization, and sewer lines. Twenty-two sewer lines were repaired/rehabilitated under these programs in the past fiscal year.

Sewer cleaning crews specifically targeted 65.2 miles of sewer lines known for grease accumulation problems. This maintenance program reduced the likelihood of sanitary sewer backups and overflows. Emergency cleaning of 58.2 miles of sanitary sewer was also conducted to remove grease and reduce sanitary sewer overflows. Additionally, in an effort to reduce grease blockages that result in sanitary sewer overflows, Tulsa continued its grease abatement program, better known as FOG (Fats, Oils, Grease) Best Management Practices Program, for the sanitary sewer. This voluntary program encourages restaurant owners to follow best management practices that ensure proper kitchen and grease management practices. Various meetings with business owners also facilitated discussion on the proper care and maintenance for trash receptacles, grease rendering bins, and parking lots.

Action	Results
Businesses Inspected	1,679
Businesses Participating in the FOG Program	267
Samples Obtained	10
Number of Enforcement Actions	4
Fines Issued	\$627

As a result of the FOG BMP program the following actions took place during this reporting period:

Annual Report FY 2020-2021

Television Network	Frequency (# times aired)	Impressions (# views)
KOTV Channel 6	262	7,192.8
KJRH Channel 2	100	635.6
KTUL Channel 8	60	632,106
Cox Cable	138	60,890

Section 1 – Status of Implementing the Stormwater Management Program Below is a breakdown of the advertising the FOG program conducted during this year:

In addition to television, the FOG program ran radio advertisements 150 times on Griffin Radio Broadcast Group's stations (KBEZ-FM, KFAQ-AM, KHTT-FM, KVOO-FM, KXBL-FM) for a total of 78,800 impressions. I-Heart Radio ran the FOG commercial 850 times for a total of 203,600 impressions.

The FOG program increases residential educational activities during the holiday months to prevent residential grease blockages due to holiday cooking activities. This year these activities included 'Trap the Grease' booths at 2 area community event locations distributing grease related promotional items with a total of around 100 participants. Also, a fryer oil collection event was held which collected 200 gallons of fryer oil for proper disposal from 50 participants.

Tulsa continued efforts to reduce sanitary sewer overflows into storm sewer through the use of TV inspection and smoke testing techniques. Work completed during the reporting period included:

247 miles of sanitary sewer TV inspected60 sanitary manholes raised to grade197 main line sanitary sewer repairs14,824 feet of main line sanitary sewer replaced or rehabilitated

In addition to investigating the private sewer defects located through smoke testing, the smokie inspector program also investigates private businesses that have a history of sewer defects. These businesses include apartment complexes, nursing homes and assisted living apartments, mobile home and RV parks, office complexes, motels, hotels, hospitals, schools, and shopping centers. The following statistics are from some of these sources. For the fiscal year 2020 - 2021, the smokie inspectors investigated and closed 4,869 cases. Eighty-six of these cases were closed by cleanout repairs made by the inspectors.

These repairs reduced stormwater inflow to the sanitary sewer, which in turn reduced sanitary sewer overflows and illicit discharges to the stormwater sewer. Permit compliance was achieved through implementation of these programs. The number of sanitary sewer overflows during this time was 132. This is 0.05% decrease from the prior year and a larger decrease from the long-term average of approximately 240 SSO's per year. Sewer Operations and Maintenance Key Performance Indicator is less than 10 overflows per 100 miles of sewer per year, or 199 overflows (1990 miles of sewer).

c.) Floatables

The City of Tulsa, the "Keep Oklahoma Beautiful" organization and the Metropolitan Environmental Trust (the M.e.t.) sponsor many programs that directly or indirectly target litter control. These programs include but are not limited to:

- Annual Creek Cleanup A remote creek cleanup was held April 10-24 and had almost 200 participants.
- *Earth Month* This program throughout the month of April consisted of activities targeting the protection of resources including the reduction of litter and non-point source pollution.
- *Earth Day* April 22, 2021 was set aside to draw attention to environmental efforts by citizens and area businesses, including reduction of litter and pollutants.

Tulsa took advantage of the opportunity to educate citizens on the importance of eliminating litter at many special events during this reporting period. Public education at these events usually involved setting up a display and handing out materials such as brochures, pencils, etc. These events included:

- The Greater Tulsa Home and Garden Show: March 12th, 2020-March 15th, 2020
- Kendall-Whittier Elementary School: May 26th, 2021
- Enviro-Expo at Bartlett Square: May 12th, 2021
- Tulsa Community College Global Fest: February 26th, 2020

A full list of public education activities conducted by the City of Tulsa can be found in Attachment B.

The Curbside Recycling Program continues offering weekly pick-up of plastic bottles and jugs, glass jars and bottles, cardboard and paper, aluminum and metal cans. 111,252 Tulsans participate which has resulted in the collection of 16,653 tons of recyclables for this reporting period. However due to a fire, this recycling facility is temporarily shut down, and these recyclables are being converted into energy. The recycling facility is slated to reopen in Dec. 2021. This program is promoted on the City website and at Tulsarecycles.com.

Environmental educational activities were conducted this year at various children's events. These events involved children who were educated on the importance of reducing litter, non-point source pollution and recycling through various activities. Other education activities included the use of videos, hands on landscape displays (i.e. "Enviroscape"), distribution of hand-outs and material containing non-point source pollution information, hands on stream monitoring of the creeks and performing park clean-ups. See Attachment C for a full list of kids events.

Tulsa, in conjunction with the Tulsa County Conservation District/Blue Thumb historically had a storm sewer inlet placarding program which included the message "No Dumping Save Our Streams Tulsa" or "Dump No Waste Drains to River" and has a



telephone number to report violators. All new storm sewer inlets have a similar message prestamped on the hood. Therefore any placarded inlets will eventually be replaced with stamped inlets, making the placarding program unnecessary.

Tulsa's Stormwater Quality group began a litter monitoring program in September of 2017 with the goal of better understanding the litter problem in Tulsa and doing more targeted education. The following is a breakdown of litter inspections completed this year. This program will rotate through sections (watersheds) of Tulsa each year with the main goal of the program being to educate property owners on the need to keep litter picked up and prevent it from impacting the MS4. The employee in this position splits their time approximately 50/50 between conducting litter inspections and working in our Household Pollutant Collection Facility. This position had also been vacant then hamstrung by another vacancy in our Collection Facility, requiring more time of the employee there and less time for him to conduct litter inspections. Still they were able to accomplish the following:

- 307 litter inspections
- 1,032 total sq ft. of litter directed to be cleaned-up

The following map shows where the litter inspections were conducted in relation to Stormwater Management ponds. The data from this map is largely from 2020 and will be updated soon. Litter inspection efforts are partially focused on proximity to stormwater management areas, so these features do not become conductors of litter throughout Tulsa. Again, this program is scheduled to rotate through Tulsa's watershed's, and is still in its beginning stages.



Two sets of litter BMP's were created and printed previously, one targeted towards businesses and the other towards citizens. This literature has been passed out as a result of one-one contact with citizens regarding issues as well as during public events.

The City of Tulsa has anecdotally noticed a continued increase in the amount of litter and illegal dumping issues in Tulsa. Many of these pieces of litter end up in Tulsa's streams as "floatables" potentially causing blockages and creating eyesores for the community's perception of its natural resources. It is these two issues that this litter inspection program aim's to abate, though the amount of time and resources currently dedicated to this issue is small compared to the breadth of the problem.

The Metropolitan Environmental Trust (The M.e.t.) continued to operate 10 recycling depots that are conveniently located throughout the metropolitan Tulsa area. Citizens can bring plastics, newspapers, office paper, magazine, cardboard, glass, aluminum, batteries, cooking grease, used motor oil for recycling and electronics (at seven of the locations). These depots were also used for the distribution of environmental educational information, including fliers on special collection events and disposal of chemicals to the household pollutant facility. The M.e.t. displayed recycling and anti-litter propaganda through Facebook and Twitter. The M.e.t. helped promote litter cleanups with a couple of neighborhood groups in FY 20/21 and supplied gloves, bags, and safety vests. The

M.e.t. has a full-time educator who gave environmental lessons in schools and for scouts. Attachment A is a spreadsheet showing the entire year of education.

Tulsa Parks emptied 1,152 trash containers (placed at 102 parks and 15 stormwater detention sites) 1-2 times per week. Stormwater detention structures are multiple use facilities, which serve as city parks when not in use for stormwater detention. Additional trash containers were placed in parks to serve special events and scheduled activities. In addition, maintenance crews picked up loose trash from parks a minimum of once per week. Trash containers with hinged lids have replaced opened topped barrels which have resulted in a reduction of loose trash.

The Stormwater Management Division has crews that removed litter from 12 wet ponds and miles of lined and earthen channels that comprise Tulsa's storm sewer, thus reducing the amount of floatables discharged to waters of the state.

The City of Tulsa's Public Facilities Section continued to utilize inmate work crews to remove litter along streets and expressways throughout Tulsa in an effort to keep the city free of roadside trash and debris. Stormwater Management also has a crew that collects trash and other material discarded along roads, right of ways, and other city property. During this fiscal year they spent 580 hours collecting 30.25 cubic yards of debris.

Street curb lines within the Inner Dispersal Loop (Downtown Business District) were cleaned on a weekly basis. During this cleaning, crews simultaneously removed debris from the storm sewer intake structures. Pole mounted trashcans were inspected and emptied daily as needed.

The removal of 1,063 tons of trash was accomplished through the placement of 1,147 thirty cubic yard trash dumpsters in residential neighborhoods within the corporate city limits of Tulsa. Tulsan's requested 21,111 pickups of bulky waste (appliances, furniture, electronics, tires) of which 333 Freon bearing items were properly evacuated. In addition, 60 lbs. of latex paint were picked up with the curbside bulky waste program from 40 requests.

The illegal dumping program uses the visual observation efforts of various field officers and citizen reports to identify and locate dumpsites throughout the City of Tulsa. Active sites are monitored through the use of visual observation and when possible, concealed surveillance. After these activities are completed, the sites are cleaned, charted and monitored for new dump activity. These activities serve to deter the reactivation of dumping in the area and encourage the use of proper disposal methods. Signage at 25 routine illegal dumping locations which read "No Dumping" and describe the enforcement possible if someone were caught.

This year, the Solid Waste division located 1,298 illegal dumpsites and conducted 271 investigations of illegal dumpsites within the city limits. No citations were issued based on these investigations, but 20 police reports were filed. Fifty-seven signs have been added at 25 locations in an effort to deter this continued illegal dumping. Dumpsite

contents were from construction activities, demolitions, green waste, furniture, appliances, tires and other household items. During this fiscal year, they collected 402 tons of debris from these dumpsites.

The City of Tulsa Security Patrol also made field inspections of chronic illegal dumpsites, but no arrests or tickets statistics were provided as a result of these inspections. These inspections are generated by 311 citizen and outreach complaints of homeless encampments on City of Tulsa Right of Way that generate chronic amount of trash and debris.

The Better Way Program picked up 1,842 bags of trash totaling 29.1 tons of trash.

Center of Employment Opportunities program cleaned up 34 tons of trash and limb debris from the Right of way as well as removing and trimming 53 tons of green waste from roadways and side walks

Community service crews removed 4,540 bags of trash and debris totaling 39.1 tons of trash and debris.

In addition, the City of Tulsa continued to collect and dispose of trash at its five floatable monitoring locations (see Section 4-Monitoring Data).

d.) Collection of used motor vehicle fluids and household hazardous wastes

Financial support continued for the M.e.t.'s recycling depots, which accept oil, antifreeze (only 2 of the 10 locations collect antifreeze), cooking grease and batteries, as well as other recyclable materials. All depots are open 24 hours per day (attended approximately 6 to 8 hours/day), seven days per week and are located in areas which are easily accessible to the public. The amount of material collected at these depots for the reporting period can be found in the following table. These numbers reflect totals from all the recycling depots and a pilot program that is collecting from nine restaurants/bars located throughout the greater Tulsa metropolitan area.

Material	Amount	
Oil	3,255 gals.	
Antifreeze	2,350 gals.	
Plastics (incl. plastic bags)	328,468 lbs.	
Aluminum and Steel	243,432 lbs.	
Glass	766,568 lbs.	
Batteries	16,020 lbs. automobile	
	27,970 lbs. household	
Newspaper, Paper, and Magazines	705,881 lbs.	
Cooking Grease	3,255 gals.	
Electronics	257,988 lbs.	
Cardboard	1,943,266 lbs	

In FY 20/21 The M.e.t. staff answered calls and emails from citizens asking what to do with their pollutants. Staff educates on where to take items and how to handle their items responsibly. Staff gave out voucher numbers to citizens who live in outlying communities, so citizens are able to use the City of Tulsa's Household Pollutant Collection Facility at no charge (if below 45 pounds). The charge is given to the community through a contract arrangement between The M.e.t. and the City of Tulsa.

The M.e.t. conducts special collection events during the year where it also distributes educational material to the public regarding locations of the recycling depots for use during times when the household pollutant collection events are not available, and less hazardous alternatives for chemicals used in the household.

During these collection events, educational fliers are distributed to the public. Each car received fliers regarding the following topics: (1) locations of the recycling depots and (2) Tulsa's Household Pollutant Collection Facility's.

Items collected at the special collection events in FY 20/21 are as follows:

- 7/18/20 Smoke Alarm & Fire Extinguisher Collection at Lowes 15and Yale/Tulsa

 collected 29 Fire Extinguishers, 41 smoke alarms,5 mercury thermometers, 42
 Fl Bulbs and 15 gallons of household batteries.
- 10/3/20 Tire & Ewaste in Collinsville/Owasso collected 364 tires and 5,322 pounds of Ewaste.
- 10/10/20 Tire & Ewaste at Tulsa Zoo collected 591 tires and 4, 641 Ewaste.
- 10/24/20 Prescription Take Back at Central Tulsa Depot collected 133 pounds of medication.
- 11/7/20 Smoke Alarm & Fire Extinguisher Collection at Lowes 71&169, Tulsa collected36 fire extinguishers, 40 smoke alarms, 5 thermometers, 31 Fl Bulbs and 10 gallons of household batteries.
- 11/28/20 Cooking Grease Event at Central Tulsa Depot, 220 gallons
- 3/6/21 Big Spring Clean Event at Tulsa County Fairgrounds at 21&Sheridan collected300 pounds ammunition, 2,360 pounds cardboard, 660 pounds medication, 2,670 tires, 25,403 pounds Ewaste,
- 4/10/21 Tire Event Clean up in West Tulsa collected 759 tires and 2,344 Ewaste.
- 4/24/21 Tire Event and Electronic Waste at Claremore Fairgrounds collected132 tires and 596 pounds of Ewaste.
- 4/24/21 Prescription Take Back at Central Tulsa Depot collected 7 boxes of medication.

The City of Tulsa has a Household Pollutant Collection Facility at 4502 South Galveston Ave. The facility is open 2 days a week (Wednesdays and Saturdays) from 8:00am till 4:30pm. This facility replaced the biannual collection events and has resulted in an easier and quicker method of pollutant disposal for Tulsans and the surrounding communities. This facility has been well received by the public as evidenced by our survey results and social media recognition. It celebrated being open 5 years this January. See graphic for summary of metrics during this time.

Below is a summary of the amounts of pollutants collected during the calendar year 2020:

Total weight collected: 323,857 lbs Total Tulsa customers: 2,422 Total M.e.t. customers: 407 Total Customers from outside Tulsa and M.e.t. communities: 25



City of Tulsa Gov O January 29 · 🔇

Happy 5th anniversary to The Household Pollutant Collection Facility! Its doors were opened for the first time in January 2016, and today, Tulsans continue to bring their household pollutants like cleaners, latex paint, automotive fluids, and lawn chemicals for safe disposal. If you have unused household pollutants to drop them off, please call them at (918) 591-4325 during regular business hours.

...





The following is a breakdown of the wastestreams per category:

In addition to the above household pollutants, the facility also collected and disposed of:

- 160,280 pounds of latex paint
- 17,122 pounds of used oil
- 6,658 pounds of antifreeze
- 8,166 lbs. of batteries
- 800 gallons of cooking oil

e.) Locate and eliminate illicit discharges and improper disposal

Dry weather field screening was conducted on approximately 36.04 square miles (22,358 acres) of the Tulsa's storm sewer system during the period of July 1, 2020 to June 30, 2021. Thus compliance with this section of the permit was achieved by screening 24 % of the Tulsa's MS4. The dry weather field screening program was designed to locate illicit discharges and illegal disposals into Tulsa's storm sewer.

A total of 192 outfalls were screened, of which 53 contained flows during dry weather periods. Once dry weather flow was located, the flow was sampled and tested for pH, temperature, appearance, conductivity, detergents, chlorine, copper, ammonia and fluoride (See Section 4 for specific data collected during dry



weather field screening). If contaminants were identified in concentrations above action levels then a dry weather flow follow-up investigation was conducted. Dry weather flow

follow-up investigations continued until the source of the flow was identified. When the source of the illicit discharge was identified it was eliminated.

The Stormwater Management Division continued to conduct random industrial inspections. Inspections were conducted to achieve compliance with Part II(A)(8) Industrial and High Risk Runoff. During these inspections, inspectors were checking for illicit discharges to the MS4 or the potential for an illicit discharge. If an illicit discharge was found, action was taken to halt the discharge using the Pollution Ordinance.

As addressed in Part II(A)(6)(b), Tulsa continued efforts to reduce sanitary sewer overflows into storm sewers during this reporting period. This was accomplished through the use of TV inspections and smoke testing techniques. Work completed during the reporting period included:

246.7 miles of sanitary sewer TV inspected
10.75 miles of storm sewer TV inspected
60 sanitary manholes raised to grade
590.4 linear feet of main line storm sewer repairs
197 main line sanitary sewer repairs
14,824 linear feet of main line sanitary sewer replaced or rehabilitated

These repairs resulted in the reduction of stormwater inflow and infiltration into the sanitary sewer, which in turn reduced sanitary sewer overflows and illicit discharges to the storm sewer system. Rehabilitation projects supplemented Tulsa's efforts by correcting known structural storm sewer problem areas (see Part II(A)(6)(b) Sanitary Sewer Overflows).

As previously mentioned, investigation/complaint procedures currently in place continue to be very effective in locating illicit discharges and improper disposal practices during this reporting period.

f.) Removal of illicit discharges

Once the source of an illicit discharge was located the responsible party was required to halt the discharge, redirect the discharge to the sanitary sewer or obtain an OPDES wastewater discharge permit from the ODEQ. Twenty-three illicit discharges were eliminated from Tulsa's MS4 during this reporting period as a result of enforcement of the Pollution Ordinance.

g.) Maintain a list of OPDES permit holders within the City of Tulsa

Databases are maintained for all OPDES permits for all discharges from construction, industrial activities, and OPDES wastewater discharge permittees within Tulsa. These databases include the name, address, OPDES permit number, contact person, SIC code(s) and other information. Updates were made when information became available. This information is usually obtained through inspections or ODEQ notification.

The City of Tulsa suffered a massive ransomware attach that prevented access to our databases for multiple months from April thru September 2021. The integrity of the databases is still being determined, but it did affect some records that had been recently entered when the ransomware occurred. Every effort has been made to verify the accuracy of the information obtained from these databases for this annual report, but there is the possibility of missing records.

Part II(A)(7) Spill Prevention and Response

Status: Compliant and ongoing

All agencies and City Departments responding to spills are instructed to follow the City's Pollution Ordinance. This ordinance requires the removal of a pollutant rather than disposing to the storm sewer, unless there is an immediate threat to life and health. The Pollution Ordinance provides Stormwater Management with the authority to require the responsible party to clean up the spill. This Ordinance also gives the Stormwater Management Division the authority to recoup all cost incurred from the responsible party. The Stormwater Management Division has authority to oversee all clean-up work involving spills within the City of Tulsa.



This requirement was achieved as delineated in a Memorandum of Agreement between the Tulsa Fire Department (TFD) Hazardous Materials Unit, the Tulsa City – County Health Department and the Streets and Stormwater Department. In accordance with Section 300 of the TFD Emergency Operation Procedures, all agencies and City departments responding to spills ensured compliance with the Pollution Ordinance by removing spilled pollutants rather than flushing it into the storm sewer, unless there was an immediate threat to public health and safety.

The TFD Haz-Mat Unit responded to incidents involving spills or possible releases of chemicals or pollutants which either had the potential to, or were discharged to the City's sanitary or storm sewer. Whenever the TFD responded to a spill that had entered either the sanitary or storm sewer system, the Streets and Stormwater Department was notified to evaluate impact on sewer systems and coordinate remediation activities.

If the responsible party was identified, they were required to conduct the clean up or hire a remediation company. In cases involving remediation, all work was inspected to ensure a proper and thorough clean up.

Below is a summary of the investigations conducted by the Stormwater Management Division:

Number of Investigations	Description of Investigations
13	Construction (relating to construction site potential violations)
10	Hazmat (relating to potential discharges of pollutants from fire department responses involving the hazardous materials unit)
207	Stormwater (relating to potential releases of pollutants to the storm sewer or violations of the Pollution Ordinance)
2	Drug Labs (relating to the potential release of pollutants from drug lab remediation to the storm sewer or violations of the Pollution Ordinance)
232	Total number of investigations for this reporting year

Stormwater Management inspectors conducted 461 industrial stormwater runoff inspections, each involving a discussion regarding spill prevention and management with industrial representatives.

Agreements have been put into place between Tulsa and both the Oklahoma Turnpike Authority (OTA) and the Oklahoma Department of Transportation (ODOT) that address spills that occur on OTA or ODOT MS4s within Tulsa.

Part II(A)(8) Industrial & High Risk Runoff

Status: Compliant and ongoing

Tulsa continued to use the Industrial & High Risk Runoff program to identify, monitor and control pollutants from municipal landfills; treatment, storage and disposal facilities for municipal waste; facilities subject to EPCRA (Emergency Planning and Community Right-to-know Act) Title III, Section 313 reporting requirements; and any other industrial or commercial discharge the City determined had the potential to contribute substantial pollutant loading to the City's storm sewer system. This program contains procedures for inspecting, monitoring and controlling pollution from the aforementioned sources. A database of industrial stormwater sources discharging to the City's storm sewer continues to be maintained.



During this reporting period, 461 industrial stormwater inspections were conducted. Two enforcement actions were taken against industries or facilities in order to eliminate illegal or illicit discharges. \$200 in fines was associated with these enforcement actions.

This program has also provided an opportunity to educate owners and operators of industrial or commercial facilities concerning stormwater quality regulations and requirements as per ordinances and regulations.

Part II(A)(9) Construction Site Runoff

Status: Compliant and ongoing

a.) Structural and non-structural best management practices

Through inspections and enforcement actions, Tulsa required construction sites to implement and maintain adequate structural and non-structural (BMPs) during this reporting period. The use and maintenance of structural and nonstructural best management practices (BMPs) to reduce pollutants discharged to the City's storm sewer from construction sites has been achieved through control measures provided in the Pollution Ordinance, Title 11-A, Chapter 3 (Watershed Development Regulations), Chapter 5 (Pollution Ordinance), Title 35 Infrastructure Development Process (IDP), and building permits.



During this reporting period Tulsa's Development Services section issued:

- 18 Watershed Development permits, which include Earth Change permits.
- 152 Stormwater Drainage permits
- 825 Stormwater Connection permits
- 246 Floodplain permits
- 14 Floodway permits

These permits require the operator to have adequate erosion control measures in place and maintained prior to, and throughout the duration of the project until final stabilization. Prior to receiving an Earth Change permit; applicants were required to submit an NOI and storm water pollution prevention plan for all sites disturbing at least one acre. Additionally, 19 Stormwater Pollution Prevention plans were reviewed to ensure the use and maintenance of structural and nonstructural erosion control BMPs at construction sites.

b.) Inspection and control of construction sites

Inspection and enforcement of control measures to reduce soil erosion at construction sites is shared between several City groups (Stormwater Management, Development Services and Engineering Services). Stormwater Management conducted a total of 1,978 construction site inspections for compliance with erosion control measures and issued 13 enforcement actions. The total amount of fines and penalties collected was \$550.

Development Services conducted 379 erosion control inspections at the same number of construction sites. Fourteen corrective actions were issued as a result of these inspections. If a site is in violation, the inspector contacts the builder and informs him/her of the actions which must be taken to come into compliance. If voluntary compliance is not achieved, the Stormwater Management Division conducts follow-up inspection to ensure compliance with the Pollution Ordinance. If the site is still non-compliant appropriate enforcement action is taken. Building permits were not issued for construction sites larger than one acre until a stormwater pollution prevention plan was in place.

