2019 Annual Report

For the period of July 1, 2018 - June 30, 2019
Prepared by the City of Tulsa Streets and Stormwater Department

Save Our Streams

Municipal Stormwater
Discharge Permit #OKS000201

CITY OF Tulsa
A New Kind of Energy.

Annual Report

OPDES Stormwater Permit #OKS000201
July 1, 2018 to June 30, 2019

Co-Permittees:

Oklahoma Turnpike Authority

Oklahoma Department of Transportation

TABLE OF CONTENTS

CONTENTS **PAGE**

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.

Roy N. Teeters
Manager
Stormwater & Land Management Division

10.9.19
Date

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, 2018 through June 30, 2019, 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.

Maintenance of Above Ground Stormwater Structural Controls

ABOVE GROUND STRUCTURE(S)	INVENTORY (FOR REPORTING PERIOD)	OPERATIONS & MAINTENANCE (O&M) ACTIVITY	O&M ACTIVITY (COMPLETED EACH REPORTING PERIOD)
Channels/ Streams/ Detention Ponds	1,633 acres	Mowing	11 x/year of mowable property (totaling 19,599 acres)
Channels & Streams/ Detention Ponds	1,633 acres	Weed control (Herbicide)	All parcels 1 x/year for broad leaf weed control (totaling 1,633 acres)
Channels & Streams (Hydro Mulch Plus)	418 acres	Weed Control (Herbicide)	All parcels 5 x/year for growth control (totaling 2,090 acres)
Channels & Streams (Inhouse)	259 acres	Weed Control (Herbicide)	All parcels 3 x/year for growth control (totaling 759 acres)
Wet Ponds	64 acres	Algae Control	All ponds 3 x/year for growth control (totaling 192 acres)
Channels/ Streams/ Detention Ponds	1,369 acres	Cleaning/ Sediment Removal (Ponds/Streams)	63,711 cubic yards/period
Roadside Ditches	974 miles	Sediment Removal (Roadside Ditching)	57,140 linear feet/period

Maintenance of Below Ground Stormwater Structural Controls

BELOW GROUND STRUCTURE(S)	INVENTORY (FOR REPORTING PERIOD)	OPERATIONS & MAINTENANCE (O&M) ACTIVITY	O&M ACTIVITY (COMPLETED EACH REPORTING PERIOD)
Storm Sewer Pipe (all pipe - driveway pipe, crossover pipe, etc…)	1,178 miles	Inspect Flush/clean Repair or Replace	6.6 miles/period 3.3 miles/period 1,444 linear feet units/period
Catch Basin/Inlets	68,453 units	Inspect & Clean Repair	2,993 units/period 295 units/period
Pump Station	14 units	Clean interior, Inspect & Maintain	344 maintenance activities

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 re-development. 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

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 in 2019, 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. This update was completed and adopted August 12, 2019. 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. However incorporating additional landscape requirements into the initial update would have delayed the overall project, so it was decided that the Landscaping Chapter would be updated separately. This process began in March of 2017 and a Stormwater Quality representative has been 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. This update was completed in December, 2018.

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.

Section 1 – Status of Implementing the Stormwater Management Program

As mentioned above, the Stormwater Design Criteria Manual is undergoing an update, including Chapter 1100, now titled Low Impact Development. This Chapter simply references the Low Impact Development Design Manual which is currently nearing completion, led by Dr. Jason Vogel at the University of Oklahoma. When this Manual is completed, Tulsa will have taken a big step toward promoting and providing guidance on LID projects in Tulsa. The City of Tulsa is also working with Dr. Vogel on a LID Maintenance and Inspection Manual. This process began in early 2018. Workshops will be held with regulators and developers to fine tune these documents before implementation. Further promotion of LID was accomplished by implementation of the following:

- LID was promoted at 34 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.
- Continued LID workgroup to work on incentivizing LID as well as design and maintenance specifications.
- Developed "Guide to Low Impact Development" literature that is distributed at public events.

The City of Tulsa has a pervious pavement pilot project where five concrete companies poured their pervious pavement mix at a City of Tulsa parking lot. Tulsa, in cooperation with Oklahoma State University and the University of Oklahoma, continues to monitor and maintain the site and showcase it to the development and construction communities.

The City of Tulsa has adopted an already existing City of Tulsa 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 but not requested to be in this program.

Further promotion of LID in Tulsa has been accomplished through the continued effort of the LID workgroup. The Stormwater Quality group coordinates these regularly scheduled meetings. The working group meets to discuss a variety of LID related topics and is currently developing design guidelines for LID practices, the maintenance and inspection, as well as requiring/incentivizing

LID. The group consists of City of Tulsa employees from a variety of departments: Engineering Services, Development Services, Planning and Stormwater Quality, as well as faculty and students from the University of Oklahoma, landscape architects, INCOG and surrounding municipalities.

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 16 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 yds^3 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

Type	Sweeping Requirement	Sweeping completed	O & M Activity (for reporting period)	Material Removed
Arterial	~8x annually	16	10,472 miles	5,288 yds^3
Residential	~4x annually	4	10,489 miles	30,913 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. Numbers for inmate work crews are as follows:

Litter Removal from Roadways

Collected by	Amount Collected	
Inmate work crews	9,705 bags	231.1 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
Street sweeping	58 curb miles/week
Storm sewer intake structure and sidewalk cleaning	1x/week
130 trash cans (inspect/clean)	1x/week
12 Pet Waste Stations (refilled)	7x/week

The Streets and Stormwater Department 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.

Stormwater Management employees attended the following events regarding the proper application and disposal of pesticides, fertilizers and herbicides:

3/6/2019 - Oklahoma Vegetation Management Association Spring Conference – Shawnee

2/11/2019 – In-house training, Using SDS information – Tulsa, OK

11/27-28/2018 – 73rd Annual Oklahoma Turfgrass Research Conference – OSU Stillwater, OK

10/23/2019 – In-house training, Application PPE – Tulsa, OK

10/9/2018 – Winfield United Academy – Tulsa, OK

10/2-4/2018 - Oklahoma Vegetation Management Association Fall Conference – Catoosa, OK

9/17/2018 – In-house training, Reward, SDS – Tulsa, OK

8/9/2018 – Plant Materials for the Green Industry – OSU Stillwater, OK

Tulsa Parks employees attended training at:

Winfield Academy in October 2018 and Okla. Turf Conference in November 2018.

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 www.tulsamastergardeners.org/ 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 newsletter in the months of July'18, January'19 and March'19.. 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 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 www.cityoftulsa.org/sos and is regularly promoted. The number of pageviews was 9,426 during this time likely due to increased promotion of the website during the HPCF Special Collection Event.

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)

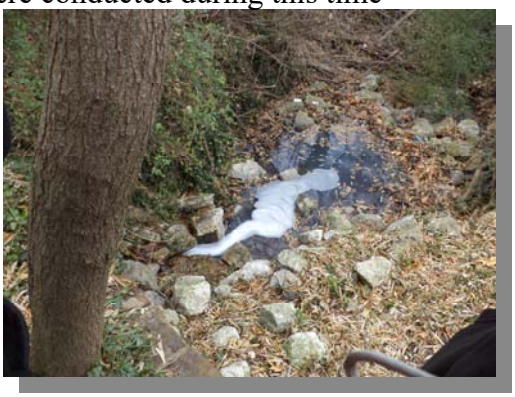
For the above discharges, Tulsa has established BMP's that must be implemented prior to allowing the discharge to the MS4. Failure to implement these measures may result in a violation of the Pollution Ordinance.

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 320 investigations were conducted identifying 18 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. Thirty 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 through the use of 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 "Bark in the Park" theme night at the Tulsa Drillers baseball and Tulsa Roughneck soccer games. "Responsible Pet Ownership" flyers and pet waste bags were passed out to Tulsa area pet owners. The attendance at those games averaged 3,200 and 1,100 respectively.

In an effort to control runoff from pet waste, 15 Tulsa parks have a total of 27 pet waste signs. Pet stations provide pet waste disposal bags to properly dispose of pet waste in the trash. The stations are checked weekly and filled as needed.

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 responded to 164 service requests. Fifty-four of these came from the 311 call center.

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 241 special event permit applications.

b.) Sanitary sewer overflows

In a continuing effort to eliminate sanitary sewer overflows during this reporting period, the City initiated six sanitary sewer manhole and/or pipeline rehabilitation projects. One sanitary sewer evaluation study was initiated during this reporting period. No un-sewered area projects were completed during this reporting year which would have reduced 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 non-target 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-five sewer lines were repaired/rehabilitated under these programs in the past fiscal year.

Sewer cleaning crews specifically targeted 61.94 miles of sewer lines known for grease accumulation problems. This maintenance program reduced the likelihood of sanitary sewer backups and overflows. Emergency cleaning of 66.91 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.

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

Action	Results
Businesses Inspected	1,172
Fog Trainings Conducted	5 trainings/ 216 total attendees
Businesses Participating in the FOG Program	212
Samples Obtained	5
Number of Enforcement Actions	0
Fines Issued	$0

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:

98.82 miles of sanitary sewer TV inspected
44 sanitary manholes raised to grade
189 main line sanitary sewer repairs
16,830 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 2018 – 2019, the smokie inspectors investigated and closed 527 cases. Ten 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 235. This is 48% increase from previously due to increased overflows during record flooding this Spring. 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* – Co-sponsored by Tulsa County Conservation District (TCCD) and the City of Tulsa on May 4th, 2019, 25 volunteers removed litter from Coal Creek. Not only did this clean-up remove litter from the creek, it also helped to bring attention to the importance of reducing litter discharges to urban streams and waterways.

- *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, 2019 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:

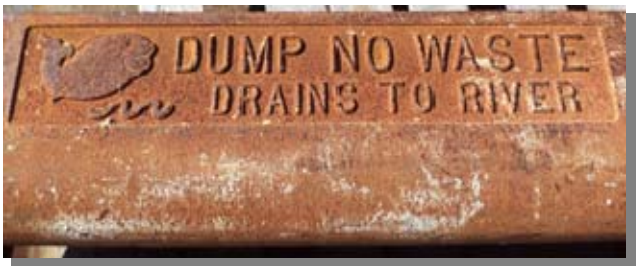
- Christmas Market @ The Park:12/8-12/9/2018
- The Greater Tulsa Home and Garden Show: 3/7-3/10/2019
- Tulsa Irish Festival: 3/15-3/16/2019
- Enviro-Expo at Guthrie Green: 4/16/2019

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. 109,630 Tulsa households participate which has resulted in the collection of 19,523 tons of recyclables for this reporting period. This program is promoted on the City website and at Tulsarecycles.com. In addition to curbside recycling, there are 131 public space and intergovernmental location accepting recyclables, which culminated in the collection of 147.63 tons.

Environmental educational activities were conducted this year at various children's events. These events involved 2,501 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.



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 obsolete.

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 litter assessment program has become idled during this reporting period as the position became vacant. A new hire has been brought on in the meantime and more information will be reported on this program in the future.

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 M.e.t. continued to operate ten recycling depots that are conveniently located throughout the metropolitan Tulsa area. Citizens can bring plastics, cardboard, newspapers, glass, aluminum, batteries, cooking grease and used motor oil for recycling and electronics at five locations. These depots were also used for the distribution of environmental educational information, including brochures and posters at some locations addressing the reduction of litter. Additionally, the M.e.t. distributed approximately 250 car litterbags, displayed anti-litter posters at the depots and at booths throughout the year. The M.e.t. supplied trash bags and gloves for groups like –Scouts and civic groups, who have picked up litter. In FY 18/19, the M.e.t. provided these items for two groups. In addition, the M.e.t. staff multiple educational booths and gave several speeches to school classrooms and scouting groups on trash, recycling and litter. Attached is a spreadsheet showing the entire year of education.

Tulsa Parks emptied 1,154 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 184.6 hours collecting 395.2 cubic yards of debris.

Streets within the Inner Dispersal Loop (Downtown Business District) were cleaned on a daily 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 1,866 tons of trash was accomplished through the placement of 1,766 thirty cubic yard trash dumpsters in residential neighborhoods within the corporate city limits of Tulsa. Tulsan's requested 19,583 pickups of bulky waste (appliances, furniture, electronics, tires) of which 337 Freon bearing items were properly evacuated. In addition, 535 lbs. of latex paint were picked up with the curbside bulky waste program from 11 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 54 routine illegal dumping locations which read "No Dumping" and describe the enforcement possible if someone were caught.

This year, the Solid Waste division located 2,382 illegal dumpsites and conducted 925 investigations of illegal dumpsites within the city limits. Four citations were issued based on these investigations. Dumpsite contents were from construction activities, demolitions, green waste, furniture, appliances, tires and other household items. During this fiscal year, they collected 345 tons of debris which was taken to the landfill and 1,459 cu. Yds. of greenwaste which was taken to Tulsa's Greenwaste Site.

The City of Tulsa Security Patrol also made 464 field inspections of chronic illegal dumpsites, but no arrests or tickets were given as a result of their inspections. These inspections were the number of 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 1,822 bags of trash totaling 12.26 tons of trash.

Center of Employment Opportunities program cleaned up 45.77 tons of trash and limb debris from the Right of way as well as removing and trimming 117.53 of green waste from roadways and side walks

Community service crews removed 2,428 bags of trash and debris totaling 27.43 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	24,305 gals.
Antifreeze	1,355 gals.
Plastics (incl. plastic bags)	345,236 lbs.
Aluminum	76,873 lbs.
Glass	1,008,640 lbs.
Batteries	17,643 lbs. automobile 37,050 lbs. household
Newspaper	1,382,680 lbs.
Cooking Grease	3,432 gals.
Electronics	170,950 lbs.
Cardboard	1,597,640 lbs

The M.e.t. also had the following collection events in Tulsa and during the events hand out fliers about household pollutants. The amounts collected are as follows:

- 9/15/18 Fire Extinguisher & Smoke Alarm Event – collected 18 fire extinguishers, 15 smoke alarms,1, thermometer, 95 fluorescent bulbs
- 3/2/19 Fire Extinguisher & Smoke Alarm Event – collected 17 fire extinguishers, 19 smoke alarms and 4 thermometers
- 10/6/18 Tire Event in East Tulsa – 235 tires.
- 4/27/19 Tire Event in West Tulsa – 514 tires

In FY 18/19, The M.e.t. staff answered calls and emails from citizens who ask what to do with their pollutants. Staff educates on where to take items and how to handle 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 blow sixty pounds). The charge is given to the community through a contract arrangement between the M.e.t. and the City of Tulsa.

