The City of
NORMAN

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Public Works Department

Stormwater Division
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September 1, 2020

Mr. Michael Moe, P.E., Engineering Manager
Water Quality Division
Oklahoma Department of Environmental Quality
P.O. Box 1677
Oklahoma City, OK 73102

Re: **City of Norman Phase II MS4 2020 Annual Report**
Authorization No. OKR040015

Dear Mr. Moe:

The Phase II Municipal Separate Storm Sewer System (MS4) General Permit, OKR04, requires that an annual report be submitted to DEQ each year by September 1st if the permittee is implementing its Stormwater Management Program (SWMP) on a fiscal year (July 1 to June 30) basis or by March 1st if implementing the SWMP on a calendar year basis (January 1 to December 31). At the time of permit renewal, the City of Norman notified DEQ that it would be implementing its SWMP on a fiscal year basis.

Please find enclosed the 2020 Phase II MS4 Annual Report for the City of Norman, as required by the Phase II MS4 general permit, OKR04, which covers the reporting period of July 1, 2019 to June 30, 2020, as required under Authorization No. OKR040015.

If you have any questions or need additional information regarding this matter, please contact me at (405) 366-5455 or write to me at the letterhead address.

Sincerely,

Carrie Evenson

Carrie J. Evenson, Ph.D., P.E., CFM
Stormwater Program Manager

City of Norman
Phase II MS4 Annual Report
Reporting Period 7/1/2019 to 6/30/2020

Phase II Small Municipal Separate Storm Sewer System (MS4) General Permit (OKR04)
Authorization No. OKR040015
September 1st, 2020

City of Norman Phase II MS4 Annual Report
Reporting Period 7/1/2019 to 6/30/2020

Phase II Small Municipal Separate Storm Sewer System (MS4)
General Permit (OKR04)
Authorization No. OKR040015

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Section 1. Compliance Status

1.1 Executive Summary

The FYE 2020 Phase II MS4 Annual Report for the City of Norman (City) is submitted as required by Part V.C.1 of the Oklahoma Department of Environmental Quality Phase II Municipal Separate Storm Sewer System (MS4) General Permit, OKR04, Authorization No. OKR040015, and covers the reporting period of July 1, 2019, through June 30, 2020. As part of these requirements, the City conducted an assessment of permit compliance, including an assessment of the appropriateness of Best Management Practices (BMPs), progress toward the goal of reducing the discharge of pollutants, and achieving measurable goals for each Minimum Control Measure (MCM). The City's assessment indicates that it is in compliance with permit requirements.

On November 29, 2005, the City received Authorization No. OKR040015. General Permit OKR04 expired on February 9, 2010, but was administratively continued until its reauthorization, which became effective on November 1, 2015. A Notice of Intent (NOI) and other permit application material were submitted as part of the OKR04 application on January 29, 2016. On March 17, 2017, the City received Authorization No. OKR040015.

Some of the major accomplishments during the FYE 2020 reporting period include removing pollutants from the MS4 through street sweeping, spill response, dry weather field screening, and infrastructure maintenance; educating the public on the importance of stormwater pollution prevention through public clean-up events, meetings, discussions, and the Artful Inlets program; and enhanced inspections of construction sites. The City's two stormwater inspectors conducted 1,184 inspections of 109 sites during the reporting period. During the City's annual Household Hazardous Waste Collection event, held on November 2, 2019 over 120,000 pounds of materials were collected and properly disposed.

A continuing requirement for this reporting period involves implementation of the Lake Thunderbird Watershed Total Maximum Daily Load (TMDL) Compliance and Monitoring Plans. On November 10, 2013, ODEQ issued a TMDL for the Lake Thunderbird watershed, which established a waste load allocation for the Cities of Norman, Oklahoma City, and Moore, and required that each city submit Compliance and Monitoring Plans. The City's Compliance and Monitoring Plans were approved by ODEQ on September 21, 2016, and subsequently adopted by the City Council on October 25, 2016. Monitoring began in March 2016, and implementation of non-structural BMPs outlined in the Compliance Plan is currently underway.

As an example of an annually implemented non-structural BMP, throughout the month of October 2019, the Stormwater Division hosted the Lake Thunderbird Watershed Clean-up Blitz, which culminated in the Fourth Annual Lake Thunderbird Watershed Workshop and Clean-up Event at Lake Thunderbird State Park. The goal of the blitz is to educate Norman citizens on the impact stormwater has on Lake Thunderbird's water quality and to engage the public to participate in the protection of the watershed. In addition, everyone who came took an active role in removing pollution, in the form of trash, from the watershed. Approximately 65 people attended at least one event, and

several attended more than one. Trash was collected from various parks located within the watershed, and awards were presented at the workshop for Most Material Collected, Most Unusual Item Found and Blitz All Star (for those participants who attended every event). Overall, the volunteers collected almost 800 pounds of trash and recyclables that may otherwise have ended up in Lake Thunderbird.

An additional non-structural BMP that continued during the reporting period was the City's participation in the Lake Thunderbird Watershed TMDL Technical Working Group, now known as the Lake Thunderbird Watershed Partnership (Partnership). The Cities of Norman, Moore, and Oklahoma City established the Partnership to coordinate activities related to the Lake Thunderbird watershed. The group currently meets on a quarterly basis and is working together to formalize the Partnership and ensure all interested stakeholders are provided an opportunity to develop and implement watershed-wide BMPs.

As with all things, challenges and successes go hand-in-hand. During the latter part of 2019, the Stormwater Division began coordinating with multiple City departments/divisions, governmental agencies, citizen volunteer groups and other stakeholders to plan for an ambitious set of activities to mark the 50th anniversary of Earth Day. The activities planned during April were branded as Green Norman EcoMonth activities. The planning committee met bi-weekly for months. All participants were educated on stormwater and other environmental topics while meeting. Sadly, to paraphrase the poet Robert Burns, the best laid plans of mice and men often go awry, and a Stay at Home Order was issued due to the COVID 19 pandemic the week before our kickoff event was scheduled. We were able to partner with Keep Oklahoma Beautiful and Earth Rebirth to host the Colonial Estates Park cleanup on March 7th. The Colonial Estates Park cleanup brought over 20 community volunteers together to remove an astounding 950 pounds of trash and debris from Colonial Estates Park. We also held our rain barrel distribution event on May 29th and 30th using appropriate social distancing techniques and personal protective equipment. Over 130 rain barrels and composters distributed to mostly Norman residents who will use them to help conserve and protect one of our most precious natural resources as well as help us comply with permit requirements. With the help of a local citizen, Amanda Nairn, we also created a how-to video on rain barrel installation for the City of Norman YouTube page. The link to this video was provided to everyone who purchased a rain barrel in place of the usual in-person workshop we had originally planned. Luckily, we have sown the seeds to harvest when good times return, and we look forward to implementing all of our plans when it is finally safe to do so. We look forward to an exciting time in the hopefully near future!

1.2 BMP Implementation and Evaluation

The City considers the BMPs as submitted to ODEQ on January 29, 2016, as part of the permitting process to be appropriate and effective during this reporting period. Evaluation of the BMPs is on-going, and if any are found to be no longer effective or appropriate, the BMP will be amended, deleted and/or replaced.

An assessment of the BMPs currently being implemented by the City is presented in the tables in Section 1.3.

1.3 MCM Measurable Goals

Progress in achieving the measurable goals for each BMP of the six MCMs is presented in the following tables. Supporting documentation for each MCM is attached in Appendix A.

Public Education and Outreach MCM

BMP	Goal	Frequency/ Implemented	Comments
Distribute informational brochure with utility bills	One brochure to 75% of all utility accounts	Annually	Distributed six utility bill inserts: 1. Yard Waste Tips July/August 2019 2. Fertilizer Use Tips November 2019 3. Fertilizer Use Tips November 2019 4. Rain Barrel Promotion January 2020 5. Know Your Flood Risk April/May 2020 6. Know Your Flood Risk June 2020
Add stormwater pollution prevention information to city web site	Information posted	Annual review/update	The City of Norman's website underwent a major transformation in FYE 2020. As part of this transformation, the Stormwater Division's portion was updated and revamped. Information on pollution prevention tips, rain barrels, and public events were posted on the City's main page throughout the Fiscal Year.
Operate Action Center Hotline	Receive and respond to 90% of verified complaints	Annually	Action Center complaints are received and responded to throughout the year. In FYE 2020, the Stormwater Division responded to 334 citizen calls. Response rate was 100%.
Public stormwater education event	Coordinate with Environmental Services for Earth Day event	Annually	Due to COVID-19 restrictions, the City's Earth Day Festival was cancelled.
Educational event & materials for schools	Supply material to 2 elementary schools annually and participate in Public Works Week event at local school	Annually	Public Works Week activities were cancelled due to COVID-19 restrictions.

BMP	Goal	Frequency/ Implemented	Comments
			Demonstrated the EnviroScape watershed model to the following classes: 1. Terra Verde 5th Grade November 1, 2019 2. Children's House Montessori (pre-K-5), March 4, 2020 Distributed stormwater educational materials to local elementary schools through the City's Environmental Control Advisory Board's (ECAB) "Water's Worth It" annual poster contest in 2020. Poster contest packets are distributed to teachers at approximately 22 public and private elementary schools within Norman city limits. Posters are typically displayed during April's Second Friday Art Walk. During the reporting period, April's Second Friday Art Walk was cancelled.
Newspaper ads	Quarterly ads in local paper with water quality, pollution prevention or watershed protection information	Annually	Seven stormwater topics were placed as ads in the **Norman Transcript** in FYE 2020: 1. We Drink Our Stormwater July 2019, August 2019, March 2020, May 2020 2. Tips for Draining Your Pool August 2019 3. Lake Thunderbird Watershed Events October 2019 4. When You're Fertilizing Your Lawn, You're Not Just Fertilizing Your Lawn November 2019 5. Rain Barrel Promotion December 2019, January 2020, March 2020, April 2020, May 2020 6. When the Rain Doesn't Drain April 2020 7. Don't Blow It June 2020

BMP	Goal	Frequency/ Implemented	Comments
			Additionally, six stormwater topics were placed as ads in special magazine editions of the **Transcript**: 1. Don't Blow It-**Discover Norman Magazine** August 2019 2. We Drink Our Stormwater-**OU Commemorative Magazine** September 2019 3. When You're Fertilizing the Lawn, You're Not Just Fertilizing Your Lawn-**Norman Magazine** November/December 2019 4. Recycle the Rain-**Norman Magazine** January/February 2020 5. When the Rain Doesn't Drain-**Norman Magazine** March/April 2020 6. Don't Blow It-**Norman Magazine** May/June 2020
Develop stormwater pollution prevention brochure for fertilizer use	Distribute to 75% of all utility accounts	Once	Completed in 2016. Brochure sent to landscape professionals in March 2020. A utility bill insert providing fertilizer use tips was also distributed to all utility accounts in November 2019.
Develop Spanish language SWPP brochure	Develop Spanish language stormwater pollution prevention informational materials	Once	Completed in 2016. Brochure sent to landscape professionals on March 31, 2020. Additional Spanish language informational materials have been created for the Yard Waste program and the Construction Stormwater program related to proper disposal of leaves and grass clippings and proper maintenance of BMPs, respectively.