Engineering Services Division conducted daily inspections on 105 city and 85 privately funded Infrastructure Development Process (IDP) projects. Implementation and continued compliance with the Pollution Ordinance was enforced. Appropriate structural and nonstructural erosion control measures were inspected during these site inspections. If the existing erosion control methods were inadequate, additional structural or nonstructural BMPs were required. Engineering Services has the authority to revoke Watershed Development Permits as a result of failure to implement and maintain adequate erosion control measures. None of these permits were revoked during this reporting period, but violations were reported to the contractors at weekly progress meetings. This resulted in corrective action leading to compliance.



c.) Education and training of construction site operators

The brochure "Construction Site Best Management Practices" was available to construction operators at the Permit Center. Construction operators normally must visit the Permit Center in order to obtain Watershed Development permits from the City of Tulsa, but during the pandemic, access to this resource was restricted though this brochure is still available on the City of Tulsa website. This brochure lists erosion and sediment controls that can be utilized at construction activities. This brochure was also available at other events (see Attachment B). Approximately 50 of these brochures distributed during this reporting period.

To assist local developers and builders with the use, installation and maintenance of erosion control measures, City of Tulsa representatives attended Builders Council as well as Developer Council meetings held at the Greater Tulsa Home Builders Association as

we are able. These meetings prior to the pandemic had been held monthly, but lately have been occurring with less frequency.

City inspectors conducting soil erosion control inspections at construction sites, informed construction site operators on aspects of use and maintenance of appropriate structural and nonstructural BMP's. Additionally, City of Tulsa supervisors answered questions regarding construction site OPDES requirements and erosion control requirements.

Although formal training was not conducted by Field Engineering, whenever a contractor was out of compliance, Field Engineering took the time to train contractors on the correct installation of erosion control measures.

City inspectors conducting soil erosion control inspections at construction sites, informed construction site operators on aspects of use and maintenance of appropriate structural and nonstructural BMPs. Additionally, City of Tulsa supervisors answered questions regarding construction site OPDES requirements and erosion control requirements.

Building permit applicants of all private developments were notified of their responsibility under the OPDES permitting program during the building permit application review process and during any pre-submittal meetings. Through the infrastructure development process (IDP), proposed developments were reviewed and applicants were notified of the OPDES erosion and sediment control requirements prior to issuing IDP project permits. The City of Tulsa offers pre-development meetings to those considering a new development within the City. These meetings are site specific and provide guidance on all requirements. Included in the discussion is the requirement for erosion control throughout the construction period and the permanent requirements to prevent stormwater pollution. In addition, the City explains storm water pollution requirements when we conduct presentations or training to the development and building communities.

d.) Building permit applicants notification

Building permit applicants of all private developments were notified of their responsibility under the OPDES permitting program during the building permit application review process and during any pre-submittal meetings. Through the infrastructure development process (IDP), proposed developments were reviewed, and applicants were notified of the OPDES erosion and sediment control requirements prior to issuing IDP project permits.

In addition, the City explains stormwater pollution including the use of Low Impact Development (LID) as an effective Best Management Practice. Utilizing the predevelopment meetings and the IDP process to open the discussion about implementing LID practices before any development has actually taken place makes successful implementation of practices more likely to occur. In addition, the City explains stormwater pollution requirements and the benefits of LID when conducting presentations or training to the development and building communities.

Developers and design engineers were provided the "OPDES General Permit for Stormwater Discharges from Construction Activities (OKR10)" information. Anyone obtaining an OPDES General Permit for Stormwater Discharges from Construction Activities (OKR10) submitted a stormwater pollution prevention plan along with an NOI, for review and approval prior to receiving an Earth Change permit. A stormwater pollution prevention plan checklist was utilized during the review process.

Part II(A)(10) Public Education

Status: Compliant and ongoing

The City of Tulsa Stormwater Quality group continues its robust public education efforts through the implementation of strong media campaigns. The Stormwater Quality group collaborated with Byers Creative to develop new animated commercials for social media and 60 second live action videos to help deliver stormwater quality public education messages. City Communication staff posted 79 messages to social with stormwater messages this period. Tulsa's Facebook page has 45,000 followers, Twitter 57,000



followers, and 38,000 followers on Instagram which allow these messages to reach quite a large audience. The animated commercials show how leaves and grass, pet waste, and household pollutants can make their way into the storm sewer system causing contamination. The 60 second videos expand upon this concept by further showing how the "Little Things" we do in our daily lives can have a negative impact on water quality. In addition to these new commercials, the Sgt. Red and Mingo commercials have been run as well during parts of this reporting period. The below table shows the number of views from the commercials, in addition to the number of radio and digital ad impressions.

Media	Impressions (# of views/listens)
KOTV Channel 6	3.8 Million Impressions
Spotify	420,000 Impressions
NPR	1.98 Million Impressions
OTT	385,704 Impressions
Channel 2	1.7 Million Impressions

The City of Tulsa maintains a TV channel for the broadcast of public meetings, events, and forums. This channel has been shown to be watched by roughly half of Tulsans or 85,446 households. During non-broadcast times, various videos including several Stormwater Quality videos are shown.

The City of Tulsa passes out tote bags, pens, pencils, rain gauges all with the City of Tulsa website printed on them, pet waste bags with City of Tulsa printed on them, temporary tattoos of Sgt. Red and Mingo, fishing poles with a sticker that has our SOS logo, website and phone number on it.

Tulsa and its educational partners continued to educate the public on the prevention of pollution at the source. To get the most from each educational opportunity, many public educational activities targeted multiple sources of non-point source pollution, including vehicle fluids, pesticides, herbicides, fertilizers and erosion control practices. A detailed description of the City of Tulsa's public education efforts can be found in Section 6(c).



The following groups participated in various public education events during this reporting period:

- City of Tulsa
 - Streets and Stormwater Department
 - Parks Department
 - Communications Department
- Tulsa County Conservation District (Blue Thumb Program)
- Metropolitan Environmental Trust (M.e.t.)

Education Activities Included:

- Displays at workshops and conferences
- Public presentations at conferences and seminars
- Presentations at local schools
- Presentations at homeowners' associations and neighborhood gatherings
- Creation and distribution of educational material (brochures, activity sheets, note pads, etc.) at a number of events
- Newspaper press releases and articles informing the public about environmental issues, including non-point source pollution
- Environmental awareness at numerous events
- Utility bill stuffer stormwater information sent to all citizens that purchase water and sewer as well as pay utility bills to the City of Tulsa

See Attachment B for a full list of Educational Activities.

During this reporting period, Tulsa continued to create and utilize existing brochures, pamphlets and handouts to meet and exceed all its public education requirements. A complete listing of this material can be found as Attachment A "Educational Material Distributed 2020-2021". Attachment B "Education Events 2020-2021" is a complete listing of all the public education events the Stormwater Quality group participated in during this reporting period. Both these attachments can be found in the appendix of Section 6.

Annual Report FY 2020-2021





The Tulsa County Blue Thumb Program continued its efforts to reduce non-point source pollution. The Tulsa County Conservation District (TCCD) is involved with this Clean Water Act Section 319 funded program, which utilizes citizen volunteers. Volunteers have contributed thousands of hours of work to the Blue Thumb program's activities. The program's goal is to make citizens of Tulsa aware of non-point source pollution and to encourage the adoption of practices that protect Tulsa's streams. This program has contributed greatly to the education of the public through the organization and training of citizen watershed monitoring groups and distribution of the "Blue Thumb Fish Prints". The Blue Thumb Program continues to collect data from area streams and uses this data to focus educational activities within the affected watersheds. This education involves informing local citizens on how to protect their streams against non-point source pollution. The TCCD continues to promote the Blue Thumb Program and encourage participation at public events, such as the Greater Tulsa Home and Garden Show and the Enviro Expo.

The Stormwater Quality group administers an electronic newsletter that is sent out quarterly to an estimated 2,000 email addresses. Through this newsletter recipients are educated on stormwater issues such as proper disposal of grass clippings, businesses that are practicing Best Management Practices are recognized and stormwater quality educational events are promoted. The public is also informed of ways they can help

improve and maintain stormwater quality, how they can contact the City of Tulsa for more information, request personnel to come speak at an event and how to report illicit discharges.

The Stormwater Quality group partners with the City of Tulsa's Working in Neighborhoods (WIN) department to further public education efforts. The WIN department has a weekly newsletter that goes out to approximately 470 neighborhood leaders and 28,500 citizens via the Nextdoor app. The Stormwater Quality group utilizes this newsletter to help spread the word about upcoming educational events and programs. Details of WIN newsletter announcements can be found in Appendix B.

a.) Public reporting of illicit discharges and improper disposal

Numerous publications that promote the public reporting of illicit discharges and improper disposal were created and distributed by the City of Tulsa. Regular distribution locations included Tulsa Parks, Recreation Centers, and libraries. Material was also distributed at events such at events though these were limited by the pandemic during the usually busy April/Earth Month period. The following is a partial list of publications distributed:

"Stormwater Quality Programs" is a general brochure highlighting the current stormwater quality programs in the City of Tulsa. Also provided in the brochure are ten solutions to stormwater pollution, including the reporting of illicit discharges, and lists a telephone number and instructions on how to do so. This number is promoted all educational material distributed through our stormwater quality programs.

"City of Tulsa – General Guide to Regulatory Floodplains" is a brochure designed to guide the public through floodplain requirements within the City of Tulsa. It provides a telephone number and encourages the public to report illegal discharges into the storm sewer.

"City of Tulsa Official Floodplain Notice" and "Flood Hazard Information About Your Property", are two brochures that were sent to approximately 15,000 residences last year who live in or near the floodplain, have the potential to experience flooding and what to do in case of flooding. It provides a contact telephone number and encourages the public to report illegal discharges into the storm sewer.

"City of Tulsa Floodplain Map Atlas" is a hardcopy atlas/book that shows the FEMA SFHAs and the City of Tulsa Regulatory Floodplains throughout the City. The atlas also provides flood hazard information as well as provides phone numbers for citizens to report blocked drains or illegal dumping.

"2020 Repetitive Loss Area Notice" is an annual publication that goes to all property owners who are near a repetitive loss property. A repetitive loss property is defined as a property that has filed one or more insurance claims for
flood losses in the past 10 years. This publication provides phone numbers for citizens to report blocked drains or illegal dumping.

During this reporting period, information was placed into four monthly utility bill stuffers August 2020, September 2020, January 2021 and March 2021 encouraging the public to report illegal discharges. These articles gave instructions on the proper procedures for reporting along with telephone numbers for the 311 Center, which is the primary method for reporting of citizen concerns. Additionally, the 311 Center has 'on hold' messages that deliver stormwater quality information to callers. Multiple message topics were conveyed to callers during this time period. In previous years, over 580,000 calls were made to the Customer Care Center.

Tulsa maintains a website, <u>www.cityoftulsa.org/sos</u> that has several links to tips that promote ways to reduce stormwater runoff pollution including the public reporting of illegal discharges to the storm sewer. The number of pageviews was unavailable during this time due to the ransomware attack. While conducting inspections, City of Tulsa personnel continued to direct citizens, business owners or operators to our website for more information about our programs.

Tulsa's Annual Creek Cleanup. co-sponsored by Tulsa County Conservation District (TCCD) occurred on 4/12 - 4/24, 2021. Volunteers removed litter from Sugar, Haikey, Fry Ditch, Vensel, Joe, Dirty Butter, Mingo, Brookhollow, Bird, Flat Rock, Mooser, and Crow Creek. Not only did this clean-up remove litter from these creeks, it also helped to bring attention to the importance of reducing litter discharges to urban streams and waterways.

As a result of public awareness of the reporting of illicit discharges and improper disposal, 232 investigations were conducted involving the identification and removal of 8 illicit discharges to the storm sewer during this reporting period.

b.) <u>Proper management and disposal of used motor vehicle fluids and household hazardous wastes</u>

Public education in the proper management and disposal of used motor vehicle fluids and household hazardous wastes was accomplished through various methods. These methods include the distribution of the following educational material:

"Motor Oil" is a brochure distributed during this reporting period that targeted the proper use, storage and disposal of motor oil.

"Stormwater Quality Programs" is a brochure given to the public detailing our stormwater quality programs. Included in the brochure is information on the adverse



effects of household chemicals on the environment as well as instructions on how to dispose of chemicals properly.

"City of Tulsa – General Guide to Regulatory Floodplains" is a brochure designed to guide the public through floodplain requirements within the City of Tulsa. It provides a telephone number and encourages the public to report illegal discharges into the storm sewer.

"City of Tulsa Official Floodplain Notice" and "Flood Hazard Information About Your Property", are two brochures that were sent to approximately 15,000 residences last year who live in or near the floodplain, have the potential to experience flooding and what to do in case of flooding. It provides a contact telephone number and encourages the public to report illegal discharges into the storm sewer.

On January 6, 2016, the City of Tulsa opened the new Household Pollutant Collection Facility at 4502 South Galveston Ave. The facility is open 2 days a week (Wednesdays and Saturdays) from 8:00 am till 4:30 pm. See Part II(A)(6)(d) for a summary of the pollutants collected this year. Education material is distributed at this Facility.

At most of the major events and outreach, the used motor vehicle fluid and household hazardous waste brochures were distributed. See attachments for specific info.

Currently, The M.e.t. has ten drop-off recycling depots with collection containers for used motor oil, cooking grease and batteries. Two of the ten locations have containers for antifreeze collections. The "Recycling Locations" map flier and the "Tulsa Area Recycling Directory" both provide locations to the depots. These handouts are given during speeches, booths and events. The website, <u>www.MetRecycle.com</u> promotes the events and depots. Also, the website RecycleThisTulsa.com works like an app on a phone and citizens can retrieve recycling information. Staff had interviews on local news television station before and during the special collection events. Fliers are distributed at booths, speeches and events throughout the year (see list below).

In regard to quantities of fliers distributed in FY 20/21 at events, educational booths or mailed to public:

The M.e.t. Recycling Locations: 2,000+

COT Household Pollutant Collection Facility: 2,000+

Tulsa Metro Area Recycling Directory: 2,500

Latex Paint and the Environment: 200 Focus on The Four (curbside recycling) – 500

COT Medication Flier – 100 Deep Green Clean: 15

The revised specifications for new storm sewer inlet hoods include the message "Dump No Waste, Drains to River". These specifications were accepted by the City of Tulsa and the new inlet hoods have been obtained. As a result, all new or repaired catch basins will now have the message permanently cast into the hood therefore not requiring a placard.

Public education was conducted at Tulsa Parks, Tulsa Public Schools, day camp, Gathering Place, and additional events involving approximately 1,274 children attended. Activities included videos, handouts, demonstrations and arts and craft. More details about this program can be found on Attachment C in the Appendix of Section 6.

c.) Proper use, application and disposal of pesticides, herbicides and fertilizers

The responsibility of educating the public on the proper use, application and disposal of pesticides, herbicides and fertilizers was accomplished through the distribution of educational material (brochures, bookmarks, notepads, stickers, etc.), public speaking engagements, and utility bill stuffers. The following section lists some of the materials and activities used to comply with this requirement. An extensive list along with the number of pamphlets distributed can be found in Appendix A and B of Section 6.

"Fertilizers" and "Pesticides" are two brochures which emphasize the proper application and disposal for the use of pesticides and fertilizers. It also lists alternatives to chemicals to control pests and fertilize lawns.

"Stormwater Quality Programs" is a brochure given to the public detailing our stormwater quality programs. Included in the brochure is information on the adverse effects of pesticides and fertilizers on the environment as well as instructions on how to dispose of them properly.

"Pollution Prevention Plan" is a Best Management Practice (BMP) created to guide citizens to do their part to keep our storm sewer clean. It addresses a number of pollutants including but not limited to fertilizers, herbicides and pesticides.

The Master Gardeners Program sponsored by Oklahoma State University - Tulsa Cooperative Extension Office maintains a telephone information service for the public regarding all aspects of gardening and landscaping, including the proper application and disposal of pesticides, herbicides and fertilizers. This service is offered five days a week, between 9 a.m. and 4 p.m. and has numerous brochures available to the public. See Part II (A) (5) "Pesticide, Herbicide and Fertilizer Application" for more information about this program. This program was publicized by Tulsa through the distribution of the "*Fertilizers*" brochure. OSU provided additional advertising through various means.

The City of Tulsa requires all City personnel, as well as all City contractors that apply pesticides and herbicides to be licensed and subject to all the regulations under the Oklahoma Pesticide Applicators Law, including re-certification. City personnel that apply pesticides, herbicides and fertilizers received annual in-house training on specific types of pesticides, herbicides and fertilizers that are applied. When available, employees

attended workshops, conferences and additional training on pesticides, herbicides and fertilizers application and disposal. The Tulsa Parks Department and Stormwater Management Division received training many times throughout the fiscal year.

Tulsa's website contains guidance for pesticide and fertilizers application for both commercial and residential applicators. This website is located at <u>www.cityoftulsa.org/sos</u> and is regularly promoted.

Part II(A)(11) Employee Education

Status: Compliant and ongoing

Presentations were made to personnel from Engineering Services, Development Services, Street Maintenance, Parks Dept., and Stormwater Management on their responsibilities at facilities and job sites.



Employees in the Streets and Stormwater Department are eligible for promotional advancement upon completion of a "Stormwater Operator Certification" program conducted by the Stormwater Management group. This two day- sixteen hour course covers topics such as stormwater history in Tulsa, maintenance responsibilities, and Low Impact Development. It includes both classroom and field work and attendees are required to pass a test for certification. To date 230 employees have been certified. During this FY, 10 employees attended the training.

All City of Tulsa contractors as well as all employees that are required to apply pesticides, herbicides and fertilizers are required to be licensed under the Oklahoma Pesticide Applicators Law. In-house training regarding the application of various chemicals was conducted for city applicators during this reporting period. See Part II (A) (5) Pesticide, Herbicide, and Fertilizer Application.

City contractors responsible for herbicide, pesticide and fertilizer application, as well as landscape specialists and other lawn care providers were specifically educated on the proper use of chemicals, disposal thereof and spill prevention procedures. The City of Tulsa requires all contract applicators to be licensed under the Oklahoma Combined Pesticide Law and Rules (Title 2 of the Oklahoma Statues). This license requires each applicator to properly apply, dispose and address spills in an environmentally friendly manner.

Part II(A)(12) Monitoring Programs

Status: Compliant and ongoing

a.) Dry weather field screening program

The dry weather field screening program continued during this reporting period. The details of this program are previously mentioned in Part II (A) (6) (e).

b.) Watershed characterization program

See Section 4

c.) Industrial and high risk runoff

The following table is a list of facilities classified under the SWMP as "Industrial and High Risk Runoff". This designation requires them to conduct self monitoring of their stormwater runoff. A summary of the number of industries that conducted monitoring during the permit life are as follows:

I&HRR Facility Categories	# of facilities identified	# conducting monitoring
Municipal landfills	1	0
Other treatment, storage and disposal facilities of municipal waste (e.g. transfer stations, incinerators, etc.)	6	0
Hazardous waste treatment, storage, disposal and recovery facilities	2	0
Facilities that are subject to EPCRA Title III, Section 313	46	0
Industrial or commercial discharges the permittee determines are contributing a substantial pollutant loading to the MS4.	5	1

Letters informing industries of their responsibility to conduct monitoring were sent out at the end of FY 13-14. All monitoring results were required to be submitted to the Stormwater Management Division within one year. All monitoring results were reviewed and placed in the industry's activity file. Additional information regarding this program can be found at Part II (A) (8) Industrial & High Risk Runoff.

Legal Authority

The City of Tulsa utilizes several Ordinances to ensure compliance with OPDES Permit #OKS000201. The following is a list of the most commonly used Ordinances accompanied by a brief description.

Title 11-A Chapter 3 (Watershed Development Regulations) – This Ordinance allows for the regulation of the methods for handling and disposing of stormwater run-off; the development, excavation, grading, regrading, paving, land filling, berming and diking of land; allows for the regulation of development within flood plains in order to assure that development is not dangerous to health, safety or property due to stormwater run-off; and allows for the regulation of the connection to and use of the stormwater drainage system. Through this Ordinance, Tulsa permits construction activities that are one acre or greater.

Title 11-A, Chapter 5 (Pollution) – This Ordinance was adopted in November of 1995 in order to give Tulsa the legal authority needed to comply with all of the municipal separate storm sewer system discharge permit requirements that were not covered by existing Ordinances. It prohibits illicit discharges to the storm sewer; allows for the control and monitoring of stormwater runoff; provides Tulsa with the legal means to inspect and investigate potential sources of pollution to the storm sewer; and contains judicial enforcement remedies. This Ordinance was revised during 2006-2007 reporting period to include provision for recovery of cost incurred by Tulsa against violators of this Ordinance. Maximum amount of fines per violation per day is \$1,000.00.

Title 11-C, Chapter 12 (Requirements For Industrial Users To Discharge To The Sanitary Sewer Systems) – This Ordinance provides general sewer use requirements; allows for wastewater discharge permit issuance and inspection of all industries that discharge to the sanitary sewer; prohibit the inflow of stormwater into the sanitary sewer system; and contains judicial enforcement remedies.

Title 24, Chapters 1 and 2 (Nuisances) - These Ordinances provides for abatement of nuisances, including litter, industrial wastes, sewage, etc. from any area lake, basin, public park, alley, highway or street through enforcement actions including total cost recovery to the City of Tulsa from the any person, firm corporation, partnership, or other legal entity who commits or who permits the creation or continuation of a nuisance.

Title 42, Chapter 11 (Planned Unit Development) – This ordinance encourages innovative land development while maintaining appropriate limitation on the character and intensity of use and assuring compatibility with adjoining and proximate properties. It also promotes greater flexibility within the development to best utilize the unique physical features of a particular site. Creative land use design and open space preservation are also promoted in this Ordinance. Further, the final purpose of this Ordinance is to achieve a continuity of function and design within the development.

Section 2 – Proposed Changes to the Stormwater Management Program

Section 2

Proposed Changes to the Stormwater Management Program

The City of Tulsa is currently in the process of negotiating a renewal of Permit OKS000201. The permit changes the City of Tulsa is recommending are aimed to improve the performance of the Stormwater Management Program. Any changes made in the requirements of the permit during the negotiation process will be incorporated into the SWMP within 6 months of effective date of the final permit. This requirement is in accordance with Tulsa's MS4 Permit OKS000201 Part III(A)(1).

Section 3 – Revisions to Assessments of Controls and Fiscal Analysis

Section 3

Revisions, if necessary, to the assessment of controls and the fiscal analysis reported in the permit application under OAC 252.606-1-3(b)(3)(L) adopting and incorporating by reference 40 CFR 122.26(d)(2)(iv) and (d)(2)(v)

No revisions to the "Controls" have been made during this reporting period.

Section 4 – Summary of the Data

Section 4

A Summary of the Data/Monitoring Data Accumulated Throughout the Reporting Year

To comply with the permit, individual programs were created or adopted and then implemented. Implementation resulted in the creation of databases that track dry weather field screening and floatables monitoring. Data was collected during this reporting period, reviewed for accuracy and completeness and then entered into specific databases. Each program is explained in the following paragraphs along with associated data.