The City sponsored two special household pollutant collection events during this reporting period. The events took place on Nov. 3rd, 2018 and March 30th, 2019. These events differed from the routine collection of household pollutants by accepting items such as medicine, ammunition, tires, and large electronics. Local radio and television news spots, utility bill stuffers, distribution of brochures, Facebook posts, Twitter, and organizational newsletters were all utilized to advertise these events.

The events were very successful with participation of 579 vehicles from Tulsa and surrounding communities resulting in the collection of the following:

Material	Amount
Tires	884 tires
Ammunition	125 lbs.
Medicine	605 lbs
Electronics	8,968 lbs.

During this collection event, educational fliers were distributed to the public. Each car received fliers regarding the following topics: locations of the recycling depots, latex paint disposal, grease, stormwater quality issues and alternative cleaning products.

Section 1 – Status of Implementing the Stormwater Management Program

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.

Below is a summary of the amounts of pollutants collected this fiscal year:

Total weight collected: 124,542
Total Tulsa customers: 1,933
Total M.e.t. customers: 503
Total Customers from outside Tulsa and M.e.t. communities: 10
The following is a breakdown of the total amount of weight collected per category:

Wastestream	Amount Collected (lbs.)
Toxic Liquid	12,178
Toxic Solid	7,746
Aerosols	10,960
Low Viscous Flammable	12,002
High Viscous Flammable	12,089
Bulbs	2,222
Bases	4,376
Acids	3,208
Oxidizers	3,871
Loosepack Flammable	3,026

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

- 1,400 gallons of used oil
- 700 gallons of antifreeze
- 6,175 lbs. of batteries
- 120 gallons of cooking oil

Through a voucher system, The M.e.t. staff answered thousands of calls the past year answering questions from non-Tulsa citizens on what to do with their pollutants. Staff has educated citizens on where to take items or handle responsibly. Staff gave out voucher numbers to citizens who live in outlying communities so the citizen is able to use the Tulsa facility at no charge (if their disposal is below 60 pounds). The charge is given to the community through a contract arrangement.

e.) Locate and eliminate illicit discharges and improper disposal

Dry weather field screening was conducted on approximately 51.45 square miles (32,928 acres) of the Tulsa's storm sewer system during the period of July 1, 2018 to June 30, 2019. Thus compliance with this section of the permit was achieved by screening 19 % 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 113 outfalls were screened, of which 17 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:

98.82 miles of sanitary sewer TV inspected
6.6 miles of storm sewer TV inspected
44 sanitary manholes raised to grade
1,444 linear feet of main line storm sewer repairs
189 main line sanitary sewer repairs
16,830 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. Eighteen 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.

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
23	**Construction** (relating to construction site potential violations)
16	**Hazmat** (relating to potential discharges of pollutants from fire department responses involving the hazardous materials unit)
277	**Stormwater** (relating to potential releases of pollutants to the storm sewer or violations of the Pollution Ordinance)
4	**Drug Labs** (relating to the potential release of pollutants from drug lab remediation to the storm sewer or violations of the Pollution Ordinance)
320	**Total number of investigations for this reporting year**

Stormwater Management inspectors conducted 495 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, 495 industrial stormwater inspections were conducted. Four enforcement actions were taken against industries or facilities in order to eliminate illegal or illicit discharges. No fines were 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:

1,070 Watershed Development permits, which include Earth Change permits.

296 Stormwater Drainage permits

633 Stormwater Connection permits

122 Floodplain permits

6 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, 64 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 1,631

construction site inspections for compliance with erosion control measures and issued 24 enforcement actions. The total amount of fines and penalties collected was $850.

Development Services conducted 3,091 pre-construction erosion control inspections at 2,308 construction sites. 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 8 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.

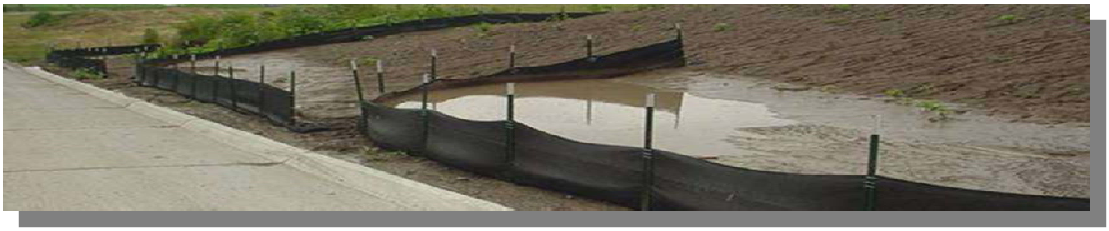
c.) Education and training of construction site operators

The brochure "Construction Site Best Management Practices" was available to construction operators at the Permit Center. Construction operators must visit the Permit Center in order to obtain Watershed Development permits from the City of Tulsa. 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 75 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 monthly Builders Council as well as Developer Council meetings held at the Greater Tulsa Home Builders Association as we are able.

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 BMP's. Additionally, City of Tulsa supervisors answered questions regarding construction site OPDES requirements and erosion control requirements.



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. 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 are the requirements for erosion control throughout the construction period and the permanent requirements to prevent stormwater pollution.

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

Recently the City of Tulsa significantly increased its public education efforts by implementing a more robust stormwater quality media campaign. 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. 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 billboard impressions.

Name	Impressions	Length of Time
NCM	1,515,584	Nov 2018 - June
Ch 6	4,706,000	Feb - June
Ch 8	1,049,801	May - June
Ch 8 OTT	73,922	May and June
Facebook	32,959	One week in June
Total	**7,345,307**	

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 191,207 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. Stormwater education material was viewed approximately 1,090,461 during the reporting period. 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:

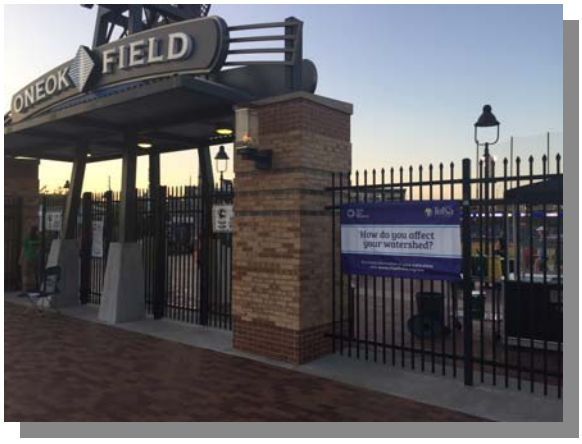
- City of Tulsa
    - Streets and Stormwater Department
    - Parks Department
    - Communications Department
- Tulsa County Conservation District (Blue Thumb Program)
- Metropolitan Environmental Trust (M.e.t.)

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 (Enviro Expo, Guthrie Green Earth Fest, and Household Pollutant Collection 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 2018-2019". Attachment B "Education Events 2018-2019" 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.



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 42,327 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. The newsletter is sent out a total of four times per year, usually in March, June, September and December which is equivalent to 8,000 contacts a year. 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 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 as the Environmental Expo, TCC Eco Fest, and school educational demonstrations. 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 map 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 Flood Notice" and *"Flood Hazard Information About Your Property",* are two brochures that were sent to approximately 14,500 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.

During this reporting period, information was placed into three monthly utility bill stuffers July 2018, November 2018 and January 2019 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. Thirty-four messages were conveyed to callers during this time period. In previous years, 612,338 customers utilized the Customer Care Center.

Tulsa maintains a website, www.cityoftulsa.org/sos 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 9,426 during this time likely due to increased promotion of the website during the HPCF Special Collection Event.. While conducting inspections, City of Tulsa personnel continued to instruct citizens, business owners or operators to report any unusual discharge into the City's storm sewer immediately.

Tulsa's annual Creek Cleanup was co-sponsored by Tulsa County Conservation District (TCCD) and the City of Tulsa on May 4th, 2019. Twenty-five volunteers removed litter from Coal Creek. Not only did this clean-up remove litter from the creek, 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, 320 investigations were conducted involving the identification and removal of 18 illicit discharges to the storm sewer during this reporting period.

b.) Proper management and disposal of used motor vehicle fluids and household hazardous wastes

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 Official Flood Notice" and "Flood Hazard Information" are two brochures that were sent to approximately 14,500 residences last year who had the potential to experience flooding and what to do in case of flooding. It also encourages the public to dispose of used motor oil and antifreeze properly.

"City of Tulsa – General Guide to Regulatory Floodplains" is a map 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.

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.

The following is a list of some of the events where material regarding used motor vehicle fluid and household hazardous waste was distributed to the public:

Educational Events	
Enviro Expo	Monarchs on the Mountain
Tulsa State Fair	Household Pollutant Collection Events
Tulsa Drillers Games	TPS Earth Day Event

Currently, The M.e.t. has 10 drop-off recycling depots with collection containers for used motor oil, cooking grease and batteries. Two of the 10 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, www.metrecycle.com promotes the Household Pollutant Collection Facility and depots. Fliers are distributed at booths, speeches and events throughout the year (see list below).

The following is a list detailing the quantity of materials the M.e.t. distributed:

FY 18/19 distribution estimates below:
Tulsa area Recycling Directory: 1,700
Buy Recycled, Close the Loop: 100
Latex Paint and the Environment: 200
Focus on the Four: 1,000
COT Medication Flier: 300
Deep Green Clean: 200
Recycling Locations Map: 2,000
Mercury in Your Home: 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 2,501 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 received training in October and November of 2018. The City of Tulsa's 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 www.cityoftulsa.org/sos and is regularly promoted.

Public education and outreach in the proper management and disposal of household grease waste was accomplished through the city of Tulsa's FOG grease abatement program. Through this program, 2119 FOG BMP door hangers and 1480 apartment packets (can toppers, grease bags, FOG BMP literature) were handed to residents involved in grease-related sewer blockage/overflow investigations. The FOG program ran television commercials highlighting the importance of proper household grease disposal through the trash rather than through the sanitary sewer. The commercials were aired on the following television networks:

The commercials were aired on the following television networks.

Television Network	Frequency (# times aired)	Impressions (# views)
KOTV Channel 6	155	391,666
KJRH Channel 2	58	248,048
KTUL Channel 8	49	152,103
Cox Cable	189	99,977

In addition to television, the FOG program ran radio advertisements 100 times on Journal Broadcast Group's stations (106.9 KHITS and 92.9 BOBFM) for a total of 171,800 impressions. AM 740 KRMG ran the FOG commercial 102 times for a total of 121,500 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 grocery store locations distributing grease related promotional items with a total of around 210 participants. Also, a fryer oil collection event was held which collected 326 gallons of fryer oil for proper disposal

from 53 participants. Six FOG booths were set up at community events and had approximately 6000 visitors to the booths.

Part II(A)(11) Employee Education

Status: Compliant and ongoing

Presentations were made to personnel from Sewer Operations Maintenance, Engineering Services, Development Services, Street Maintenance, Parks Dept., and Stormwater Management on their responsibilities at facilities and job sites. Open discussion followed the presentation where information was exchanged resulting in program improvement.

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 one day- eight 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 167 employees have been certified. During this FY 22 employees attended the training.

City of Tulsa Stormwater Management personnel attended an EPA MS4 Region 6 Stormwater Conference in New Mexico in 2018. The conference featured presentations on stormwater management including topics on low impact development and green infrastructure, TMDLs, construction and industrial stormwater and stormwater programs and 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.)	**5**	**0**
Hazardous waste treatment, storage, disposal and recovery facilities	**2**	**0**
Facilities that are subject to EPCRA Title III, Section 313	**49**	**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

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, 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

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 32,928 acres (51.45 square miles). Of the 113 outfalls screened, 17 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	**113**
Total area screened	32,928 acres 51.45 sq. mi.
# of outfalls that did not require follow-up (without flow)	96
# of outfalls with dry weather flows not requiring follow-up (flows present but pollutant concentration below action levels)	17
# of outfalls requiring dry weather flow follow-up (flow with concentrations of pollutants above the action levels)	0

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

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

Floatable Monitoring Summary Station: Reed Park 4200 S. Union Ave.				
Date	**Floatables Present**	**Collection (Cubic Yards)**	**% Organic**	**% Inorganic**
7/3/18	no	0		
7/31/2018	no	0		
8/8/2018	no	0		
8/14/2018	yes	2.5	60%	40%
8/15/2018	no	0		
8/17/2018	no	0		
8/21/2018	no	0		
9/6/2018	no	0		
9/25/2018	no	0		
10/9/2018	yes	0.5	100%	0%
10/16/2018	no	0		
11/1/2018	no	0		
11/6/2018	no	0		
11/30/2018	yes	16	90%	10%
12/18/2018	yes	0.75	90%	10%
12/28/2018	yes	0.5	100%	0%
1/2/2019	no	0		
1/4/2019	yes	0.5	70%	30%
1/15/2019	no	0		
1/23/2019	no	0		
2/7/2019	no	0		
2/12/2019	no	0		
2/22/2019	no	0		
2/26/2019	no	0		
3/12/2019	yes	Flooded		
3/13/2019	yes	Flooded		
3/20/2019	yes	18	70%	30%
3/26/2019	no	0		
4/2/2019	no	0		
4/4/2019	no	0		
4/16/2019	no	0		
4/30/2019	no	0		
5/1/2019	no	0		
5/7/2019	no	0		
5/8/2019	no	0		
5/14/2019	no	0		
5/22/2019	no	0		
6/5/2019	yes	0.25	100%	0%
6/18/2019	no	0		
6/25/2019	no	0		
Total Cubic Yards		39		
Average Floatable Makeup (%)			85%	15%