Public Participation and Involvement MCM

BMP	Goal	Frequency/ Implemented	Comments
Establish web site link for receipt of email regarding stormwater issues	Respond to 90% of all emails received	Annually	pwstormwater@normanok.gov has been established for receipt of email regarding stormwater issues. Response rate was 100%.
Environmental Control Advisory Board (ECAB)	A stormwater quality representative will meet with ECAB quarterly to provide information on stormwater pollution issues.	Annually	Stormwater Division representatives have attended ECAB meetings on a monthly basis and have worked with the group on several stormwater issues and events.
Operate Action Center Hotline	Receive and respond to 90% of verified complaints	Annually	Action Center complaints are received and responded to throughout the year. In FYE 2020, Stormwater Division responded to 334 citizen calls. Response rate is 100%.
Public meeting for stormwater issues	Hold one public meeting annually	Annually	Two public meetings (August 22 and September 4, 2019) were held regarding the revised FIRM maps proposed by FEMA for Brookhaven and 10 Mile Flat Creeks. On October 27, 2019, the Lake Thunderbird Workshop and Cleanup Event was held, the City's program and the Thunderbird TMDL were discussed, and participants were encouraged to provide comment, ask questions and participate.
Public Stormwater Education Event	Coordinate with Environmental Services for one event annually	Annually	Environmental Services Coordinator's representative discussed the Household Hazardous Waste Collection Events with volunteers at the Third Annual Lake Thunderbird Workshop and Clean-up Event on November 2, 2019. Due to COVID-19 restrictions, the City's annual Earth Day Festival was cancelled.

BMP	Goal	Frequency/ Implemented	Comments
Blue Thumb/Oklahoma Conservation Commission Partnership	Maintain working relationship with Blue Thumb and coordinate for one stormwater public education event annually	Annually	Blue Thumb volunteer, Karen Chapman, hosted a booth and discussed her monitoring experience with Bishop Creek at the Lake Thunderbird Workshop and Clean-up Event on October 27, 2019. The Stormwater Division also coordinated a park/creek clean-up with Blue Thumb volunteers on October 4, 2019. Hitachi employees attended as well.
Lake Thunderbird TMDL public meeting	Hold one public meeting annually for education and discussion of the Lake Thunderbird TMDL	Annually	Fourth Annual Lake Thunderbird Workshop and Clean-up Event held on October 27, 2019.

Illicit Discharge Detection and Elimination MCM

BMP	Goal	Frequency/ Implemented	Comments
Operate Action Center Hotline	Receive and respond to 90% of complaints received	Annually	Action Center complaints are received and responded to throughout the year. In FYE 2020, Stormwater Division responded to 334 citizen calls. Response rate was 100%.
Household Hazardous Waste Collection Day	Provide annual event for the public to drop off unwanted household waste and report amount of waste collected	Annually	Conducted on November 2, 2019. Reusable bags and stormwater-related information were provided to participants.
Dry Weather Field Screening	90% of visual screening points inspected each year	Annually	63 outfalls were inspected in FYE 2020.
Illicit Discharge Investigations	Perform source investigation on all identified illicit discharges and connections	Annually	Conducted throughout the year as identified. Four illicit discharges were found and eliminated in FYE 2020. Additionally, 98 grass clipping door hangers and/or warning letters were issued in FYE 2020.
Enforcement Actions	Take enforcement actions as allowed by City regulations where responsible parties for illicit discharges are identified	Annually	Enforcement actions are taken as necessary to eliminate illicit discharges. None were required in FYE 2020.

BMP	Goal	Frequency/ Implemented	Comments
Inspect MS4 System	Visually inspect open channels and camera enclosed conduits. Inspect 10% of system each year	Annually	During the reporting period, 8,920 inlets were inspected and 2,838 were cleaned, resulting in the removal of over 9 tons of debris and material. Additional channels and pipes are inspected and maintained as time and resources allow.

Construction Site Runoff Control MCM

BMP	Goal	Frequency/ Implemented	Comments
Earth Change Permit	Permit 90% of all earth disturbing operations over 1 acre in size	Annually	24 Earth Change Permits were issued in FYE 2020.
Construction site inspection	Inspect 90% of sites within 30 days of permit issuance and at least monthly. Perform enforcement actions as needed	Annually	100% of sites were inspected within 15 days. 1,184 inspections were conducted at 109 sites in FYE 2020.
Education event for construction/development	Hold two events for developers, constuction crews, utility contractors and engineering companies	Annually	The fall Builders Workshop was held on November 14, 2019. A spring Builders Workshop scheduled for May 2020 was cancelled due to COVID-19 restrictions.
Water Quality Protection Zone Ordinance (WQPZ)	Implement requirements of the Water Quality Protection Zone Ordinance including establishment and maintenance of streamside buffers	Annually	WQPZ ordinance has been established, and zones are identified as property is platted on an ongoing basis.
Lake Thunderbird TMDL building/development workshop	Hold annual workshop for the building and development community on the Lake Thunderbird TMDL compliance requirements and Lake Thunderbird watershed protection	Annually	Discussion of the Lake Thunderbird TMDL compliance requirements and Lake Thunderbird watershed protection was held at the Builders Workshop on November 14, 2019.

Post-Construction Site Runoff from New/Redevelopment MCM

BMP	Goal	**Frequency/ Implemented**	**Comments**
Review/amend City engineering and development regulations	Remove any barriers to Low Impact Development (LID)	Review every 5 years	Review of engineering and development criteria and city ordinances is ongoing. On February 25, 2020, the City of Norman contracted with Freese and Nichols, Inc., (FNI) to update the Engineering Design Criteria Manual, review ordinances and guidance documents for barriers to LID, and develop green stormwater infrastructure design criteria and maintenance and inspection procedures. In June 2020, FNI conducted staff interviews and held an external stakeholder meeting to involve local builders, developers, and other interested entities in the process.
Implement WQPZ ordinance	Establish water quality protection zones in riparian areas	Annually	WQPZ ordinance has been established, and zones are identified as property is platted.
Fertilizer Ordinance	Implement the Manufactured Fertilizer Ordinance to educate the public and commercial fertilizer applicators on proper fertilizer use	Annually	Letters regarding the Manufactured Fertilizer Ordinance were sent to public and commercial applicators on March 31, 2020
Stormwater impoundment inspection	Inspect 50% of stormwater impoundments	Annually	Ten stormwater impoundments were inspected in FYE 2020.
Post-Construction Events	Include information on post-construction BMPs in construction/development events listed for MCM 4	Annually	This is ongoing.

Municipal Good Housekeeping MCM

BMP	Goal	Frequency/ Implemented	Comments
Develop employee training program	Provide one training session for 75% of targeted employees	Annually	This BMP is under development and is currently mostly handled on an ad hoc basis. Due to limited resources, current staff have been unable to fully implement this task. Pertinent employees were encouraged to attend the Builders Workshop held on November 14, 2019, where they learned about BMPs for erosion and sediment control and for Low Impact Development (LID), as well as basic water quality protection. Staff from Engineering, Line Maintenance, and Streets attended this event. The Public Works Streets and Stormwater Divisions meet together annually. During this annual meeting, held on January 24, 2020, brief discussion was held on being observant and responding to stormwater quality issues in town and at municipal facilities. Additionally, planning began for installation of inlet filters throughout the North Base in targeted areas of concern. This was completed in July 2020. During the planning phase, management team employees were educated about stormwater pollution prevention and common issues found at municipal facilities and asked to pass that information along to their subordinates.

BMP	Goal	Frequency/ Implemented	Comments
Street Sweeping	Sweep at least 2,500 curb miles annually to prevent sediment, debris and pollutants from entering the MS4	Annually	4,965 lane miles were swept in FYE 2020.
City facility stormwater inspections	Inspect half of all facilities identified as potential sources of stormwater pollution	Annually	In FYE 2020, North Base facility and Lindsey Yard were inspected. North Base contains several Departments/Divisions.
Map City facility storm sewer (SS) systems	Locate all SS inlets and outfalls at two City facilities every year	2 facilities annually until complete	SS inlets and outfalls were identified at the North Base facility and Lindsey Yard in FYE 2020.
Spill Kits	Provide spill containment kits to 25% of City vehicles	Annually	Spill kits were purchased and made available to Fleet, Line Maintenance, Parks Maintenance, and Sanitation vehicles and facilities during the reporting period.
Employee Newsletter	Distribute stormwater pollution prevention information to City Employees through the newsletter once each quarter	Annually	Stormwater pollution prevention information was placed in the following editions of the employee newsletter: August 2019, September 2019, October 2019, February 2020, and June 2020.
Employee education on Lake Thunderbird TMDL	Incorporate Lake Thunderbird TMDL requirements into City employee training events.	Annually	Lake Thunderbird TMDL requirements were incorporated into the Builders Workshop on November 14, 2019, into educational materials provided for MCM 1, and were discussed at the Lake Thunderbird Watershed Workshop and Cleanup Event on October 27, 2019, which included City employee as participants.