Dry Weather Field Screening

Dry weather field screening was continued during this reporting period in an ongoing effort to detect the presence of illicit connections and improper disposal. One hundred thirteen outfalls were screened, covering approximately 22,358 acres (36.04 square miles). Of the 192 outfalls screened, 53 contained dry weather flow. Once dry weather flow was located, the flow was sampled and tested for pH, temperature, appearance, conductivity, detergents, chlorine, copper, ammonia and fluoride. If contaminants were identified in concentrations above action levels, then dry weather flow follow-up activities were implemented. Dry weather flow follow-up procedures continued until the source was identified. When an illicit discharge was identified, it was eliminated. Specific numbers for this reporting period are as follows:

Total # of outfalls screened	192
Total area screened	22,358 acres
i otar ar ca screened	36.04 sq. mi.
# of outfalls that did not require follow-up (without flow)	139
# of outfalls with dry weather flows not requiring follow-up	42
(flows present but pollutant concentration below action	
levels)	
# of outfalls requiring dry weather flow follow-up	11
(flow with concentrations of pollutants above the action	
levels)	

Floatable Monitoring Summary

Data was obtained from five floatable monitoring locations Inspections were performed after rainfall events (> 0.1 in.) during this reporting period. If floatables were present during an inspection, they were collected and data was gathered

Section 4 – Summary of the Data

regarding the quantity in cubic yards and make-up in percent (organic and inorganic). A summary of the data is as follows:

Floatables Monitoring Summary Station: Sheridan Park,10400 South 67th East Avenue

Date	Floatables	Collection	%	%
	Present	(Cubic Yards)	Organic	Inorganic
7/7/2020	yes	0.5	90%	10%
7/14/2020	yes	2	100%	0%
7/28/2020	yes	2	90%	10%
7/30/2020*				
8/12/2020	yes	1	100%	0%
8/13/2020	yes	0.5	100%	0%
8/28/2020	yes	0.5	100%	0%
9/1/2020	no	0		
9/2/2020	no	0		
9/9/2020	yes	1	80%	20%
9/22/2020	no	0		
10/27/2020	yes	0.5	100%	0%
10/29/2020	no	0		
11/13/2020	yes	0.5	90%	10%
11/19/2020	yes	0.25	100%	0%
11/22/2020	yes	1	80%	20%
11/25/2020	yes	0.5	100%	0%
12/2/2020	yes	1	100%	0%
12/17/2020	no	0		
12/22/2020	yes	0.5	100%	0%
12/30/2020	yes	0.25	100%	0%
1/5/2021	yes	1	90%	10%
1/25/2021*	yes		100%	0%
2/2/2021	yes	0.25	100%	0%
3/11/2021	no	0		
3/16/2021	yes	0.5	80%	20%
3/18/2021	no	0		
3/23/2021	yes	0.25	100%	0%
3/25/2021	no	0		
4/20/2021	yes	0.25	100%	0%
4/27/2021	yes	0.5	100%	0%
4/29/2021	yes	0.75	100%	0%
5/4/2021	yes	0.25	90%	10%
5/12/2021	yes	0.25	50%	50%
5/18/2021	no	0		
5/20/2021	no	0		
5/25/2021	yes	0.1	100%	0%
5/28/2021	yes	0.25	90%	10%
6/3/2021	no	0		
6/8/2021	yes	0.25	90%	10%
6/22/2021	yes	0.75	50%	50%
6/30/2021	yes	0.5	80%	20%
		47.05		
		17.85	0.20/	00/
Average Floatable Makeup (%)			92%	۵%

* Needs Machine

Section 4 -Summary of the Data

Floatables Monitoring Summary Station: Osage Detention, 1101 West Pine Street

Date	Floatables	Collection (Cubic Vards)	% Organic	%
7/7/20	Fiesen		100%	
7/1//20	yes	2	60%	40%
7/28/2020	yes	0.5		40%
7/20/2020	yes	0.5	70%	20%
8/12/2020	yes	0.5	70%	30%
8/12/2020	yes	1 25	00%	20%
8/13/2020	yes	1.23	90%	10%
0/20/2020	110	0	F 00/	F.00/
9/1/2020	yes	1	50%	50%
9/2/2020	110	0		
9/9/2020	no	0		
9/22/2020	no	0	500/	50%
10/2//2020	yes	0.2	50%	50%
10/29/2020	yes	0.25	80%	20%
11/13/2020	yes	0.5	50%	50%
11/19/2020	no	0		
11/22/2020	no	0		
11/25/2020	yes	1	70%	30%
12/3/2020	yes	0.25	90%	10%
12/15/2020	yes	0.5	100%	0%
12/22/2020	yes	0.25	90%	10%
12/30/2020	yes	0.25	90%	10%
1/5/2021	yes	5	90%	10%
1/25/2021	no	0		
2/2/2021	no	0		
3/11/2021	no	0		
3/16/2021	no	0		
3/18/2021	yes	5	90%	10%
3/23/2021	yes	0.2	50%	50%
3/25/2021	yes	0.1	100%	0%
4/20/2021	yes	0.1	50%	50%
4/27/2021	yes	0.5	80%	20%
4/29/2021	no	0		
5/4/2021	no	0		
5/12/2021	yes	0.25	100%	0%
5/18/2021	yes	0.25	100%	0%
5/20/2021	yes	0.25	90%	10%
5/25/2021	yes	0.5	80%	20%
5/28/2021	no	0		
6/1/2021	no	0		
6/3/2021	no	0		
6/8/2021	yes	5 50% 5		50%
6/22/2021	yes	0.75	70%	30%
6/29/2021	· ·	underwater		
Total Cubic Yards		28.	1	
Average Floatable Mak	eup (%)		79%	21%

Section 4 -Summary of the Data

Floatables Monitoring Summary Station: Vensel Creek 11100 S. Yale Ave.

Date	Floatables	Collection	% Organia	%
7/7/20	VAS		90%	10%
7/14/20	yes ves	0.5	100%	0%
7/28/2020	yes	2.5	80%	20%
8/12/2020	yes	1.5	100%	0%
8/13/2020*	yes no	1.5	100/0	070
8/28/2020	Ves	1	100%	0%
9/1/2020	yes no	0	100/0	070
9/2/2020	no	0		
9/9/2020	Ves	15	90%	10%
9/22/2020	yes	0	50%	1070
10/27/2020*	no	0		
10/29/2020	Ves	0	90%	10%
11/13/2020	yes	4	90%	10%
11/19/2020	yes	0.25	100%	0%
11/22/2020	yes	0.5	100%	0%
11/25/2020	yes	0.5	100%	0%
12/2/2020	yes	3	100%	0%
12/22/2020	yes	1	80%	20%
12/22/2020	no	1	00%	2070
1/5/2021	Ves	2	100%	0%
1/25/2021*	yes	2	100%	0%
2/2/2021	yes	0.25	100%	0%
3/11/2021	yes	0.5	100%	0%
3/16/2021	yes	1	100%	0%
3/18/2021	yes	0.25	80%	20%
3/23/2021	yes	1	90%	10%
3/25/2021	yes	1	90%	10%
4/20/2021	yes	1	80%	20%
4/27/2021	yes	1.5	100%	0%
4/29/2021	yes	1	80%	20%
5/4/2021	yes	0.5	100%	0%
5/12/2021	yes	0.5	90%	10%
5/18/2021	no	0	50/0	20/0
5/20/2021	Ves	0.1	90%	10%
5/25/2021	no	0	5070	20/0
5/28/2021	Ves	0.25	100%	0%
6/3/2021	yes	0.25	100%	0%
6/8/2021	yes	0.25	90%	10%
6/22/2021	yes	0.25	100%	0%
6/29/2021	yes	1	100%	0%
0/20/2021	yes	-	100/0	0/0
				L
Total Cubic Yards		29.1		
Average Floatable Makeup (%)			94%	6%

* Underwater

Section 4 -Summary of the Data

Floatables Monitoring Summary Station: Reed Park 4200 S. Union Ave.

Date	Floatables	Collection	%	%
	Present	(Cubic Yards)	Organic	Inorganic
7/7/20	yes	1	100%	0%
7/14/20	no	0		
7/28/2020	yes	0.25	90%	10%
7/30/2020	no	0		
8/12/2020	no	0		
8/13/2020	no	0		
8/28/2020	no	0		
9/1/2020	no	0		
9/2/2020	no	0		
9/9/2020	no	0		
9/22/2020	no	0		
10/27/2020	no	0		
10/29/2020	no	0		
11/13/2020	no	0		
11/19/2020	yes	0.25	100%	0%
11/22/2020	no	0		
11/25/2020	no	0		
12/3/2020	no	0		
12/15/2020	no	0		
12/22/2020	yes	0.25	90%	10%
12/30/2020	yes	0.25	100%	0%
1/5/2021	no	0		
1/25/2020	no	0		
2/2/2021	yes	0.25	100%	0%
3/11/2021	yes	0.5	100%	0%
3/18/2021	no	0		
3/23/2021	no	0		
4/20/2021	no	0		
4/27/2021	no	0		
4/29/2021	no	0		
5/4/2021	no	0		
5/12/2021	yes	0.25	100%	0%
5/18/2021	no	0		
5/20/2021	no	0		
5/25/2021	no	0		
5/28/2021	no	0		
6/1/2021	no	0		
6/3/2021	no	0		
6/8/2021	no	0		
6/22/2021	no	0		
6/29/2021	no	0		
Total Cubic Yards		3		
Average Floatable Makeup (%)			98%	3%

Section 4 – Summary of the Data

Floatables Monitoring Summary Station: 4800 W. 8th St.

Date	Floatables Present	Collection (Cubic Yards)	% Organic	% Inorganic
7/7/2020	yes	0.75	100%	0%
07/28/200	yes	0.75	80%	20%
7/30/2020	no	0		
8/12/2020	no	0		
8/13/2020	yes	1.5	80%	20%
8/28/2020	yes	1	80%	20%
9/1/2020	yes	1	50%	50%
9/2/2020	no	0		
9/9/2020	yes	0.1	50%	50%
9/22/2020	yes	0.1	80%	20%
10/27/2020	yes	0.1	50%	50%
10/29/2020	yes	0.5	90%	10%
11/13/2020	yes	0.5	50%	50%
11/19/2020	no	0		
11/22/2020	no	0		
11/25/2020	yes	0.5	80%	20%
12/3/2020	yes	0.5	80%	20%
12/15/2020	yes	0.5	80%	20%
12/22/2020	yes	0.25	100%	0%
12/30/2020	yes	0.25	100%	0%
1/5/2021	yes	0.2	50%	50%
1/25/2021	yes	0.1	50%	50%
2/2/2021	yes	0.25	100%	0%
3/11/2021	yes	0.25	80%	20%
3/16/2021	yes	0.5	50%	50%
3/18/2021	yes	0.5	50%	50%
3/23/2021	yes	0.1	50%	50%
3/25/2021	yes	0.1	50%	50%
4/20/2021	yes	0.2	50%	50%
4/27/2021	yes	0.5	70%	30%
4/29/2021	yes	0.25	90%	10%
5/4/2021	yes	0.25	70%	30%
5/12/2021	yes	0.25	100%	0%
5/18/2021	yes	0.25	80%	20%
5/20/2021	yes	0.25	80%	20%
5/25/2021	no	0		
5/28/2021	yes	0.25	100%	0%
6/1/2021	no	0		
6/3/2021	no	0		
6/8/2021	yes	2	50%	50%
6/22/2021	yes	0.5	90%	10%
6/29/2021	yes	2	80%	20%
Total Cubic Yards		17		
Average Floatable Make Up (%)		73%	27%

Annual Report FY 2020-2021

Section 4 – Summary of the Data

Watershed Characterization - Stream Monitoring Reports





CITY OF TULSA WATERSHED CHARACTERIZATION PROGRAM

Comprehensive Watershed Characterization Assessment Year 5 (2020-2021):

City of Tulsa Streets and Stormwater Stormwater Management Division 4502 South Galveston Tulsa, OK 74107

Prepared by

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Table of Contents

	Page
1.0 INTRODUCTION	1
1.1 Objective	
2.0 BENEFICIAL USES	4
2.1 Agriculture	
2.1.1 Total Dissolved Solids	4
2.2 Fish and Wildlife Propagation	5
2.2.1 Dissolved Oxygen	5
2.2.2 Toxicants and Metals	5
2.2.3 pH (Hydrogen Ion Activity)	6
2.2.4 Oil and Grease	6
2.2.5 Suspended and Bedded Sediments	7
2.2.5.1 Turbidity	7
2.2.5.2 Habitat Assessment	7
2.2.6 Biological	7
2.2.6.1 Fish Collections	7
2.2.6.2 Benthic Macroinvertebrates	8
2.3 Primary Body Contact.	9
2.4 Anti-Degradation Policy	
2.4.1 Nutrients	
3.0 SUMMARY	
4.0 REFERENCES	23

Table of Figures

Figure 1 - City of Tulsa watershed	map	3
------------------------------------	-----	---

List of Tables

Table 1 – Sampling sites and locations	.2
Table 2 – Total Dissolved Solids standards	4
Table 3 – Dissolved Oxygen standards	.5
Table 4 – pH standards	.6
Table 5 – Turbidity standards	.7
Table 6 – Fish IBI scores	.7
Table 7 - Benthic macroinvertebrate metrics for summer and winter index periods	. 8
Table 8 – E. coli totals	.9
Table 9 – Enterococcus totals	9
Table 10 – Nutrient totals	.10
Table 11 - Complete analytical sampling results for all parameters for Coal Creek Upstream	.11
Table 12 – Complete analytical sampling results for bacteria samples for Coal Creek	
Upstream	. 11
Table 13 – Complete analytical sampling results for all parameters for Coal Creek	
Downstream	. 12
Table 14 – Complete analytical sampling results for all bacteria samples for Coal Creek	
Downstream	. 12
Table 15 - Complete analytical sampling results for all parameters for Crow Creek Upstream	.13
Table 16 – Complete analytical sampling results for bacteria samples for Crow Creek	
Upstream	.13

Table 17 – Complete analytical sampling results for all parameters for Crow Creek	1.4
Downstream	14
Downstream	14
Table 19 – Complete analytical sampling results for all parameters for Fry Ditch Creek	. 17
	15
Table 20 – Complete analytical sampling results for bacteria samples for Fry Ditch Creek Upstream	15
Table 21 – Complete analytical sampling results for all parameters for Fry Ditch Creek Downstream	16
Table 22 – Complete analytical sampling results for bacteria samples for Fry Ditch Creek	. 10
Downstream	16
Table 23 – Complete analytical sampling results for all parameters for Sugar Creek Upstream	. 17
Table 24 – Complete analytical sampling results for bacteria samples for Sugar Creek Upstream	17
Table 25 – Complete analytical sampling results for all parameters for Sugar Creek	
Downstream	18
Table 26 – Complete analytical sampling results for bacteria samples for Sugar Creek Downstream.	18
Table 27 – Complete analytical sampling results for all parameters for Tupelo Creek North	19
Table 28 – Complete analytical sampling results for bacteria samples for Tupelo Creek North	
Fork	19
Table 29 – Complete analytical sampling results for all parameters for Tupelo Creek South	20
FOIK	20
Fork	20
Table 31 – Complete analytical sampling results for all parameters for Upper Mill Creek	20
Upstream	21
Table 32 – Complete analytical sampling results for bacteria samples for Upper Mill Creek Upstream	21
Table 33 – Complete analytical sampling results for all parameters for Upper Mill Creek	
Downstream.	22
Table 34 – Complete analytical sampling results for bacteria samples for Upper Mill Creek	
Downstream	22

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1.0 INTRODUCTION

1.1 Objective

The purpose of this document is to serve as a comprehensive report of results from the biological, habitat, and analytical assessments of Coal Creek, Crow Creek, Fry Ditch Creek, Sugar Creek, Tupelo Creek, and Upper Mill Creek. These assessments were performed in order to comply with requirements set forth in Part II(A)(13)(12)(b) and (13)(a) and (b) and Part IV(A)(1) and (2) of Oklahoma Pollutant Discharge Elimination System (OPDES) municipal stormwater (MS4) Permit No. OKS000201 for the City of Tulsa, Oklahoma (ODEQ, OPDES Permit OKS000201, 2011). In addition, assessment results are applied to Oklahoma Water Quality Standards. These standards are described in both (OWRB, 2020a) and (OWRB, 2020b). While these implementations describe a multitude of surface water quality standards, this document will compare and describe only the standards applicable to the parameters required in the Watershed Characterization Program sub section of the Municipal Separate Storm Sewer System permit (ODEQ, OPDES Permit OKS000201, 2011). All remaining parameter results without applicable water quality standards will still be included in this report.

The data presented in this comprehensive report was collected over a one-year period beginning in July of 2020 with completion in June of 2021 except for benthic macroinvertebrate data which requires a minimum of four sampling events within a two-year period. Field collection and assessment methodology followed project standard operating procedures (SOPs) as provided in the quality assurance project plans (QAPPs) for the biological component (CCRC & FTN, 2014) and the analytical component (CCRC & FTN, 2014). These QAPPs provide quality assurance and quality control procedures for all aspects of the watershed characterization program. They were submitted to and received approval from the Oklahoma Department of Environmental Quality as per MS4 permit requirements. All field data sheets were scanned electronically and archived at the City of Tulsa Stormwater Management Division. All field measurements (in situ measurements, flows, observations), biological information (taxonomic identification, organism counts), and analytical results were compiled in Excel spreadsheets and verified (data entry, formula calculations) per project QA/QC procedures (CCRC & FTN, 2014) (CCRC & FTN, 2014). All raw data, SOPs, and QAPPs are available upon request.

The year 5 streams of the watershed characterization program were chosen in anticipation of upcoming bacteria TMDL implementation. Of the 30 streams completed in years one through four, six were chosen based upon E. coli WQS exceedances. In addition, streams with a high frequency of monthly no flows and streams with small watershed sizes within the jurisdiction of the City of Tulsa were excluded. This protocol was followed for the selection of Upper Mill Creek, Tupelo Creek, Sugar Creek, Fry Ditch Creek, Coal Creek. Crow Creek was chosen over Vensel Creek to compliment a Watershed Based Plan being developed by the Oklahoma Conservation Commission.

Each of the six streams were analytically sampled at two sites on the same day, to further scrutinize the watershed to identify potential sources. These sites were chosen attempting to evenly split the

1

collection areas while still allowing accessibility and safety for the sampling technician. Biological sampling, with the exception of benthic macroinvertebrates, was performed only at the most downstream sample site, as time and resources were a limiting factor. Also, many of the upstream sites did not have sufficient biologically viable locations to collect effective or useful data.

Waterbody	<u>WBID</u>	<u>Latitude</u>	<u>Longitude</u>	<u>Watershed</u> <u>Area (mi²)</u>	Ecoregion
Coal Creek Upstream	OK121300010090_00	36.177258	-95.914675	8.23	Central Irregular Plains
Coal Creek . Downstream	OK121300010090_00	36.205972	-95.913403	8.23	Central Irregular Plains
Crow Creek Upstream	OK120420010090_00	36.125863	-95.926904	2.51	Central Irregular Plains
Crow Creek Downstream	OK120420010090_00	36.116401	-95.981791	2.51	Central Irregular Plains
Fry Ditch Creek Upstream	OK120420010025_00	36.021181	-95.892811	3.43	Central Irregular Plains
Fry Ditch Creek Downstream	OK120420010025_00	36.012477	-95.893871	3.43	Central Irregular Plains
Sugar Creek Upstream	OK121300 Not Listed	36.105872	-95.847554	1.92	Central Irregular Plains
Sugar Creek Downstream	OK121300 Not Listed	36.108241	-95.858272	1.92	Central Irregular Plains
Tupelo Creek North Fork	OK121300 Not Listed	36.149819	-95.852354	2.27	Central Irregular Plains
Tupelo Creek South Fork	OK121300 Not Listed	36.147054	-95.851559	2.27	Central Irregular Plains
Upper Mill Creek Upstream	OK121300010050_00	36.144466	-95.909017	4.85	Central Irregular Plains
Upper Mill Creek Downstream	OK121300010050_00	36.149339	-95.888005	4.85	Central Irregular Plains

Table 1 - Sampling sites and locations

2



Figure 1 - City of Tulsa watershed map

2.0 BENEFICIAL USES

2.1 Agriculture

2.1.1 <u>Total Dissolved Solids</u> - Data collected on Total Dissolved Solids for the following streams indicate a few impairments of the agricultural beneficial use. Water quality standards require ten samples. The number of samples collected exceeds the number of samples required by water quality standards. If the sample mean is less than the yearly mean standard, and not more than 10% of samples exceed the sample standard, then the beneficial use is supported. The creeks impaired did not meet water quality standards both upstream and downstream.

Waterbody	Sample Mean (mg/L)	<u>Single Sample</u> (mg/L)	<u>Water Quality Standard</u> (mg/L)
Crow Upstream	378	610	
Crow Downstream	285	360	Samples 1969 Vearly 1406
Fry Ditch Upstream	383	970	Sample: 1868, rearry: 1496
Fry Ditch Downstream	378	580	
Coal Upstream	538	1500	
Coal Downstream	418	530	
Sugar Upstream	347	480	
Sugar Downstream	343	460	Sample: 170 Vearly: 297
Tupelo North Fork	497	620	Sample: 470, fearly: 387
Tupelo South Fork	407	500	
Upper Mill Upstream	799	1000	
Upper Mill Downstream	613	770	

 Table 2 – Total Dissolved Solids standards

2.2 Fish and Wildlife Propagation: Warm Water Aquatic Community

2.2.1 <u>Dissolved Oxygen</u> - Data collected on Dissolved Oxygen concentrations show that the beneficial use is not supported for several of the streams. Water quality standards require ten samples. The number of samples collected exceeds the number of samples required. The WWAC subcategory of the Fish and Wildlife Propagation beneficial use designated for a stream shall be deemed to be fully supported with respect to the DO criterion if 10% or less of the samples from the stream are less than 6.0 mg/L from April 1 through June 15 and less than 5.0 mg/L during the remainder of the year. Streams marked with an asterisk have no flow or very little flow which may result in low dissolved oxygen at one sampling site but not the other. The sites that did not meet water quality standards had very little to no flow compared to the other sampling site.

Waterbody	Sample Mean (mg/L)	<u>% of samples in</u> <u>exceedance</u>	Water Quality Standard (mg/L)			
Coal Upstream	7.92	8.3%				
Coal Downstream*	7.73	16.7%				
Crow Upstream	7.69	8.3%				
Crow Downstream	7.78	8.3%				
Fry Ditch Upstream	7.66	33.3%				
Fry Ditch Downstream	7.50	33.3%	April 1 – June 15: 6.0			
Sugar Upstream*	7.99	25.0%	June 16 – March 30: 5.0			
Sugar Downstream	8.00	8.3%				
Tupelo North Fork*	7.50	33.3%				
Tupelo South Fork	8.07	0%				
Upper Mill Upstream	8.04	0%				
Upper Mill Downstream	8.06	8.3%				

Table 3 - Dissolved Oxygen standards

2.2.2 <u>Toxicants/Metals</u> - None of the creeks were impaired for toxicants and metals previously, and sampling requirements have already been met for this permit cycle.

5

2.2.3 <u>pH (Hydrogen Ion Activity)</u> - Data collected on pH readings show full support of the beneficial use for all streams. Water quality standards require ten samples. The number of pH measurements taken exceeds the number of required measurements. All pH measurements fell within the standard range. Water quality standards are met if no more than 10% of samples are outside the standard range: 6.5 - 9.0 s.u.

Waterbody	Sample Range (s.u)	Water Quality Standard Range (s.u)
Coal Upstream	7.2 – 8.5	
Coal Downstream	7.1 - 8.3	
Crow Upstream	7.5 – 7.8	
Crow Downstream	7.5 – 8.1	
Fry Ditch Upstream	Fry Ditch Upstream7.3 – 7.8	
Fry Ditch Downstream	7.2 – 7.8	
Sugar Upstream	6.8 - 8.4	6.5 – 9.0
Sugar Downstream	7.6 - 8.4	
Tupelo North Fork	7.3 – 8.0	
Tupelo South Fork	7.5 – 8.5	
Upper Mill Upstream	7.7 – 8.5	
Upper Mill Downstream	7.7 – 8.2	

Table 4 – pH standards

2.2.4 <u>Oil and Grease</u> - Oil and Grease is based on visual assessment. No more than 10% of observations can show the occurrence of an oily sheen or oil/grease deposits. Visual observations do not indicate the presence of Oil and Grease pollution, supporting the beneficial use in all streams.

2.2.5 <u>Suspended and Bedded Sediments</u> - Using habitat assessment data to determine support of the beneficial use is conditional upon the support of turbidity data and fish collection data.

2.2.5.1 <u>Turbidity</u> – Data collected on Turbidity readings show full support of the beneficial use. Water quality standards are met when no more than 10% of samples exceed the sample standard. The number of samples collected exceeds the number of samples required.

Waterbody	Sample Mean (NTU)	<u>% of samples in</u> <u>exceedance</u>	Water Quality Standard (NTU)			
Coal Upstream	9.04	8.3%				
Coal Downstream	7.12	0%				
Crow Upstream	3.70	0%				
Crow Downstream	5.48	0%				
Fry Ditch Upstream	6.69	0%				
Fry Ditch Downstream	4.80	0%	50			
Sugar Upstream	4.48	0%	50			
Sugar Downstream	5.87	0%				
Tupelo North Fork	2.81	0%				
Tupelo South Fork	2.45	0%				
Upper Mill Upstream	2.94	0%				
Upper Mill Downstream	8.32	0%				

Table 5 – Turbidity standards

2.2.5.2 <u>Habitat Assessment</u> - All the creeks had passing habitat scores when sampled last and the habitats were not reassessed this sampling year.

2.2.6 Biological

2.2.6.1 <u>Fish Collections</u> – Below is the data recorded from fish collections performed on the streams. With the focus of this year's sampling on creeks that were severely impaired for bacteria, many upstream analytical sample sites were not viable for a fish collection. Fish collection requirements have already been met for this permit cycle but were performed at the downstream locations simply to compare fish collections scores to previous collections.