Floatable Monitoring Summary Station: Vensel Creek 11100 S. Yale Ave.				
Date	**Floatables Present**	**Collection (Cubic Yards)**	**% Organic**	**% Inorganic**
7/3/18	no	0		
7/17/18	yes	0.5	90%	10%
7/31/2018	yes	0.25	80%	20%
8/8/2018	yes	1	90%	10%
8/14/2018	no	0		
8/15/2018	yes	0.5	90%	10%
8/17/2018	yes	0.25	100%	0%
8/21/2018	yes	0.25	100%	0%
9/6/2018	Underwater			
9/25/2018	Yes	0.5	100%	0%
10/9/2018	no	0		
10/16/2018	Yes	1.5	80%	20%
11/1/2018	no	0		
11/6/2018	no	0		
11/30/2018	yes	2.25	80%	20%
12/18/2018	yes	0.75	90%	10%
12/28/2018	yes	1.5	90%	10%
1/2/2019	Underwater			
1/4/2019	Underwater			
1/15/2019	yes	1	100%	0%
1/23/2019	yes	1	100%	0%
2/7/2019	yes	1	100%	0%
2/12/2019	yes	0.5	100%	0%
2/26/2019	yes	0.5	100%	0%
3/12/2019	yes	1	100%	0%
3/20/2019	no	0		
3/26/2019	yes	1	100%	0%
4/2/2019	yes	1	100%	0%
4/4/2019	yes	0.5	100%	0%
4/16/2019	yes	1	100%	0%
4/30/2019	no	0		
5/1/2019	Underwater			
5/7/2019	yes	1	100%	0%
5/21/2019	no	0		
6/5/2019	yes	3	100%	0%
6/18/2019	yes	0.5	100%	0%
6/25/2019	yes	0.25	80%	20%
Total Cubic Yards		22.5		
Average Floatable Makeup (%)			95%	5%

Floatable Monitoring Summary Sheridan Park, 10400 S. 67th E. Ave.				
Date	**Floatables Present**	**Collection (Cubic Yards)**	**% Organic**	**% Inorganic**
7/3/2018	yes	0.15	100%	0%
7/17/2018	yes	0.5	90%	10%
7/31/2018	yes	0.25	70%	30%
8/8/2018	yes	1	90%	10%
8/14/2018	no	0		
8/15/2018	yes	0.25	100%	0%
8/17/2018	no	0		
8/21/2018	yes	1.25	100%	0%
9/5/2018	yes	1.5	70%	30%
9/6/2018	Underwater			
9/25/2018	Yes	0.5	100%	0%
10/9/2018	yes	0.25	100%	0%
10/16/2018	yes	0.25	90%	10%
11/1/2018	no	0		
11/6/2018	yes	0.5	90%	10%
11/30/2018	yes	0.25	90%	10%
12/18/2018	yes	1	95%	5%
12/28/2018	yes	1	80%	20%
1/2/2019	yes	0.5	90%	10%
1/4/2019	no	0		
1/15/2019	yes	0.15	80%	20%
1/23/2019	yes	1	100%	0%
2/7/2019	yes	0.5	100%	0%
2/12/2019	no	0		
2/26/2019	yes	0.75	90%	10%
3/12/2019	yes	1	80%	20%
3/20/2019	yes	1	100%	0%
3/26/2019	yes	0.5	80%	20%
4/2/2019	yes	0.25	100%	0%
4/4/2019	yes	0.25	50%	50%
4/16/2019	yes	0.25	100%	0%
4/30/2019	no	0		
5/1/2019	yes	1	80%	20%
5/7/2019	no	0		
5/8/2019	no	0		
5/21/2019	no	0		
6/5/2019	yes	1	100%	0%
6/18/2019	yes	0.25	100%	0%
6/25/2019	yes	0.25	90%	10%
Total Cubic Yard		17.3		
Average Floatable Makeup (%)			90%	10%

Floatable Monitoring Summary Station: Osage Detention, 1101 West Pine Street				
Date	**Floatables Present**	**Collection (Cubic Yards)**	**% Organic**	**% Inorganic**
7/3/18	yes	0.25	50%	50%
7/17/18	no	0		
7/31/2018	no	0		
8/14/2018	yes	0.25	90%	10%
8/15/2018	yes	0.5	50%	50%
8/17/2018	no	0		
8/21/2018	yes	1	40%	60%
9/5/2018	yes	0.25	80%	20%
9/6/2018	Underwater			
9/25/2018	yes	1	75%	25%
10/9/2018	yes	2	100%	0%
10/16/2018	no	0		
11/1/2018	no	0		
11/6/2018	no	0		
11/30/2018	yes	2	90%	10%
12/18/2018	yes	0.25	90%	10%
12/28/2018	no	0		
1/2/2019	no	0		
1/4/2019	yes	0.25	50%	50%
1/15/2019	No	0		
1/23/2019	No	0		
2/7/2019	No	0		
2/12/2019	No	0		
2/22/2019	yes	1	70%	30%
2/26/2019	No	0		
3/12/2019	yes	1.5	70%	30%
3/13/2019	No			
3/20/2019	yes	5	60%	40%
3/26/2019	yes	0.25	100%	0%
4/2/2019	yes	2	70%	30%
4/4/2019	no	0		
4/16/2019	yes	0.5	30%	70%
4/30/2019	yes	0.25	90%	10%
5/1/2019	yes	0.5	70%	30%
5/7/2019	yes	0.2	50%	50%
5/8/2019	yes	1	50%	50%
5/14/2019	no	0		
5/22/2019	yes	26		
6/5/2019	yes	6	60%	40%
6/18/2019	yes	3.5	50%	50%
6/25/2019	yes	0.75	90%	10%
Total Cubic Yards		56.2		
Average Floatable Makeup (%)			68%	32%

Floatables Monitoring Summary Station: Fire Station, 4800 W. 8th St.				
Date	**Floatables Present**	**Collection (Cubic Yards)**	**% Organic**	**% Inorganic**
7/3/2018	yes	0.15	50%	50%
7/17/2018	yes	0.5	60%	40%
7/31/2018	yes	0.5	80%	20%
8/8/2018	yes	1	70%	30%
8/14/2018	yes	1.5	70%	30%
8/15/2018	yes	0.5	50%	50%
8/17/2018	yes	0.25	90%	10%
8/21/2018	yes	0.5	50%	50%
9/5/2018	yes	0.5	80%	20%
9/6/2018	Underwater			
9/25/2018	yes	1	50%	50%
10/9/2018	yes	0.5	100%	0%
10/16/2018	no	0		
11/1/2018	yes	0.5	50%	50%
11/6/2018	yes	0.5	50%	50%
11/30/2018	yes	1.5	100%	0%
12/28/2018	yes	0.5	90%	10%
1/2/2019	yes	0.5	70%	30%
1/4/2019	yes	0.15	60%	40%
01/15/22019	yes	0.25	80%	20%
1/23/2019	yes	0.25	70%	30%
2/7/2019	no	0	0%	0%
2/12/2019	yes	0.25	90%	10%
2/22/2019	yes	0.5	80%	20%
2/26/2019	no	0		
3/12/2019	yes	Flooded		
3/20/2019	yes	1	90%	10%
3/26/2019	no	0		
4/2/2019	yes	1.5	80%	20%
4/4/2019	no	0		
4/16/2019	yes	0.5	70%	30%
4/30/2019	yes	0.25	70%	30%
5/1/2019	yes	1	90%	10%
5/7/2019	yes	0.2	50%	50%
5/8/2019	yes	0.5	50%	50%
5/14/2019	no	0		
5/22/2019	yes	0.5	80%	20%
6/5/2019	no	0		
6/18/2019	yes	0.25	80%	20%
6/25/2019	yes	0.5	100%	0%
Total Cubic Yards		18		
Average Floatable Make Up (%)			73%	27%

Watershed Characterization - Stream Monitoring Reports

CITY OF TULSA
WATERSHED CHARACTERIZATION PROGRAM

Comprehensive Watershed Characterization Assessment Year 3 (2018-2019):

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

Prepared by

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Senior Environmental Monitoring Technician
Watershed Characterization Project

October 8, 2019

Table of Contents

Table of Figures

List of Tables

1.0 INTRODUCTION

1.1 Objective

The purpose of this document is to serve as a comprehensive report of findings, impacts, and responses taken from the biological, habitat, and analytical assessments of Adams Creek, Brookhollow Creek, Center Creek, Coal Creek, Cooley 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 II(A)(13)(14)(a), 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, 2013a) and (OWRB, 2013b). Where applicable, reference conditions will not be established until the conclusion of the current permit. Until such references are established, those standards will result in an "insufficient data" designation with regards to support within the Fish and Wildlife propagation beneficial use. 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 2018 with completion in June of 2019 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.

Waterbody	WBID	Latitude	Longitude	Total Watershed Area (mi^2)	Ecoregion
Adams Creek	OK121500020150_00	36.090000	-95.781667	1.57	Central Irregular Plains
Brookhollow Creek	OK121300 Not Listed	36.122899	-95.838760	4.87	Central Irregular Plains
Center Creek	OK121500 Not Listed	36.144705	-95.761696	3.85	Central Irregular Plains
Coal Creek	OK121300010090_00	36.205972	-95.913403	17.10	Central Irregular Plains
Cooley Creek	OK121300 Not Listed	36.161897	-95.860272	6.14	Central Irregular Plains
Sugar Creek	OK121300 Not Listed	36.108241	-95.858272	1.92	Central Irregular Plains
Tupelo Creek	OK121300 Not Listed	36.148847	-95.852114	2.27	Central Irregular Plains
Upper Mill Creek	OK121300010050_00	36.149339	-95.888005	4.85	Central Irregular Plains

Table 1 - Sampling sites and locations

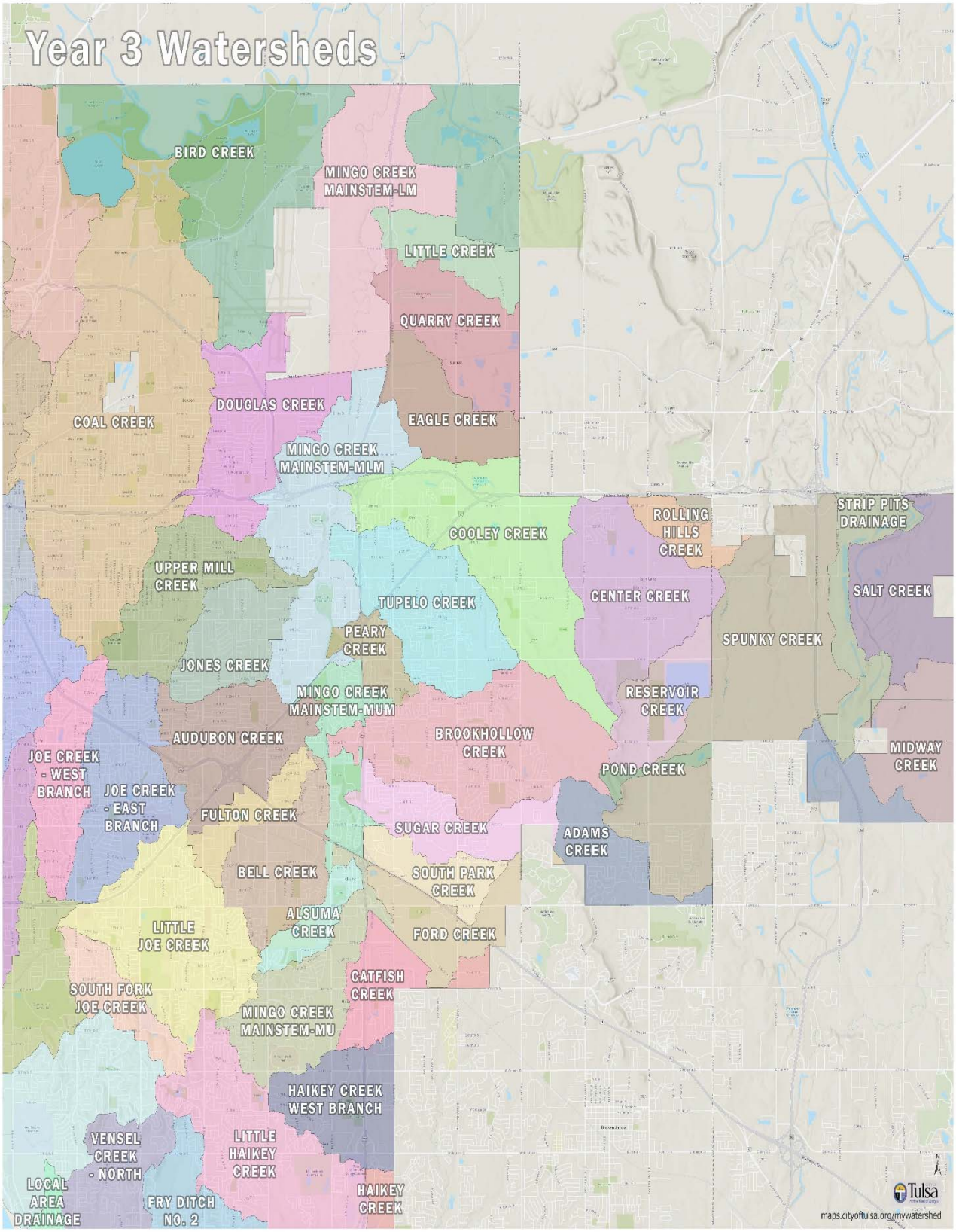

Figure 1 – City of Tulsa watershed map

2.0 BENEFICIAL USES

2.1 Agriculture

2.1.1 Total Dissolved Solids - 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.

Waterbody	Sample Mean (mg/L)	Single Sample (mg/L)	Water Quality Standard (mg/L)
Adams Creek	322	400	Sample: 456, Yearly: 350
Center Creek	374	640	
Brookhollow Creek	347	400	Sample: 470, Yearly: 387
Coal Creek	403	520	
Cooley Creek	382	410	
Sugar Creek	357	420	
Tupelo Creek	415	530	
Upper Mill Creek	560	690	

Table 2 – Total Dissolved Solids standards

2.2 Fish and Wildlife Propagation: Warm Water Aquatic Community

2.2.1 Dissolved Oxygen - Data collected on Dissolved Oxygen concentrations show that the beneficial use is not supported for seven of the eight streams. Water quality standards require ten samples. The number of samples collected exceeds the number of samples required. Water quality standards are met if no more than 10% of the samples exceed the sample standard. Streams marked with an asterisk have no flow or very little flow which may result in low dissolved oxygen concentrations.