1.4 Pollutant Reduction

The City of Norman believes that BMPs currently implemented have resulted in a reduction in the discharge of pollutants to the storm sewer system. The effectiveness and efficiency of all current BMPs will be reviewed annually and used in the development of the Minimum Control Measure BMPs for the next five-year permit term. Pollutant recovery/reduction activities are shown below.

Street Sweeping:

4,077 tons of material were removed from the MS4 during FYE 2020.

Storm Drain Inlet Cleaning:

2,838 inlet cleanings were done during FYE 2020.
9 tons of debris were removed from the MS4 during the reporting period.

Litter Removal:

25.8 tons of trash were removed from the MS4 during FYE 2020 through the City's litter control program.
2,065 pounds of trash were removed from the MS4 during FYE 2020 through clean-up events throughout the City.

Hazardous Waste Collection Event:

38,050 pounds of chemicals collected
7,460 pounds of used oil and antifreeze collected
49,899 pounds of paint collected
25,841 pounds of e-waste collected
84 tires collected

Spills:

Approximately 5 gallons of hydraulic oil and 6 ounces of mercury were recovered during spill response operations associated with 2 spills that occurred during the reporting period.

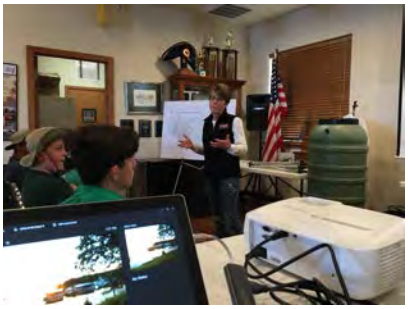
2.1 FYE 2020 Reporting Cycle

MCM #1: PUBLIC EDUCATION AND OUTREACH AND MCM #2: PUBLIC PARTICIPATION AND INVOLVEMENT

The City hosts and attends several public education and outreach events throughout the year. Some of the ways stormwater messages are provided to Norman residents include utility bill inserts, newspaper ads, public meetings, Council meetings, social media, and public events like the Monarch Festival, Home and Garden Show, Downtown Fall Festival and the Household Hazardous Waste Event. The *Runoff Roundup*, a quarterly email newsletter, is sent to a self-selected list of stormwater stakeholders. Staff is always excited and eager to educate the public about pollution prevention generally and stormwater pollution prevention specifically and actively look for new and impactful ways to get messaging across to targeted and general audiences.

In 2016, ODEQ approved the Lake Thunderbird Watershed TMDL Compliance and Monitoring Plans. In order to satisfy certain requirements of the Compliance Plan, the City must educate the public on the requirements of the Lake Thunderbird TMDL. Throughout the month of October 2019, the City of Norman Stormwater Division hosted the Lake Thunderbird Watershed Clean-up Blitz, which culminated in a workshop and clean-up event at the lake itself. The event satisfies public education requirements in both the City's Stormwater Management Program and Lake Thunderbird TMDL Compliance Plan. The goal of these events was to educate Norman citizens on Lake Thunderbird water quality and the role stormwater plays and to have them play an active role in removing pollution, in the form of trash, from the watershed. The parks chosen for this series of events were Crestland Park (September 29), Griffin Community/Sutton Park (October 6), and Lake Thunderbird State Park (October 27). Approximately 65 people participated in these events, and several attended more than one event. Approximately eight hundred (800) pounds of trash and recyclables were removed from the watershed.

At the workshop, awards were given for most material collected, most unusual item found, and for Blitz All-Stars. Almost 50 people attended the workshop and clean-up event, and Blane Stacy, Oklahoma Conservation Commission, demonstrated the rainfall runoff simulator using several types of soils. In addition to receiving information on the connection between stormwater runoff and Lake Thunderbird's water quality, participants also received information on the programs offered by the Oklahoma Water Survey, Lake Thunderbird State Park, Thunderbird Sailing Club, Oklahoma Conservation Commission and Blue Thumb, Keep Oklahoma Beautiful and the City.



From left to right, Rebecca Bond describing Blue Thumb, Blane Stacy demonstrating the rain simulator, partial group picture of participants.

Unfortunately, due to the COVID-19 pandemic, its associated Stay at Home Order and social distancing requirements, many of the public education and outreach activities planned for the spring of FYE 2020 had to be cancelled. New and different methods of reaching the public, including virtual workshops, are being attempted, andexcitement builds as more and more options for virtual education become available and accepted by the general public.

MCM #3: ILLICIT DISCHARGE DETECTION AND ELIMINATION

The City's Illicit Discharge Detection and Elimination Program primarily consists of dry weather field screening, responding to citizen complaints, and addressing spills or leaks that have the potential to enter the storm sewer system.

The City has identified sixty-three (63) outfalls for dry weather field screening (see map below for locations). All outfalls were inspected during the reporting period. Outfall inspection forms were completed and photos taken at each outfall. No illicit discharges were identified during FYE 2020 as a result of these activities.

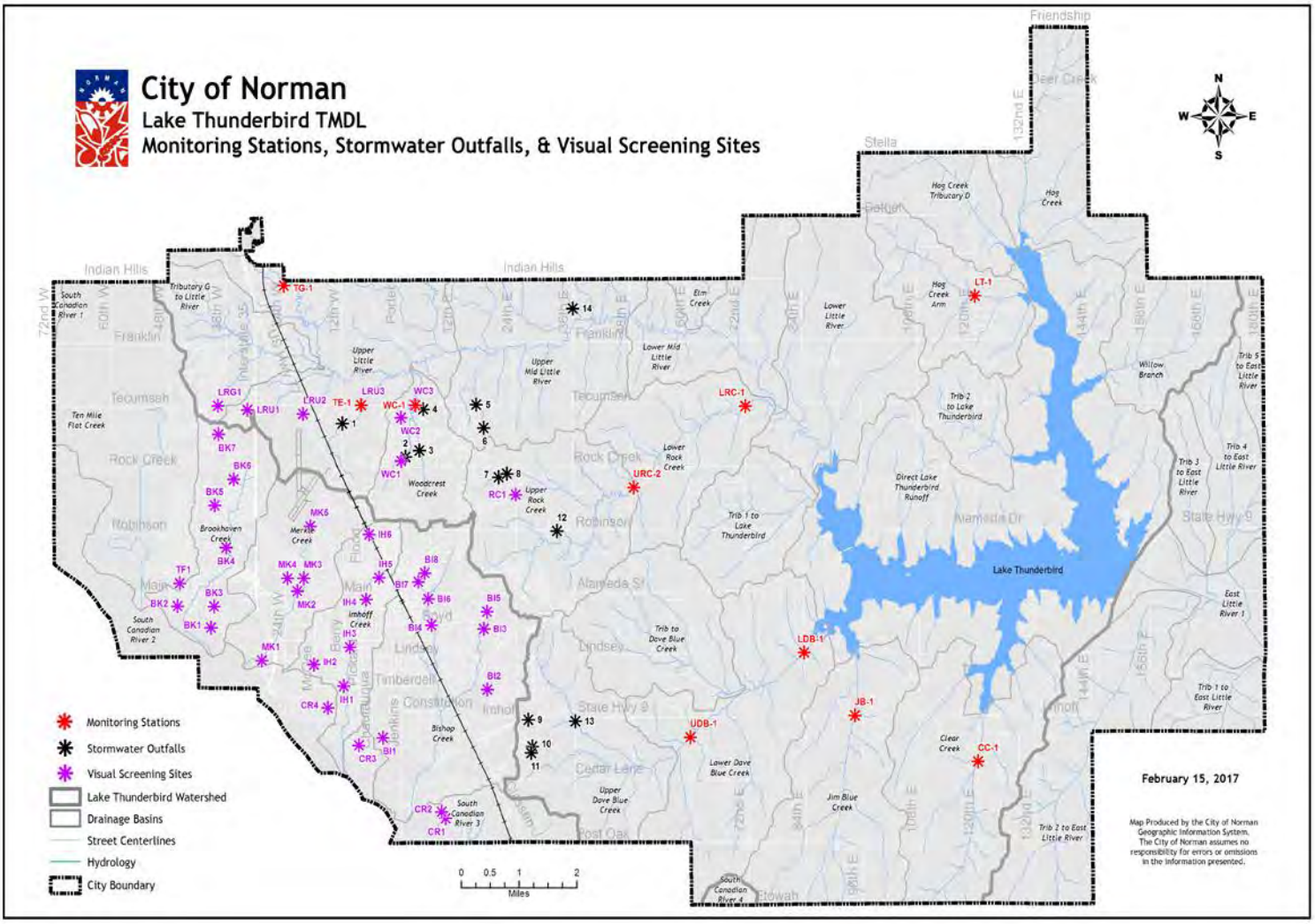
During FYE 2020, the City received three hundred thirty-four (334) citizen inquiries, either directly from the citizen, through the City Action Center, or by referral from other City staff and Council members. All complaints receive an initial investigation to verify the report and determine if the Stormwater Division had jurisdiction over the issue. Those not regulated by the Stormwater Division are referred to the appropriate department and/or State agency. A summary of all complaints received in FYE 2020 is presented in Appendix B.

Received	Response	Resolved
334	334	334

The City responded to 2 spills during the reporting period.

Date	Location/Event
8/28/19	Hydraulic oil spill at Harrogate Dr and Meadowridge Rd.
6/23/20	Mercury spill at Chapel Ridge Apartments

City of Norman MS4 Sampling and Visual Screening Points



MCM #4: CONSTRUCTION SITE RUNOFF CONTROL

The City's Construction Site Runoff Control Program primarily consists of issuing Earth Change Permits to sites within city limits that disturb an acre or greater, inspecting these sites to ensure that they are in compliance with the construction stormwater requirements set out in Section 5000 of the City's Engineering Design Criteria Manual, and issuing enforcement actions for any non-compliant sites. Additionally, in conjunction with MCMs 1 and 6, outreach is also a large part of the City's program. Below is a summary of the activities conducted in FYE 2020:

Earth Change Permits:

During the reporting period, 24 new sites were permitted.