Waterbody	aterbody <u>Sample</u> <u>Composition</u>		Total Score	<u>Score Key</u>			
Coal Creek	18	13	31				
Crow Creek	18	9	27	30+ Beneficial Use			
Fry Ditch Creek	14	11	25	Supported; 23 – 29			
Sugar Creek	10	11	21				
Tupelo Creek	6	11	17	<22 Impaired			
Upper Mill Creek	8	11	19				

Table 6 - Fish IBI scores

2.2.6.2 <u>Benthic Macroinvertebrate Collections</u> – Below is the data recorded from benthic macroinvertebrate collections during the summer and winter index periods (ODEQ, Continuing Planning Process, 2012). A few of the creeks had varied scores and no conclusions could be made whether macros thrived upstream or downstream. Fry Ditch Creek had slightly better scores at the downstream location. Sugar Creek's downstream location proved to be considerably better than the

Waterbody	Summer 2020 Score	Winter 2021 Score
Coal Upstream	45%	30%
Coal Downstream	65%	44%
Crow Upstream	52%	52%
Crow Downstream	32%	67%
Fry Ditch Upstream	58%	52%
Fry Ditch Downstream	65%	67%
Sugar Upstream	58%	37%
Sugar Downstream	90%	67%
Tupelo North Fork	45%	44%
Tupelo South Fork	58%	52%
Upper Mill Upstream	45%	22%
Upper Mill Downstream	39%	37%
>80% Attaining	: 80 – 50% Undetermined : <50% No	t Attaining

upstream sample site. Upper Mill Creek had poor scores at both the upstream and downstream locations.

Table 7 – Benthic macroinvertebrate metrics for summer and winter index periods

2.3 Primary Body Contact – Below is the data collected on *E. coli* and *Enterococcus* concentrations. Water quality standards require 10 samples. The number of samples collected exceeds the number of samples required. The monitoring period to support this beneficial use is May 1 through Sept 30. Water quality standards are met when the geometric mean does not exceed the standard. All streams exceeded water quality standards in the recreational period for both *E. coli* and *Enterococcus* regardless of sampling location.

<u>Waterbody</u>	<u>E. coli Recreation</u> Sample Geometric Mean (MPN/100mL)	<u>E. coli Non-</u> recreation <u>Sample</u> <u>Geometric Mean</u> (MPN/100mL)	<u>Single Sample</u> (MPN/100mL)	<u>Water Quality</u> <u>Standard</u> (MPN/100mL)
Coal Upstream	1449	339	8620	
Coal Downstream	771	115	41100	
Crow Upstream	1384	232	4350	
Crow Downstream	897	155	2420	Recreational Period
Fry Ditch Upstream	148	63	770	Geometric Mean:
Fry Ditch Downstream	304	64	2420	126; Non recreational
Sugar Upstream	225	156	12000	Period Geometric
Sugar Downstream	218	80	2000	Mean.
Tupelo North Fork	976	1119	20000	630
Tupelo South Fork	316	218	2400	
Upper Mill Upstream	1074	264	24000	
Upper Mill Downstream	3567	652	100000	

Table 8 - E. *coli* totals

<u>Waterbody</u>	<u>Enterococcus</u> <u>Recreation</u> <u>Sample</u> <u>Geometric Mean</u> (MPN/100mL)	Enterococcus Non-recreation Sample Geometric Mean (MPN/100mL)	Single Sample (MPN/100mL)	<u>Water Quality</u> <u>Standard</u> (MPN/100mL)
Coal Upstream	1629	136	2420	
Coal Downstream	772	42	2420	
Crow Upstream	1328	232	2420	
Crow Downstream	898	179	2420	Recreational Period
Fry Ditch Upstream	240	55	1550	Geometric Mean:
Fry Ditch Downstream	322	49	2420	33; Non recreational
Sugar Upstream	460	88	2400	Period Geometric
Sugar Downstream	432	113	2400	Mean.
Tupelo North Fork	777	959	2420	165
Tupelo South Fork	1108	308	2420]
Upper Mill Upstream	1131	183	2420]
Upper Mill Downstream	1176	353	2420]

Table 9 – *Enterococcus* totals

2.4 Anti-Degradation Policy

2.4.1 <u>Nutrients</u> - Analytical results for Total Phosphorus and Nitrate/Nitrite show no need for further investigation to show support of the beneficial use. Water quality standards requires 10 samples. The number of samples collected exceeds the number of required samples. Water quality standards are met if no more than 10% of samples are out of range. While Nitrate/Nitrite concentrations have an action level, it is not a required parameter within the MS4 permit (ODEQ, OPDES Permit OKS000201, 2011).

<u>Waterbody</u>	Total Phosphorous Sample Mean (mg/L)	<u>Nitrite - Nitrate</u> <u>Sample Mean</u> <u>(mg/L)</u>	<u>% of samples in</u> <u>exceedance</u>	Water Quality Threshold (mg/L)
Coal Upstream	0.06	1.44	0%	
Coal Downstream	0.04	0.65	0%	
Crow Upstream	0.06	1.09	0%	
Crow Downstream	0.08	1.00	0%	
Fry Ditch Upstream	0.07	0.59	0%	Total Phosphorus:
Fry Ditch Downstream	0.05	0.68	0%	0.24
Sugar Upstream	0.03	0.27	0%	Nitrate/Nitrite:
Sugar Downstream	0.04	0.25	0%	4.95
Tupelo North Fork	0.05	0.47	0%	
Tupelo South Fork	0.03	0.38	0%	
Upper Mill Upstream	0.02	0.94	0%	
Upper Mill Downstream	0.06	0.99	0%	

Table 10 - Nutrient totals

3.0 SUMMARY

Coal Creek, Tupelo Creek and Upper Mill Creek all show impairment of the agriculture beneficial use, however all these creeks have had higher total dissolved solids levels in the past. Coal Creek, Fry Ditch Creek, Sugar Creek and Tupelo Creek were impaired for dissolved oxygen. Coal Creek was the only creek not previously impaired for dissolved oxygen. The fish collection scores were almost the same previous collections for all the creeks resulting in continued impairment for Sugar Creek, Tupelo Creek and Upper Mill Creek. Crow Creek, Fry Ditch Creek, Sugar Creek and Tupelo Creek have macroinvertebrate scores similar to previous samplings. Coal Creek and Upper Mill Creek have more scores resulting in impairment than their previous sampling year. All streams sampled were previously impaired for bacteria and remain impaired for this sampling year.

					С	oal Creek	x Upstrea	m				
ANALYIE	7/20/20	8/4/20	9/23/20	10/7/20	11/3/20	12/1/20	1/5/21	2/3/21	3/8/21	4/5/21	5/6/21	6/9/21
BOD(5) Day (BDL 3) mg/L	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.7	3.0	3.0	3.0
Conductivity µS	1890	1587	396	357	469	423	483	478	514	561	643	634
Dissolved Oxygen mg/L	2.95	5.28	5.80	6.00	8.94	10.99	12.13	12.13	10.58	11.00	8.75	7.49
Flow CFS	0.00	0.00	0.22	0.18	0.09	0.22	0.46	0.30	0.21	0.24	0.25	0.33
Nitrogen, Ammonia (BDL 0.10) mg/L		0.50	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Nitrogen, Kjeldahl, Total (BDL 0.50) mg/L	1.40	1.10	0.81	0.25	0.39	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Nitrogen, Nitrate-Nitrite (BDL 0.2) mg/L	0.54	0.28	1.10	0.82	1.80	1.20	2.60	2.30	1.50	2.10	0.94	2.10
Nitrogen, Total as N (BDL 0.5) mg/L	1.90	1.30	1.90	0.81	2.20	1.20	2.60	2.20	1.50	2.00	0.50	2.10
pH (s.u.)	7.33	7.24	8.02	7.80	8.08	8.01	8.51	7.99	8.09	7.92	8.00	7.99
Phosphorus, Total (BDL 0.010) mg/L	0.08	0.20	0.11	0.03	0.03	0.03	0.02	0.02	0.03	0.02	0.04	0.07
Phosphorus, Total Dissolved BDL (0.010) mg/L	0.02	0.02	0.09	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.04
Solids, Total Dissolved (BDL 10) mg/L	1500	1300	250	270	360	340	380	390	410	390	440	420
Solids, Total Suspended (BDL 2.0) mg/L	17.0	27.0	7.0	2.0	2.3	4.4	3.3	2.0	2.0	2.0	7.6	5.4
Temperature, Water °C	25.5	22.4	20.1	18.4	14.2	8.6	8.9	8.2	10.5	14.5	15.9	19.9
Turbidity (NTU)		67.3	4.0	1.1	1.4	1.2	1.1	1.4	2.9	1.5	4.0	1.7
Results foun	d to be b	elow the	detectio	n limit ar	e reporte	d as the o	detectior	limit				

Table 11 – Complete analytical sampling results for all parameters for Coal Creek Upstream

		Coal Creek Upstream																
ANALYTE	7/20/2 0	8/4/20	9/23/20	10/7/20	11/3/20	12/1/20	1/5/2 1	2/3/2 1	3/8/2 1	4/5/2 1	5/6/21	5/27/21	6/9/21	6/9/21	6/15/21	6/17/21	6/22/21	6/24/21
<i>E. coli</i> MPN/100mL	150	390	4800	490	120	920	1300	2000	16	228	2950	1050	8620	7590	980	1050	3550	1990
Enterococcus MPN/100mL	170	1100	2400	770	71	15	980	390	9	299	2420	2420	2420	680	2420	2420	2420	2420
	Results found to be below the detection limit are reported as the detection limit (BDL 1)																	

Table 12 - Complete analytical results for bacteria samples for Coal Creek Upstream

					Со	al Creek	Downstre	am				
ANALYIE	7/20/20	8/4/20	9/23/20	10/7/20	11/3/20	12/1/20	1/5/21	2/3/21	3/8/21	4/5/21	5/6/21	6/9/21
BOD(5) Day (BDL 3) mg/L	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Conductivity µS	601	443	279	490	542	459	543	526	639	725	665	665
Dissolved Oxygen mg/L	3.72	5.43	6.35	5.65	9.22	11.64	12.04	11.68	10.17	10.17	7.55	5.26
Nitrogen, Ammonia (BDL 0.10) mg/L	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.18	0.10	0.10	0.10
Nitrogen, Kjeldahl, Total (BDL 0.50) mg/L		0.50	0.60	0.50	0.50	0.50	0.50	0.50	0.56	0.91	0.94	0.55
Nitrogen, Nitrate-Nitrite (BDL 0.2) mg/L		0.20	0.27	0.20	1.20	0.55	1.60	1.00	0.84	0.58	0.50	0.62
Nitrogen, Total as N (BDL 0.5) mg/L	0.50	0.50	0.86	0.50	1.50	0.52	1.50	0.99	1.40	1.50	0.50	1.17
pH (s.u.)	7.47	7.59	7.75	7.78	7.92	7.66	7.07	7.87	8.26	7.88	7.75	7.70
Phosphorus, Total (BDL 0.010) mg/L	0.05	0.06	0.10	0.03	0.03	0.02	0.02	0.02	0.03	0.02	0.01	0.03
Phosphorus, Total Dissolved BDL (0.010) mg/L	0.04	0.03	0.04	0.02	0.03	0.02	0.01	0.01	0.02	0.01	0.02	0.03
Solids, Total Dissolved (BDL 10) mg/L	380	280	190	360	470	450	500	490	530	520	440	410
Solids, Total Suspended (BDL 2.0) mg/L	7.0	5.3	21.0	11.0	4.2	5.6	2.0	7.0	3.0	2.0	7.6	8.4
Temperature, Water °C	27.1	22.4	20.5	17.1	10.7	5.1	6.1	6.5	11.5	17.0	17.5	23.3
Turbidity (NTU)		5.3	46.2	1.7	2.1	1.7	2.0	2.8	2.8	1.8	6.4	6.8
Results foun	d to be be	elow the	detectior	n limit are	e reporte	d as the o	detection	limit				

 Table 13 – Complete analytical sampling results for all parameters for Coal Creek Downstream

								(Coal Cre	ek Dow	nstream	1						
ANALYTE	7/20/20	8/4/20	9/23/20	10/7/20	11/3/20	12/1/20	1/5/20	2/3/21	3/8/21	4/5/2 1	5/6/21	5/27/21	6/9/21	6/9/2 1	6/15/2 1	6/17/21	6/22/21	6/24/2 1
<i>E. coli</i> MPN/100mL	200	1000	1700 0	37	110	770	99	80	44	248	770	365	387	435	105	127	4110 0	649
<i>Enterococcus</i> MPN/100mL	1600	1400	2400	340	110	28	33	11	10	68	1150	679	2420	248	50	153	2420	921
			F	Results f	ound to	be belo	w the de	etection	limit are	e repor	ted as t	he detec	tion lim	it (BDL	1)			

Table 14 – Complete analytical results for bacteria samples for Coal Creek Downstream

					Cr	ow Creek	Upstream	n				
ANALYIE	7/21/20	8/10/20	9/23/20	10/13/20	11/5/20	12/21/20	1/13/21	2/22/21	3/15/21	4/14/21	5/18/21	6/16/21
BOD(5) Day (BDL 3) mg/L	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Conductivity µS	1042	603	527	479	547	471	512	319	476	372	628	678
Dissolved Oxygen mg/L	3.54	6.31	5.86	5.53	6.83	11.07	12.17	12.96	10.09	9.69	6.74	7.46
Flow CFS	0.11	0.09	0.09	0.45	0.06	0.23	0.29	0.71	0.45	0.86	0.16	0.31
Nitrogen, Ammonia (BDL 0.10) mg/L	0.46	0.10	0.10	0.10	0.10	0.10	0.10	0.30	0.10	0.10	0.10	0.10
Nitrogen, Kjeldahl, Total (BDL 0.50) mg/L	4.20	0.50	0.50	0.50	0.50	0.50	9.60	0.84	0.50	0.87	0.68	0.50
Nitrogen, Nitrate-Nitrite (BDL 0.2) mg/L	1.90	0.70	1.30	0.65	1.20	1.20	1.50	0.86	1.00	1.10	0.66	0.97
Nitrogen, Total as N (BDL 0.5) mg/L	6.00	0.70	1.20	0.65	1.50	1.20	11.00	1.70	0.99	2.00	1.34	0.97
pH (s.u.)	7.67	7.61	7.72	7.73	7.63	7.74	7.52	7.84	7.75	7.69	7.72	7.63
Phosphorus, Total (BDL 0.010) mg/L	0.06	0.08	0.06	0.06	0.08	0.02	0.04	0.06	0.05	0.10	0.08	0.06
Phosphorus, Total Dissolved BDL (0.010) mg/L	0.05	0.06	0.05	0.05	0.07	0.02	0.02	0.03	0.02	0.07	0.05	0.04
Solids, Total Dissolved (BDL 10) mg/L	610	370	320	310	360	390	500	320	360	230	380	390
Solids, Total Suspended (BDL 2.0) mg/L	3.3	3.6	2.0	4.4	2.0	2.0	3.2	3.6	13.0	4.4	14.0	9.0
Temperature, Water °C	25.0	24.4	19.8	15.9	15.0	8.4	6.4	4.2	11.3	13.2	18.5	23.0
Turbidity (NTU)	2.0	2.2	1.7	2.6	3.2	1.7	1.3	7.0	7.2	8.1	6.2	1.3
Results found	d to be be	elow the	detectior	limit are	reporte	d as the d	etection	limit				

Table 15 – Complete analytical sampling results for all parameters for Crow Creek Upstream

									(Crow Ci	eek Ups	tream							
ANALYI	7/2 1	1/20	8/10/2 0	9/23/20	10/13/20	11/5/20	12/21/20	1/13/21	2/22/21	3/15/21	4/14/21	5/18/21	5/27/21	6/9/2 1	6/15/21	6/16/21	6/17/21	6/22/21	6/24/21
<i>E. coli</i> MPN/100 r	mL 13	300	920	1300	980	330	130	6	3	2000	4140	1500	649	1550	1990	1200	1730	4350	816
Enterococc MPN/100 r	<i>cus</i> mL 98	80	1700	2400	1600	490	170	2	33	1700	2420	1990	579	1050	980	525	1550	2420	2420
					Results	found to	be below	w the de	tection	limit are	reporte	ed as the	e detect	ion limi	t (BDL 1)			

Table 16 - Complete analytical results for bacteria samples for Crow Creek Upstream

					Cro	w Creek l	Downstre	am				
ANALYIE	7/21/20	8/10/20	9/23/20	10/13/20	11/5/20	12/21/20	1/13/21	2/22/21	3/15/21	4/14/21	5/18/21	6/16/21
BOD(5) Day (BDL 3) mg/L	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.0	3.0
Conductivity µS	573	545	138	559	498	413	408	396	246	136	518	595
Dissolved Oxygen mg/L	4.50	8.62	7.33	6.46	9.33	12.54	13.66	13.21	9.63	9.67	8.29	7.39
Nitrogen, Ammonia (BDL 0.10) mg/L	0.12	0.10	0.10	0.10	0.10	0.10	0.10	0.39	0.10	0.10	0.10	0.10
Nitrogen, Kjeldahl, Total (BDL 0.50) mg/L	0.50	0.50	0.50	0.50	0.50	0.50	0.50	1.20	0.50	0.85	0.78	0.50
Nitrogen, Nitrate-Nitrite (BDL 0.2) mg/L	1.00	0.85	0.62	0.79	1.40	1.40	1.50	0.79	0.67	0.51	1.20	1.30
Nitrogen, Total as N (BDL 0.5) mg/L	1.00	0.85	0.61	0.78	1.40	1.40	1.50	2.00	0.50	1.30	1.98	1.30
pH (s.u.)	7.74	8.06	7.69	7.69	7.75	7.89	8.06	7.65	7.67	7.51	7.73	7.86
Phosphorus, Total (BDL 0.010) mg/L	0.05	0.10	0.08	0.07	0.06	0.04	0.03	0.16	0.08	0.14	0.09	0.07
Phosphorus, Total Dissolved BDL (0.010) mg/L	0.05	0.05	0.07	0.05	0.06	0.03	0.02	0.10	0.50	0.11	0.08	0.06
Solids, Total Dissolved (BDL 10) mg/L	320	320	140	360	360	300	360	340	180	90	310	340
Solids, Total Suspended (BDL 2.0) mg/L	2.0	2.0	2.0	2.0	2.0	2.0	3.2	42.0	5.6	8.8	6.5	1.9
Temperature, Water °C	26.1	24.4	20.3	16.1	14.4	7.7	6.1	4.3	12.5	13.0	20.2	24.5
Turbidity (NTU)	0.6	0.9	3.9	0.7	1.8	1.3	1.9	33.8	10.1	8.9	1.1	0.9
Results foun	d to be be	elow the	detectior	n limit are	reporte	d as the d	etection	limit				

 Table 17 – Complete analytical sampling results for all parameters for Crow Creek Downstream

								С	row Cre	ek Dowr	istream							
ANALYI	E 7/21/20	8/10/20	9/23/20	10/13/20	11/5/20	12/21/2 0	1/13/21	2/22/21	3/15/21	4/14/21	5/18/21	5/27/21	6/9/2 1	6/15/21	6/16/21	6/17/21	6/22/21	6/24/21
E. coli MPN/100 mL	0 260	220	2400	260	110	91	190	3	610	2420	150	649	1550	1990	1200	1730	4350	816
Enterococc MPN/100 mL	<i>cus</i> 0 440	820	2400	370	290	41	33	28	610	2420	210	579	1050	980	525	921	2420	2420
				Results	found to	be belo	w the de	etection	limit are	e reporte	ed as the	e detect	ion limi	t (BDL 1)			

Table 18 - Complete analytical results for bacteria samples for Crow Creek Downstream

14

					Fry	Ditch Cre	ek Upstre	eam				
ANALYIE	7/8/20	8/11/20	9/21/20	10/8/20	11/4/20	12/10/20	1/12/21	2/11/21	3/10/21	4/19/21	5/13/21	6/14/21
BOD(5) Day (BDL 3) mg/L	6.4	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0
Conductivity µS	429	418	443	443	432	355	431	990	621	533	476	808
Dissolved Oxygen mg/L	4.45	2.70	6.76	4.60	7.82	10.50	13.40	13.26	6.99	8.44	7.26	4.81
Nitrogen, Ammonia (BDL 0.10) mg/L	0.14	0.25	0.10	0.10	0.16	0.10	0.10	0.17	0.10	0.10	0.26	0.15
Nitrogen, Kjeldahl, Total (BDL 0.50) mg/L	0.79	1.60	0.66	0.25	0.61	0.57	0.75	0.75	0.66	0.67	0.93	0.79
Nitrogen, Nitrate-Nitrite (BDL 0.2) mg/L	0.45	0.44	0.45	0.49	0.85	0.70	0.87	1.10	0.33	0.38	0.54	0.48
Nitrogen, Total as N (BDL 0.5) mg/L	1.20	2.00	1.10	0.50	1.40	1.30	1.60	1.80	0.98	1.00	1.47	1.27
pH (s.u.)	7.52	7.64	7.71	7.65	7.78	7.69	7.30	7.82	7.74	7.72	7.68	7.68
Phosphorus, Total (BDL 0.010) mg/L	0.09	0.14	0.06	0.04	0.07	0.06	0.04	0.06	0.05	0.05	0.08	0.08
Phosphorus, Total Dissolved BDL (0.010) mg/L	0.08	0.05	0.04	0.03	0.05	0.01	0.01	0.03	0.02	0.03	0.05	0.07
Solids, Total Dissolved (BDL 10) mg/L	240	230	270	300	320	350	410	970	420	340	310	430
Solids, Total Suspended (BDL 2.0) mg/L	9.2	14.0	6.7	2.3	2.0	4.8	8.0	27.0	2.0	5.2	8.0	5.5
Temperature, Water °C	27.6	26.8	19.8	18.2	11.7	6.1	2.9	0.3	14.5	13.1	17.2	25.2
Turbidity (NTU)	5.3	11.8	4.9	2.6	5.0	6.3	6.4	9.7	7.2	7.5	9.0	4.8
Results found	d to be be	elow the o	detection	limit are	reporte	d as the d	etection	limit				

Table 19 – Complete analytical sampling results for all parameters for Fry Ditch Creek Upstream

								Fr	y Ditch	Creek U	pstream							
ANALYTE	7/8/20	8/11/20	9/21/20	10/8/20	11/4/20	12/10/20	1/12/21	2/11/21	3/10/21	4/19/21	5/13/21	5/27/21	6/9/2 1	6/14/21	6/15/21	6/17/21	6/22/21	6/24/2 1
<i>E. coli</i> MPN/100mL	81	35	68	32	140	96	49	23	120	65	235	161	548	101	115	59	365	770
Enterococcus MPN/100mL	260	100	140	280	35	43	31	86	32	40	378	192	1550	82	116	134	1200	248
				Results	found to	be belov	w the de	tection	limit are	reporte	ed as the	e detecti	ion limi	t (BDL 1)			

Table 20 – Complete analytical results for bacteria samples for Fry Ditch Creek Upstream

					Fry D	itch Cree	k Downst	ream				
ANALYIE	7/8/20	8/11/20	9/21/20	10/8/20	11/4/20	12/10/20	1/12/21	2/11/21	3/10/21	4/19/21	5/13/21	6/14/21
BOD(5) Day (BDL 3) mg/L	3.0	3.0	3.0	3.0	3.0	3.0	6.8	3.0	3.0	3.0	3.0	3.0
Conductivity µS	490	356	528	525	483	409	429	597	674	512	481	711
Dissolved Oxygen mg/L	3.42	4.10	5.12	4.39	9.21	10.61	14.06	14.58	7.42	8.29	9.70	4.18
Flow CFS	0.48	0.50	0.12	0.21	0.14	0.32	0.79	1.20	0.67	0.73	1.2	0.64
Nitrogen, Ammonia (BDL 0.10) mg/L	0.10	0.15	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.13	0.10
Nitrogen, Kjeldahl, Total (BDL 0.50) mg/L	0.94	0.91	0.71	0.31	0.63	0.50	0.50	0.62	0.72	0.50	0.71	0.61
Nitrogen, Nitrate-Nitrite (BDL 0.2) mg/L	0.54	0.69	0.59	0.68	1.00	0.74	0.93	1.00	0.43	0.44	0.55	0.53
Nitrogen, Total as N (BDL 0.5) mg/L	1.40	1.60	1.30	0.68	1.60	0.74	0.91	1.60	1.10	0.50	1.26	1.14
pH (s.u.)	7.36	7.43	7.46	7.48	7.60	7.37	7.78	7.20	7.56	7.54	7.67	7.49
Phosphorus, Total (BDL 0.010) mg/L	0.06	0.06	0.04	0.04	0.05	0.05	0.05	0.04	0.05	0.03	0.05	0.05
Phosphorus, Total Dissolved BDL (0.010) mg/L	0.05	0.04	0.03	0.03	0.04	0.02	0.01	0.03	0.02	0.02	0.03	0.04
Solids, Total Dissolved (BDL 10) mg/L	310	290	320	350	360	380	420	580	440	350	310	420
Solids, Total Suspended (BDL 2.0) mg/L	15.0	22.0	2.0	3.1	6.0	10.0	19.0	5.0	8.0	2.8	22.0	7.0
Temperature, Water °C	26.0	25.8	19.6	18.8	11.6	6.2	2.6	0.7	14.3	12.0	16.0	23.7
Turbidity (NTU)	5.5	3.2	3.2	2.0	4.5	4.9	13.5	5.2	4.9	3.4	4.7	2.8
Results foun	d to be be	elow the	detection	limit are	reporte	d as the d	etection	limit				