Waterbody	Sample Mean (mg/L)	% of samples in exceedance	Water Quality Standard (mg/L)
Adams Creek*	7.68	25%	April 1 – June 15: 6.0 June 16 – March 30: 5.0
Brookhollow Creek*	7.98	25%	
Center Creek*	8.44	17%	
Coal Creek	7.74	8%	
Cooley Creek	8.72	17%	
Sugar Creek*	9.67	17%	
Tupelo Creek*	8.51	17%	
Upper Mill Creek	9.70	0%	

Table 3 – Dissolved Oxygen standards

2.2.2 Toxicants/Metals - Data collected indicate full support of the beneficial use for Toxicants and Metals for all streams. Five samples are required for water quality standards. The number of samples collected exceeds the number of samples required. Water quality standards are met if no more than one sample exceeds the acute standard and no more than 10% of samples exceeds the chronic standard.

Waterbody	Parameter	Sample Mean (µg/L)	Single Sample (µg/L)	Water Quality Standard (µg/L)
Adams Creek	Cadmium	0.50	0.50	Cd - Acute: 58.21, Chronic: 1.66 Cu - Acute: 30.31, Chronic: 19.36 PB - Acute: 151.33, Chronic: 5.90 Zn - Acute: 176.46, Chronic: 159.83
	Copper	3.10	5.88	
	Lead	0.53	0.63	
	Zinc	11.74	12.20	
Center Creek	Cadmium	0.50	0.50	
	Copper	2.60	12.80	
	Lead	1.43	10.30	
	Zinc	15.67	39.40	
Brookhollow Creek	Cadmium	0.50	0.50	Cd - Acute: 54.43, Chronic: 1.58 Cu - Acute: 28.65, Chronic: 18.40 Pb - Acute: 140.30, Chronic: 5.47 Zn - Acute: 167.79, Chronic: 151.97
	Copper	1.37	3.46	
	Lead	0.58	1.50	
	Zinc	12.05	23.10	
Coal Creek	Cadmium	0.50	0.50	
	Copper	1.81	2.52	
	Lead	0.57	1.26	
	Zinc	12.78	20.20	
Cooley Creek	Cadmium	0.50	0.50	
	Copper	1.13	1.88	
	Lead	0.50	0.50	
	Zinc	11.44	15.90	
Sugar Creek	Cadmium	0.50	0.50	
	Copper	1.81	3.65	
	Lead	0.52	0.73	
	Zinc	11.22	15.90	
Tupelo Creek	Cadmium	0.50	0.50	
	Copper	1.65	2.67	
	Lead	0.50	0.50	
	Zinc	12.18	16.80	
Upper Mill Creek	Cadmium	0.50	0.50	
	Copper	1.36	1.87	
	Lead	0.51	0.56	
	Zinc	11.43	15.40	

Table 4 – Toxicants/Metals standards

2.2.3 pH (Hydrogen Ion Activity) - 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)
Adams Creek	6.5 – 7.4	6.5 – 9.0
Brookhollow Creek	6.8 – 7.8	
Center Creek	6.8 – 8.0	
Coal Creek	6.9 – 8.0	
Cooley Creek	7.0 – 8.0	
Sugar Creek	6.9 – 8.1	
Tupelo Creek	6.8 – 8.0	
Upper Mill Creek	7.1 – 8.2	

Table 5 – pH standards

2.2.4 Oil and Grease - 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 Suspended and Bedded Sediments - 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 Turbidity – 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)	% of samples in exceedance	Water Quality Standard (NTU)
Adams Creek	12.13	0%	50
Brookhollow Creek	7.70	0%	
Center Creek	12.96	8%	
Coal Creek	5.89	0%	
Cooley Creek	5.80	0%	
Sugar Creek	4.60	0%	
Tupelo Creek	5.04	0%	
Upper Mill Creek	8.47	0%	

Table 6 – Turbidity standards

2.2.5.2 Habitat Assessment - The resulting score of the habitat assessment on the streams can be compared to the average score of high quality sites within the same ecoregion provided by the Oklahoma Conservation Commission using a scoring workbook derived from OWRB (OWRB, 2001).

Waterbody	Instream Habitat	Pool Bottom Substrate	Pool Variability	Canopy Cover	Presence of Rocky Runs and Riffles	Flow	Channel Alteration	Channel Sinuosity	Bank Stability	Bank Vegetation Stability	Streamside Cover	Total Score	Central Irregular Plains Mean Score
Adams Creek	19.5	0.4	0.0	14.4	11.4	1.0	6.7	3.7	3.5	2.3	9.9	72.8	84.1
Brookhollow Creek	19.2	9.0	17.2	17.1	10.3	2.8	7.7	0.7	5.9	4.5	4.4	98.8	
Center Creek	19.5	6.5	13.3	19.9	5.9	1.3	16.5	0.8	6.8	5.4	9.9	105.8	
Coal Creek	19.2	6.5	13.2	11.6	10.3	8.3	6.7	0.4	3.1	1.6	9.7	90.6	
Cooley Creek	19.3	2.6	20.2	19.7	14.7	6.5	16.5	0.4	6.4	2.5	9.3	118.1	
Sugar Creek	19.5	11.0	9.9	19.1	11.4	1.3	16.5	0.4	6.2	4.7	10.0	110.0	
Tupelo Creek	19.6	7.1	13.0	12.1	14.7	1.9	15.1	3.7	3.2	2.2	9.7	102.3	
Upper Mill Creek	19.3	10.8	8.7	12.6	13.3	1.6	16.5	0.4	9.9	5.8	5.0	103.9	

Table 7 – Habitat assessment metric and total results with ecoregion mean score

2.2.6 Biological

2.2.6.1 Fish Collections – Below is the data recorded from fish collections performed on the streams.

Waterbody	Sample Composition	Fish Condition	Total Score	Score Key
Adams Creek	12	11	23	30+ Beneficial Use Supported; 23 – 29 Undetermined; <22 Impaired
Brookhollow Creek	10	15	25	
Center Creek	16	15	31	
Coal Creek	16	13	29	
Cooley Creek	12	13	25	
Sugar Creek	10	11	21	
Tupelo Creek	6	11	17	
Upper Mill Creek	8	9	17	

Table 8 – Fish IBI scores

2.2.6.2 Benthic Macroinvertebrate Collections – Below is the data recorded from benthic macroinvertebrate collections during the summer and winter index periods and the final macroinvertebrate status (ODEQ, Continuing Planning Process, 2012).

Waterbody	Summer 2017 Score	Winter 2018 Score	Summer 2018 Score	Winter 2019 Score	Final Macroinvertebrate Assessment
Adams Creek	39%	89%	39%	22%	Not Attaining
Brookhollow Creek	52%	52%	52%	67%	Undetermined
Center Creek	48%	104%	41%	80%	Not Attaining
Coal Creek	58%	67%	58%	81%	Undetermined
Cooley Creek	71%	52%	58%	52%	Undetermined
Sugar Creek	65%	67%	45%	74%	Undetermined
Tupelo Creek	39%	74%	45%	52%	Not Attaining
Upper Mill Creek	58%	67%	45%	37%	Not Attaining

Table 9 – Benthic macroinvertebrate metrics for summer and winter index periods and final assessment

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.

Waterbody	*E. coli* Recreation Sample Geometric Mean (MPN/100mL)	*E. coli* Non-recreation Sample Geometric Mean (MPN/100mL)	Single Sample (MPN/100mL)	Water Quality Standard (MPN/100mL)
Adams Creek	446	60	18000	Recreational Period Geometric Mean: 126; Non-recreational Period Geometric Mean: 630
Brookhollow Creek	291	97	17000	
Center Creek	150	83	2400	
Coal Creek	527	160	6300	
Cooley Creek	154	220	550	
Sugar Creek	755	220	42000	
Tupelo Creek	1081	402	160000	
Upper Mill Creek	4466	788	34000	

Table 10 – *E. coli* totals

Waterbody	*Enterococcus* Sample Geometric Mean (MPN/100mL)	*Enterococcus* Sample Geometric Mean (MPN/100mL)	Single Sample (MPN/100mL)	Water Quality Standard (MPN/100mL)
Adams Creek	1324	115	9700	Recreational Period Geometric Mean: 33; Non-recreational Period Geometric Mean: 165
Brookhollow Creek	653	42	9700	
Center Creek	269	15	2400	
Coal Creek	685	44	2400	
Cooley Creek	70	84	550	
Sugar Creek	357	30	9700	
Tupelo Creek	966	1034	9700	
Upper Mill Creek	1080	71	9700	

Table 11 – *Enterococcus* totals

2.4 Anti-Degradation Policy

2.4.1 Nutrients - 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).

Waterbody	Total Phosphorous Sample Mean (mg/L)	Nitrite - Nitrate Sample Mean (mg/L)	% of samples in exceedance	Water Quality Threshold (mg/L)
Adams Creek	0.06	0.30	0%	Total Phosphorus: 0.24 Nitrate/Nitrite: 4.95
Brookhollow Creek	0.04	0.34	0%	
Center Creek	0.16	0.23	0%	
Coal Creek	0.04	1.05	0%	
Cooley Creek	0.03	0.39	0%	
Sugar Creek	0.03	0.52	0%	
Tupelo Creek	0.04	0.64	0%	
Upper Mill Creek	0.04	1.35	0%	

Table 12 – Nutrient totals

3.0 SUMMARY

Center Creek, Coal Creek, Tupelo Creek and Upper Mill Creek all show impairment of the agriculture beneficial use, however Center Creek, Tupelo Creek, and Upper Mill Creek have had higher total dissolved solids levels in historical readings as well. A possible factor in this apparent impairment is the stark contrast in WQS between ecoregions with the Central Irregular Plains streams having a lower standard (more difficult to attain) where just on the other side of the ecoregion boundary in the Cross Timbers the WQS is much higher (more easily met). Most of the low dissolved oxygen readings were during high temperatures and no/low flows. Adams creek was the only stream with a lower than average habitat assessment score. Adams Creek exhibited no flow for the first few months of sampling and at the time of habitat assessment, did not have any pools which contributed to a lower score. Fish collections showed impairment for Sugar Creek, Tupelo Creek and Upper Mill Creek. These creeks did not have much fish diversity as well as a low number of intolerant species. Benthic macroinvertebrate collections indicate that Adams Creek, Center Creek, Tupelo Creek and Upper Mill Creek are impaired for two or more of the index periods. These streams had very few different taxa from the EPT orders and very few individuals from the EPT orders that were present. All streams exceeded the geometric mean for *E. coli* and *Enterococcus* for recreational period sampling.

ANALYTE	Adams Creek											
	7/9/18	8/13/18	9/10/18	10/3/18	11/7/18	12/3/18	1/8/19	2/5/19	3/18/19	4/2/19	5/6/19	6/3/19
BOD(5) Day (BDL 3) mg/L	3.0	3.2	3.0	3.0	3.0	8.5	3.1	3.0	3.0	3.0	3.0	3.0
Cadmium, Total (BDL 0.5) µg/L	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Conductivity µS	764	419	329	536	505	454	434	473	442	388	388	600
Copper, Total (BDL 0.5) µg/L	5.35	4.06	3.37	2.53	2.86	2.71	2.53	1.43	1.92	2.90	5.88	1.65
Dissolved Oxygen mg/L	2.44	5.78	5.05	5.14	6.62	8.37	12.08	11.09	11.45	12.79	5.78	5.51
Flow CFS	0.00	0.00	0.00	0.01	0.05	0.00	0.51	0.23	0.25	0.33	1.02	0.13
Hardness, Total (BDL 3.6) mg/L	140	140	150	180	215	230	230	270	240	200	160	230
Lead, Total (BDL 0.5) µg/L	0.63	0.50	0.60	0.50	0.50	0.50	0.52	0.50	0.50	0.61	0.52	0.50
Nitrogen, Kjeldahl, Total (BDL 0.50) mg/L	2.70	0.92	0.56	0.50	0.85	0.72	1.00	0.50	1.10	0.51	1.00	2.90
Nitrogen, Nitrate-Nitrite (BDL 0.2) mg/L	0.38	0.31	0.25	0.20	0.22	0.21	0.36	0.20	0.25	0.30	0.55	0.33
Nitrogen, Total as N (BDL 0.5) mg/L	3.10	1.20	0.80	0.50	1.10	0.93	1.40	0.50	1.30	0.80	1.50	3.23
Oxygen Demand, Chemical (BDL 20) mg/L	42	25	27	27	43	20	15	15	33	22	26	20
pH (s.u.)	7.16	7.10	6.82	6.95	6.93	6.55	7.38	7.39	7.42	7.11	7.13	7.36
Phosphorus, Total (BDL 0.010) mg/L	0.093	0.071	0.070	0.047	0.063	0.070	0.055	0.037	0.038	0.047	0.088	0.043
Phosphorus, Total Dissolved BDL (0.010) mg/L	0.050	0.048	0.043	0.032	0.048	0.032	0.025	0.025	0.016	0.019	0.050	0.027
Solids, Total Dissolved (BDL 10) mg/L	270	260	250	310	380	390	336	400	360	310	250	350
Solids, Total Suspended (BDL 2.0) mg/L	17.0	19.0	12.0	4.7	2.0	4.6	8.8	5.5	8.0	10.0	11.0	4.3
Temperature, Water °C	24.6	23.5	19.8	22.1	11.8	5.8	8.5	7.9	9.8	9.1	19.7	23.8
Turbidity (NTU)	27.2	18.8	11.5	2.4	1.9	7.4	15.1	9.0	12.2	17.8	15.0	7.3
Zinc, Total (BDL 10) µg/L	10.6	14.0	10.0	10.0	10.0	10.0	14.1	10.0	10.0	22.2	10.0	10.0
Results found to be below the detection limit are reported as the detection limit												