Construction Site Inspections:

New sites started during reporting period:	22
Continuing sites during reporting period:	134
Closed sites during reporting period:	0
Total number of open sites during reporting period:	99
Total number of sites inspected during reporting period:	109
Total number of inspections performed:	1,184

Construction Site Enforcement:

The City issued 0 Notices of Violation, 0 Stop Work Orders and 0 Citations for non-compliance in FYE 2020.

Outreach Efforts:

Builders Workshops:	1
Builders Association Tabling Events:	1

MCM #5: POST-CONSTRUCTION STORMWATER MANAGEMENT

The City encourages the use of green infrastructure and LID practices as part of the development process and has adopted the City of Wichita/Sedgwick County LID Manual, though plans are underway to create a locally based LID manual as part of the Engineering Design Criteria Manual update that began during the reporting period and will continue into FYE 2021. The City has also passed a WQPZ ordinance and a Manufactured Fertilizer ordinance. Inspections of a certain number of stormwater detention ponds are also conducted annually in an attempt to address pollution in post-construction stormwater runoff. Additionally, each year the City partners with the Central Oklahoma Stormwater Alliance (COSWA) to offer discounted rain barrels to the public. For FYE 2020, 130 rain barrels were distributed during the City's distribution event. The City of Norman also attempts to incorporated green infrastructure into as many city projects as possible. For example, the new Norman Central Branch of the Pioneer Library System opened in November 2019 and included educational signage and low impact development practices including bioretention and a green roof as part of its construction.

The WQPZ ordinance was established to protect riparian buffer areas in the Lake Thunderbird watershed, and zones are established as property is platted. The Manufactured Fertilizer Ordinance was established to regulate the application of phosphorus in manufactured fertilizers in Norman. It requires a soil test before phosphorus-containing fertilizers can be applied, restricts fertilizer from being applied to impervious areas, and require commercial fertilizer applicators to register with the City. Each year, a letter is sent to commercial applicators to remind them of this requirement. In FYE 2020, the letter was sent to public and commercial applicators on March 31, 2020. Ten (10) stormwater detention ponds were inspected in FYE 2020.

MCM #6: MUNICIPAL GOOD HOUSEKEEPING

As part of the Municipal Good Housekeeping Program, the City's goal is to address potential pollution sources at municipal maintenance facilities. This includes training municipal employees on topics such as spill prevention and response and general good housekeeping measures. One major activity that occurs as part of the Municipal Good Housekeeping Program is street sweeping. The City currently operates four (4) vacuum sweepers on a routine basis. During the reporting period, 4,077 tons of material were removed from the MS4, and 4,965 lane miles were swept. Street sweepers also respond to non-hazardous material spills and clean inlets as necessary.

The Stormwater Division provided refill spill kits for facilities and vehicles associated with facilities deemed to have the potential to cause stormwater pollution and advised facility personnel on how to better manage each facility's pollutants and runoff. For example, at the North Base complex, which houses the Line Maintenance, Fleet, Traffic, and Sanitation Divisions, inlets were chosen and quotes obtained for the installation of inlet filter inserts to help minimize the impact that the facility, and the activities therein, could have on stormwater quality. At North Base, an innovative approach to the containment of shop floor wash water was also implemented, which involved using a street sweeper to vacuum up and properly dispose of any wash water generated that could not be directly discharged to the sanitary sewer. Additionally, at the Lindsey Yard, a wash bay for equipment and vehicles was constructed, and staff were directed to perform all wash activities inside the bay.

During FYE 2020, members of the Line Maintenance, Engineering, Street, and Stormwater Divisions attended the Builders Workshop on November 14, 2019, and learned about water quality protection, the Lake Thunderbird TMDL requirements, and installation and maintenance of erosion and sediment control BMPs. Line Maintenance, Sanitation and Fleet employees at municipal facilities deemed to have the potential to pollute stormwater runoff were educated about effects of polluted stormwater runoff and how to mitigate it during site planning and preparation for the inlet filter inserts.

The Employee Newsletter was also used to educate personnel on stormwater issues. Advertisements for the rain barrel promotions and clean-up events, as well as general information about stormwater quality, household hazardous waste disposal options, and reporting

illicit discharges were placed in the newsletter throughout the reporting period. Also, at the Public Works Leadership Retreat on December 13, 2019, the Public Works Leadership Team observed the green infrastructure practices that have been implemented at the Pioneer Library Norman Central Branch, which includes bioretention and green roof management practices.

2.2 Next Reporting Cycle

The next reporting period will include data from July 1, 2020, through June 30, 2021. The Annual Report covering that period will be submitted by September 1, 2021. Recurring BMPs will be continued, and enhancements will be investigated.

2.3 Proposed Changes

There are no changes proposed to the Stormwater Management Program at this time.

3.1 TMDL Compliance

ODEQ issued a TMDL for the Lake Thunderbird watershed in November 2013. The TMDL required the Cities of Norman, Moore, and Oklahoma City to develop Compliance and Monitoring Plans to limit the amount of nitrogen, phosphorus, and sediment entering Lake Thunderbird from stormwater runoff. The City submitted the Compliance and Monitoring Plans (Plans) to ODEQ in November 2015. After much review and discussion, ODEQ approved the City's Plans on September 23, 2016. On October 25, 2016, City Council approved Council Resolution R-1617-41, which adopted the Plans.

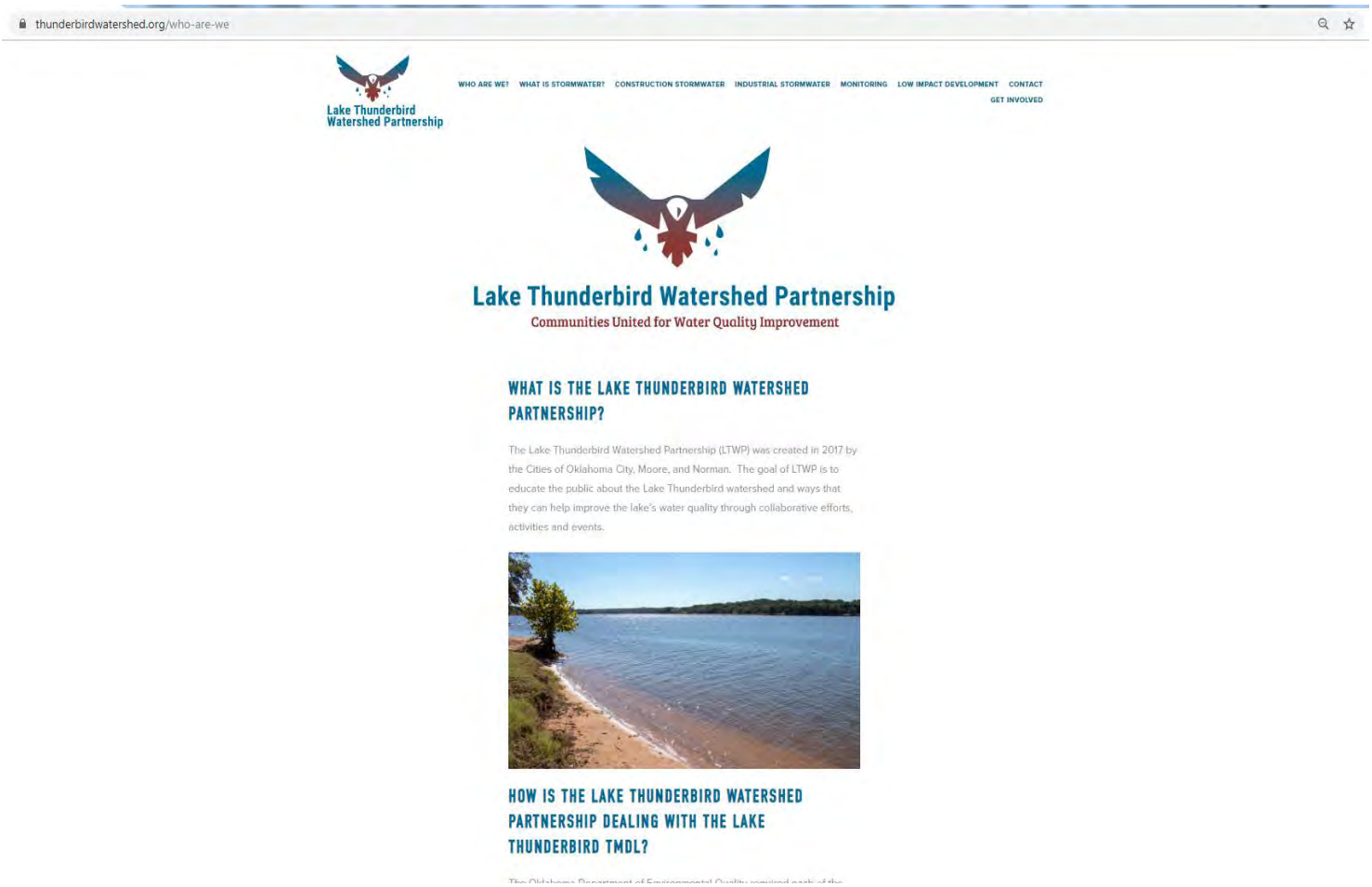
The City has been proactive in measures to reduce the contaminant load to Lake Thunderbird. In November 2009, the Norman City Council accepted the Storm Water Master Plan which recommended the establishment of Stream Planning Corridors in the Lake Thunderbird watershed to protect the creeks and streams and thereby protect lake water quality. The WQPZ was established by City ordinance in June 2011 and provided stream buffers for new development in the Lake Thunderbird watershed as recommended by the Storm Water Master Plan. A Manufactured Fertilizer Ordinance was adopted by the Norman City Council in 2013 which required that certain criteria be met in order to use fertilizer containing phosphorus in the Lake Thunderbird watershed. The Manufactured Fertilizer Ordinance also prohibits blowing, dumping, or otherwise causing grass clippings to be placed into the gutters and storms drains. All of these steps have been taken by the City to improve the quality of stormwater runoff discharged from the City.