Table 21 – Complete analytical sampling results for all parameters for Fry Ditch Creek Downstream

								Fr	y Ditch (Creek Do	wnstrea	m						
ANALYTE	7/8/2 0	8/11/20	9/21/20	10/18/20	11/4/20	12/10/20	1/12/21	2/11/21	3/10/21	4/19/21	5/13/21	5/27/21	6/9/2 1	6/14/21	6/15/21	6/17/21	6/22/21	6/24/21
<i>E. coli</i> MPN/100mL	170	93	650	93	610	79	110	12	46	38	291	121	345	148	365	166	2420	770
Enterococcus MPN/100mL	690	150	250	160	250	36	36	13	15	77	548	161	727	63	129	192	2420	613
				Results	found to	o be belo	w the de	etection	limit ar	e report	ed as th	e detect	ion lim	it (BDL 1	L)			

Table 22 – Complete analytical results for bacteria samples for Fry Ditch Creek Downstream

					Su	gar Creek	upstrea	m				
ANALYIE	7/22/20	8/19/20	9/28/20	10/12/20	11/16/20	12/9/20	1/20/21	2/22/21	3/16/21	4/22/21	5/17/21	6/10/21
BOD(5) Day (BDL 3) mg/L	5.4	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	6.8	3.0
Conductivity µS	766	549	328	521	457	441	405	321	512	484	566	567
Dissolved Oxygen mg/L	1.60	3.75	11.77	2.84	10.30	13.83	15.12	15.41	13.46	12.97	11.08	11.16
Nitrogen, Ammonia (BDL 0.10) mg/L	0.10	0.10	0.10	0.14	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Nitrogen, Kjeldahl, Total (BDL 0.50) mg/L	0.50	0.57	0.52	0.50	0.50	0.50	1.20	0.64	0.50	0.53	0.62	0.50
Nitrogen, Nitrate-Nitrite (BDL 0.2) mg/L	0.20	0.20	0.20	0.32	0.20	0.23	0.34	0.68	0.25	0.20	0.20	0.20
Nitrogen, Total as N (BDL 0.5) mg/L	0.50	0.57	0.52	0.50	0.50	0.50	1.50	1.30	0.50	0.53	0.62	0.50
pH (s.u.)	6.82	7.75	8.06	7.54	8.17	8.20	8.44	8.12	8.30	8.26	8.15	8.10
Phosphorus, Total (BDL 0.010) mg/L	0.03	0.03	0.05	0.04	0.02	0.02	0.01	0.05	0.03	0.02	0.02	0.03
Phosphorus, Total Dissolved BDL (0.010) mg/L	0.02	0.02	0.02	0.03	0.01	0.01	0.01	0.03	0.02	0.01	0.02	0.02
Solids, Total Dissolved (BDL 10) mg/L	420	330	230	480	360	250	350	310	400	380	320	330
Solids, Total Suspended (BDL 2.0) mg/L	8.0	2.8	3.0	3.6	2.0	2.4	2.0	18.0	4.0	4.0	9.2	6.0
Temperature, Water °C	27.7	23.6	18.0	19.4	10.4	9.6	3.7	2.6	12.0	10.2	21.4	27.2
Turbidity (NTU)	3.2	2.8	6.5	2.8	2.4	4.2	2.6	8.5	6.1	6.9	3.6	4.1
Results foun	d to be be	elow the	detectior	n limit are	reported	d as the d	etection	limit				

 Table 23 – Complete analytical sampling results for all parameters for Sugar Creek Upstream

									Sugar C	reek Ups	stream							
ANALYTE	7/22/20	8/19/20	9/28/20	10/12/20	11/16/20	12/9/20	1/21/21	2/22/21	3/16/21	4/22/21	5/17/21	5/27/21	6/9/2 1	6/10/21	6/15/21	6/17/21	6/22/21	6/24/21
<i>E. coli</i> MPN/100mL	23	370	1200 0	1100	110	78	91	130	160	41	133	228	411	121	91	140	365	105
<i>Enterococcus</i> MPN/100mL	920	870	2400	1300	38	42	25	170	120	39	34	727	866	59	126	980	1200	548
				Results	found to	be belov	w the de	etection	limit are	e reporte	ed as the	e detect	ion lim	it (BDL 1)			

Table 24 – Complete analytical results for bacteria samples for Sugar Creek Upstream

					Sug	ar Creek	Downstre	am				
ANALYIE	7/22/20	8/19/20	9/28/20	10/12/20	11/16/20	12/9/20	1/20/21	2/22/21	3/16/21	4/22/21	5/17/21	6/10/21
BOD(5) Day (BDL 3) mg/L	3.0	3.0	3.0	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Conductivity µS	598	442	277	424	361	361	427	386	582	512	549	719
Dissolved Oxygen mg/L	3.23	5.30	7.64	5.09	8.80	11.77	14.36	14.87	11.31	11.84	11.60	7.85
Flow CFS	0.00	0.12	0.23	0.26	0.06	0.44	0.42	2.54	0.95	0.29	0.19	0.75
Nitrogen, Ammonia (BDL 0.10) mg/L	0.10	0.10	0.10	0.10	0.10	0.25	0.10	0.10	0.10	0.10	0.10	0.10
Nitrogen, Kjeldahl, Total (BDL 0.50) mg/L	0.52	0.79	0.50	0.50	0.51	0.77	0.68	0.71	0.50	0.50	0.59	0.50
Nitrogen, Nitrate-Nitrite (BDL 0.2) mg/L	0.20	0.20	0.20	0.20	0.20	0.26	0.27	0.57	0.28	0.20	0.20	0.20
Nitrogen, Total as N (BDL 0.5) mg/L	0.52	0.79	0.50	0.50	0.51	1.00	0.95	1.30	0.50	0.50	0.59	0.50
pH (s.u.)	7.63	8.02	7.86	7.84	7.85	8.08	8.37	7.81	8.10	8.05	8.36	7.97
Phosphorus, Total (BDL 0.010) mg/L	0.02	0.03	0.05	0.05	0.07	0.06	0.02	0.08	0.03	0.02	0.02	0.04
Phosphorus, Total Dissolved BDL (0.010) mg/L	0.02	0.02	0.03	0.03	0.06	0.03	0.01	0.05	0.02	0.01	0.02	0.03
Solids, Total Dissolved (BDL 10) mg/L	330	280	220	290	310	350	420	370	460	370	310	400
Solids, Total Suspended (BDL 2.0) mg/L	2.0	2.8	8.5	2.0	3.6	8.3	2.4	25.0	2.0	7.6	2.0	5.4
Temperature, Water °C	27.0	23.9	17.1	17.7	8.9	6.7	3.6	3.0	11.2	11.2	21.7	26.0
Turbidity (NTU)	1.5	3.3	7.5	1.6	2.1	25.8	2.2	16.2	4.4	2.0	1.5	2.4
Results found	d to be be	elow the	detectior	n limit are	reported	d as the d	etection	limit				

Table 25 – Complete analytical sampling results for all parameters for Sugar Creek Downstream

		Sugar Creek Downstream																
ANALYTI	E 7/22/20	8/19/20	9/28/20	10/12/20	11/16/20	12/9/20	1/20/21	2/22/21	3/16/21	4/22/21	5/17/21	5/27/21	6/9/2 1	6/10/21	6/15/21	6/17/21	6/22/21	6/24/21
<i>E. coli</i> MPN/100m	_{nL} 56	980	920	2000	74	1	250	64	290	61	133	326	411	121	91	140	365	105
Enterococci MPN/100m	us 91	1100	2400	820	200	14	81	100	55	225	285	344	866	59	126	980	1200	548
	Results found to be below the detection limit are reported as the detection limit (BDL 1)																	

Table 26 - Complete analytical results for bacteria samples for Sugar Creek Downstream

					Tup	elo Creek	North Fo	ork				
ANALYIE	7/23/20	8/18/20	9/24/20	10/14/20	11/17/20	12/17/20	1/14/21	2/23/21	3/24/21	4/21/21	5/24/21	6/17/21
BOD(5) Day (BDL 3) mg/L	3.0	3.0	3.0	3.0	3.0	7.3	3.0	3.0	4.6	5.5	3.0	3.0
Conductivity µS	754	844	658	762	504	577	504	773	708	689	733	1056
Dissolved Oxygen mg/L	5.87	6.07	3.65	2.05	3.35	11.94	3.35	13.64	12.48	11.78	6.79	9.02
Flow CFS	0.03	0.01	0.00	0.00	0.22	0.18	0.70	1.01	0.30	0.08	0.10	0.44
Nitrogen, Ammonia (BDL 0.10) mg/L	0.10	0.10	0.10	0.10	0.10	0.10	0.94	0.10	0.10	0.10	0.10	0.10
Nitrogen, Kjeldahl, Total (BDL 0.50) mg/L	1.50	0.50	0.71	0.50	0.50	1.40	0.94	0.52	0.60	0.75	0.54	0.50
Nitrogen, Nitrate-Nitrite (BDL 0.2) mg/L	1.90	0.41	0.41	0.20	0.20	0.26	0.43	0.47	0.37	0.36	0.47	0.20
Nitrogen, Total as N (BDL 0.5) mg/L	1.90	0.50	1.10	0.50	0.50	1.60	1.40	1.00	0.94	1.10	1.01	0.50
pH (s.u.)	7.76	7.29	7.46	7.55	7.35	7.89	7.35	7.87	7.98	7.67	7.64	7.49
Phosphorus, Total (BDL 0.010) mg/L	0.03	0.05	0.05	0.03	0.04	0.05	0.02	0.05	0.04	0.03	0.04	0.02
Phosphorus, Total Dissolved BDL (0.010) mg/L	0.02	0.04	0.05	0.03	0.04	0.05	0.02	0.05	0.04	0.03	0.04	0.02
Solids, Total Dissolved (BDL 10) mg/L	410	490	410	530	490	510	490	620	490	490	450	580
Solids, Total Suspended (BDL 2.0) mg/L	5.5	9.7	8.0	5.6	12.0	15.0	4.4	2.4	6.8	5.4	17.0	4.4
Temperature, Water °C	25.4	24.0	21.6	14.2	14.0	7.6	14.0	7.4	13.4	11.7	19.7	24.4
Turbidity (NTU)	4.8	1.9	6.7	1.3	1.7	2.6	0.8	2.6	6.6	1.3	2.7	0.9
Results found	d to be be	elow the	detectior	n limit are	reporte	d as the d	etection	limit				

Table 27 – Complete analytical sampling results for all parameters for Tupelo Creek North Fork

								Τι	ipelo Cr	eek Nort	th Fork							
ANALYTE	7/23/20	8/18/20	9/24/20	10/14/20	11/17/20	12/17/20	1/14/21	2/23/21	3/24/21	4/21/21	5/24/21	5/27/21	6/9/2 1	6/15/21	6/17/21	6/17/21	6/22/21	6/24/2 1
<i>E. coli</i> MPN/100mL	2000 0	1700	3900	290	5600	690	1100	1000	1700	1050	727	687	488	308	58	488	3730	727
Enterococcus MPN/100mL	2400	870	2400	110	2400	2000	580	1100	2400	921	1550	488	132	68	2420	129	2420	2420
				Results	found to	be below	v the de	tection l	imit are	reporte	d as the	detecti	on limit	: (BDL 1)				

Table 28 - Complete analytical results for bacteria samples for Tupelo Creek North Fork

					Tup	elo Creek	South Fo	ork				
ANALYIE	7/23/20	8/18/20	9/24/20	10/14/20	11/17/20	12/17/20	1/14/21	2/23/21	3/24/21	4/21/21	5/24/21	6/17/21
BOD(5) Day (BDL 3) mg/L	8.9	3.0	3.0	3.0	3.5	3.0	3.0	3.0	3.3	3.0	3.0	3.0
Conductivity µS	604	655	598	512	476	625	434	511	579	543	613	675
Dissolved Oxygen mg/L	8.71	5.40	6.66	5.45	10.21	5.71	13.14	15.00	12.58	9.73	8.80	10.00
Nitrogen, Ammonia (BDL 0.10) mg/L	0.12	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Nitrogen, Kjeldahl, Total (BDL 0.50) mg/L	0.85	0.88	0.50	0.50	0.92	0.50	0.93	0.50	0.50	0.52	0.50	0.74
Nitrogen, Nitrate-Nitrite (BDL 0.2) mg/L	0.20	0.20	0.25	0.45	0.20	0.38	0.66	1.00	0.56	0.20	0.28	0.22
Nitrogen, Total as N (BDL 0.5) mg/L	0.85	0.88	0.50	0.50	0.92	0.50	1.60	1.00	0.53	0.52	0.28	0.96
pH (s.u.)	8.41	8.02	7.79	7.94	8.17	7.50	7.98	8.05	8.46	7.91	8.27	8.34
Phosphorus, Total (BDL 0.010) mg/L	0.06	0.04	0.03	0.04	0.03	0.04	0.02	0.03	0.02	0.01	0.04	0.04
Phosphorus, Total Dissolved BDL (0.010) mg/L	0.03	0.02	0.03	0.04	0.01	0.03	0.01	0.02	0.01	0.01	0.03	0.03
Solids, Total Dissolved (BDL 10) mg/L	350	410	360	330	420	500	450	490	430	360	390	390
Solids, Total Suspended (BDL 2.0) mg/L	18.0	2.0	2.3	9.2	42.0	2.0	4.4	2.4	2.4	2.0	7.5	2.0
Temperature, Water °C	27.4	22.6	18.9	15.8	9.2	5.1	5.4	1.3	11.5	7.2	20.5	26.3
Turbidity (NTU)	10.4	1.1	2.0	4.4	0.9	2.1	1.6	1.3	1.8	0.9	1.3	1.7
Results found	d to be be	elow the o	detectior	n limit are	reported	d as the d	etection	limit				

 Table 29 – Complete analytical sampling results for all parameters for Tupelo Creek South Fork

								Т	upelo Cr	eek Sout	h Fork							
ANALYTE	7/23/20	8/18/20	9/24/20	10/14/20	11/17/20	12/17/20	1/14/21	2/23/21	3/24/21	4/21/21	5/24/21	5/27/21	6/9/2 1	6/15/21	6/17/21	6/17/21	6/22/21	6/24/2 1
<i>E. coli</i> MPN/100mL	2400	690	1100	170	160	240	240	370	690	58	1050	210	866	219	56	20	167	219
<i>Enterococcus</i> MPN/100mL	2400	2400	2400	270	730	460	370	310	820	31	2420	517	2420	248	2420	403	126	2420
				Results	found to	be below	v the de	tection l	imit are	reporte	d as the	detection	on limit	: (BDL 1)				

Table 30 – Complete analytical results for bacteria samples for Tupelo Creek South Fork

					Uppe	r Mill Cro	eek Upstr	eam				
ANALYIE	7/27/20	8/20/20	9/24/20	10/20/20	11/18/20	12/22/20	1/19/21	2/23/21	3/24/21	4/26/21	5/25/21	6/22/21
BOD(5) Day (BDL 3) mg/L	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Conductivity µS	1175	1177	1073	1154	820	703	895	867	814	931	991	954
Dissolved Oxygen mg/L	9.90	7.64	6.76	7.42	18.85	19.19	15.41	11.75	12.74	14.01	9.36	10.21
Flow CFS	0.39	0.46	0.12	0.14	0.13	0.40	0.46	0.31	0.74	0.45	1.05	0.35
Nitrogen, Ammonia (BDL 0.10) mg/L	0.11	0.10	0.10	0.10	0.10	0.10	0.10	0.19	0.10	0.10	0.10	0.10
Nitrogen, Kjeldahl, Total (BDL 0.50) mg/L	1.00	0.66	0.50	0.50	0.50	0.50	1.30	0.50	0.60	0.50	0.50	0.73
Nitrogen, Nitrate-Nitrite (BDL 0.2) mg/L	1.40	1.10	0.56	0.49	0.41	0.91	0.83	0.84	1.40	0.91	1.10	1.30
Nitrogen, Total as N (BDL 0.5) mg/L	2.40	1.70	0.54	0.50	0.50	0.88	2.10	0.84	2.00	0.89	1.10	2.03
pH (s.u.)	8.16	8.44	7.86	7.84	8.48	7.74	7.96	7.83	8.06	7.98	8.00	8.07
Phosphorus, Total (BDL 0.010) mg/L	0.03	0.02	0.02	0.02	0.02	0.01	0.01	0.03	0.02	0.02	0.02	0.03
Phosphorus, Total Dissolved BDL (0.010) mg/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.02
Solids, Total Dissolved (BDL 10) mg/L	720	740	800	1000	940	810	880	810	690	770	720	710
Solids, Total Suspended (BDL 2.0) mg/L	4.8	2.0	2.0	3.7	2.0	2.5	2.0	4.4	2.8	2.0	2.0	2.0
Temperature, Water °C	26.9	26.3	19.0	12.6	12.9	11.0	7.4	8.0	11.9	17.2	19.6	22.5
Turbidity (NTU)	2.7	1.4	2.6	3.0	2.0	2.0	1.7	6.9	5.8	2.5	2.2	2.5
Results found	d to be be	elow the	detectior	n limit are	reporte	d as the d	etection	limit				

Table 31 – Complete analytical sampling results for all parameters for Upper Mill Creek Upstream

								Upj	per Mill	Creek U	pstream							
ANALYTE	7/27/20	8/20/20	9/24/20	10/20/20	11/18/20	12/22/20	1/19/21	2/23/21	3/24/21	4/26/21	5/25/21	5/27/21	6/9/2 1	6/15/21	6/17/21	6/22/21	6/22/21	6/24/2 1
<i>E. coli</i> MPN/100mL	610	280	1400	24000	280	170	180	10	220	196	461	2750	687	461	365	7120	6770	1300
<i>Enterococcus</i> MPN/100mL	2000	1300	2400	2400	180	340	41	24	130	365	921	1300	649	178	687	2420	2420	1120
				Results	found to	be belov	v the de	tection l	imit are	reporte	d as the	detecti	on limit	(BDL 1)				

Table 32 - Complete analytical results for bacteria samples for Upper Mill Creek Upstream

					Upper	Mill Cree	k Downst	ream				
ANALYIE	7/27/20	8/20/20	9/24/20	10/20/20	11/18/20	12/22/20	1/19/21	2/23/21	3/24/21	4/26/21	5/25/21	6/22/21
BOD(5) Day (BDL 3) mg/L	3.0	3.0	3.0	8.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Conductivity µS	1071	812	821	525	845	746	685	681	685	854	840	915
Dissolved Oxygen mg/L	8.66	6.68	6.29	4.31	7.37	11.41	11.03	10.97	10.16	12.65	8.32	6.66
Nitrogen, Ammonia (BDL 0.10) mg/L	0.10	0.10	0.10	0.10	0.58	0.10	0.10	0.28	0.10	0.10	0.10	0.10
Nitrogen, Kjeldahl, Total (BDL 0.50) mg/L	2.00	0.50	0.50	0.50	0.50	0.94	0.76	1.40	0.54	0.50	0.50	0.81
Nitrogen, Nitrate-Nitrite (BDL 0.2) mg/L	1.40	0.93	0.72	0.69	0.57	0.89	0.88	0.92	1.50	0.92	1.20	1.30
Nitrogen, Total as N (BDL 0.5) mg/L	3.40	0.91	0.71	1.20	0.58	1.80	1.60	2.30	2.00	0.90	1.20	2.11
pH (s.u.)	8.08	8.19	8.16	7.74	7.83	8.09	8.15	8.03	8.11	8.24	8.14	8.01
Phosphorus, Total (BDL 0.010) mg/L	0.05	0.04	0.03	0.16	0.04	0.02	0.02	0.05	0.03	0.11	0.05	0.07
Phosphorus, Total Dissolved BDL (0.010) mg/L	0.04	0.02	0.02	0.05	0.03	0.01	0.01	0.04	0.02	0.01	0.04	0.07
Solids, Total Dissolved (BDL 10) mg/L	650	630	620	420	770	640	640	570	530	630	650	600
Solids, Total Suspended (BDL 2.0) mg/L	15.0	8.4	4.8	48.0	2.0	2.0	4.0	8.8	2.0	2.0	2.0	13.2
Temperature, Water °C	26.3	23.8	20.8	13.5	11.7	9.1	7.9	7.2	12.1	17.7	19.4	23.0
Turbidity (NTU)	6.8	4.4	5.0	49.4	2.6	1.1	4.0	9.0	3.1	1.7	2.3	10.5
Results found	d to be be	elow the	detectior	n limit are	reported	d as the d	etection	limit				

Table 33 – Complete analytical sampling results for all parameters for Upper Mill Creek Downstream

								Uppe	r Mill Ci	reek Dov	vnstrean	n						
ANALYTE	7/27/20	8/20/20	9/24/20	10/20/20	11/18/20	12/22/20	1/19/21	2/23/21	3/24/21	4/26/21	5/25/21	5/27/21	6/9/2 1	6/15/21	6/17/21	6/22/21	6/22/21	6/24/2 1
<i>E. coli</i> MPN/100mL	2400	820	1000	100000	4400	140	210	39	1700	921	1410	3010	866	2420	1670 0	2760 0	3450 0	4800
<i>Enterococcus</i> MPN/100mL	2400	980	2400	2400	870	980	96	50	610	548	980	866	328	173	1550	2420	2420	2420
				Results	found to	be below	the det	ection li	mit are	reported	d as the	detectio	n limit	(BDL 1)				

Table 34 - Complete analytical results for bacteria samples for Upper Mill Creek Downstream

4.0 REFERENCES

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Section 1. Findings Summary

Analytical

Analytical results were compared with State Water Quality Standards. The findings are shown in Figure 1. As you can see most streams had 3 or less impairments. Many were regarding Dissolved Oxygen, a result of low flows in the dry summer months. The cause for the largest number of impairments was Bacteria (*E. coli & Enterococcus.*).



Fish

Fish findings were compared to State Water Quality Standards. The findings are shown in Figure 2. Results showed a minority of impaired beneficial use status with the highest number of streams falling in the undetermined category.



Benthic Macroinvertebrates

Benthic findings (Figure 3) were compared to State WQS though for a few streams of year 1, the required number of samples was not met. Comparing to WQS, a large percentage of streams fell into the undetermined category in beneficial use assessment.



Data Averages

The below tables are a summarized average of analytical results. Red indicates exceedances of WQS or impairment scoring.