Table 13 – Complete analytical sampling results for all parameters for Adams Creek

ANALYTE	Adams Creek												
	7/9/18	8/13/18	8/29/18	9/5/18	9/10/18	9/11/18	10/3/18	11/7/18	12/3/18	5/6/19	6/3/19	6/6/19	6/13/19
E. coli (BDL 1) MPN/100mL	1600	130	250	18000	390	190	79	11	250	490	260	280	260
Enterococcus MPN/100mL	2400	610	1300	9700	500	1400	1300	13	91	1000	630	1700	1200
Results found to be below the detection limit are reported as the detection limit													

Table 14 – Complete analytical results for bacteria samples for Adams Creek (highlighted samples were taken during the recreation period)

ANALYTE	Brookhollow Creek											
	7/23/18	8/23/18	9/17/18	10/11/18	11/15/18	12/11/18	1/9/19	2/6/19	3/21/19	4/9/19	5/7/19	6/5/19
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	3.3	3.0	3.0
Cadmium, Total (BDL 0.5) µg/L	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Conductivity µS	760	598	617	427	408	394	451	414	465	571	558	593
Copper, Total (BDL 0.5) µg/L	0.55	3.46	1.22	1.45	2.05	0.82	2.18	0.72	0.76	0.87	1.04	1.31
Dissolved Oxygen mg/L	2.66	5.89	3.95	6.22	10.77	10.98	11.98	11.69	11.16	8.70	6.69	5.42
Flow CFS	0.02	0.29	0.00	0.11	0.09	0.12	3.50	0.12	0.40	0.47	0.97	0.58
Hardness, Total (BDL 3.6) mg/L	190	250	250	240	270	270	290	310	305	300	290	270
Lead, Total (BDL 0.5) µg/L	0.50	1.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Nitrogen, Kjeldahl, Total (BDL 0.50) mg/L	1.70	1.10	0.50	0.50	0.50	0.50	0.96	0.50	0.50	0.50	0.50	0.54
Nitrogen, Nitrate-Nitrite (BDL 0.2) mg/L	0.20	0.47	0.50	0.42	0.24	0.20	0.43	0.22	0.30	0.20	0.56	0.35
Nitrogen, Total as N (BDL 0.5) mg/L	1.70	1.50	0.50	0.50	0.50	0.50	1.40	0.50	0.50	0.50	0.54	0.87
Oxygen Demand, Chemical (BDL 20) mg/L	97	20	22	27	20	64	20	20	20	20	20	20
pH (s.u.)	7.34	7.58	7.58	6.88	7.71	7.67	7.79	7.33	7.63	7.66	7.51	7.66
Phosphorus, Total (BDL 0.010) mg/L	0.07	0.09	0.02	0.04	0.05	0.03	0.03	0.03	0.02	0.02	0.03	0.03
Phosphorus, Total Dissolved BDL (0.010) mg/L	0.03	0.02	0.02	0.03	0.04	0.01	0.03	0.03	0.01	0.01	0.02	0.01
Solids, Total Dissolved (BDL 10) mg/L	320	340	340	320	400	370	380	360	370	330	280	350
Solids, Total Suspended (BDL 2.0) mg/L	18.0	58.0	2.0	3.3	3.6	2.9	19.0	4.0	2.9	5.8	2.0	16.0
Temperature, Water °C	25.3	24.0	24.5	15.3	4.4	4.7	5.0	5.5	9.4	16.5	19.0	22.6
Turbidity (NTU)	21.02	16.50	2.84	8.32	1.89	5.05	6.07	5.26	6.21	4.14	4.85	10.20
Zinc, Total (BDL 10) µg/L	10.0	23.1	15.4	10.0	12.4	10.0	13.5	10.0	10.0	10.0	10.0	10.2
Results found to be below the detection limit are reported as the detection limit												

Table 14 – Complete analytical sampling results for all parameters for Brookhollow Creek

ANALYTE	Brookhollow Creek											
	7/23/18	8/23/18	8/29/18	9/5/18	9/11/18	9/17/18	10/11/18	11/15/18	12/11/18	5/7/19	6/5/19	6/6/19	6/13/19
E. coli (BDL 1) MPN/100mL	44	520	84	17000	120	290	220	100	41	550	490	390	370
Enterococcus MPN/100mL	140	980	580	9700	110	650	340	18	12	980	550	580	820
Results found to be below the detection limit are reported as the detection limit													

Table 15 – Complete analytical results for bacteria samples for Brookhollow Creek (highlighted samples were taken during the recreation period)

ANALYTE	Center Creek											
	7/24/18	8/13/18	9/10/18	10/3/18	11/19/18	12/11/18	1/8/19	2/14/19	3/18/19	4/8/19	5/13/19	6/12/19
BOD(5) Day (BDL 3) mg/L	3.2	40.0	4.7	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Cadmium, Total (BDL 0.5) µg/L	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Conductivity µS	963	271	343	1183	425	441	431	407	464	572	457	531
Copper, Total (BDL 0.5) µg/L	3.86	12.80	2.15	1.35	1.66	2.57	1.38	1.18	0.94	1.01	1.54	0.81
Dissolved Oxygen mg/L	2.96	4.36	5.57	5.38	9.93	12.10	11.76	13.41	11.84	9.40	7.49	7.08
Flow CFS	0.00	0.00	0.00	0.00	0.00	0.06	0.48	0.53	0.35	0.55	0.90	0.30
Hardness, Total (BDL 3.6) mg/L	180	120	160	170	268	290	240	250	270	260	220	246
Lead, Total (BDL 0.5) µg/L	1.84	10.30	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Nitrogen, Kjeldahl, Total (BDL 0.50) mg/L	1.20	2.00	1.00	0.52	0.50	0.59	1.60	0.50	0.50	0.50	0.56	0.50
Nitrogen, Nitrate-Nitrite (BDL 0.2) mg/L	0.20	0.20	0.20	0.20	0.20	0.20	0.28	0.32	0.20	0.20	0.32	0.20
Nitrogen, Total as N (BDL 0.5) mg/L	1.20	2.00	1.00	0.52	0.50	0.59	1.90	0.82	0.50	0.50	0.88	0.50
Oxygen Demand, Chemical (BDL 20) mg/L	56	70	20	29	20	76	15	20	20	20	20	20
pH (s.u.)	7.04	7.68	7.37	7.71	6.80	7.10	7.73	7.84	7.85	8.00	7.21	7.71
Phosphorus, Total (BDL 0.010) mg/L	0.12	1.20	0.07	0.05	0.07	0.08	0.06	0.05	0.03	0.03	0.08	0.04
Phosphorus, Total Dissolved BDL (0.010) mg/L	0.02	0.02	0.04	0.02	0.07	0.06	0.03	0.03	0.02	0.02	0.06	0.03
Solids, Total Dissolved (BDL 10) mg/L	530	190	230	640	360	420	364	340	390	360	330	330
Solids, Total Suspended (BDL 2.0) mg/L	32.0	840.0	6.6	13.0	2.5	7.1	5.2	4.6	2.0	2.0	12.0	3.3
Temperature, Water °C	24.2	25.9	20.7	22.7	5.2	2.7	7.8	7.3	9.3	17.7	15.2	20.7
Turbidity (NTU)	31.80	55.90	8.15	9.86	2.77	8.23	7.24	8.08	4.93	4.50	9.09	4.98
Zinc, Total (BDL 10) µg/L	22.2	35.1	10.0	10.0	39.4	10.5	10.0	10.0	10.0	10.0	10.8	10.0
Results found to be below the detection limit are reported as the detection limit												

Table 17 – Complete analytical sampling results for all parameters for Center Creek

ANALYTE	Center Creek											
	7/24/18	8/13/18	8/29/18	9/5/18	9/10/18	9/11/18	10/3/18	11/19/18	12/11/18	5/13/19	6/6/19	6/12/19	6/13/19
E. coli (BDL 1) MPN/100mL	240	99	18	28	80	86	35	110	150	440	2400	340	200
Enterococcus MPN/100mL	440	2400	42	290	140	96	22	8	20	440	480	110	500
Results found to be below the detection limit are reported as the detection limit													

Table 18 – Complete analytical results for bacteria samples for Center Creek (highlighted samples were taken during the recreation period)

ANALYTE	Coal Creek											
	7/24/18	8/7/18	9/19/18	10/1/18	11/19/18	12/17/18	1/7/19	2/14/19	3/19/19	4/22/19	5/28/19	6/11/19
BOD(5) Day (BDL 3) mg/L	3.0	3.0	3.0	3.0	3.0	3.0	3.0	27.0	3.0	3.0	8.4	3.0
Cadmium, Total (BDL 0.5) µg/L	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Conductivity µS	544	762	464	491	355	479	641	448	635	748	820	773
Copper, Total (BDL 0.5) µg/L	1.72	1.29	2.37	2.31	1.26	1.33	2.04	2.52	1.19	1.98	2.08	1.62
Dissolved Oxygen mg/L	5.46	6.75	3.96	5.79	10.51	10.29	8.77	10.60	10.17	7.24	6.16	7.23
Flow CFS	0.63	2.50	0.20	0.34	0.32	0.60	1.88	0.95	2.38	2.05	5.06	2.94
Hardness, Total (BDL 3.6) mg/L	160	140	170	190	210	320	320	270	338	340	350	348
Lead, Total (BDL 0.5) µg/L	1.26	0.50	0.50	0.50	0.50	0.50	0.50	0.53	0.50	0.50	0.61	0.50
Nitrogen, Kjeldahl, Total (BDL 0.50) mg/L	0.50	0.50	0.50	0.51	0.50	0.50	0.50	0.59	0.50	0.5	5.50	0.50
Nitrogen, Nitrate-Nitrite (BDL 0.2) mg/L	0.20	0.20	0.20	0.34	0.48	2.30	2.40	0.61	1.80	1.10	1.80	1.20
Nitrogen, Total as N (BDL 0.5) mg/L	0.50	0.50	0.50	0.85	0.50	2.30	2.40	1.20	1.70	1.10	7.30	1.20
Oxygen Demand, Chemical (BDL 20) mg/L	37	20	22	20	20	65	15	44	20	20	20	20
pH (s.u.)	7.92	7.70	7.76	7.32	7.62	6.91	7.33	7.28	7.96	7.71	7.70	7.33
Phosphorus, Total (BDL 0.010) mg/L	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.06	0.05
Phosphorus, Total Dissolved BDL (0.010) mg/L	0.03	0.03	0.03	0.02	0.02	0.03	0.03	0.03	0.01	0.01	0.04	0.04
Solids, Total Dissolved (BDL 10) mg/L	240	230	250	370	330	460	500	390	520	520	520	510
Solids, Total Suspended (BDL 2.0) mg/L	2.5	3.2	2.0	2.0	2.0	2.0	2.0	7.0	2.4	2.0	19.0	22.0
Temperature, Water °C	24.8	26.4	24.8	21.4	6.0	4.9	10.8	7.2	11.0	18.2	22.1	20.3
Turbidity (NTU)	17.90	14.70	1.91	1.44	1.26	6.29	2.69	7.45	4.86	1.69	5.38	5.07
Zinc, Total (BDL 10) µg/L	20.2	10.0	12.9	10.4	10.0	12.5	13.6	18.4	12.2	10.0	11.5	11.7
Results found to be below the detection limit are reported as the detection limit												

Table 19 – Complete analytical sampling results for all parameters for Coal Creek

ANALYTE	Coal Creek											
	7/24/18	8/7/18	8/29/18	9/5/18	9/11/18	9/19/18	10/1/18	11/19/18	12/17/18	5/28/19	6/6/19	6/11/19	6/13/19
E. coli (BDL 1) MPN/100mL	690	6300	280	610	150	370	140	88	330	440	380	460	520
Enterococcus MPN/100mL	310	2400	580	1400	82	170	57	5	280	1100	730	1400	2400
Results found to be below the detection limit are reported as the detection limit													

Table 20 – Complete analytical results for bacteria samples for Coal Creek (highlighted samples were taken during the recreation period)

ANALYTE	Cooley Creek											
	7/10/18	8/21/18	9/19/18	10/25/18	11/13/18	12/18/18	1/15/19	2/11/19	3/11/19	4/22/19	5/28/19	6/12/19
BOD(5) Day (BDL 3) mg/L	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Cadmium, Total (BDL 0.5) µg/L	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Conductivity µS	668	620	641	566	463	486	405	350	448	537	596	600
Copper, Total (BDL 0.5) µg/L	0.93	1.18	0.99	1.15	1.16	1.58	0.80	0.66	1.02	1.88	1.36	0.90
Dissolved Oxygen mg/L	3.67	7.50	3.66	7.56	12.85	10.43	15.23	9.94	12.39	6.94	7.18	7.26
Flow CFS	0.05	3.42	0.07	0.34	0.37	1.30	1.72	0.81	1.04	3.63	2.34	0.55
Hardness, Total (BDL 3.6) mg/L	240	300	250	300	290	310	290	300	280	270	280	301
Lead, Total (BDL 0.5) µg/L	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Nitrogen, Kjeldahl, Total (BDL 0.50) mg/L	0.74	1.00	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	2.10	0.50
Nitrogen, Nitrate-Nitrite (BDL 0.2) mg/L	0.20	0.52	0.26	0.24	0.25	0.62	0.88	0.24	0.51	0.20	0.53	0.20
Nitrogen, Total as N (BDL 0.5) mg/L	0.74	1.60	0.50	0.50	0.50	0.60	0.86	0.50	0.51	0.50	2.70	0.50
Oxygen Demand, Chemical (BDL 20) mg/L	20	20	22	20	20	20	20	20	20	20	20	20
pH (s.u.)	7.16	7.78	7.53	7.15	7.04	7.60	7.92	7.13	7.19	7.63	7.75	7.41
Phosphorus, Total (BDL 0.010) mg/L	0.03	0.06	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.02
Phosphorus, Total Dissolved BDL (0.010) mg/L	0.01	0.03	0.03	0.02	0.02	0.03	0.03	0.03	0.01	0.01	0.02	0.01
Solids, Total Dissolved (BDL 10) mg/L	350	410	370	380	400	400	380	390	410	350	360	380
Solids, Total Suspended (BDL 2.0) mg/L	4.4	13.0	5.2	2.3	2.0	2.0	3.3	2.0	2.0	3.5	7.2	4.3
Temperature, Water °C	28.4	22.1	24.8	13.9	5.5	8.2	4.9	6.4	8.4	17.1	21.6	20.6
Turbidity (NTU)	8.45	13.00	3.59	3.82	7.29	3.33	4.68	3.45	7.39	3.07	8.41	3.07
Zinc, Total (BDL 10) µg/L	15.9	13.8	10.0	10.0	12.7	10.0	10.0	10.9	14.0	10.0	10.0	10.0
Results found to be below the detection limit are reported as the detection limit												