Implementation of the Plans has been established on a 5 year permit cycle basis. The City has begun the first 5 year cycle by implementing a Monitoring Plan to establish a baseline for flow and pollutant loading of streams flowing from or through the City to Lake Thunderbird. Pollutants currently being monitored are nitrogen, phosphorus, and total suspended solids. BMPs are also being implemented as part of the City's Compliance Plan, primarily through educational campaigns, enhancing existing programs, and working towards more frequent cleaning efforts. These efforts during the first 5 years are aimed at reducing pollutants in stormwater runoff at the source. The Plans and the results of the monitoring will be reviewed at the end of this initial 5 year cycle to determine where best to establish structural BMPs during the next 5 year cycle.

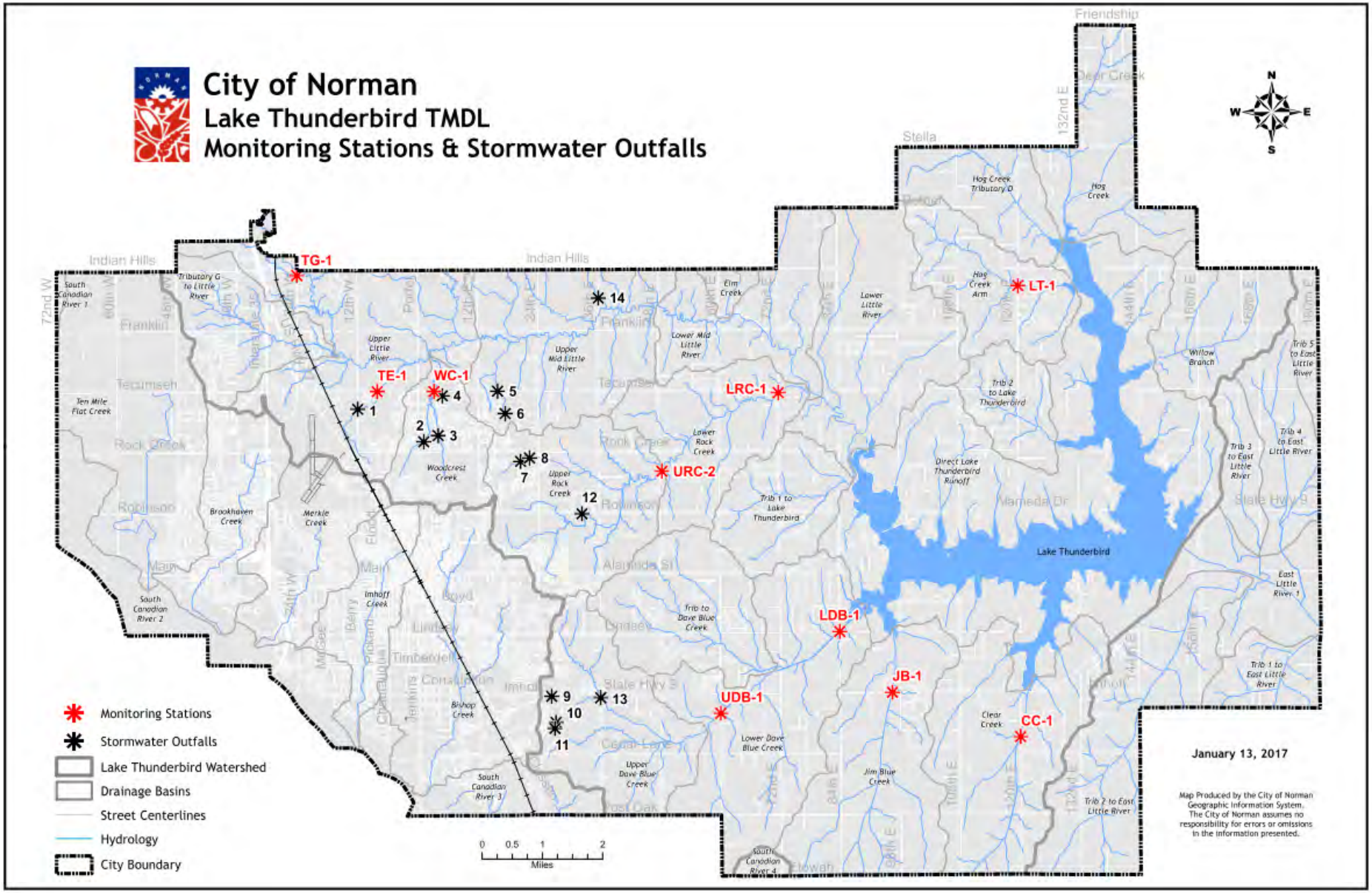
On January 26, 2016, City Council approved Contract No. K-1516-79 by and between the City of Norman and OWRB in the amount of $229,756.23. OWRB implemented the monitoring program in March 2016. Installation of stream gauging stations was completed in May 2016. Monthly monitoring is ongoing at ten (10) permanent monitoring stations. An additional fourteen (14) major stormwater outfalls have been identified, and seven (7) of these sites are sampled once per quarter.

A Lake Thunderbird Watershed TMDL Technical Working Group was established in 2016. This Working Group includes technical staff from the Cities of Moore, Norman, and Oklahoma City. The goal of the group is to collaborate on common non-structural BMPs and share information each has learned during the TMDL implementation process. In 2018, it was renamed as the Lake Thunderbird Watershed Partnership, and a branding strategy was implemented, which included a

logo and tagline available for use by all three cities. Additionally, a collaborative website was developed and implemented: www.thunderbirdwatershed.org. Watershed signs were installed at 25 locations during the reporting period. The partnership collaborated on the 4th Annual Lake Thunderbird Watershed Workshop and Clean-up Event held on October 27, 2020 at Lake Thunderbird State Park. In May 2020, the City of Norman was notified that it had been awarded a United States Bureau of Reclamation WaterSMART grant to formally establish the Lake Thunderbird Watershed Partnership as a watershed group. Contract negotiations began during the reporting period.



Pollutant Reductions Based on WTM Models in the City of Norman TMDL Compliance Plan							
Pollutant	Jim Blue	Clear Creek	Lake Thunderbird and Laterals	Little River	Rock Creek	Dave Blue	**Total for FYE 2020 (lbs)**
Phosphorus	76.7	72.7	441.6	125.6	68.8	90.4	**875.8**
TSS	2,874	2,721	16,563	53,510	31,105	31,795.2	**138,568.2**
Nitrogen	464.9	440.1	2,679	797.5	497.8	643	**5,522.3**


City of Norman
Lake Thunderbird TMDL
Monitoring Stations & Stormwater Outfalls
TG-1
TE-1
WC-1
LRC-1
URC-2
LDB-1
UDB-1
JB-1
CC-1
LT-1
1
2
3
4
5
6
7
8
9
10
11
12
13
14
Lake Thunderbird
Monitoring Stations
Stormwater Outfalls
Lake Thunderbird Watershed
Drainage Basins
Street Centerlines
Hydrology
City Boundary
0 0.5 1 2
Miles
January 13, 2017
Map Produced by the City of Norman Geographic Information System. The City of Norman assumes no responsibility for errors or omissions in the information presented.

Section 4. Optional Permit Coverage under MCM #7

All City construction projects active in the reporting period were either under control of a contractor/construction site operator and/or less than one acre of disturbed area. All construction site operators performing earth disturbing activities within the boundary of the City of Norman are informed that they must comply with all federal, state and local regulations related to erosion control and stormwater runoff.

4.1 Active Projects

None in reported period

4.2 Started Projects

None in reported period

4.3 Completed Projects

None in reported period

Section 5. Summary/Permittee Information

5.1 Permittee Information

Permittee	City of Norman, Oklahoma
Address	201West Gray, Bld A
City/State/Zip	Norman, OK 73069
Contact	Carrie J. Evenson, Ph.D., P.E., CFM Stormwater Program Manager
Contact Phone	(405) 366-5455
Authorization No.	OKR040015
Authorization Date	November 29th, 2005

5.2 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 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.

Signature: _____ Date: 9-1-20

Name (printed): Darrel Pyle Title: City Manager

Appendix A: Supporting Documentation

MCM #1: PUBLIC EDUCATION AND OUTREACH

Stormwater Division Homepage

Environmental Volunteer Information from City Website.

We Drink Our Stormwater Newspaper Ad – August 2019

Examples of Promotional Items

Utility Bill Insert – November 2019

Facebook Posts

City of Norman, OK - City Government
February 11 ·

Don't forget to submit your design for this year's Artful Inlets to the Norman Arts Council by Friday! Learn more on their website at http://bit.ly/ArtfulInlet2020.

Carrie Evenson and 17 others 3 Comments 18 Shares

City of Norman, OK - City Government
May 22 ·

We've rescheduled our rain barrel distribution event! If you've purchased a rain barrel through the public works division, you can pick it up Friday, May 29 from 4 pm to 6 pm or Saturday, May 30 from 9 am to 1 pm at our Lindsey Yard located at 668 E. Lindsey.

If you're interested in ordering a rail barrel it's not too late! You can order rain barrels until Sunday, May 24, 2020 by visiting www.upcyclerainbarrel.com/normanok.html.

Rain barrels capture water from roofs and hold it for later use. The stored rain barrel water can then be used to water lawns and gardens, wash cars, or for other similar activities. Using a rain barrel is great way to help protect and improve water quality within the City of Norman as well as to conserve our precious drinking water resources.