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Parameter	Crow	Dirty Butter	Flatrock	Hager	Harlow	Mooser	Nickel
Cadmium, Total (μg/L) (DL 0.5 μg/L)	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Conductivity μS	468	370	405	718	453	439	279
Copper, Total (µg/L) (DL 0.5 µg/L)	2.86	2.56	2.07	1.77	1.34	2.89	1.69
Dissolved Oxygen (mg/L)	8.7	7.83	7.34	6.22	5.76	6.62	8.9
E. coli Geomean(MPN/100 mL) (DL 1 MPN/100 mL)	272	163	271	644	57	328	282
Enterococcus Geomean (MPN/100 mL)(DL 1 CFU/100 mL)	264	161	162	1074	90	285	269
Flow (cfs)	1.32	3.67	3.81	0.05	0	0.39	7.07
Hardness, Total (mg/L) (DL 3.6 mg/L)	207	173	154	306	173	191	126
Lead, Total (µg/L) (DL 0.5 µg/L)	0.88	0.92	0.81	0.74	0.69	0.53	0.62
Nitrogen, Total Kjeldahl (mg/L)(DL 0.50 mg/L)	0.59	0.54	0.57	0.6	0.66	0.58	0.62
Nitrogen, Nitrate-Nitrite (mg/L) (DL 0.2 mg/L)	1.08	0.57	35	0.23	0.26	0.29	0.46
Nitrogen, Total as Nitrogen (mg/L)(DL 0.50 mg/L)	1.33	0.66	0.55	0.57	0.75	0.63	0.77
pH (su)	7.5-7.9	7.5-7.9	7.5-7.9	7.3-7.7	7.1-7.8	7.2-8.0	7.4-7.9
Phosphorus, Total (mg/L) (DL 0.010 mg/L)	0.06	0.04	0.04	0.06	0.06	0.03	0.03
Phosphorus, Dissolved (mg/L) (DL 0.010 mg/L)	0.05	0.02	0.03	0.03	0.03	0.02	0.02
Solids, Total Dissolved (mg/L) (DL 10 mg/L)	308	269	268	538	317	309	217
Solids, Total Suspended (mg/L) (DL 2.0 mg/L)	5.13	7.48	7.93	14.25	5.59	4.06	5.96
Water Temperature (°C) (Low-High)	2.4-27	3.7-28	3.7-28	3.8-27	7.4-29	3.5-27	0.8-29
Turbidity (NTU)	3.22	8.14	9.24	18.23	10.58	4.4	9.89
Zinc, Total (μg/L) (DL 10 μg/L)	16.26	14.78	13.19	13.25	16.12	15.43	14.03
Benthic Macroinvertebrates - Summer (1/2)	<mark>26%</mark> /52%	65%	71%	52%	19%	69%	56%
Benthic Macroinvertebrates - Winter (1/2)	59%/67%	52%	59%	44%	44%	39%	45%
Fish	29	37	35	22	22	27	33
Habitat Score / High Quality Reference Score	96/84.1	95/84.1	113.7/84.1	97.1/93.6	<mark>92.2</mark> /93.6	96.8/93.6	110.5/93.6
Impervious cover (%)	31.51	31.18	17.22	4.05	3.69	21.71	7.88
Watershed Size (mi ²)	2.51	7.98	21.25	2.97	4.17	4.98	11.64

Parameter	Ford	Fred	Fry Ditch No. 2	Haikey (Tulsa)	Joe	South Park	Spunky (Tulsa)	Vensel
Oxygen Demand, 5-Day Biological (mg/L)(DL 3.0 mg/L)	3.06	3.18	3.06	3.42	4	5	3	3
Cadmium, Total (µg/L) (DL 0.5 µg/L)	0.42	0.38	0.42	0.38	0.38	0.38	0.38	0.38
Coliform, Fecal (CFU/100 mL)(DL 1 CFU/100 mL)	56	130	56	231	176	151	70	210
Conductivity µS	440	517	440	473	456	528	570	562
Copper, Total (µg/L) (DL 0.5 µg/L)	1.72	1.84	1.72	1.63	1.49	1.59	1.83	1.83
Diazinon (µg/L) (DL 0.17-5.0 µg/L)	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Dissolved Oxygen (mg/L)	10.59	9.14	10.59	8.85	9.2	8.52	9.97	10.61
E. coli Geomean(MPN/100 mL) (DL 1 MPN/100 mL)	67	214	552	277	194	186	102	311
Enterococcus Geomean (MPN/100 mL)(DL 1 CFU/100 mL)	261	462	898	927	141	747	213	343
Flow (cfs)	0.38	0.25	0.38	0.48	2.34	0.09	2.14	0.36
Hardness, Total (mg/L) (DL 3.6 mg/L)	194	244	194	189	177	210	237	244
Lead, Total (µg/L) (DL 0.5 µg/L)	0.49	0.41	0.49	0.57	0.38	0.62	0.39	0.38
Nitrogen, Total Kjeldahl (mg/L)(DL 0.50 mg/L)	1.1	0.92	1.1	0.62	0.61	1.25	0.84	0.81
Nitrogen, Nitrate-Nitrite (mg/L) (DL 0.2 mg/L)	0.23	0.38	0.23	0.37	0.24	0.23	1.19	0.29
Nitrogen, Total as Nitrogen (mg/L)(DL 0.50 mg/L)	1.15	1.13	1.15	0.77	0.66	1.29	1.94	0.94
Oil and Grease (mg/L) (DL 6.0-6.5 mg/L)	6.65	8.1	6.65	7.08	6.89	6.53	6.68	9.01
Oxygen Demand, Chemical (mg/L)(DL 20 mg/L)	21	20	21	21	22	32	22	20
pH (su)	6.8-7.9	7.33	7.58	7.2-7.9	7.0-7.6	7.0-7.7	7.3-8.3	7.0-7.8
Phosphorus, Total (mg/L) (DL 0.010 mg/L)	0.07	0.04	0.07	0.06	0.04	0.15	0.7	0.05
Phosphorus, Dissolved (mg/L) (DL 0.010 mg/L)	0.05	0.03	0.05	0.03	0.03	0.04	0.63	0.03
Solids, Total Dissolved (mg/L) (DL 10 mg/L)	314	392	314	338	308	384	418	388
Solids, Total Suspended (mg/L) (DL 2.0 mg/L)	12.7	9.98	12.7	10.63	2.84	41.2	8.78	6.2
Water Temperature (°C) (Low-High)	1.7-30	6.1-27	3.6-26	3.0-28	0.9-29	4.2-28	1.9-29	2.3-27
Turbidity (NTU)	10.78	10.22	10.78	8.82	5.55	52.26	10.68	8.4
Zinc, Total (μg/L) (DL 10 μg/L)	12.23	11.02	12.23	9.91	8.99	10.47	9.74	10.51
Benthic Macroinvertebrates - Summer (1/2)	52%/52%	65%/ <mark>45%</mark>	52% /45%	58%/ <mark>39%</mark>	52%/52%	55%/58%	77%/65%	<mark>26%/</mark> 52%
Benthic Macroinvertebrates - Winter (1/2)	74%/67%	59%/59%	52%/59%	44%/44%	37%/44%	59%/67%	<mark>44%</mark> /104%	<mark>44%/</mark> 89%
Fish	25	19	27	29	29	23	33	17
Habitat Score / High Quality Reference Score	71 /84.1	59.1 /84.1	97/84.1	111.1/84.1	95.17/84.1	80.9 /84.1	110.67/84.1	100.93/84.1
Impervious cover (%)	31.39	28.84	21.07	32.19	68.6	28.39	4.2	21.95
Watershed Size (mi ²)	2.41	1.71	3.43	2.22	13.11	0.9	15.01	5.29

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Parameter	Adams	Brookhollow	Center	Coal	Cooley	Sugar	Tupelo	Upper Mill
Oxygen Demand, 5-Day Biological (mg/L)(DL 3.0 mg/L)	3.48	3	6.24	5.45	3	3	5.1	3.1
Cadmium, Total (μg/L) (DL 0.5 μg/L)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Conductivity µS	478	521	540	596	532	534	540	777
Copper, Total (µg/L) (DL 0.5 µg/L)	3.1	1.37	2.6	1.81	1.13	1.81	1.65	1.36
Dissolved Oxygen (mg/L)	7.68	7.98	8.44	7.74	8.72	9.67	8.5	9.7
E. coli Geomean(MPN/100 mL) (DL 1 MPN/100 mL)	446	291	150	527	154	755	1081	4466
Enterococcus Geomean (MPN/100 mL)(DL 1 CFU/100 mL)	1324	653	269	685	70	357	966	1080
Flow (cfs)	0.21	0.56	0.26	1.66	5.8	0.25	0.38	0.31
Hardness, Total (mg/L) (DL 3.6 mg/L)	199	270	223	263	284	250	274	352
Lead, Total (µg/L) (DL 0.5 µg/L)	0.53	0.58	1.43	0.57	0.5	0.52	0.5	0.51
Nitrogen, Total Kjeldahl (mg/L)(DL 0.50 mg/L)	1.11	0.69	0.83	0.93	0.7	0.68	0.6	0.61
Nitrogen, Nitrate-Nitrite (mg/L) (DL 0.2 mg/L)	0.3	0.34	0.23	1.05	0.39	0.52	0.64	1.35
Nitrogen, Total as Nitrogen (mg/L)(DL 0.50 mg/L)	1.36	0.79	0.91	1.67	0.83	0.93	0.89	1.54
Oxygen Demand, Chemical (mg/L)(DL 20 mg/L)	26	30	32	27	19	27	23	22
pH (su)	6.5-7.4	6.8-7.8	6.8-8.0	6.9-8.0	7.0-8.0	6.9-8.1	6.8-8.0	7.1-8.2
Phosphorus, Total (mg/L) (DL 0.010 mg/L)	0.06	0.04	0.16	0.04	0.031	0.03	0.04	0.04
Phosphorus, Dissolved (mg/L) (DL 0.010 mg/L)	0.03	0.02	0.03	0.03	0.02	0.02	0.03	0.03
Solids, Total Dissolved (mg/L) (DL 10 mg/L)	322	347	374	403	382	357	415	560
Solids, Total Suspended (mg/L) (DL 2.0 mg/L)	8.91	11.46	77.53	5.68	4.3	9.5	15.3	5.5
Water Temperature (°C) (Low-High)	5.8-24.6	4.4-25.3	2.7-25.9	4.9-26.4	4.9-28.4	2.7-26.0	2.8-25.8	5.4-27.0
Turbidity (NTU)	12.13	7.7	12.96	5.89	5.8	4.6	5	8.47
Zinc, Total (μg/L) (DL 10 μg/L)	11.74	12.05	15.67	12.78	11.44	11.22	12.18	11.43
Benthic Macroinvertebrates - Summer (1/2)	39%/39%	52%/52%	48%/41%	58%/58%	71%/58%	65%/ <mark>45%</mark>	39%/45%	58%/ <mark>45%</mark>
Benthic Macroinvertebrates - Winter (1/2)	89%/ <mark>22%</mark>	52%/67%	104%/80%	67%/81%	52%/52%	67%/74%	74%/52%	67%/ <mark>37%</mark>
Fish	23	25	31	29	25	21	17	17
Habitat Score / High Quality Reference Score	72.8 /84.1	98.8/84.1	105.8/84.1	90.6/84.1	118.1/84.1	110/84.1	102.3/84.1	103.9/84.1
Impervious cover (%)	1.8	28.97	6.18	31.86	21.16	22.06	39.34	50.33
Watershed Size (mi ²)	1.57	4.87	3.85	17.1	6.14	1.92	2.27	4.85

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Parameter_	Berryhill	Douglas	Eagle	Lower Mingo	Upper Mingo	Quarry	Salt (Tulsa)
Oxygen Demand, 5-Day Biological (mg/L)(DL 3.0 mg/L)	3	5.5	4.58	3.28	3	3	3
Cadmium, Total (μg/L) (DL 0.5 μg/L)	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Conductivity µS	338	630	607	504	712	649	1905
Copper, Total (μg/L) (DL 0.5 μg/L)	1.69	2.11	1.09	1.34	2.14	0.8	0.99
Dissolved Oxygen (mg/L)	10.27	7.89	9.45	9.05	10.22	9.58	10.2
<i>E. coli</i> Geomean(MPN/100 mL) (DL 1 MPN/100 mL)	51	364	75	99	288	39	53
Enterococcus Geomean (MPN/100 mL)(DL 1 CFU/100 mL)	42	479	79	64	150	32	136
Flow (cfs)	0.96	0.24	0.33	14.51	0.22	2.88	2.11
Hardness, Total (mg/L) (DL 3.6 mg/L)	152	237	288	210	281	303	1097
Lead, Total (µg/L) (DL 0.5 µg/L)	0.5	0.96	0.67	0.54	0.5	0.5	0.58
Nitrogen, Total Kjeldahl (mg/L)(DL 0.50 mg/L)	0.66	1.16	0.76	0.9	1.08	0.61	1.11
Nitrogen, Nitrate-Nitrite (mg/L) (DL 0.2 mg/L)	0.5	0.59	0.21	0.27	0.33	0.21	0.34
Nitrogen, Total as Nitrogen (mg/L)(DL 0.50 mg/L)	0.96	1.63	0.76	0.99	1.22	0.66	1.32
Oxygen Demand, Chemical (mg/L)(DL 20 mg/L)	23	48.6	21	20	23	20	22
pH (su)	6.7-7.1	7.0-7.9	5.5-8.0	7.27-8.0	7.3-8.1	5-8.0	7.0-7.99
Phosphorus, Total (mg/L) (DL 0.010 mg/L)	0.03	0.05	0.03	0.04	0.04	0.02	0.08
Phosphorus, Dissolved (mg/L) (DL 0.010 mg/L)	0.02	0.03	0.01	0.02	0.02	0.01	0.04
Solids, Total Dissolved (mg/L) (DL 10 mg/L)	243	472	411	339	516	464	1791
Solids, Total Suspended (mg/L) (DL 2.0 mg/L)	6	13	18.78	12.56	10.5	8.46	16.06
Water Temperature (°C) (Low-High)	4.8-27	3.9-25.4	4.4-26.5	3.3-27.80	0.8-29.2	6.9-28.5	6.7-23.8
Turbidity (NTU)	4	10.1	9.43	8.59	7.13	4.96	12.81
Zinc, Total (μg/L) (DL 10 μg/L)	10	14.46	14.81	10.33	10.84	10	10.3
Benthic Macroinvertebrates - Summer (1/2)	56%/81%	<mark>34%</mark> /90%	45%/45%	52%/97%	65%/65%	52%/ <mark>45%</mark>	58%/52%
Benthic Macroinvertebrates - Winter (1/2)	<mark>45%</mark> /52%	72%/ <mark>22%</mark>	44%/44%	64%/ <mark>37%</mark>	59%/ <mark>37%</mark>	67%/ <mark>44%</mark>	59%/ <mark>44%</mark>
Fish	27	31	19	33	21	27	23
Habitat Score / High Quality Reference Score	111/93.1	<mark>82</mark> /84.1	85.7/84.1	124.1/84.1	87.6/84.1	119.9/84.1	111.1/84.1
Impervious cover (%)	9.1	46.47	16.98	35.41	53.62	17.05	0.2
Watershed Size (mi ²)	4.89	3.32	1.13	57.95	1.3	4.71	3.39

Section 2. Impacts Identified

Habitat

Habitat scores were compared to Oklahoma Water Resources Board High Quality Habitat mean scores (Oklahoma Conservation Commission 2006). As shown in Figure 4 generally habitat scores met or exceeded state reference conditions.

It remains noteworthy to consider that habitat assessments are performed on reaches of the stream that have viable biological communities, and do not include channelized portions very often. These habitat scores may not be representative of the entire stream.

Figure 4. Habitat Assessment Scoring for all 30 Streams



Benthic Macroinvertebrates

Benthic Macroinvertebrate collections may indicate the impact of first flush from rain events. Unbalanced correlation between analytical results and Fish species identification indicate there is an unknown event that is occurring preventing the establishment of beneficial macroinvertebrates. Increases in low impact development to mitigate impervious surface coverage may aid in increasing benthic macroinvertebrate populations. Staff increases for wet weather event monitoring and follow-up and response crews may give more insight into pollution sources.

Sanitary Sewer Overflows

The GIS program mapped Sanitary Sewer overflows in the City of Tulsa that were reported. With bacteria being the leading exceedance of WQS, overflows reaching the stormwater conveyance system would undoubtedly have an impact. In those, the SWQ compliance and enforcement group would be notified and respond to monitor such overflows. A GIS program to map and monitor SSOs, Septic System Locations, and Microbial Source Tracking results is in development, and my give insight to problem areas in the future.

The table below shows the number of overflows and estimated bypass amounts in each watershed:

Watershed	Total Overflows	Total Bypass Amount in Gallons
Joe Creek	93	2757539
Coal Creek	92	3554055
Dirty Butter Creek	51	1724367
Flat Rock Creek	41	205647
Lower Mingo Creek	40	4573766
Upper Mill Creek	39	3319480
Crow Creek	33	2165153
Brookhollow Creek	32	74462
Upper Mingo Creek	29	303477
Haikey Creek	23	68234
Tupelo Creek	18	354029
Douglas Creek	18	65488
Fred Creek	15	170476
Spunky Creek	12	223562
Mooser Creek	11	271126
Vensel Creek	10	3832
Fry Ditch No. 2	6	90708
Cooley Creek	4	6190
Sugar Creek	3	18888
Hager Creek	1	Not available
Berryhill Creek	1	Not available
Nickel Creek	0	0
Harlow Creek	0	0
Ford Creek	0	0
South Park Creek	0	0
Adams Creek	0	0
Center Creek	0	0
Eagle Creek	0	0
Quarry Creek	0	0
Salt Creek	0	0

TDS

Streams draining to Bird Creek had a much more stringent WQS regarding TDS than streams draining to the Arkansas River. With all these streams being subject to many of the same land uses, all the City of Tulsa watersheds would be well within compliance with the TDS standard for the Arkansas River drainage. It is difficult to mitigate TDS when all streams share a similar "ambient" TDS range. Except for Salt Creek, there were very few recorded spikes in TDS of sample results. Salt Creek was identified to have abandoned strip mining pits be the primary contributor to high TDS readings, however there have been no identified effects on wildlife.

Fish Kills

In February of 2021, an extended freeze caused a record number of water line breaks in the City of Tulsa. Fish kills were reported in Coal Creek, Mill Creek, Flat Rock Creek, Dirty Butter Creek, Joe Creek, Crow Creek, Braden Pond, and Crescent Pond. The breaks were repaired, and readings have returned to normal.

Section 3. Responses Taken

For instances of Identified WQS exceedances, a follow up and response program was established in 2015. While it took some time to establish, it essentially identified any WQS exceedance as soon as the laboratory data was available. The only disadvantage with the follow up and response program is the turnaround time for samples to be analyzed in the labs would be days, weeks or even a month depending on the parameter. A total of 113 follow-ups were performed since the inception of the program in 2017. Also, in some cases the following months watershed characterization samples showed returned to acceptable levels. The most identified exceedance was in Bacteria, which the WQS is normally a geometric mean of many samples over time, not just one. In response to a single sample exceeding the geomean standard, Dry Weather Field screening procedure was taken to identify any potential illicit discharges. There were not any instances of identifying point source contributions that would be the primary cause of the bacteria exceedances through in field stream measurements. GIS mapping is being developed to show instances of SSO's, Septic System Locations, and Microbial Source Tracking Results. In the future, this map can be included in the impacts identified section.

In the case of TDS, many watersheds were located in a area that had no difference other than the stream segment ID that designated a more lenient WQS. If those streams would have the same standard as the other nearby streams.

Below is a table of recorded exceedances and follow-ups taken. In most cases, a discernable source of the exceedance was not found.

Date	Stream name	Parameter	Measured value	Follow up result
Jul-17	Spunky Creek	Total Phosphorus	0.64 mg/L	Green Country WWT Effluent
Oct-17	Spunky Creek	Total Phosphorus	0.45 mg/L	Green Country WWT Effluent

Nov-17	Spunky Creek	Total Phosphorus	1 mg/L	Green Country WWT Effluent
Nov-17	Spunky Creek	TDS	400 mg/L	Green Country WWT Effluent
Dec-17	South Park Creek	Total Phosphorus	0.27 mg/L	Below WQS before Source ID
Dec-17	Spunky Creek	Total Phosphorus	0.92 mg/L	Green Country WWT Effluent
Dec-17	Spunky Creek	TDS	460 mg/L	Green Country WWT Effluent
Feb-18	Spunky Creek	Total Phosphorus	1.1 mg/L	Green Country WWT Effluent
Apr-18	Spunky Creek	Total Phosphorus	0.29 mg/L	Green Country WWT Effluent
Apr-18	Spunky Creek	TDS	530 mg/L	Green Country WWT Effluent
May-18	South Park Creek	TDS	810 mg/L	Below WQS before Source ID
May-18	Spunky Creek	Total Phosphorus	0.42 mg/L	Green Country WWT Effluent
May-18	Spunky Creek	TDS	400 mg/L	Green Country WWT Effluent
Jun-18	Ford Creek	Total Phosphorus	0.41 mg/L	
Jun-18	Spunky Creek	Total Phosphorus	0.71 mg/L	Green Country WWT Effluent
Jun-18	Spunky Creek	TDS	400 mg/L	Green Country WWT Effluent
Jul-18	Center Creek	TDS	530 mg/L	Average ambient range
Jul-18	Upper Mill Creek	TDS	690 mg/L	Continue to Monitor
Aug-18	Upper Mill Creek	TDS	650 mg/L	Follow- up, no source ID
Sep-18	Upper Mill Creek	TDS	670 mg/L	Follow- up, no source ID
Oct-18	Center Creek	TDS	640 mg/L	Continue to Monitor
Oct-18	Upper Mill Creek	TDS	670 mg/L	Average Ambient Range
Nov-18	Tupelo Creek	TDS	410 mg/L	Average Ambient Range
Nov-18	Upper Mill Creek	TDS	480 mg/L	Average Ambient Range
Nov-18	Sugar Creek	TDS	400 mg/L	Average Ambient Range
Nov-18	Cooley Creel	TDS	400 mg/L	Average Ambient Range
Nov-18	Center Creek	TDS	360 mg/L	Average Ambient Range
Nov-18	Brookhollow Creek	TDS	400 mg/L	Average Ambient Range
Nov-18	Adams Creek	TDS	380 mg/L	Average Ambient Range
Dec-18	Adams Creek	TDS	390 mg/L	Average Ambient Range
Dec-18	Center Creek	TDS	420 mg/L	Average Ambient Range
Dec-18	Coal Creek	TDS	420 mg/L	Average Ambient Range
Dec-18	Cooley Creel	TDS	400 mg/L	Average Ambient Range
Dec-18	Sugar Creek	TDS	390 mg/L	Average Ambient Range
Dec-18	Tupelo Creek	TDS	500 mg/L	Average Ambient Range
Dec-18	Upper Mill Creek	TDS	480 mg/L	On a steady decline, no source ID
Jan-19	Coal Creek	TDS	500 mg/L	Average Ambient Range
Jan-19	Tupelo Creek	TDS	470 mg/L	Average Ambient Range
Jan-19	Upper Mill Creek	TDS	470 mg/L	Average Ambient Range
Feb-19	Tupelo Creek	TDS	530 mg/L	Average Ambient Range
Feb-19	Upper Mill Creek	TDS	500 mg/L	No source ID
Mar-19	Coal Creek	TDS	520 mg/L	Exceedance too low to search for source

Mar-19	Tupelo Creek	TDS	500 mg/L	Exceedance too low to search for source		
Mar-19	Upper Mill Creek	TDS	530 mg/L	Exceedance too low to search for source		
May-19	Upper Mill Creek	TDS	510 mg/L	No source ID		
Jul-19	Salt Creek	TDS	2100 mg/L	Strip pit contributions		
Aug-19	Eagle Creek	TDS	450 mg/L	Well below cross timbers SWQS		
Aug-19	Quarry Creek	TDS	500 mg/L	Well below cross timbers SWQS		
Aug-19	Salt Creek	TDS	2100 mg/L	Strip pit contributions		
Sep-19	Salt Creek	TDS	2100 mg/L	Strip pit contributions		
Oct-19	Salt Creek	TDS	1900 mg/L	Strip pit contributions		
Nov-19	Salt Creek	TDS	1800 mg/L	Strip pit contributions		
Dec-19	Upper Mingo Creek	TDS	660 mg/L	DWFS		
Jan-20	Douglas Creek	TDS	580 mg/L	Sample TDS upstream		
Jan-20	Eagle Creek	TDS	1700 mg/L	On par with historical data		
Jan-20	Salt Creek	TDS	1500 mg/L	Strip pit contributions		
Jan-20	Upper Mingo Creek	TDS	680 mg/L	Sample TDS upstream		
Feb-20	Douglas Creek	TDS	650 mg/L	Follow up		
Feb-20	Salt Creek	TDS	1900 mg/L	Strip pit contributions		
Feb-20	Upper Mingo Creek	TDS	680 mg/L	Follow up		
Mar-20	Salt Creek	Phosphorus Total	0.43 mg/L	Follow up		
Mar-20	Salt Creek	TDS	390 mg/L	Strip pit contributions		
Mar-20	Upper Mingo Creek	TDS	480 mg/L	Shown ambient		
Apr-20	Salt Creek	TDS	2000 mg/L	DWFS		
Apr-20	Upper Mingo Creek	TDS	600 mg/L	Shown ambient		
May-20	Douglas Creek	TDS	520 mg/L	Shown ambient		
May-20	Quarry Creek	TDS	390 mg/L	Re-sample		
May-20	Salt Creek	TDS	1900 mg/L	Strip pit contributions		
May-20	Upper Mingo Creek	TDS	490 mg/L	Shown ambient		
Jun-20	Douglas Creek	TDS	560 mg/L	Shown ambient(nonpoint)		
Jun-20	Salt Creek	TDS	1900 mg/L	Strip pit contributions		
Jun-20	Upper Mingo Creek	TDS	660 mg/L	Shown ambient		
Jul-20	Crow Upstream	Total Nitrogen	6.0 mg/L	Re-sample		
Jul-20	Upper Mill Downstream	TDS	650 mg/L	Check conductivity		
Jul-20	Upper Mill Upstream	TDS	720 mg/L	Check conductivity		
Jul-20	Sugar Upstream	TDS	420 mg/L	Check conductivity upstream		
Jul-20	Coal Upstream	TDS	1500 mg/L	Check conductivity upstream		
Aug-20	Upper Mill Downstream	TDS	630 mg/L	Check upstream re-sample results		