Table 21 – Complete analytical sampling results for all parameters for Cooley Creek

ANALYTE	Cooley Creek											
	7/10/18	8/21/18	8/29/18	9/5/18	9/11/18	9/19/18	10/25/18	11/13/18	12/18/18	5/28/19	6/6/19	6/12/19	6/13/19
E. coli (BDL 1) MPN/100mL	71	260	79	44	550	91	310	230	150	140	330	340	150
Enterococcus MPN/100mL	23	550	7	20	19	140	150	59	66	400	190	110	71
Results found to be below the detection limit are reported as the detection limit													

Table 22 – Complete analytical results for bacteria samples for Cooley Creek (highlighted samples were taken during the recreation period)

ANALYTE	Sugar Creek											
	7/23/18	8/23/18	9/17/18	10/11/18	11/15/18	12/15/18	1/9/19	2/6/19	3/21/19	4/8/19	5/7/19	6/5/19
BOD(5) Day (BDL 3) mg/L	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Cadmium, Total (BDL 0.5) µg/L	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Conductivity µS	761	547	539	464	424	413	447	450	501	640	609	616
Copper, Total (BDL 0.5) µg/L	1.60	2.76	3.01	1.45	3.65	1.34	0.97	0.94	1.30	1.43	1.71	1.52
Dissolved Oxygen mg/L	8.58	6.64	3.73	8.42	12.37	11.52	13.34	13.13	12.62	12.90	6.96	5.77
Flow CFS	0.00	0.15	0.00	0.26	0.10	0.09	1.40	0.05	0.13	0.17	0.42	0.25
Hardness, Total (BDL 3.6) mg/L	150	200	190	210	280	290	300	290	277	280	270	250
Lead, Total (BDL 0.5) µg/L	0.50	0.73	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Nitrogen, Kjeldahl, Total (BDL 0.50) mg/L	0.70	1.20	0.57	0.50	0.50	0.50	1.50	0.50	0.50	0.50	0.50	0.72
Nitrogen, Nitrate-Nitrite (BDL 0.2) mg/L	0.20	0.20	0.20	0.33	0.20	0.20	1.60	0.87	0.91	0.37	0.79	0.40
Nitrogen, Total as N (BDL 0.5) mg/L	0.70	1.20	0.57	0.50	0.50	0.50	3.10	0.85	0.88	0.50	0.78	1.10
Oxygen Demand, Chemical (BDL 20) mg/L	58	36	20	24	20	61	20	20	20	20	20	20
pH (s.u.)	7.14	7.96	7.22	7.86	7.25	6.93	8.09	7.94	8.01	7.89	7.94	7.96
Phosphorus, Total (BDL 0.010) mg/L	0.03	0.07	0.08	0.03	0.02	0.03	0.03	0.03	0.02	0.02	0.03	0.02
Phosphorus, Total Dissolved BDL (0.010) mg/L	0.02	0.01	0.02	0.02	0.02	0.02	0.03	0.03	0.01	0.01	0.02	0.01
Solids, Total Dissolved (BDL 10) mg/L	260	300	290	280	400	390	410	420	410	410	350	360
Solids, Total Suspended (BDL 2.0) mg/L	2.0	34.0	6.6	3.9	2.6	4.6	2.0	2.5	2.0	2.0	2.5	50.0
Temperature, Water °C	26.2	24.3	24.2	14.4	4.0	2.7	4.4	5.1	10.2	18.7	20.0	24.2
Turbidity (NTU)	18.07	2.33	4.76	6.13	1.05	4.93	2.94	2.74	2.79	2.41	4.90	2.20
Zinc, Total (BDL 10) µg/L	12.4	14.9	15.9	10.0	11.4	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Results found to be below the detection limit are reported as the detection limit												

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

ANALYTE	Sugar Creek											
	7/23/18	8/23/18	8/29/18	9/5/18	9/11/18	9/17/18	10/11/18	11/15/18	12/5/18	5/7/19	6/5/19	6/6/19	6/13/19
E. coli (BDL 1) MPN/100mL	330	980	57	42000	290	1600	390	170	160	730	2000	520	220
Enterococcus MPN/100mL	57	920	12	9700	170	690	70	8.6	43	1400	210	550	290
Results found to be below the detection limit are reported as the detection limit													

Table 24 – Complete analytical results for bacteria samples for Sugar Creek (highlighted samples were taken during the recreation period)

ANALYTE	Tupelo Creek											
	7/10/18	8/16/18	9/4/18	10/2/18	11/26/18	12/19/18	1/16/19	2/11/19	3/19/19	4/17/19	5/15/19	6/18/19
BOD(5) Day (BDL 3) mg/L	4.2	4.0	3.0	3.0	26.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Cadmium, Total (BDL 0.5) µg/L	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Conductivity µS	376	433	475	551	391	584	516	574	597	703	640	642
Copper, Total (BDL 0.5) µg/L	2.23	2.62	1.68	1.96	2.67	1.24	0.79	1.80	0.73	1.18	1.39	1.48
Dissolved Oxygen mg/L	2.58	5.36	3.61	5.36	10.36	9.93	12.84	15.11	10.85	8.62	7.53	10.02
Flow CFS	0.00	0.00	0.00	0.03	0.14	0.52	1.12	0.08	0.60	0.69	0.83	0.58
Hardness, Total (BDL 3.6) mg/L	200	170	180	190	260	360	350	320	350	340	300	270
Lead, Total (BDL 0.5) µg/L	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Nitrogen, Kjeldahl, Total (BDL 0.50) mg/L	0.93	0.96	0.68	0.50	0.50	0.50	0.50	0.50	0.50	0.57	0.50	0.50
Nitrogen, Nitrate-Nitrite (BDL 0.2) mg/L	0.26	0.20	0.20	0.20	0.20	2.00	1.70	0.68	1.00	0.56	0.41	0.26
Nitrogen, Total as N (BDL 0.5) mg/L	1.20	0.96	0.68	0.50	0.50	2.00	1.70	0.68	0.99	0.50	0.50	0.50
Oxygen Demand, Chemical (BDL 20) mg/L	22	20	20	20	66	20	20	20	20	26	20	20
pH (s.u.)	6.98	6.87	7.53	7.10	7.65	7.37	7.71	7.60	7.48	7.97	7.59	7.95
Phosphorus, Total (BDL 0.010) mg/L	0.08	0.05	0.06	0.03	0.10	0.03	0.03	0.03	0.01	0.02	0.02	0.03
Phosphorus, Total Dissolved BDL (0.010) mg/L	0.07	0.04	0.03	0.02	0.08	0.03	0.04	0.03	0.01	0.01	0.02	0.02
Solids, Total Dissolved (BDL 10) mg/L	380	260	270	330	410	500	470	530	500	460	440	430
Solids, Total Suspended (BDL 2.0) mg/L	110.0	8.5	4.6	3.4	23.0	2.4	2.0	4.8	2.0	13.0	6.0	4.0
Temperature, Water °C	25.3	25.8	25.4	21.7	2.8	7.8	6.8	5.4	8.7	17.3	18.7	24.5
Turbidity (NTU)	9.39	18.20	4.64	2.42	12.70	1.56	0.87	5.96	0.76	0.91	1.25	1.76
Zinc, Total (BDL 10) µg/L	14.6	14.2	10.0	14.4	16.2	10.0	10.0	16.8	10.0	10.0	10.0	10.0
Results found to be below the detection limit are reported as the detection limit												

Table 25 – Complete analytical sampling results for all parameters for Tupelo Creek

ANALYTE	Tupelo Creek											
	7/10/18	8/16/18	8/29/18	9/4/18	9/5/18	9/11/18	10/2/18	11/26/18	12/19/18	5/15/19	6/6/19	6/13/19	6/18/19
E. coli (BDL 1) MPN/100mL	690	6200	190	53	160000	1300	870	240	310	490	390	980	1300
Enterococcus MPN/100mL	2400	4800	280	53	9700	690	1000	1600	690	1100	490	1400	820
Results found to be below the detection limit are reported as the detection limit													

Table 26 – Complete analytical results for bacteria samples for Tupelo Creek (highlighted samples were taken during the recreation period)

ANALYTE	Upper Mill Creek											
	7/24/18	8/21/18	9/4/18	10/2/18	11/26/18	12/18/18	1/15/19	2/18/19	3/19/19	4/17/19	5/15/19	6/24/19
BOD(5) Day (BDL 3) mg/L	3.0	3.0	3.4	3.0	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Cadmium, Total (BDL 0.5) µg/L	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Conductivity µS	1221	942	1138	1026	533	574	546	506	629	688	769	749
Copper, Total (BDL 0.5) µg/L	1.87	1.74	1.72	1.60	1.74	1.35	0.56	0.64	0.81	1.68	1.04	1.61
Dissolved Oxygen mg/L	6.60	7.81	6.13	6.51	11.72	10.76	13.53	13.13	12.81	10.03	8.70	8.70
Flow CFS	0.00	0.26	0.12	0.04	0.17	0.16	0.43	0.22	0.57	0.65	0.29	0.87
Hardness, Total (BDL 3.6) mg/L	340	380	380	350	330	330	350	340	349	360	380	330
Lead, Total (BDL 0.5) µg/L	0.50	0.50	0.50	0.56	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Nitrogen, Kjeldahl, Total (BDL 0.50) mg/L	0.86	0.50	1.20	0.74	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Nitrogen, Nitrate-Nitrite (BDL 0.2) mg/L	0.60	1.40	0.94	0.65	0.63	1.50	2.40	1.20	1.70	1.90	1.80	1.50
Nitrogen, Total as N (BDL 0.5) mg/L	1.40	1.40	2.10	1.40	0.61	1.40	2.30	1.20	1.60	1.80	1.80	1.50
Oxygen Demand, Chemical (BDL 20) mg/L	41	20	20	36	20	20	20	20	20	20	20	20
pH (s.u.)	7.96	8.12	8.17	7.79	7.39	7.13	7.73	7.53	8.14	7.95	8.04	7.72
Phosphorus, Total (BDL 0.010) mg/L	0.04	0.06	0.11	0.07	0.03	0.03	0.03	0.01	0.02	0.03	0.03	0.04
Phosphorus, Total Dissolved BDL (0.010) mg/L	0.03	0.06	0.07	0.03	0.02	0.03	0.03	0.02	0.01	0.01	0.02	0.03
Solids, Total Dissolved (BDL 10) mg/L	690	650	670	670	480	480	480	500	530	510	580	480
Solids, Total Suspended (BDL 2.0) mg/L	4.5	8.0	10.0	6.3	2.2	2.0	2.0	2.0	3.8	18.0	4.3	3.0
Temperature, Water °C	27.0	23.7	25.3	23.4	7.6	10.0	7.1	5.4	10.8	16.3	20.4	22.8
Turbidity (NTU)	21.20	7.02	8.68	9.19	2.20	1.10	2.02	2.23	3.77	2.17	2.00	4.61
Zinc, Total (BDL 10) µg/L	13.6	10.0	12.5	15.4	10.0	10.0	11.2	10.9	11.4	10.0	11.2	10.9
Results found to be below the detection limit are reported as the detection limit												

Table 27 – Complete analytical sampling results for all parameters for Upper Mill Creek

ANALYTE	Upper Mill Creek											
	7/24/18	8/21/18	8/29/18	9/4/18	9/5/18	9/11/18	10/2/18	11/26/18	12/19/18	5/15/19	6/6/19	6/13/19	6/24/19
E. coli (BDL 1) MPN/100mL	2400	1600	1400	2000	34000	2400	2400	1200	170	8000	9300	4400	11000
Enterococcus MPN/100mL	690	1200	250	1000	9700	240	290	20	61	1000	1600	1400	2000
Results found to be below the detection limit are reported as the detection limit													

Table 28 – Complete analytical results for bacteria samples for Upper Mill Creek (highlighted samples were taken during the recreation period)

4.0 RESPONSES TAKEN

The following is a description of the responses taken per pollutant which have been monitored by the City of Tulsa's Watershed Characterization Program during Year 3 of the program. In the Fall of 2014 (after Year 3 of the Permit) the City of Tulsa created a new position whose primary duty is to review and respond to data collected by the Watershed Characterization Program. This position has aided in the development of the Responses Taken program, though they have many other duties as well which has not enabled them to focus on this program solely.