72 27 Comments 26 Shares

Stormwater Quality Quarterly

Runoff Roundup

May 2020

City of Norman Contact Information

Stuart Shumate, CSI
Stormwater Compliance Inspector
Office: 405-217-7777
Cell: 405-323-7155370-3295

Faith Haynes, CSI
Stormwater Compliance Inspector
Office: 405-366-5453
Cell: 405-370-3295

Michele Loudenback, RPES,CFM
Stormwater Program Specialist
Office: 405-366-5435
Cell: 405-473-0578

Carrie Evenson, Ph.D, PE, CFM
Stormwater Program Manager
Office: 405-366-5455
Cell: 405 365-4928

pwstormwater@normanok.gov
http://www.normanok.gov/content/storm-water-quality

Oklahoma Department of Environmental Quality Contact Information

Stormwater Program
Office: 405-702-8100
http://www.deq.state.ok.us/wqdnew/stormwater/index.html

Clean Streets = Clean Creeks

Summer beckons to the outdoors. Here are some tips on how to reduce the impact on stormwater quality from your lawn:

- Raise your mower height to 3 inches for summer months. Taller grass grows deeper roots, shades and protects the soil, is less prone to disease, pests, and weeds, and captures more excess rainwater on the property.
- June is a good time to spread biological controls on your lawn or garden, such as beneficial nematodes to control Japanese beetle grubs. Avoid use of chemical pesticides and herbicides if possible, they damage beneficial insects and soil structures. If weed problems develop, spot treat specific weed patches rather than treating the entire lawn or garden.
- Leave a minimum of a 3 foot unmowed edge along streams, ponds, and drainage channels.
- Avoid overwatering your lawn and garden and adjust your sprinklers so that irrigation water does not fall on streets, sidewalks or driveways. Overwatering can increase plant disease, deplete the soil of nutrients and increase your water bill, while watering impervious surface can increase the number of pollutants in your runoff.
- Never dispose of grass clippings and other yard waste by dumping, blowing, or sweeping it into the street or storm drains. Yard waste adds excessive nutrients to streams and can deplete oxygen from the water causing harm to aquatic life and increasing the incidence of algal blooms.
- Consider reducing impervious surfaces and/or installing a rain garden. Both of these actions can reduce the amount of runoff from your property, thus reducing the amount of pollutants leaving your property.

Don't Blow It! Compost It!

Blowing grass clippings into the street may seem harmless, but grass carried by stormwater runoff into storm drains:

- Causes pollution of our creeks and streams
- Contributes to flooding in our neighborhoods

You can help! Mulch your grass, blow the clippings back onto your lawn, or compost your yard waste (grass, leaves, twigs, and hedge clippings). By doing your part you can help prevent flooding caused by debris that blocks storm drains, reduce pollutants in our water (nitrogen, phosphorus, and yard chemicals that are in our yard waste), and minimize the growth of harmful algae levels in our lake and waterways. This is important to our community; the City of Norman passed an ordinance that can result in a fine of up to $200 for those who dump, blow, sweep or place yard waste in our streets or storm drains (Ord. 0-1213-34, & Section 6000 Engineering Design Criteria).

BUILDERS' CORNER

m a site is a significant source of sediment pollution? Track out is dirt, mud or other debris roadway by vehicles or equipment leaving a construction site. As rainfall, wind, or other ve- ent can be washed into storm drains or lifted into the air. A stabilized construction exit can track out. A typical stabilized construction exit consists of 2" to 3" rock laid over geotextile. imum depth of 18" and should be a minimum of 50' long or 4 times the circumference of the Additionally, the exit should be graded to prevent sediment-laden water from flowing down ay. Equipment and vehicles should be directed to the exit. As with any Best Management itical for effectiveness. Accumulated sediment within the rock should be removed routinely, eplaced periodically. If excessive track out occurs, the exit should be lengthened or an alter- e, such as rumble plates or wheel washes.

LETTING NATURE DO ITS JOB: RAINWATER HARVESTING

Rainwater harvesting is the collection and storage of rainwater for reuse on site, rather than allowing it to become runoff. Archaeological evidence shows that rainwater harvesting is an ancient technique that was practiced as far back as 4,000 years ago. Rainwater has a nearly neutral pH and is free from salts, minerals, and other natural and man-made contaminants. The harvested water can be used to irrigate lawns and gardens, wash cars or be used for other similar activities. When harvested rainwater is used for these types of things, less drinkable water is used, increasing water conservation and lowering water bills. Additionally, when rainfall becomes runoff, it can pick up pollution and deposit it into our waterways. Harvesting the rainwater helps to reduce stormwater pollution by minimizing the amount of stormwater runoff that leaves a site. An added bonus? Plants thrive when watered with harvested rainwater!

RAIN BARREL PROMOTION

If you are interested in purchasing a rain barrel, the Central Oklahoma Stormwater Alliance (COSWA) is wrapping up its 2020 rain barrel promotion. The rain barrels are made from repurposed food-grade barrels and can be purchased for $63.50 by going to:

www.upcyclerainbarrel.com/normanok.html.

Mail-in orders will be accepted through May 20, 2020 and online orders will be accepted through May 24, 2020.

Rain barrels must be picked up at the City of Norman Public Works Yard, 668 East Lindsey Street, on either **May 29 from 4 pm to 6 pm or May 30 from 9 am to 1 pm**. Spread the word and help protect our valuable water resources!

For more information, please contact Michele at michele.loudenback@normanok.gov or 405-329-2524.

Swimming Pool and Hot Tub Discharges

Discharging chlorinated pool or hot tub water into waterways is harmful to fish and other wildlife. The best option at the end of the season is to discharge the water into the sanitary sewer. If you cannot do that, make sure the water is de-chlorinated before the pool or hot tub is drained. To de-chlorinate the water, stop chlorinating the water and allow it to sit for at least two days while the sun helps dissipate the chlorine. Use a pool test kit to ensure the pH is neutral (close to 7) and the chlorine is gone. Out of courtesy, avoid draining the water across neighboring properties. It is important that salt water pool and hot tub water and filter backwash water always be sent to the sanitary sewer.

MCM #2: PUBLIC PARTICIPATION AND INVOLVEMENT

Downtown Fall Festival - November 1, 2019

Lake Thunderbird Workshop and Clean-up - October 27, 2019

MCM #3: ILLICIT DISCHARGE DETECTION AND ELIMINATION

Dry Weather Field Screening Form – Example from March 2020

DRY WEATHER FIELD SCREENING & ILLICIT DISCHARGE REPORT FORM

SECTION 1: BACKGROUND DATA

Hydrologic Unit Code (HUC) 12 Watershed: Brookhaven	DWFS ☒ Complaint ☐	Date: 03/26/21 Time 11:13AM
Outfall ID: BK2 OR Generating Site Address:		
Investigators: M. Loudenback	Form completed by: M. Loudenback	
Rainfall (in.): Last 24 hours: 0 Last 48 hours: 0	Photo's: yes	
Land Use in Drainage Area (Check all that apply):		
☐ Industrial	☐ Open Space	
☐ Ultra-Urban Residential	☐ Institutional	
☒ Suburban Residential	Other:	
☐ Commercial	Known Industries:	
Notes:		

SECTION 2: OUTFALL DESCRIPTI

LOCATION		
☒ Pipe	**Flow Present?**	☐ Yes ☒ No *If No, Skip to Section 4*
	Flow Description (If present)	☐ Trickle ☐ Moderate ☐ Substantial
☐ Open drainage		
☐ In-Stream		

SECTION 3: PHYSICAL INDICATORS FOR FLOWING OUTFALLS ONLY

Are Any Physical Indicators Present in the flow? ☐ Yes ☒ No *(If No, Skip to Section 4)*

INDICATOR	CHECK If Present	DESCRIPTION	RELATIVE SEVERITY INDEX (1-3)		
Odor	☐	☐ Sewage ☐ Rancid/Sour ☐ Petroleum/gas ☐ Sulfide ☐ Other:	☐ 1 – Faint	☐ 2 – Easily detected	☐ 3 – Noticeable from a distance
Color	☐	☐ Clear ☐ Brown ☐ Gray ☐ Yellow ☐ Green ☐ Orange ☐ Red ☐ Other:	☐ 1 – Faint colors in sample bottle	☐ 2 – Clearly visible in sample bottle	☐ 3 – Clearly visible in outfall flow
Turbidity	☐		☐ 1 – Slight		
Floatables -Does Not Include Trash!	☐	☐ Sew ☐ Petr			

Pipe benthic growth	☐	☐ Brown ☐ Orange ☐ Green ☐ Other:	

SECTION 4: PHYSICAL INDICATORS FOR

Are physical indicators that are not related to flow

INDICATOR	CHECK If Present
Outfall Damage	☐
Deposits/Stains	☐
Abnormal Vegetation	☒
Poor pool quality	☐

SECTION 5: MODE OF ENTRY

☐ Sewer cross connection	☐ Industrial cross connection
☐ Straight pipe	☐ Seepage
☐ Commercial cross connection	☐ Spills
☐ Outdoor washing	☐ Non-target irrigation
☐ Other	☐ Sewer overflow
Location of entry to stormsewer:	

SECTION 6: GENERATING SITE

☑ Residential	☐ Institutional
☐ Sewer cross connection	☐ Natural Causes
☐ Municipal	☐ Unknown
☐ Industrial	☐ Other

Location of discharge origin: _____

Estimated amount of discharge: _____

SECTION 7: ANY NON-ILLICIT DISCHARGE CONCERNS (E.G. TRASH OR NEEDED INFRASTRUCTURE REPAIRS)?
SECTION 8: ANY ANALYSES PERFORMED; IF SO, WHAT?

Pictures:

Spill Response Form – Example from August 28, 2019

City of Norman
Stormwater Quality

SPILL RESPONSE REPORT

Site Name/Address: Harrogate and Meadow Ridge Dr.
Date/Time: 8/28/2019 9:00 AM **Current Weather:** clear
Responding Personnel: M. Loudenback **Spill Quantity:** ~ 5 gallons

Checklist	Yes	No	N/A	Comments
Has the spilled material discharged to the MS4?	☒	☐	☐	
Has the spilled material reached an MS4 outfall?	☐	☒	☐	
Has the spill been contained?	☒	☐	☐	
Has the spilled material been identified?	☒	☐	☐	Hydraulic oil
Does the spilled material pose a health hazard?	☒	☐	☐	
Does the spilled material pose an environmental hazard?	☒	☐	☐	
Does the spill require notification to other entities (ODEQ, ODOT, etc.)?	☐	☒	☐	
Has the spill been properly cleaned?	☒	☐	☐	
Has the responsible party been identified?	☒	☐	☐	Sanitation
Has the responsible party been notified?	☒	☐	☐	They cleaned the spill

☐ Attached Documents –

Location Map

Spill Response Documentation

Photo	Action Description
	Area is clean

Comments: A line sprung a leak and about 5 gallons made it onto the ground. Floor dry and brooms were utilized to clean the spill.