Aug-20	Upper Mill Upstream	TDS	740 mg/L	Re-sample
Aug-20	Coal Upstream	TDS	1300 mg/L	Re-sample
Sep-20	Upper Mill Downstream	TDS	620 mg/L	Continue with last month's follow-ups
Sep-20	Upper Mill Upstream	TDS	800 mg/L	Continue with last month's follow-ups
Sep-20	Tupelo Upstream	TDS	410 mg/L	Continue with last month's follow-ups
Oct-20	Upper Mill Downstream	TDS	420 mg/L	Continue with last month's follow-ups
Oct-20	Upper Mill Upstream	TDS	1000 mg/L	Continue with last month's follow-ups
Oct-20	Tupelo Upstream	TDS	530 mg/L	Continue with last month's follow-ups
Oct-20	Sugar Upstream	TDS	480 mg/L	Continue with last month's follow-ups
Nov-20	Upper Mill Downstream	TDS	770 mg/L	Site runoff
Nov-20	Upper Mill Upstream	TDS	940 mg/L	Investigate ONE GAS
Nov-20	Tupelo Upstream	TDS	490 mg/L	Check conductivity upstream
Nov-20	Coal Downstream	TDS	470 mg/L	Check conductivity upstream
Dec-20	Coal Downstream	TDS	450 mg/L	DWFS
Feb-21	Tupelo Downstream	TDS	490 mg/L	Near standard
Mar-21	Tupelo Downstream	TDS	430 mg/L	Near standard
Mar-21	Sugar Downstream	TDS	460 mg/L	Follow-up
Mar-21	Sugar Upstream	TDS	400 mg/L	Follow-up
Mar-21	Coal Downstream	TDS	530 mg/L	Near standard
Mar-21	Coal Upstream	TDS	410 mg/L	Near standard
Apr-21	Upper Mill Downstream	TDS	630 mg/L	Average Ambient Range
Apr-21	Upper Mill Upstream	TDS	770 mg/L	Average Ambient Range
Apr-21	Tupelo Upstream	TDS	490 mg/L	Average Ambient Range
Apr-21	Coal Downstream	TDS	530 mg/L	Average Ambient Range
Apr-21	Coal Upstream	TDS	390 mg/L	Average Ambient Range
May-21	Upper Mill Downstream	TDS	650 mg/L	Average Ambient Range
May-21	Upper Mill Upstream	TDS	720 mg/L	Average Ambient Range
Jun-21	Upper Mill Downstream	TDS	600 mg/L	Average Ambient Range

Jun-21	Upper Mill Upstream	TDS	710 mg/L	Average Ambient Range
Jun-21	Tupelo Downstream	TDS	390 mg/L	Average Ambient Range
Jun-21	Tupelo Upstream	TDS	580 mg/L	Average Ambient Range
Jun-21	Sugar Downstream	TDS	400 mg/L	Average Ambient Range
Jun-21	Coal Downstream	TDS	410 mg/L	Average Ambient Range
Jun-21	Coal Upstream	TDS	420 mg/L	Average Ambient Range
Jun-21	Coal Upstream	TDS	420 mg/L	Average Ambient Range

Public Education

Areas of the City of Tulsa with a high number of septic systems were targeted with digital ads through Over the top (OTT) video streaming and music streaming advertisements. The same was attempted with areas where pet waste might be at high concentrations as well.

The Annual Creek Clean-Up for the City of Tulsa was converted to a virtual event. This allowed for 20 different clean-up locations throughout the city and boasted over 200 participants. Improvement on the process of signing up and participation in future years would contribute to watershed pollution awareness and reduction of pollution introduction.

Section 4. Modifications

1. Implement a fish stocking regime

In cases of streams with high habitat scores and low fish scores, coupled with identified downstream fish re-population barriers, implement a stocking regime by collecting fish downstream and transporting to be released upstream. There are no regulations requiring the altering of channels to eliminate fish barriers, making it unlikely to ever be a priority project.

2. Increase personnel dedicated to follow up sampling and/or tributary surveys. This would increase the ability to identify potential sources and allow for additional wet weather sampling events. Also continue to improve the tracking database for follow-up and response to include more results and historical reference when encountering further exceedances.

3. Research the addition of sampling for polyfluoroalkyl substances (PFAS), a relatively new test to protect citizens from environmental pollutants.

4. Continue to develop thresholds for microbial source tracking in identifying bacterial sources.

5. Investigate adoption of Chlorophyll A as a sampling parameter to determine nutrient impacts on waterways.

Section 5 – Annual Expenditures

Section 5

Annual Expenditures for the Reporting Period/Budget for the Year Following Each Annual Report

	FY 2020/2021 Actual (before	FY 2021/2022 Budget
	audit)	
Section Name		
Warehouse	15,678	22,922
Customer Care	221,665	247,537
Security (Direct charge fund 560)	51,193	63,000
Asset Management Admin (plus 1614)	946	848
Security	211,173	257,997
Building Operations – Administration	1,946	2,053
Building Operations – Contracts	2,635	2,733
Building Maintenance	32,873	51,851
Custodial Services	13,232	12,510
IT Capital Direct Charges	36,000	36,000
Engineering Services Administration	122,741	155,749
Engineering Administration – Stormwater	193,968	482,690
Reproduction changed to Central Services	231,964	281,188
Design Services – Administration	42,878	44,022
Design	786,445	906,365
Hydrology and Hydraulics	41,550	46,570
Alert System	33,419	151,716
Field Engineering – Administration	69,082	54,937
Construction Inspection	435,871	516,066
Call OKIE – Encroachments	65,142	61,269
Field Surveys	143,188	170,214
Planning and Project Management Administration	46,694	54,019
Project Management	26,017	17,814
Infrastructure Management	136,018	141,900
Graphics / CADDS	188,703	204,663
Floodplain Management	2,349,700	2,430,703
Planning Stormwater/General	126,478	132,913
Engineering Graphics	130,947	135,406
Right of Way	122,096	140,320
Streets & Stormwater – Administration	116,183	151,680
SS Payroll & Accts Payable	21,380	32,340
SS – Stormwater Fund	4,687,307	4,847,761
S&SW Dir Internal IT	43,106	54,508

Section 5 – Annual Expenditures

Stormwater & Land Management Admin	1,095,074	1,109,816
Detention, Ditch, Concrete Channel	1,474,282	1,364,934
Channel Maintenance and Ditching	1,742,225	2,226,085
Storm Sewer Maintenance	2,821,039	849,323
Stormwater Quality	1,741,933	1,453,652
Stormwater Vegetation	2,720,152	2,824,279
Household Pollutant Collection	43,251	45,100
Land Reclamation Site	159,570	
STREET MAINT & INSPECTIONS - ADMIN	135,490	166,429
STREET MAINTENANCE PATCHING	703,342	929,718
Paving Cut Administration	56,989	47,480
S&SW Mowing and Sweeping	1,530,708	2,260,959
S&SW Invest/Inspection		615,274
S&SW Stormsewer Cleaning		862,077
S&SW Stormsewer Repairs		1,828,580
Water and Sewer Admin.	21,404	22,996
Water & Sewer Dept. – Stormwater	27,026	69,242
W&S Admin Internal IT	4,697	3,800
Quality Assurance – Administration	7,961	10,728
Quality Assurance – Operations Support	1,059	1,825
Laboratories	112,629	156,978
Distribution Systems - Administration	13,877	13,894
Field Cust. Serv. Rep. I (Meter Reading)	57,679	59,807
Sewer O & M – Admin	68,732	70,544
Lift and Pump Stations	282,110	329,149
General Site Services changed to P&R Fac Sys Land & Gen Maint	318,748	352,937
Horticulture changed to P&R Uti Svs Horticulture	86,422	105,054
Park - Fac Svs Forestry - New split from Horticulture	48,300	55,502
Fin Dir Internal IT	3,792	5,583
Utilities Administration	623,484	718,002
IT Administration	37,924	41,859
IT Operations	197,274	158,329
IT Client Services	290,899	253,247
Sewer O & M – Support Services / Dispatch	17,800	16,874
Transfer to Capital Projects	5,000,000	6,150,000
Debt Service	2,076,986	2,214,000
Total	34,271,077	39,306,321

Section 6 – A Summary of Enforcement Actions, Inspections and Public Education

Section 6

A Summary of Enforcement Actions, Inspections, and Public Education

A. Enforcement Actions

It is the philosophy of the City of Tulsa to bring responsible parties into compliance through education prior to initiating any enforcement action. Enforcement actions are taken only when deemed necessary to ensure permit compliance.

During this reporting period 232 investigations were conducted identifying 8 illicit discharges to the storm sewers. Title 11-A Chapter 5 (Pollution Ordinance) was adopted November 1995 and continues to be utilized for the removal of non-storm water discharges (see Section 6). This Ordinance allows the City of Tulsa to recover cleanup cost from the responsible party.

A summary of the investigations conducted by the Stormwater Management Division are as follows:

Number of Investigations	Description of Investigations
13	Construction (relating to construction site potential violations)
10	Hazmat (relating to potential discharges of pollutants from fire department responses involving the hazardous materials unit)
207	Stormwater (relating to potential releases of pollutants to the storm sewer or violations of the pollution ordinance)
2	Drug Labs (relating to the potential release of pollutants from drug lab remediation to the storm sewer or violations of the pollution ordinance)
232	Total number of investigations for this reporting year

Section 6 – A Summary of Enforcement Actions, Inspections and Public Education

- Construction Site Erosion Control
 - The Stormwater Management Division conducted 1,978 construction site inspections resulting in 13 enforcement actions. These actions consisted of issuing a notice of violation that may involve fines and cost recovery. The total amount of fines and penalties collected was \$550.
- Industrial, Commercial and Residential Sites
 - Tulsa continued to use the Industrial and High Risk Runoff program to identify, monitor and control pollutants from municipal landfills; treatment, storage and disposal facilities for municipal waste; facilities subject to EPCRA Title III, Section 313 reporting requirements; and any other industrial or commercial discharge the City determined had the potential to contribute substantial pollutant loading to the City's storm sewer system. This program contains procedures for inspecting, monitoring and controlling pollution from the aforementioned sources. A database of industrial storm water sources discharging to the City's storm sewer continues to be maintained. During this reporting period, 461 industrial stormwater inspections were conducted. Two enforcement actions were taken against industries or facilities in order to eliminate illegal or illicit discharges. \$200 in fines was levied during this fiscal year.

B. Inspections

The following is a summary of inspections that were conducted during this reporting period. These inspections were previously mentioned in other sections of this report.

Sewer Operations Maintenance and SM conducted the following:

• Sanitary sewer lines TV inspected – 247 miles

SM conducted the following inspections:

- Storm sewer lines inspected 11 miles
- Industrial and commercial storm water runoff inspections 461
- Construction site erosion control inspections 1,978

Development Services conducted the following number of inspections:

• 379 construction site inspections were conducted with attention on erosion controls measures.

Section 6 – A Summary of Enforcement Actions, Inspections and Public Education

Engineering Services conducted the following inspections:

• Daily inspections at construction projects (190 city and privately funded Infrastructure Development Process (IDP) projects).

C. Public Education Programs

The public education programs utilized by the City of Tulsa have been described in Section 1 of this report. The City of Tulsa understands that public education plays a major role in reducing non-point source pollution and improving stormwater runoff quality. Tulsa believes that it is better to prevent non-point source pollution at the source through education than to control it after it is generated. Many educational programs used by the City of Tulsa to meet permit requirements are completed through the cooperative efforts of other groups, such as The M.e.t. and the Tulsa County Conservation District, as well as various City of Tulsa departments. Through activities such as educational events, presentations, school visits, summer day camps, conferences, television/radio commercials, billboards etc. education material was viewed many millions of times during this reporting period. See below for more information on Tulsa's Public Education Program's.

Attachment A "Public Education 2020-2021" lists the educational material distributed during this reporting period by the City of Tulsa.

Attachment B "Education Events 2020-2021" lists the educational activities performed during this period by the City of Tulsa.

Attachment C "Children's Education Activities 2020-2021" lists various educational activities performed for children's groups.

	Illicit Discharge	Animal Waste	Antifreeze	Motor Oil	Paint	Fertilizer	Pesticides	LID	Compost	Yard Waste	Erosion	Floatables	Master Gardener	HHPCF	Custromer Care Line/Websi te	# Distributed
General Brochure	x	х	х	x	x	х	х	x	х	х	х	х		х	х	1486
Pet Waste	x	х					х								х	850
Pesticides	x					х	х						х	х	х	0
Motor Oil	x		х	x										х	х	0
Fertilizer	x					х							х	х	х	0
Pollution Prevention Plan	x														x	0
Outside Washing	x		х	x											x	11
Car Wash	x		x	x			х			х			х		x	10
Pool Water Disposal	х												х			10
Landscaping BMP	х					х	х			х			х		х	10
Pond Maintenance BMP	х			x							х	х		х		0
Carpet Cleaning BMP	x														x	0
Construction Brochure	x		x	х											x	0
HHPCF Brochure	x		x	x	x	х	х	x								1463
Enviroscape Activity	х	х	х													5
Fish Prints Activity	х	х														0
Fishing Pole																0
Rain Gauge	x														x	256
Pencils	x															1084
Educational Display	x	x	x	x	x	x	х	x	х	x	х	х	х		х	1
Cups															х	86
Pet Waste Bags		х														192
Pens		х													х	478
Tattoos																0
Seed Packets	x														x	1229
SOS Tote Bags	x					x	х								x	330
Total Materials																7501

Attachment A: Education Materials Distributed or Used in FY 20-21

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Jate	iven Jam		t att
7.1.2020	Tulsa Mid-Week Farmers Market	Set up edcuation tabel at Tulsa Farmers Market mid-week event	. ∓ 65
7.1.2020	Paws and White Claws	Formerly "Bark in the Park". Dog owners brought pets to baseball game. We spoke with fans about stormwater guality	1.254
7.2.2020	1st Thursday	Monthly Environmental Meeting	44
7.8.2020	Paws and White Claws	Set up eduation tabel at Tulsa Drillers baseball game. Bring your dog night.	1.101
7.15.2020	Paws and White Claws	Set up education table at Driller for dog themed night	998
8.1.2020	Kendall Whittier Elementary Back 2 School	We provided totes, educational brochures, and some giveaways to be handed out at this event	500
8.5.2020	Litter Outreach	Discussion of ways QT can help reduce the amount of litter in Tulsa, speciffically of QT products. They will look into and get back, and possibly consider adopting a stream.	4
8.6.2020	Internal Training	Water Distribution Day shift reviewed SWQ and SOS information.	13
8.6.2020	Internal Training	Water Distribution Night shift reviewed SWQ and SOS information.	8
8.6.2020	Sustainable Tulsa	1st Thursday - Sustainable Transportation	60
8.7.2020	Internal Training	Water Distribution took the internal training I sent out.	9
8.9.2020	Backpack Giveaway	City Church help a backpack giveaway at Clinton West. I dropped off items to go into the backpacks.	300
8.11.2020	Internal Training	Water Distribution group	11
		Monthly Stormwater Board meeting. LID manuals approved. Discussion on need for Development Services increased oversight and inspections of runoff from developments due to negativr	
8.18.2020	SDHMAB	affects on developments downstream, and LID promoted as a means to negate some of these impacts.	20
8.19.2020	Internal Training	Water Distribution Group	10
9.15.2020	School Giveaway	I gave the 200 bags I filled to the school to give away to families.	200
9.15.2020	LID Presentation	LID Presentation to Tribal Environmental Coalition of Oklahoma	20
9.17.2020	Student Education Backpacks	SWQ Backpacks filled with some education and giveaways for students doing the virtual school programs at Tulsa Parks.	20
9.17.2020	Student Education Backpacks	SWQ Backpacks filled with some education and giveaways for students doing the virtual school programs at Tulsa Parks.	30
9.19.2020	Monarchs Mobile Edition	Set up a driveby location for the Mobile Monarch event. Our location was crow creek meadow.	12
9.21.2020	Student Education Backpacks	SWQ Backpacks filled with some education and giveaways for students doing the virtual school programs at Tulsa Parks.	7
9.21.2020	Student Education Backpacks	SWQ Backpacks filled with some education and giveaways for students doing the virtual school programs at Tulsa Parks.	10
9.25-26.20	Rain Barrel Event	Citizens order rain barrel at discount rate from upcycle and pick up at HPCF. This event was schedule for two days, however some customers will pick up later.	86
9.26.2020	Fishing Derby	Fishing Derby for kids hosted by Tulsa Parks. I set up education table with SOS canopy next to registration table.	37
9.28.2020	Presentation to Oxley Volunteers	Gave a presentation to group of volunteers on Stormwater Quality and touched on floodplains and flooding	17
9.29.2020	SCHMAB Presentation	Presentationt about litter investigation program and summary of status after 1.5 years.	15
11.12.2020	SWOCC	We had 10 employees attend the Stormwater Operator Certification Course	10
		Mike spoke to owner of Next-Level Washing about their services and how it impacts our ordinance. Owner (Brian) says he is aware of ordinance and when in Tulsa uses hot water and puts ouy	
11.17.2020	Outside wasning		1
12.3.2020	ist Thursday	Niontniy sustainable i uisa meeting, introduced myseir and taik snortly about recycling oil and grease.	64
12.18.2020	Garden Courtyard Apartments	I talked to the manager of the facility and asked her if she could pass out litter information to the residents and she said she would. She agreed to make copies and said there are 200 residents.	1
1.7.2021	1st Thursday	Monthly sustainable Tulsa meeting. Shared the little things video as well as updated news.	76
1.8.2021	Bistol Apartments	Janell spoke with apartment manager and gave her education to give out.	1
2.4.2021	1st Thursday	Monthly sustainable Tulsa meeting. Shared the little things video as well as updated news.	161
2.10.2021	EMD	Inspection	6
3.2.2021	Orchard Apartment	Janell spoke with apartment manager and gave her education to give out.	58
3.4.2021	1st Thursday	Monthly sustainale Tulsa meeting. Sharred two power points about HHP and Creek Clean-Up.	85
3.3.2021	EMD	Inspection	4
4.1.2021	1st Thursday	Monthly sustainable Tulsa meeting. Shared two power points about the virual creek clean-up and HHP.	91
		Gave Cheryl Cheadle 10 tumblers, 28 coloring books, 30 SWQ hanouts, 30 HHP fridge magnets, 30 rain gauges, 14 find what is wrng with this picture, one resuable bag and two packbacks to give	
4.7.2021	Cheryl Cheadle Teacher Items	to teachers.	30
4.12.2021	Creek Cleanup	Gave out several SOS bags, pens, rain garden seeds, etc. A number of volunteers went out and cleaned various creeks.	217
5.4.2021	1st Thursday	Monthly sustainable Tulsa meeting. Shared the little things video as well as updated news.	68
5.5.2021	Drillers Game	Set up edcuation tabel at Tulsa Drillers baseball game. Bring your dog night.	1,000
5.7.2021	Rain Barrel Pickup	Citizens order rain barrel at discount rate from upcycle and pick up at HPCF. This event was schedule for two days, however some customers will pick up later.	183
5.12.2021	Environmental Expo	Set up a booth downtown at the environmental expo. Discuss the different ways in which you can effect the environment.	400
5.14.2021	Job Fair	Job fair for homeless tulsans was held at the Sheridan Hotel.	100
5.26.2021	Kendall Whittier Elementary	Set up a giveaway of stormwater supplies for the students at the elementary school	70
6.3.2021	1st Thursday	Monthly sustainable Tulsa meeting. Shared the little things video as well as updated news.	46
6.21.2021	Hicks Park Event	Summer camp event for kids of ages 6-12 years of age.	28
6.23.2021	Drillers Game	Set up edcuation tabel at Tulsa Drillers baseball game. Bring your dog night.	750
6.30.2021	Drillers Game	Set up edcuation tabel at Tulsa Drillers baseball game. Bring your dog night.	900

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Dat	Eve		# al
7.1.2020	Pre-Development Meeting	Conference call reguarding pre-contruction for street project	11
7.13.2020	Pre-Development Meeting	Construction of QT store.	12
8.3.2020	Pre-Development Meeting	Construction of Event Center.	14
8.12.2020	Pre-Development Meeting	Pre-Construction Conference CallI with 10 people	10
8.10.2020	Pre-Development Meeting	Meeting was for a residential townhouse development.	12
8.10.2020	Pre-Development Meeting	Meeting was for a Large residential development.	12
8.17.2020	Pre-Development Meeting	Meeting was for Retail and Resiential Building. They will have a lot of landscaping and a courtyard, but have no plans for LID.	17
8.19.2020	Pre-Development Meeting	No details Provided (9:00a)	9
8.20.2020	Pre-Development Meeting	No details provided. (9:00a)	10
8.20.2020	Pre-Development Meeting	No details provided. (1:00p)	10
9.3.2020	Pre-Construction	Discussed ECM's and Dragout on project in Riverwest Parks.	12
9.21.2020	Pre-Development Meeting	Building of a housing addition. Builders have plans for LID including pavers and bio-swells.	13
9.30.2020	Pre-Construction Meeting	Discussed ECM's and Dragout on Southside Waste Water Treatment Plant Concrete rehab project	10
10.1.2020	Pre-Construction Meeting	Discussed ECM's and Dragout for 91st St and South Union Ave. Sanitary Sewer Inceptor Project near Nickle Creek	7
10.1.2020	Pre-Construction Meeting	Discussed ECM's and dragout at waterline replacement city wide project	8
10.2.2020	Pre-Development Meeting	Construction of a industrial park. No plans of LID.	14
10.5.2020	Pre-Development Meeting	Construction of a 40 room recovery center. No plans for LID.	14
10.5.2020	Pre-Development Meeting	Construction of a parking lot. No LID intended.	12
10.12.2020	Pre-Development Meeting	Construction of a processing facility. Will be containing rain water from roof drains as LID.	14
10.15.2020	Pre-Construction	Waterline Replacement Citywide Project.	8
11.13.2020	Pre-Development Meeting	Construction of large building with kitchen for Meals on Wheels. Owner stated the possibilities for using LID, but hasn't at this location.	17
12.7.2020	Pre-Development Meeting	Single family home development called Maybelle Estate Villas. They are not planning any LID.	14
1.5.2021	Pre-Development Meeting	Residential development. Owners stated that they wouldnot be using LID.	13
3.8.2021	Pre-Development Meeting	Construction of offices and warehouse. Owners stated that they would not be using LID.	14
3.8.2021	Pre-Development Meeting	Construction of a commerical building. Owners stated that they would not be using LID.	13
3.22.2021	Pre-Development Meeting	Construction of a Costco. Planners stated that they would not use LID.	16
3.22.2021	Pre-Development Meeting	Construction of a hospital. Engineer stated that they would not use LID.	18
3.25.2021	Pre-Development Meeting	Construction of manufacturing facility and office building. Would look into using LID.	15
3.29.21	Pre-Development Meeting	Construction of commercial facility and living units. Owners stated that they would not use LID.	16
4.12.21	Pre-Development Meeting	Construction of an office and shop building. The owners stated they have not talked about using LID before.	15
4.19.21	Pre-Development Meeting	Construction of a Studio. Owners stated that they would not use LID.	16
4.19.21	Pre-Development Meeting	Construction of a Studio. Owners stated that they would not use LID. (two meeting on the same day)	16
5.10.21	Pre-Development Meeting	Construction of a Kum-and-Go.	16
5.17.21	Pre-Development Meeting	Construction of a cafeteria at Bishop Kellv High School.	10
7.7.2020	Twitter	Rain Barrel	NA
7.7.2020	Instagram	Rain Barrel	NA
7.7.2020	Youtube	Construction Site	NA
7.9.2020	Twitter	HHP	NA
7 16 2020	Twitter	Tain Barrel	NA
7 20 2020	Youtube	Ruenrint for Success	NA
7 20 2020	Youtube		NA
7 20 2020	Youtube		NA
8 4 2020	Instagram	San Barrel	NA
9 5 2020	Instagram	Tain Barrol	NA
9.5.2020	Twitter	Rain Barral	NA
9.9.2020	Twitter	Swan Shon	NA
9.9.2020	Twitter	Swap Shop	NA
9 9 2020	Facebook	Rain Rarrel	NA NA
9 10 2020	Facebook	HHD/Swan Shon	N/A
9 20 2020	Eacebook	Intri Jonep Joop Dain Barrel	INA NA
9.20.2020	Twitter	nain bancel	NA NA
5.20.2020	Instagram	Nain Daried	NA NA
9.20.2020	mstagram Twitter	Indii Daliye	NA
9.25.2020	Twitter		NA
10.14.2020	Facebook		NA
10.14.2020	IWILLER	JACLIVILY DOUK	NA