FY 2018-2019 Impairments

Adams Creek – Benthic, Bacteria

Brookhollow Creek - Bacteria

Center Creek – TDS, Benthic, bacteria

Coal Creek – TDS, bacteria

Cooley Creek – DO, bacteria

Sugar Creek – Fish, bacteria

Tupelo Creek – TDS, Fish, Benthic, bacteria

Upper Mill Creek – TDS, Fish, Benthic, bacteria

Responses were taken on a City wide basis based on data from the Watershed Characterization Program for the following parameters:

E. coli – A determination on the beneficial use attainment for Tulsa's streams based on the Watershed Characterization data was able to be made due to sufficient number of samples during the recreational period. All of these samples indicate impairment. Based on the perceived widespread non-attainment of the Primary Body Contact Use, a microbial source tracking program was initiated in 2017. The results of this program are preliminary but it appears humans and dog contribute DNA in higher proportion that other sources, however many sources of wildlife have not been tested. Confounding evidence has been found however when a stream indicates impairment based on a FIB test however a MST sample taken at the same time finds no source for the screening conducted (human, dog, goose, etc…)

Promotional pet waste bag dispensers were purchased in June of 2014. These bags are distributed at various public education events, at animal shelters, and veterinarian clinics. In 2015 the City of Tulsa's Stormwater Quality Program also chose to cosponsor the Tulsa Driller's Bark in the Park baseball games. These games are promoted to dog owners who are allowed to bring their pets into the park. The Stormwater Quality group had a booth at these games where they talk with citizens about cleaning up after their pets and why it is important.

Pet waste signs have been put up along some of Tulsa's City parks and stormwater facilities. As more

information is gathered on Tulsa's streams, priority will be given to placing more of these signs in streams impacted by high bacteria counts.

Sanitary sewer overflows and septic systems have been mapped and are undergoing continual update and correction to analyze the relationship between these issues and bacteria counts. A mailer has been initiated which when sent out will remind septic tank owners of their responsibilities to properly maintain that system to prevent contaminations of waterways.

See Part II(A)(1) of the Annual Report for information on the number and length of preventative maintenance conducted on sewer lines in order to avoid sanitary sewer overflows.

Total Dissolved Solids – Data collected from Center, Coal, Tupelo, and Upper Mill Creek indicates impairment when compared to State Water Quality Standards. A possible factor in this apparent impairment is the stark contrast in WQS between ecoregions with the Central Irregular Plains streams having a lower standard (more difficult to attain) where just on the other side of the ecoregion boundary in the Cross Timbers the WQS is much higher (more easily met).

In order to combat the issue of sediment leaving construction sites, the Tulsa Enforcement Response Guide was changed in 2014 to make enforcement actions builder specific. This allows enforcement to be escalated more quickly with the desired response being better installed and maintained BMPs. Further an additional inspector's position was created to increase the number of erosion control inspections being conducted.

Dissolved Oxygen – Cooley Creek appears to be impaired for DO when taking into account low/no flow conditions when compared to State Water Quality Standards.

Literature has been created and distributed alerting citizens to the hazards of blowing yard waste into the street and stormdrain. Also, as mentioned above, literature and mailers have been promoted that alert citizens and commercial companies to not over-apply fertilizers which could reach Tulsa's streams causing algae blooms and eventually reducing DO levels.

The dumping of many household and industrial chemicals also has the potential to reduce D.O. levels in streams. Educational awareness of where storm drains go and how to dispose of chemicals properly was promoted through many forms of media. The City of Tulsa also has a robust industrial inspection program to education and regulate industries that have a high risk of polluting Tulsa's streams.

Fish and Benthics – Analysis are being conducted to determine the driving factors of fish and benthic impairments in streams. There is no one simple factor (land use, haz-mat incidents, LID features, etc…) which determine beneficial use attainment/non-attainment. As such correlations and relationships are still being assessed to best respond to perceived fish and benthic impairments.

General Stormwater Quality Awareness – Radio, TV, and billboard ads were purchased to educate the citizens of Tulsa on general stormwater quality issues beginning in October of 2015. These ads cover general stormwater pollution awareness topics such as low impact development, not dumping foreign substances in the stormdrain, proper erosion control measures, not blowing grass clippings in the street, and the impact of pollutants on aquatic life. Recently additional videos targeted at more of the adult audience have been created which reminds citizens that the "Little Things" they do add up to impact our streams. The other video recently created traces the storm sewer system from a residence to

the river tying back the principal of protecting what goes into the stormdrain.

5.0 REFERENCES

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Section 5

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

City of Tulsa		
* FY 2017/2018 reflects migration to ERP system	**FY 2018/2019 Actual**	**FY 2019/2020 Budget**
Section Name		
Warehouse	15,035	22,136
Customer Care	200,540	212,188
Security (Direct charge fund 560)	65,869	62,837
Asset Management Admin	7,602	5,335
Security	192,361	260,594
Building Operations – Administration	1,914	1,924
Building Operations – Contracts	2,352	2,644
Building Maintenance	33,607	16,365
Custodial Services	10,817	10,830
IT Capital Direct Charges	76,327	36,000
Engineering Services Administration	80,607	151,619
Engineering Administration – Stormwater	539,398	656,670
Reproduction changed to Central Services	199,188	228,394
Design Services – Administration	35,546	41,877
Design	743,200	801,853
Hydrology and Hydraulics	62,957	46,496
Alert System	112,947	81,686
Field Engineering – Administration	44,278	65,162
Construction Inspection	579,047	571,644
Call OKIE – Encroachments	61,791	55,637
Field Surveys	140,463	164,574
Planning and Project Management Administration	61,486	53,193
Project Management	26,999	31,222
Infrastructure Management	78,998	123,670
Graphics / CADDS	217,089	293,703
Floodplain Management	2,084,460	2,604,113
Planning Stormwater/General	128,613	128,104
Engineering Graphics	57,209	51,087
Right of Way	129,447	136,010
Streets & Stormwater – Administration	133,565	125,534
SS Payroll & Accts Payable	19,496	28,331
SS – Stormwater Fund	3,912,161	4,311,396
Stormwater & Land Management Admin	999,316	1,019,465

Detention, Ditch, Concrete Channel	1,338,232	1,808,422
Channel Maintenance and Ditching	1,974,861	2,205,217
Storm Sewer Maintenance	2,504,590	5,191,567
Stormwater Quality	1,312,766	1,735,944
Stormwater Vegetation	2,189,592	2,850,795
Household Pollutant Collection	54,819	56,312
Stormwater Roadside Mowing	440,664	499,914
STREET MAINT & INSPECTIONS - ADMIN	125,494	165,079
STREET MAINTENANCE -- PATCHING	787,645	855,943
Paving Cut Administration	55,237	53,499
Street Sweeping	1,331,859	1,610,110
Water and Sewer Admin.	20,288	20,984
Water & Sewer Dept. – Stormwater	29,000	38,639
Quality Assurance – Administration	5,069	7,539
Quality Assurance – Operations Support	806	1,410
Laboratories	80,081	86,521
Distribution Systems - Administration	12,007.15	13,490
Field Cust. Serv. Rep. I (Meter Reading)	64,373.25	68,231
Field Cust. Serv. Rep. II (Meter Turn On/Off)	0.00	-
Sewer O & M – Admin	68,626.08	65,335
Lift and Pump Stations	276,721.77	292,985
General Site Services changed to P&R Fac Sys Land & Gen Maint	285,824	304,775
Horticulture changed to P&R Uti Svs Horticulture	111,994	97,405
Park - Fac Svs Forestry - New split from Horticulture		54,659
Utilities Administration	445,796	638,166
IT Administration	17,769	22,459
IT Operations	158,073	303,121
IT Client Services	164,807	205,642
Sewer O & M – Support Services / Dispatch	12,551	19,319
Total	24,924,227	31,675,775

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 320 investigations were conducted identifying 18 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
23	Construction (relating to construction site potential violations)
16	Hazmat (relating to potential discharges of pollutants from fire department responses involving the hazardous materials unit)
277	Stormwater (relating to potential releases of pollutants to the storm sewer or violations of the pollution ordinance)
4	Drug Labs (relating to the potential release of pollutants from drug lab remediation to the storm sewer or violations of the pollution ordinance)
320	Total number of investigations for this reporting year

- Construction Site – Erosion Control
    - The Stormwater Management Division conducted 1,631 construction site inspections resulting in 24 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 $850.
- 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, 495 industrial stormwater inspections were conducted. Four enforcement actions were taken against industries or facilities in order to eliminate illegal or illicit discharges. No fines were 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 – 98.82 miles

SM conducted the following inspections:

- Storm sewer lines inspected – 6.6 miles
- Industrial and commercial storm water runoff inspections – 495
- Construction site erosion control inspections – 1,631

Development Services conducted the following number of inspections:

- 3,091 construction site inspections were conducted with attention on erosion controls measures.

Engineering Services conducted the following inspections:

- Daily inspections at construction projects (94 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 approximately 1,090,461 times during this reporting period. See below for more information on Tulsa's Public Education Program's.

Attachment A "Public Education 2018-2019" lists the educational material distributed during this reporting period by the City of Tulsa.

Attachment B "Education Events 2018-2019" lists the educational activities performed during this period by the City of Tulsa.

Attachment C "Children's Education Activities 2018-2019" lists various educational activities performed for children's groups.

Attachment A: Educational Materials Distributed or Used in FY 18/19

	Illicit Discharges	Animal Waste	Antifreeze	Motor Oil	Paint	Fertilizer	Pesticides	LID	Compost	Yard Waste	Erosion	Floatables	Master Gardner	HHPCF	Customer Care/Website	# Distibuted
General Brochure	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	3302
Pet Waste	X	X					X								X	3146
Pesticides	X					X	X					X	X	X	X	579
Motor Oil	X		X	X										X	X	821
Fertilizer	X					X							X	X	X	871
Pollution Prevention Plan	X														X	17
Outside Washing	X		X	X		X	X								X	25
Car Wash	X		X	X		X	X								X	232
Pool Water Disposal	X													X	X	10
Landscaping	X					X	X			X			X		X	1147
Pond Maintanance	X			X							X	X			X	41
Carpet Cleaning	X														X	0
Construction Brochure	X										X				X	153
HHPCF Brochure	X		X	X	X	X	X							X	X	5506
Enviroscape Activity	X	X	X	X	X	X	X	X			X	X		X		3092
Fish Prints	X	X														252
Fishing Poles	X															130
Rain Gauges	X														X	1052
Pet Waste Bags		X														1534
Pens															X	2698
Seed Packets	X					X	X								X	2514
Tote Bags															X	1439
Total Materials																28561

Attachment B: Education Events FY 18/19

Date	Event Name	Description	# Attended
7/26/2018	Inter-Tribal Environmental Conference	Talked about SWPPP, LID, and ECM's in place	30
8/2/2018	First Thursday	Sustainable Tulsa Monthly Event	100
8/8/2018	Bark In The Park - Tulsa Roughnecks	Event focused on Pet Waste Awareness	1200
8/13/2018	Pre-Development Meeting	Small Development. Indivivual Lots	8
8/15/2018	Bark in the Park - Tulsa Driilers	Event focused on Pet Waste Awareness	3446
8/19/2018	Rain Barrel Workshop	DIY Rain Barrel & Low Impact Development	31
8/20/2018	Pre-Development Meeting	Adding bleachers & press box to stadium	12
8/20/2018	Pre-Development Meeting	Residential Neighboorhood	12
8/29/2018	Bark in the Park - Tulsa Drillers	Event focused on Pet Waste Awareness	1238
9/10/2018	Pre-Development Meeting	Commercial Park	7
9/13/2018	OU-LID Meeting	LID Inspection and Maintainiance Manual	6
9/22/2018	Monarchs On The Mountain	Butterfly Migration Education	2000
9/27-10/7	Tulsa State Fair	Public Event - Amusement and Enterrtainment	1,025,000
10/1/2018	Pre-Development Meeting	Office with parking	11
10/2/2018	OU-LID Meeting	LID Inspection and Maintainiance Manual	7
10/9/2018	HBA Developers	Stormwater Construction BMP Edcuation	20
10/13/2018	Howl-O-Ween	Dog Event, provided pet waste education	39
10/17/2018	Guthrie Green Food Truck Wednesday	Public Food truck event	200
10/24/2018	Build My Future	Event promoting trade jobs to highschoolers	960
10/27/2018	Fiesta de Halloween	Local event for Spanish community	200
11/5/2018	LID Manual	Discuss LID-Maintanance Manual	9
11/13/2018	Grissom Elementary	Elementary education event	16
11/26/2018	Pre-Development Meeting	Office, Apartment and Garage	13
12/3/2018	Pre-Development Meeting	Speedy Carwash	7
12/4/2018	Stormwater Operator Certification Training	Internal Training	18
12/6/2018	Chick-Fil-A Employee Education	Employee Edcuation	90
12/8-9/2018	Outdoor Christmas Market	Public Holiday Shopping event	1,100
12/10/2018	Pre-Development Meeting	QuikTrip project	7
12/10/2018	Pre-Development Meeting	Day Center for Homeless	10
12/12/2018	Change Makers - Leadership Tulsa	Internal Leadership Course	40+
12/17/2018	LID Manual	LID Inspection and Maintainiance Manual	4