Inspector's Name: Michele Loudenback Date: August 29, 2019

MCM #4: CONSTRUCTION SITE RUNOFF CONTROL

CITY OF NORMAN
STORM WATER QUALITY
EARTH CHANGE PERMIT APPLICATION

NOW - Please print or type all data

PROJECT INFORMATION

NAME OF PROJECT: _____

ADDRESS: _____

DISTURBED AREA (ACRES): _____ LATITUDE: _____ LONGITUDE: _____

PROPOSED START DATE: _____ PROPOSED END DATE: _____

LOCATION OF STORM WATER POLLUTION PREVENT PLAN (SWPP): [ ] ONSITE [ ] OFFSITE [ ] N/A

ADDRESS (IF LOCATED OFFSITE): _____

APPLICANT/OWNER/OPERATOR [ ] PRIMARY CONTACT [ ] SECONDARY CONTACT

NAME (PRINTED): _____ COMPANY: _____

ADDRESS: _____ CITY: _____ STATE: _____ ZIP: _____

PHONE: _____ CELL: _____ E-MAIL: _____

GENERAL CONTRACTOR [ ] PRIMARY CONTACT [ ] SECONDARY CONTACT

[ ] CHECK IF SAME AS APPLICANT

NAME (PRINTED): _____ COMPANY: _____

ADDRESS: _____ CITY: _____ STATE: _____ ZIP: _____

PHONE: _____ CELL: _____ E-MAIL: _____

ENGINEER/DESIGNER

NAME (PRINTED): _____ COMPANY: _____

ADDRESS: _____ CITY: _____ STATE: _____ ZIP: _____

PHONE: _____ CELL: _____ E-MAIL: _____

FOR OFFICE USE

PERMIT#: _____ WARD: _____ FEE: _____

WATERSHED: _____ SUB-WATERSHED: _____

RECEIVING WATER: _____ DATE: _____

APPROVED BY: _____

SUBMITTALS
[ ] NOI
[ ] SWPP
[ ] ECP
[ ] CHECK

City of Norman
Stormwater Division

CONSTRUCTION SITE COMPLIANCE ASSISTANCE VISIT

Site Name/Address/Responsible Party

Date/Time: Click here to enter a date
Current Activity: Inactive
Last Rain Date: Click here to enter a date
Current Weather: Select Weather
Quantity: Select a Quantity
Last Inspection Date: Click here to enter a date

Deficiency	Yes	Recommendation
No Earth Change Permit	☐	
Non-allowable Discharge	☐	
Erosion/Sediment Control Installation	☐	
Buffer Implementation	☐	
Materials Washout	☐	
Medium and Large Spills	☐	
Inlet Protection, No Basin	☐	
Construction Entrance with Tracking	☐	
Vehicle/Equipment Tracking outside Project	☐	
Portable Toilet Installation		
Repeat Non-Critical Issue		
Reports		
BMP Maintenance		
Vehicle/Equipment Tracking inside Project		
Solid Waste Management		
Stabilization		
Small Spills		
Portable Toilet Installation		
Other		

☐ No critical deficiencies noted. Pl
next inspection.

☐ Critical issues found. The critic
notification, unless otherwise re
notification. Critical issues are
inspection.

Inspector's Na

Deficiency Description:

Critical:

- **No Earth Change Permit**: There is no Earth Change Permit on file with the city of Norman.
- **Non-allowable Discharge**: There is a discharge from the site of one or more of the following: sediment, materials washout, dust, solid waste, or other pollutants.
- **Erosion/Sediment Control Installation**: One or more erosion and/or sediment controls has/have been installed improperly. These controls include, but are not limited to: silt fence, compost sock, straw wattle, triangular silt dike, rock check dams, mulch (including hydromulch), sediment basins, etc.
- **Buffer Implementation**: The appropriately sized buffer or equivalent controls has/have not been implemented near adjacent waterways.
- **Materials Washout**: There is washout on the ground of certain materials including, but not limited to, concrete, paint, stucco, drywall mud, and/or other pollutants.
- **Medium and Large Spills**: There are spills or leaks of vehicle or equipment fluids that are either greater than 5 gallons in volume or 2 square feet in size.
- **Inlet Protection, No Basin**: There is no or inadequate inlet protection in place for projects where the inlets do not drain to a sediment basin.
- **Construction Entrance with Tracking**: Vehicle and/or equipment tracking is occurring onto non-project roads because of needed maintenance or improper installation of a construction entrance.
- **Vehicle/Equipment Tracking outside Project**: Vehicle and/or equipment tracking is occurring outside of the project area.
- **Portable Toilet Installation**: A portable toilet has been installed near stormwater infrastructure, including ditches, or has tipped over in the past because it is not staked properly.
- **Repeat Non-critical Issue**: A non-critical issue has been present for three regularly scheduled inspections.

Non-critical:

- **Records**: Records, including inspections and site maps, are not available or are not updated.
- **BMP Maintenance**: BMP(s) is in need of maintenance but is not causing a non-allowable discharge. BMPs included, but are not limited to, concrete washout containers, trash receptacles, and erosion and/or sediment controls.
- **Vehicle/Equipment Tracking inside Project**: Vehicle and/or equipment tracking is occurring inside the project area. This includes tracking onto City-owned streets if infrastructure drains to a sediment basin or is protected.
- **Solid Waste Management**: Trash is not being contained in a covered, leak-proof container but is not leaving the site or project area.
- **Stabilization**: Interim and/or final stabilization is not in place but other controls are adequately preventing non-allowable discharges of sediment.
- **Small Spills**: Spills and/or leaks are present but are not greater than 5 gallons in volume or larger than 2 square feet in size.
- **Portable Toilet Installation**: Portable toilets have not been staked but are not near stormwater infrastructure nor have tipped over in the past.
- **Other**: Another type of concern is present but is not causing a non-allowable discharge.

City of Norman
Stormwater Quality

CONSTRUCTION SITE FOLLOW-UP INSPECTION REPORT

Site Name/Address/Responsible Party:

Date/Time: Click here to enter a date
Current Activity: Inactive
Last Rain Date: Click here to enter a date
Current Weather: Select Weather
Quantity: Select a Quantity
Last Inspection Date: Click here to enter a date

Concern	Compliant	Non-Compliant	N/A	Comments about the overall effectiveness of the erosion and sediment control measures. Note: For each item checked 'Non-Compliant', refer to the follow-up information on page 2.
No Earth Change Permit	☐	☐	☒	
Non-allowable Discharge	☐	☐	☒	
Erosion/Sediment Control Installation	☐	☐	☒	
Buffer Implementation	☐	☐	☒	
Materials Washout	☐	☐	☒	
Medium and Large Spills	☐	☐	☒	
Inlet Protection, No Basin	☐	☐	☒	
Construction Entrance with Tracking	☐	☐	☒	
Vehicle/Equipment Tracking outside Project	☐	☐	☒	
Portable Toilet Installation	☐	☐	☒	
Repeat Non-Critical Issue	☐	☐	☒	

☐ Site IS in compliance with current permit regulations.

☐ Site IS NOT in compliance with current permit regulatio
within 14 calendar days, unless otherwise noted, to avoi

☐ Notice of Violation pending.

☐ Notice of Violation issued.

Maintenance/Corrective Action Required

BMP & Location	Representative Photo	Action Required
	N/A	

Site Notes:
❖

Inspector's Name: Date: September 4, 2018

Concern Description:

Critical:

No Earth Change Permit: There is no Earth Change Permit on file with the city of Norman.

Non-allowable Discharge: There is a discharge from the site of one or more of the following: sediment, materials washout, dust, solid waste, or other pollutants.

Erosion/Sediment Control Installation: One or more erosion and/or sediment controls has/have been installed improperly. These controls include, but are not limited to, silt fence, compost sock, straw wattle, triangular silt dike, rock check dams, mulch (including hydromulch), sediment basins, etc.

Buffer Implementation: The appropriately sized buffer or equivalent controls has/have not been implemented near adjacent waterways.

Materials Washout: There is washout on the ground of certain materials including, but not limited to, concrete, paint, stucco, drywall mud, and/or other pollutants.

Medium and Large Spills: There are spills or leaks of vehicle or equipment fluids that are either greater than 5 gallons in volume or 2 square feet in size.

Inlet Protection, No Basin: There is no or inadequate inlet protection in place for projects where the inlets do not drain to a sediment basin.

Construction Entrance with Tracking: Vehicle and/or equipment tracking is occurring onto non-project roads because of needed maintenance or improper installation of a construction entrance.

Vehicle/Equipment Tracking outside Project: Vehicle and/or equipment tracking is occurring outside of the project area.

Portable Toilet Installation: A portable toilet has been installed near stormwater infrastructure, including ditches, or has tipped over in the past because it is not staked properly.

Repeat Non-critical Issue: A non-critical issue has been present for three regularly scheduled inspections.

MCM #5: POST-CONSTRUCTION STORMWATER MANAGEMENT

Water Quality Protection Zone

§ 2. THAT, Section 22:429.6 shall be added as follows:

SEC. 429.6 – WP, WATERSHED PROTECTION DISTRICT

1. Description and Purpose. The Watershed Protection District encompasses areas through which water drains into the Lake Thunderbird watershed, thus affecting the water supply derived from City wells and Lake Thunderbird. The City of Norman adopts a goal of nondegradation which maintains or improves the quality of water entering the various waterways in Norman and ultimately ending in Lake Thunderbird. Pollution prevention will be assured by requiring best management practices and development restrictions, where appropriate. Land uses which could adversely affect the water supply are generally prohibited, unless acceptable alternate methods are used that can be shown to substantially reduce or eliminate their negative affect on the water supply, thereby preventing the risk of contaminants in the surface water and ground water within the Lake Thunderbird watershed, and reducing the risks to the public health.