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10.14.2020	ш Z		# 0
10.14.2020	Twitter		NA NA
11.1.2020	Twitter	ACUNUTY BOOK	NA NA
12.1.2020	Facebook	Save Our streams	NA
12.1.2020	Twitter	Talu Waste	NA NA
12.5.2020	Twitter	Detter	NA NA
12.8.2020	Twitter		NA NA
12.8.2020	Twitter	npur	NA NA
12.11.2020	Twitter	Detter	NA NA
12.10.2020	Twitter		NA NA
17 2021	Instagram	ACUALY BOOK	NA
1.7.2021	Twitter		N/A
1.21.2021	Twitter	PTF Mater Oil	NA NA
1.23.2021	Facebook		NA
1.25.2021	Twitter		NA
1.25.2021	Youtubo	Intr Bunoff & Dollutante	NA
1.25.2021	Youtube		NA NA
1.25.2021	Instagram	Pet Waste	NA NA
1.27.2021	Escobook		NA
1.27.2021	Twitter		NA NA
1.29.2021	Instagram		NA
1.29.2021	Facebook		N/A
1.29.2021	Facebook		NA
2.4.2021			NA
2.6.2021	Twitter		NA
2.7.2021	Facebook	Ice Weit	NA
2.9.2021	Facebook		NA
2.16.2021			NA
2.26.2021	Twitter	HHP HHP	NA
2.26.2021	Гасероок		NA
3.6.2021	Twitter	Watersned Map	NA
3.7.2021	Гасероок	Species Spotight	NA
3.11.2021	Twitter	311	NA
3.12.2021	Гасероок	Save Our Streams	NA
3.16.2021	l witter	Watershed Map	NA
3.18.2021	Twitter	Creek Cleanup	NA
3.18.2021	Гасероок		NA
3.22.2021	Twitter	Kan Barrel	NA
3.23.2021	Facebook	kan barrei	NA
3.25.2021	Twitter	Kan Barrel	NA
3.26.2021	Twitter	Creek Cleanup	NA
3.31.2021	Twitter	Kan Barrel	NA
4.1.2021	Youtube	Creek Cleanup	NA
4.3.2021		Creek Cleanup	NA
4.3.2021	Twitter	Creek Cleanup	NA
4.9.2021	Facebook	Creek Cleanup	NA
4.12.2021	Facebook	Ureek Cleanup	NA
4.15.2021	Twitter	Watershed Map	NA
4.16.2021			NA
4.17.2021	I WITTER		NA
4.19.2021	Facebook	Lores Leanup	NA
4.20.2021	Facebook	Sgr. Keo	NA
4.23.2021			NA
4.30.2021			NA
5.1.2021	Twitter	Kan Barrel	NA
5.11.2021	Twitter	Kan Barrei	NA
5.21.2021	Iwitter	Iuus	NA

Date	Event Name	Decription	# attended
6.18.2021	Twitter	HHP	NA
6.25.2021	Twitter	Activity Book	NA
Total			9201

Attachment C: Tulsa Kids Education FY 20-21

	t e	iption	ended
Date	Even	Decr	# att
		We provided totes, educational brochures, and some	
8.1.2020	Kendall Whittier Elementary Back 2 School	giveaways to be handed out at this event	500
		City Church help a backpack giveaway at Clinton West. I	
8.9.2020	Backpack Giveaway	dropped off items to go into the backpacks.	300
		I gave the 200 bags I filled to the school to give away to	
9.15.2020	School Giveaway	families.	200
		SWQ Backpacks filled with some education and giveaways for	
9.17.2020	Student Education Backpacks	students doing the virtual school programs at Tulsa Parks.	20
		SWQ Backpacks filled with some education and giveaways for	
9.17.2020	Student Education Backpacks	students doing the virtual school programs at Tulsa Parks.	30
		SWQ Backpacks filled with some education and giveaways for	
9.21.2020	Student Education Backpacks	students doing the virtual school programs at Tulsa Parks.	7
		SWQ Backpacks filled with some education and giveaways for	
9.21.2020	Student Education Backpacks	students doing the virtual school programs at Tulsa Parks.	10
		Fishing Derby for kids hosted by Tulsa Parks. I set up	
9.26.2020	Fishing Derby	education table with SOS canopy next to registration table.	37
		Set up a giveaway of stormwater supplies for the students at	
5.26.2021	Kendall Whittier Elementary	the elementary school	/0
Total			1174

Section 7 – Identification of Water Quality Improvements or Degradation

Section 7

Identification of Water Quality Improvements or Degradation

No water quality improvements or degradation were noted during this reporting period. The City of Tulsa has preliminarily identified some factors that appear to be negatively influencing the health of Tulsa's streams. We are also developing a baseline condition which will allow us to better determine improvements or degradation in water quality. Additional personnel recently added have begun to research further the issue of water quality degradation and any info collected will be reported on in the future.

Section 8 Watershed Characterization Program

In accordance with MS4 Permit #OKS000201 requirement Part IV(C)(8) the City of Tulsa submitted the Comprehensive Assessment of the Watershed Characterization Project in the FY 2014-2015 Annual Report. In this report, the Comprehensive Assessments and Summary Reports have been combined and are presented to satisfy both those Permit requirements. Section 9 – Co-Permittee Reports

Section 9 Co-permittee Reports

Appendix A - Oklahoma Department of Transportation

Appendix A

Oklahoma Department of Transportation

Annual Report

For Reporting Period: July 1, 2020 through June 30, 2021



September 17, 2021

Roy Teeters, Storm Water & Land Management Division Manager Department of Streets and Storm Water City of Tulsa 4502 S. Galveston Ave. Tulsa, OK 74107

Attention: Jacob Hagen

Dear Mr. Hagen:

Enclosed is the Oklahoma Department of Transportation portion of the Fiscal Year 2019 Annual Report to be submitted to the Oklahoma Department of Environmental Quality in accordance with the Tulsa Municipal Separate Storm Sewer System (MS4) Permit Number OKS000201. This report covers the period from July 1, 2020 through June 30, 2021.

Please provide this office with one copy of the Annual Report as it is submitted. If you have any questions or require further information, please contact Amber McIntyre, ODOT Environmental Programs Assistant Division Manager, at 405-210-3671.

Sincerely,

Flaylor

Brian Taylor, P.E. Chief Engineer

Enclosure



Annual Report

For

July 1, 2020 through June 30, 2021



CERTIFICATION STATEMENT

NPDES Permit No. OKS000201 Review of Storm Water Annual Report

I certify under penalty 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 gathered and evaluated 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.

Brian Taylor, P.E. Chief Engineer 09/17/2021

Date



FISCAL YEAR 2021 ANNUAL REPORT BY THE OKLAHOMA DEPARTMENT OF TRANSPORTATION (ODOT) ON TULSA MS4 PERMIT # OKS000201

September 17, 2021

Status

The Oklahoma Department of Transportation (ODOT) has implemented and is in compliance with the Storm Water Management Plan. The following items demonstrate activities undertaken for this annual reporting period.

Expenditures

As part of ODOT's Storm Water Management Program, the Tulsa metro area highway system shoulders are swept to remove sediment and debris. In Fiscal Year 2021, 40,500 bags of litter were removed at the cost of \$272,519. There are four two mile- increment Adopt-a-Highway locations in the Tulsa metro where litter is picked up twice a year, and five one mile increment Adopt-a-Highway Corporation locations where litter is picked up once per month.

Erosion and Sediment Control

The department continues to monitor and inspect construction sites across the state with the goal to maintain compliance for the OKR10 and OKR04 permits. Storm water personnel conducted 23 site visits over the year. Four sites across the state were contracted out for storm water inspections, this consultant conducts weekly storm water inspections and monthly environmental compliance inspections. The agency continues to prepare and plan for a non-traditional MS4 permit

The Department's Storm Water Advisory Team (SWAT) is finalizing standard drawings for sediment and erosion control BMPs to ensure proper installation and application in the field. ODOT, in addition to a partnership with The Department of Environmental Quality (DEQ) and Association of General Contractors, is working on innovative solutions for final stabilization under


and around bridge structures in order to comply with OKR10 Notice of Termination Requirements.

Non-Traditional MS4 Program

Due to the global pandemic, as well as the Department's modernization efforts the negotiations with DEQ for obtaining an individual non-traditional MS4 permit have slowed. However, ODOT has continued to prepare and plan for this permit and is still working alongside a consultant to continue the planning and negotiation process.

The ODOT stormwater team, along with a hired consultant are still in the process of addressing five of the six Minimum Control Measures, planning and implementing programs, and working on data management for when the department has obtained an individual permit.

Illicit Discharge Detection and Elimination Program (IDDE)

ODOT Maintenance facilities continue to use the guidance document which was developed to assist ODOT personnel in identifying and reporting an Illicit Discharge. As well as the storm water program having opportunity for IDDE reporting on their webpage. Discussion on tracking Highway Spills from accidents is ongoing between ODOT Environmental Division, Maintenance personnel and the Highway Patrol.

Good Housekeeping / Pollution Prevention Plans (GHPPP)

ODOT has completed an inventory survey of facilities statewide to develop training on Good Housekeeping and Pollution Prevention. Funding for facility upgrades and/ or relocation is being pursued by the Agency. Currently, each of the eight Field Divisions are evaluating location, condition and need to determine which County facility will be moved or rebuilt on site. These upgrades will further the Good Housekeeping /Pollution Prevention Minimum Control Measure by adding updated secondary containment devices and retention facilities. In addition, ODOT has developed a Good Housekeeping Pollution Prevention Plan Facility template. The templates are being completed for facilities in the regulated areas to satisfy DEQ requirements. GHPPP's and training are being developed.

Herbicide Application

The application of herbicides is performed by Oklahoma Department of Transportation employees. ODOT closely follows the procedures, rules, and regulations contained in the Oklahoma Pesticide Applicators Law. ODOT requires all its applicators to be licensed and are subject to the implementing regulations of this law. ODOT partners with the Oklahoma Department of Agriculture to offer the Pesticide Applicators test required for a license during our annual workshops.

"The mission of the Oklahoma Department of Transportation is to provide a safe, economical, and effective transportation network for the people, commerce and communities of Oklahoma."



ODOT has a contract with the Oklahoma State University/ Oklahoma Cooperative Extension Service to provide annual herbicide applicator workshops and assistant to the division. Five Pesticide Application Certification Schools were presented to ODOT staff in FY20, totaling in 142 ODOT staff. Due to challenges of the COVID-19 pandemic and restrictions, not all of the attendees trained opted to test for certification, however currently 42% of the initial 142 participants tested and passed for certification. Fifteen continuing education (CEU) workshops were originally scheduled. However, due to coronavirus outbreak and CDC restrictions, only two of these were completed in person. In order to accommodate CEUs, two online calibration training videos were also created. In order to accommodate for in person restrictions, CEUs were available to applicators online. With a total of 445 CEUs completed. There are plans to continue to make additional CEU workshops sessions online in the future.

OSU and The Cooperative Extension program continue to act as consultants for herbicide and pesticide issues statewide. In March of 2021, there was an extensive review of ODOT certified pesticide applicator records to resolve some issues with online access of ODOT employee records through the Kelly Solutions Site.

Public Education/ Litter Program

ODOT developed a storm water coloring book to distribute electronically in 2021. The book incorporates storm water concepts, state animals and fun activities and was distributed at the home and garden show in the summer of 2021. The agency is also working to schedule regular social media posts to highlight storm water topics and is working with the Central Oklahoma Storm Water Alliance (COSWA) to participate in their outreach efforts.

ODOT has continued the statewide anti-litter campaign, "Oklahoma, Keep Our Land Grand". The litter hot-line (1-888-5-LITTER), is available to report littering anywhere across the state. Callers can report the offenders tag number. The people observed littering were sent a postcard requesting them to help "Keep Our Land Grand". Littering is against the law and offenders can be fined from \$200 to \$2000.

Every year, school-age children participated in our annual poster contest. This contest is sponsored by ODOT, Oklahoma Department of Environmental Quality, Oklahoma State Department of Education, Keep Oklahoma Beautiful, Oklahoma Environmental Management Authority, Oklahoma Rural Water Association, Oklahoma Chapter of the Sierra Club, Solid Waste Institute of NE Oklahoma, Waste Research, Inc., Oklahoma Arts Council, Oklahoma Employees Credit Union, OGE Energy Corporation, Veolia Water, Oklahoma Tourism & Recreation Department (Oklahoma State Parks), Wal-Mart, AEP-Public Service Company of Oklahoma, Oklahoma Turnpike Authority and the Oklahoma Highway Safety Office. The winning posters are printed for distribution to schools, businesses, and chambers of commerce. 35,000 posters were printed and distributed.

Adopt-a-Highway/ TRASH-OFF

"The mission of the Oklahoma Department of Transportation is to provide a safe, economical, and effective transportation network for the people, commerce and communities of Oklahoma."



ODOT'S anti-litter efforts are still on-going and include one hundred thirty eight separate "Adopta-Highway" groups who remove litter from their two mile section of state highways at an interval of four times a year, and the "TRASH-OFF", an annual volunteer spring roadside cleaning sponsored by ODOT. Tulsa has sixty three "Adopt-a-Highway" groups covering one hundred twenty six miles at a minimum of four times a year.

Each Spring, the Annual TRASH-OFF is held. Groups have expanded TRASH-OFF day to TRASH-OFF week or month. ODOT distributes trash bags for the annual TRASH-OFF. Last year, this effort resulted in over two million nine hundred thousand pounds of litter and debris collected from Oklahoma roadsides and public areas. This saved taxpayers an estimated five million dollars. In addition, Keep Oklahoma Beautiful sponsors a banquet in the fall where awards are given to participants for "Best First Effort" and "Best Overall Effort".

Wildflowers

In the spring of 2016, a memorandum of agreement was signed by ODOT in partnership with the Federal Highway Administration and the Missouri, Texas, Iowa, Kansas and Minnesota DOTs designating Interstate 35 as the Monarch Highway. The goal is to protect more of the Monarch Butterfly's natural habitat by allowing milkweed and native flowers to grow in the right-of-way where possible. In anticipation of the collaboration, ODOT began refraining from mowing highway rights-of-way statewide, except where necessary, until July when the flowers are primed for seed dispersal. Mowing was continued in urban areas and safety zones, which includes medians and rights-of-way up to 30 feet from the pavement's edge. A pollinator garden was also planted by ODOT staff at the Oklahoma City Welcome Center. The garden, a registered Monarch Waystation, is a 20 foot by 40-foot plot containing five types of milkweed, Black-eyed Susans, purple coneflower and other types of wildflowers. The garden will serve as an educational tool for the public to help them recognize and protect milkweed and other native wildflowers.

On April 30, 2020, ODOT signed onto the National Monarch Candidate Conservation Agreement with Assurances (Monarch CCAA) for Energy and Transportation Lands. By signing the agreement the Oklahoma Department of Transportation joined 21 other Energy and Transportation organizations in voluntarily committing to implementing monarch conservation measures on a portion of their organization's managed lands.

The monarch butterfly was petitioned for listing under the Endangered Species Act (ESA) in 2014. In December of 2020, the US Fish and Wildlife Service (USFWS) decided to list the species as a candidate for an Endangered listing. In anticipation of a listing decision ODOT along with other national partners has committed, through the CCAA, to adopt acres within their land system for targeted conservation measures that will provide needed habitat for the monarch butterfly and that could potentially influence the future listing decision. This agreement provides immediate regulatory certainty to ODOT and avoids potential gaps in regulatory coverage in the event the species is listed.

"The mission of the Oklahoma Department of Transportation is to provide a safe, economical, and effective transportation network for the people, commerce and communities of Oklahoma."



Collection and Recycling

ODOT's Maintenance personnel recycled approximately 1,014 gallons of oil, 86 gallons of antifreeze, and 200 pounds of used filters. The oil is picked up by a private contractor five times a year.

Mowing

The highway system in the Tulsa Metro consists of 4,303 acres which were mowed seven times for a total of 30,121 acres at a cost of \$725,529.04.

Appendix B – Oklahoma Turnpike Authority

Appendix B

Oklahoma Turnpike Authority

Annual Report

For Reporting Period: July 1, 2020 through June 30, 2021



September 22, 2021

Mr. Scott Van Loo Operations Manager, Stormwater and Land Management Streets and Stormwater Department, City of Tulsa 4502 S. Galveston Ave. Tulsa, Oklahoma 74107

Dear Mr. Van Loo,

Enclosed is the Oklahoma Turnpike Authority's portion of the Annual Report to be submitted to the Oklahoma Department of Environmental Quality (DEQ) in accordance with the City of Tulsa Municipal Separate Storm Sewer System (MS4) Permit Number OKS000201. This report covers the period from July 1, 2020 through June 30, 2021.

Please provide this office with one copy of the Annual Report as it is submitted to DEQ.

Sincerely,

Darian L. Butler

Darian L. Butler, P.E. Director of Engineering



NPDES Permit No. OKS000201 July 1, 2020 through June 30, 2021 Annual Report for Oklahoma Turnpike Authority (OTA)

Overview

This report summarizes the OTA stormwater management activities for Turnpike areas in the City of Tulsa Municipal Separate Storm Sewer System (MS4) area. The Creek Turnpike Maintenance yard and approximately 29% of the Creek Turnpike roadway are within Tulsa's MS4 boundary. The roadway areas include 5.7 miles of roadway in the south Tulsa area that crosses parts of the Vensel Creek, Fry Ditch, and Haikey Creek watersheds. The roadway areas also include 4 miles in the east Tulsa area that crosses parts of the Spunky Creek and Adams Creek watersheds. The Creek Turnpike statistics shown in the remainder of this report refer to the entire Creek Turnpike, not just the portions that are in the Tulsa MS4 area. Construction on the Gilcrease Turnpike has began January 31, 2020. When complete, the Gilcrease Turnpike will add approximately 0.7 miles of roadway to the Tulsa MS4 area in the Arkansas River watershed.

1. Status of the Implementation of the Storm Water Management Program.

Responsibilities of OTA outlined in the NPDES Part 2 Application have been met.

Structural Controls and Storm Water Collection System Operations:

OTA's commitment to a superior functioning storm water system is demonstrated by its regular inspections all of the below ground storm water carrying structures. All of the drainage structures on the Creek Turnpike are inspected every other year. The Creek Turnpike culverts were last inspected in 2021. And will be inspected next in 2023. All stormwater structures on the Creek Turnpike were inspected in 2021.

Above ground storm water controls are monitored daily by the maintenance staff who are equipped to handle any flow problems that could potentially arise. Examples of

such controls would be detention areas, roadside ditches, and culverts. To ensure the storm water is flowing efficiently, OTA mows 4 to 7 cycles per season. Approximately 1641 acres are mowed per cycle.

Areas of New Development and significant redevelopment:

A five (5) year capital plan has been developed by the Turnpike Authority to identify future construction projects. This Capital Plan is updated yearly to incorporate priority areas and any lessons learned are incorporated into future projects. OTA shall continue to look for opportunities to use low impact development and adopt Best Management Practices to minimize the impact that runoff discharges have to receiving streams.

Roadways:

All storm grates and drains used to move water off of the roadway were cleaned quarterly during this period.

OTA requires a storm water management plan for all construction projects. The OTA requires contractors to obtain necessary permits for placement of dredge or fill material (from the US Army Corps of Engineers) as well as floodplain and watershed permits (from relevant municipalities).

Approximately 3100 cubic yards of litter were collected and properly disposed by providing 33 trash containers along the Creek Turnpike. In addition, a private contractor collected litter from 1641 acres of turnpike right of way on a two-week frequency reporting 2915 bags of litter removed. Maintenance staff collected 1840 cubic yards of litter, including 277 cubic yards collected during the Great American Clean Up Campaign in March, April, and May 2021.

Finally, OTA Maintenance covers sand piles at Creek Turnpike Maintenance yards with tarps to prevent sand from washing off in the rain.

Pesticide, Herbicide, and Fertilizer Application:

The OTA requires all turnpike herbicide applicators as well as all contract applicators to be licensed and subject to all of the regulations under the Oklahoma Herbicide Applicators Law including re-certification. Applicators receive yearly training on pesticides, herbicides, and fertilizer chemicals from the Oklahoma Vegetation Management Association (OKVMA). The OTA has eight certified applicators on the Creek Turnpike. Approximately 360 gallons of herbicide were applied around sign footings, fences, and at various other locations within the limits of the right of way.

Illicit Discharge and Improper Disposal:

The bridges and culverts on the Creek Turnpike are inspected every other year. The next round of inspections will take place during the 2020-2021 annual report period.

OTA's maintenance staff collected and recycled 370 gallons of oil. The oil is routinely picked up at the maintenance yard by a private contractor (Safety Kleen). In addition to the oil, OTA recycled 61 filters. Batteries and tires were returned to locations where new ones could be purchased.

Construction Site Runoff:

The OTA understands the significance of construction site runoff and the adverse effects it can cause. As a result, strict guidelines are set forth to ensure that each construction site has adequate controls for reducing pollutants. As stated previously, all construction plans that are produced by or for the OTA have a mandatory Storm Water Management Plan and Erosion Control Plan. These sheets provide information such as location/description of project, sequence of erosion control activities, area disturbed, name of receiving waters, soil stabilization practices, structural practices, offsite vehicle tracking, a layout drawing showing exactly where soil stabilization and structural practices should be placed, and references to the OTA Standard Specification for all Storm Water Guidelines. The most optimal approach and recommendations are discussed and agreed upon prior to project implementation to ensure the best option is chosen for the project.

During construction, the approved storm water management plan is monitored and enforced regularly by the OTA's on-site representative.

Upon project completion, OTA conducts a final inspection and assures that the work areas are restored to compliance level.

Public Education:

The OTA dedicates space on its website to the subject of Storm Water Management. On the site there are links to the Phase I Annual Reports. The site includes a phone number to allow the public to contact OTA with suggestions, comments, or questions about OTA's stormwater program.

A stormwater pollution prevention bookmark was produced which included 10 suggestions for preventing stormwater pollution. This bookmark was distributed to members of the public at OTA headquarters and other locations. The bookmark can also be seen by going to OTA's website.

The OTA is also part of the anti-litter campaign, "Oklahoma Keep Our Land Grand." As part of this campaign, the OTA offers a toll free number to call to report littering as well as a place to report it on the website. Individuals who are reported littering are sent a postcard to remind them that littering is a punishable offense and that the goal is to keep Oklahoma land looking grand. For the period July 2020 - June 2021, the OTA received 17 littering report calls for the whole turnpike system. This was roughly the 1/2 of calls received during the same period the previous year.

Landscape:

OTA partners with the organization "Up With Trees" to landscape areas in and around the major interchanges in the Tulsa and Broken Arrow communities. OTA also partners with "Color Oklahoma" and maintains two wildflower plots on the right of way adjacent to the Creek Turnpike.

2. Proposed Storm Water Management Program Changes.

The OTA does not propose any changes to the Storm Water Management Program.

3. <u>Revision to the Assessment of Controls and the Fiscal Analysis.</u>

OTA proposes no revision to the assessments of controls. The Fiscal Analysis is as shown on the City of Tulsa's Report.

4. Monitoring Data Accumulated Throughout the Reporting Year.

Refer to the Regional Storm Monitoring Report.

5. <u>Annual Expenditures for the Reporting Period with a Breakdown for the Major</u> <u>Elements of the Storm Water Management Program.</u>

Description	Cost
Mowing	167,955.48
Sweeping	49,207.00
Trash Collection and Disposal	129,942.12
Herbicide	8,950.00
Total	\$ 356,054.60

6. <u>A Summary Describing the Number and Nature of Enforcement Actions, Inspection</u> <u>and Public Education Program.</u>

All enforcement actions in OTA's watershed are issued by the City of Tulsa in concurrence with the OTA. None occurred during the year covered by this report.

7. Identification of Water Quality Improvements or Degradation.

OTA was not able to identify any water quality improvements or degradations during this report period.

8. <u>Regional Monitoring Report.</u>

Please see the City of Tulsa's report.

CERTIFICATION

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 persons who manage the system or those persons directly responsible for gathering 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.

Darian L. Butler

9/22/21

Darian L. Butler, P.E. Oklahoma Turnpike Authority Date