Date	Event Name	Description	# Attended
1/2/2019	Winter Day Camp	Tulsa Parks Day Camp	23
1/11/2019	SOM Internal Training	Intrnal Training	9
1/14/2019	Free Pet Vaccine Clinic	Free Event for Pet owners	1800
2/4/2019	Pre-Development Meeting	Office owned by Roto-Rooter	12
2/6/2019	SWQ-Interdepartment Training	Internal Training	26
2/7/2019	Sustainable Tulsa - 1st Thursday	Monthly Event	160
2/12/2019	The Opp Project @ Hale Jr High	After-School program	2
2/14/2019	Interdepartmental Training	Internal Training	9
2/14/2019	The Opp Project @ Hale Jr High	After-School program	5
2/25/2019	Pre-Development Meeting	Two Metal Buildings	9
2/26/2019	The Opp Project @ Rogers Jr High	After-School program	7
2/27/2019	Interdepartmental Training	Internal Training	17
2/28/2019	Pre-Development Meeting	Apartment Units	16
3/4/2019	Pre-Development Meeting	Town Units	11
3/7-10/2019	Home & Garden Show	Public Home & Garden Event	28,780
3/11/2019	Pre-Development Meeting	Adventure Park	11
3/15-16/2019	Tulsa Irish Festival	Cultural Festival-Public Event	9,500
3/18/2019	Gathering Place-Spring Break Event	Youth focus event	1,000
3/19/2019	FOG Workshop	Presentation for local restaurants	35
3/?/2019	Spring HHP Event	Interview with National Public Radio	unknown
3/?/2019	Spring HHP Event	Interview with Good Day Tulsa	unknown
3/30/2019	Spring HHP Event	Spring Household Pollution Collection Event	400
4/1/2019	Pre-Development Meeting	Addition to Manufacturing Bulding	9
4/3/2019	Trout in the Classroom	Fish collection demonstration.	125
4/4/2019	1st Thursday	Sustainable Tulsa Event	65
4/6/2019	Pawsotively Pets	Pet Education and Micro-chipping	1000+
4/16/2019	Pre-Development Meeting	Warehouse & Office Building	14
4/17/2019	Enviro-Expo	Event promoting environmental orginizations	2000
4/26/2019	Earth Day-TU	Education event for elementary schools	1200+
4/29/2019	Pre-Development Meeting	Retail Building & Parking	10
4/29/2019	Pre-Development Meeting	Unkown Construction Project	8
5/1/2019	Bark in the Park - Drillers	Event focused on Pet Waste Awareness.	3,391
5/2/2019	1st Thursday	Sustainable Tulsa Monthly Event	100

Date	Event Name	Description	# Attended
5/4/2019	Coal Creek Clean-Up	Community focused creek clean-up	33
5/6/2019	Pre-Development Meeting	Duplex Development	12
5/10/2019	Crow Creek New Signage	Public edcuation event	6
5/14/2019	Stormwater Operator Certification Training	Internal Training	10
5/16/2019	Parks-Internal Training	Spoke to Rec staff at surrounding Tulsa Parks regarding Stomwater Quality	12
5/16/2019	Go Green Night	Tulsa Drillers Game with environmental focus	4,601
6/6/2019	1st Thursday	Monthly Environmental Event	130
6/13/2019	Summer Day Camp	Tulsa Parks Day Camp	35
6/24/2019	Pre-Development Meeting	Two Commercial Buildings	17
Totals			1,088,211

Attachment C: Tulsa Kids Education FY 18/19

Date	Event Name	Description	# Attended
10/24/2018	HBA-Build My Future	Promting Trade Jons to Grsaduating Seniors	960
10/27/2018	Fiesta de Halloween	Fall event for Hispanic Community	200
11/13/2018	Grissom Elementary	Stormwater Presentation & Fish Prints	16
1/2/2019	Whiteside Park Day Camp	Stormwater Presentation & Enviroscape	23
2/5/2019	The Opportunity Project	Afterschool Environmental Education	13
2/12/2019	The Opportunity Project	Afterschool Environmental Education	2
2/14/2019	The Opportunity Project	Afterschool Environmental Education	5
2/26/2019	The Opportunity Project	Afterschool Environmental Education	7
3/18/2019	The Gathering Place-Youth Event	Local Education Organizations	1000
4/3/2019	Trout In The Classroom	Fish Collection Demonstration	125
4/26/2019	Earth Day Event @ TU	Stormwater Information & Enviro-scape	1200
6/13/2019	Hicks Park Day Camp	Stormwater Presentation & Enviroscape	35
Total			3,586

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

Appendix A

Oklahoma Department of Transportation

Annual Report

For Reporting Period:
July 1, 2018 through June 30, 2019

Oklahoma Department of Transportation

August 19, 2019

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, 2018 through June 30, 2019.

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 Steven Gauthe, P.E., ODOT Environmental Programs Assistant Division Engineer at (405) 212-7920.

Sincerely,

Brian Taylor, P.E.
Chief Engineer

Enclosure

Oklahoma Department of Transportation

Annual Report
For
July 1, 2018 through June 30, 2019

Oklahoma Department of Transportation

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.

B. T.

8/19/19

Brian Taylor, P.E.
Chief Engineer

Date

FISCAL YEAR
2019
ANNUAL REPORT
BY THE
OKLAHOMA DEPARTMENT OF TRANSPORTATION (ODOT)
ON
TULSA MS4 PERMIT # OKS000201

August 19, 2019

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 report 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. This sweeping program for the annual report period covered one thousand, one hundred and fifty lane miles at a cost of approximately $935,000. Two inmate crews and one private contractor pick up litter from the highways in the city at an annual cost of $840,000. The estimated total expenditure for ODOT in anti-litter efforts statewide is approximately $4,500,000.

Erosion and Sediment Control

ODOT's "Storm Water Management Guidelines for Design and Construction Activities" is used by ODOT design, construction and maintenance personnel, consulting engineers and contractors to select, design and maintain appropriate erosion control measures for our construction and maintenance activities. Currently, ODOT is working with a consultant to create manuals for Design, Implementation and Inspection of erosion and sediment control devices for construction projects. An internal Erosion and Sediment Control task force was formed in January 2003 to improve and standardize best management practices for ODOT and entities acting on their behalf.

The Department formed four Storm Water Advisory Teams (SWAT) for the development of Design, Construction, Maintenance and Public Education/ Public Involvement Best Management Practices for the agency in 2009. The four teams were consolidated into one SWAT team and are

in the process of updating ODOT standards and specifications for erosion and sediment control. The team develops and conducts training and materials for educating ODOT personnel on Storm Water regulations yearly.

ODOT has developed a Construction Site Storm Water Performance Review Guideline process to ensure that Storm Water requirements are incorporated throughout the Design, Construction and Document Retention phases. This oversight review is being implemented, initially, in the regulated areas of the State.

ODOT/ DEQ Enforcement staff has conducted multiple inspections on construction site road projects across the state. Any project with compliance issues was given fourteen days to remedy prior to a second inspection. These inspections will be ongoing for the foreseeable future. The goal is to inspect all road construction contractors with every ODOT construction office at least one time.

ODOT adopted a non-compliance assessment specification for construction contractors. The specification gives ODOT a mechanism to assess per day monetary fees for failure to comply with effective and timely measures, as requested by the construction inspections.

Phase II MS4 Program

As of February 2005, ODOT was required to obtain a Phase II MS4 permit from DEQ. During this process, ODOT has been reviewing all aspects of our operations to comply with these additional requirements. ODOT has hired a consultant to advise the agency on the six Minimum Control Measures; Public Education and Outreach, Public Participation and Involvement, Illicit Discharge Detection and Elimination, Construction, Post Construction and Good Housekeeping / Pollution Prevention programs. ODOT has delivered to DEQ an application for a statewide Non-Traditional MS4 permit that is currently being reviewed by DEQ.

Illicit Discharge Detection and Elimination Program (IDDE)

ODOT continues to conduct Outfall Mapping in the regulated areas of the State. This effort is being done by Consultants. This data (pictures, inspection results) is being built into ODOT's Geographical Resource Intranet Portal system that contains multiple databases with many facets of highway information. Ongoing training for the IDDE Program continues. This includes information gathered during the Outfall Inspections and how to identify and report an Illicit Discharge. This training was developed from meetings with the Maintenance SWAT team and a Consultant. Discussion on tracking Highway Spills from accidents is ongoing between DEQ, ODOT Risk Managers, 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. ODOT has built new maintenance facilities for several counties. 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. 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. Currently, all the facilities located in the regulated areas have been inspected for pollution prevention opportunities, procedures have been reviewed with their Maintenance Supervisors. GHPPP's and training are being developed.

ODOT has incorporated a "Clean Sweep" program at all of the facilities throughout the State. This program is intended to remove old materials that may be potential pollutants. This program is ongoing and is being conducted with the assistance of the Department of Central Services on the sale of the material that can be repurposed. This undertaking is being done for the Good Housekeeping/ Pollution Prevention MCM, as well as evaluating which facilities will require Spill Prevention, Control and Countermeasure (SPCC) plans. It has been determined that many facilities will not meet the required capacity for SPCC plans, after the Clean Sweep operation has been conducted.

Additionally, ODOT has hired a Consultant to map all the maintenance facilities in the regulated areas for possible water quality impacts, e.g., sensitive waters, aquatic resources of concern, endangered and threatened species. This information will be incorporated into the mapping database mentioned in the IDDE section.

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.

ODOT has a contract with the Oklahoma State University/ Oklahoma Cooperative Extension Service to provide annual herbicide applicator workshops. Thirteen continuing education workshops were held across the state in each of the eight field divisions. Approximately six hundred people attended the workshops statewide, which includes seventy two employees from the Tulsa area. A large portion of this workshop covered the various issues concerning environmentally safe usage of herbicides. Six Certification Workshops were held statewide with

ninety seven employees attending. ODOT has scheduled the continuation of this training / certification for the coming year.

On October 31st, 2011, new EPA regulations were promulgated that brought Pesticide Application under the Clean Water Act, if applicable. ODOT has adopted a thirty foot buffer zone from all USGS "Blue Line" streams to meet EPA's Pesticide General Permit requirements. By applying "terrestrial only" applications, ODOT will not be required to obtain Pesticide Application permits under the Clean Water Act. ODOT Environmental Programs Division attended the Field Division workshops, explained the buffer zone requirements, demonstrated how this process of shutting off the spray in the correct areas and the importance of complying with this regulation. USGS "Blue Line" maps were provided for their prospective roadways.

Public Education/ Litter Program

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.

School-age children are invited annually to enter a poster contest, 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. Nearly nine thousand students, grade Kindergarten through 12th participated in 2018/2019 contest. The winning posters are printed for distribution to schools, businesses, and chambers of commerce. A quantity of forty five thousand calendars, featuring the winning posters, will be printed and distributed statewide to schools, libraries city, county, state and federal offices. One of the thirteen winning posters will be featured on fourteen thousand color reprints distributed for promotional display purposes to spread the anti-litter message to Oklahoma citizens of all ages.

The 28th Annual State poster contest winners were honored at an April awards luncheon at ODOT's office in Oklahoma City. Each state poster winner received a monetary award of $250, $150 or $100 for first, second or third place respectively. Winners also received a mounted reprint of their poster, placemats and t-shirts bearing their design. The thirteen winners were then presented to the Oklahoma State House of Representatives at the Capitol. Each of the thirteen students had the opportunity to get their photos taken with their respective representative.

Adopt-a-Highway/ TRASH-OFF

ODOT'S anti-litter efforts are still on-going and include one hundred thirty eight separate "Adopt-a-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.

The Annual TRASH-OFF was held on Saturday, April 20, 2019. This year's event involved over 40,000 volunteers in the clean up effort. Many 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".

ODOT is a member of the newly formed Central Oklahoma Storm Water Alliance (COWSA). ODOT created a Storm Water contact link to the Website to receive questions or concerns regarding our processes and/or construction projects.

Wildflowers

Wildflower planting was ODOT's first landscaping program which started in 1976, but went into full scale planting in 1987. There are more than two thousand, two hundred acres in five hundred eighty six sites planted statewide. The Oklahoma Legislature passed a bill in May 2006 creating a new Oklahoma wildflower car tag. Every wildflower tag will donate twenty dollars toward the planting of wildflowers on Oklahoma roadsides.

Citizen donations of $280,086 have purchased wildflower seed for planting along highways during the last 24 years. To date, ODOT has planted approximately two thousand three hundred acres on roadside sites statewide.

Three drill seeders, specifically designed for wildflower seed, are used by ODOT for planting on highway roadsides. These drills are available for use by Oklahoma communities and organizations.

In the spring of 2016 a memorandum of agreement was signed 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.

Collection and Recycling

ODOT's Maintenance personnel recycled approximately twelve hundred gallons of oil this past year. The oil is picked up by a private contractor five times a year. Approximately, one hundred and fifty gallons of antifreeze was recycled and ninety-eight batteries were returned to the manufacturer for reuse.

Mowing

ODOT's maintenance activities are being performed by private contractors that mow just over forty seven hundred acres per year in the Tulsa metropolitan area. This is done five times a year at a cost of approximately $2,200,000.

Appendix B

Oklahoma Turnpike Authority

Annual Report

For Reporting Period:
July 1, 2018 through June 30, 2019

OKLAHOMA
TURNPIKE
AUTHORITY

August 28, 2019

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, 2018 through June 30, 2019.

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, 2018 through June 30, 2019
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 will be begin sometime during 2019/2020. 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 2018-2019 report period was an off year for Creek Turnpike inspections. All stormwater structures on the Creek Turnpike will be inspected during the 2019-2020 report period.

   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 in March 2019.

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 4422 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. Maintenance staff collected 2028 cubic yards of litter, including 163 cubic yards collected during the Great American Clean Up Campaign in March, April, and May 2019.

In September and October 2018, OTA Maintenance cleaned debris and fixed erosion on all large concrete inlets and outlets that discharge to area streams.

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 four certified applicators on the Creek Turnpike. Approximately 335 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 2019-2020 annual report period.

OTA's maintenance staff collected and recycled 278 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 40 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 2018 – June 2019, the OTA received 54 littering report calls for the whole turnpike system. This was roughly the same number of calls received during the same period the previous year.

Employee Education:

In order to keep up to date with herbicide management practices, eight OTA Maintenance employees attended the OKVMA Conferences held October 2-4, 2018. Stormwater topics are discussed during weekly Maintenance meetings at the Creek Turnpike.

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. Revision to the Assessment of Controls and the Fiscal Analysis.

   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. Annual Expenditures for the Reporting Period with a Breakdown for the Major Elements of the Storm Water Management Program.

Description	Cost
Mowing	188,660.97
Sweeping	46,220.86
Trash Collection and Disposal	90,719.58
Herbicide	4,929.27
Total	$ 330,530.68

Note that a new mowing contract and vendor have resulted in a significant savings in mowing costs compared to previous years.

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

   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. Regional Monitoring Report.

   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

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

8-28-19

Date