Detention Pond Inspection Form – June 23, 2020

City of Norman
Stormwater Quality

STORMWATER POND INSPECTION FORM

Number: 599 **Location:** 2099 Tecumseh Drive

Site Name: Tecumseh Drive 599_Northside_Center_2099 Tecumseh Drive

Date/Time: Tuesday, June 23, 2020 12:08 PM **Weather:** Overcast

Last Rain Date: Monday, June 22, 2020 **Quantity:** < 0.5"

Inspection Type: Initial **Status:** Dry Pond

Inspection Checklist	Yes	No	N/A	Comments/Recommendations.
Trash/Debris in or around pond:	☒	☐	☐	Accumulated trash need to be removed.
Erosion on pond side slopes, berms or outlet:	☒	☐	☐	Controls may be needed to slow the flow of water entering the pond.
Sediment entering pond:	☐	☐	☒	Did not notice sediment in areas that were accessible.
Excessive vegetation in pond:	☒	☐	☐	Vegetation around trickle channel and north outfall is thick, tall, and hiding outfall.
Inlet/Outlet structures in good condition:	☒	☐	☐	Inlet Structure looks to be in good condition. Outlet was not accessible at this time.
Trees in pond or on pond berms:	☒	☐	☐	Trees need to be removed around inlet to prevent possible damage to structure
Sheen or foam on water surface:	☐	☐	☒	
Chemical/offensive odors:	☐	☒	☐	No odors present at time of inspection
Nuisance wildlife present:	☐	☒	☐	No wildlife present at time of inspection
Other notes:				

Inspector: *Faith Haynes, CSI, OCESI* **Date:** June 23, 2020

*Previously existing agricultural pond converted to detention use

Findings	Picture	Details
View of Pond from the South End. Picture 1 of 1		
View of Pond from the North End. Picture 1 of 1		
Trash/Debris in or around Pond. Picture 1 of 3		Some trash has accumulated around Pond. (Possibly due to wind)

MCM #6: MUNICIPAL GOOD HOUSEKEEPING

Monthly Employee Newsletter (October 2019)

CITY OF NORMAN

The Employee Connection

Working Together to Deliver Exceptional Service

October 2019

Pam Sharp is our Employee Spotlight this month. She began her career with the City of Norman 30+ years ago as a Recreation Supervisor for the Little Axe Community Center and still works in that same capacity today.

Pam wanted to share some history about how the Little Axe Community Center came to be. When the City of Norman annexed Little Axe, it was to protect the watershed at Lake Thunderbi the health of a lake. (A watershed is land that drai tion, i.e. Lake Thunderbird). So when this annex occurred, a group of peop Axe wanted to have some City of Norman services provided to them. At tha area qualified for Community Development Block Grant (CDBG) funding. To grant, a neighborhood committee had to be established to identify needs of the ty.

The priority needs established were fire protection and social services. This unique to the Parks and Recreation Department, as this Center is not used as type facility.

People think of Little Axe as a community or a town; but it is actually only a within the school district there are six different legal jurisdictions with Norma Little Axe is a neighborhood of not only Norman, but also Oklahoma City, C cause of the unincorporated areas, the State because Lake Thunderbird is act school district, Citizens Potawatomi and the Absentee Shawnee. The Center ma City being a jurisdiction as it received MAPS funding for MAPS for Kids.

In the early years of its conception, there were several various social service the Center. The Health Department was doing satellite clinics, the Commodity services provided, along with Action Incorporated and various wellness progra always been a part of the Center and is one of the services that is still thriv state budget cuts and program elimination, many of these services were curtail

When Pam began her career, the main services provided at Little Axe Commu ing Services and Head Start. The Center served as a meal site for Aging Se Start Program was successful from its inception. Aging Services as well as th eliminated their program with the Community Center because of state budget c

When the opportunity arose for the Community Center to become a part of System, they were in the process of doing outreach programs through comp was advancing. Little Axe Community Center is called a Community Book only one in the Pioneer Library System and it is the most popular outreach fac they handle between 500-600 items a month according to Pioneer Library's sta

(continu

Appendix B

Category	*Description*
Blowing Dust	Calls regarding dust or sand being blown from construction sites
Debris/Dumping	Calls regarding improper disposal of materials or debris
Discharge	Calls regarding liquids other than stormwater flowing down the street or from a particular location
Drainage	Calls regarding stormwater runoff issues onto or away from property
Erosion	Calls regarding removal and transport of soil due to water or wind
Illicit Discharge	Calls regarding anything other than stormwater entering a storm drain or pipe
Property Maintenance	Calls regarding improper maintenance of property (e.g. overspray from pesticide or fertilizer applications)
Rain Barrels	Calls regarding purchasing or installing rain barrels
Sewage Bypass	Calls regarding sanitary sewer/wastewater spill or leak from sewer system
Spill	Calls regarding the release of any material/substance from its container
Storm Drain Maintenance	Calls regarding various issues related to storm drains (e.g. maintenance needs, unusual smells, etc.)
Swimming Pool Discharge	Calls regarding the discharge of swimming pool water into street or storm drain or onto neighboring property
Tracking	Calls regarding the transport of dirt off a construction site due to vehicle or equipment traffic
Utility Project	Calls regarding municipal utility projects
Yard Waste	Calls regarding blowing, sweeping, or otherwise placing grass clippings or leaves in the street or down a storm drain
<Unknown>	Calls that need additional follow-up or don't fit into other categories

Summary of All Calls July 1, 2019-June 30, 2020

Date Received	*Location*	*Complaint*	*Routed To*	*Category*	*Status*
7/1/2019	Symmes and Webster	Unknown	Michele Loudenback	<Unknown>	CLOSED
7/1/2019	N/A	Unknown	Michele Loudenback	Permitting	CLOSED
7/2/2019	NW 48th and Tecumseh	Unknown	Michele Loudenback	Drainage	CLOSED
7/3/2019	Cedarwood	Unknown	Michele Loudenback	Discharge	CLOSED
7/8/2019	Hemphill and 24th Ave NW	Unknown	Michele Loudenback	Yard Waste	CLOSED
7/10/2019	1025 Mobile Circle	Unknown	Michele Loudenback	Yard Waste	CLOSED
7/11/2019	UnP	Unknown	Michele Loudenback	Yard Waste	CLOSED
7/11/2019	N/A	Unknown	Michele Loudenback	Permitting	CLOSED
7/12/2019	Boyd and Classen	Unknown	Michele Loudenback	Yard Waste	CLOSED
7/15/2019	Boarwalk and 24th NW	Unknown	Michele Loudenback	Yard Waste	CLOSED
7/15/2019	Crest on 24th NW	Unknown	Michele Loudenback	Yard Waste	CLOSED
7/16/2019	Cherry St. E of Main	Unknown	Michele Loudenback	Yard Waste	CLOSED

7/16/2019	Eufala and Pickard	Unknown	Michele Loudenback	Yard Waste	CLOSED
7/18/2019	N/A	Unknown	Michele Loudenback	Rain Barrels	CLOSED
7/22/2019	N/A	Unknown	Michele Loudenback	Permitting	CLOSED
7/22/2019	N/A	Unknown	Michele Loudenback	Permitting	CLOSED
7/25/2019	Dakota and 24th	Unknown	Unknown	Yard Waste	CLOSED
7/29/2019	Acres and Peters	Unknown	Unknown	<Unknown>	CLOSED
8/2/2019	Duffy and Asp	Don Gras	Michele Loudenback	Yard Waste	CLOSED
8/5/2019	N/A	Unknown	Michele Loudenback	Permitting	CLOSED
8/5/2019	Sprouts	Unknown	Michele Loudenback	Discharge	CLOSED
8/7/2019	Nottingham Condos	Unknown	Stuart Shumate	Fertilizer	CLOSED
8/9/2019	Eastwood Park	Unknown	Streets SW Drainage	<Unknown>	CLOSED
8/12/2019	Indian Hills Industrial Park	Unknown	Michele Loudenback	<Unknown>	CLOSED
8/13/2019	Pickard and Parsons	Unknown	Michele Loudenback	Yard Waste	CLOSED
8/13/2019	3300 Winchester Cir	Don Cervi	Michele Loudenback	Flood Protection	CLOSED
8/14/2019	Fire Station No. 4	Unknown	Unknown	<Unknown>	CLOSED
8/14/2019	Stone Lake	Unknown	Michele Loudenback	Permitting	CLOSED
8/14/2019	Boyd and Porter	Unknown	Michele Loudenback	Yard Waste	CLOSED
8/15/2019	University North Park	Unknown	Michele Loudenback	Yard Waste	CLOSED
8/15/2019	Ruby Grant Park	Unknown	Michele Loudenback	Sediment	CLOSED
8/15/2019	University North Park	Unknown	Michele Loudenback	Yard Waste	CLOSED
8/16/2019	1420 Morland	Unknown	Michele Loudenback	Yard Waste	CLOSED
8/16/2019	6051 Blue Hills Lane	Unknown	Michele Loudenback	Drainage	CLOSED
8/20/2019	Lindsey between Jenkins and Elm	Unknown	Michele Loudenback	Yard Waste	CLOSED
8/21/2019	Bishop Creek	Unknown	Michele Loudenback	Discharge	CLOSED
8/21/2019	217 E Daws	Unknown	Carrie Evenson	Drainage	CLOSED
8/21/2019	3505 Medical Park Dr	Unknown	Michele Loudenback	Permitting	CLOSED
8/22/2019	UnP Legacy Park and Target	Amos Nunnally	Michele Loudenback	Yard Waste	CLOSED
8/22/2019	Oakridge Estates	Unknown	Michele Loudenback	Permitting	CLOSED
8/23/2019	Reid Pryor	Unknown	Faith Haynes	Discharge	CLOSED

8/25/2019	3701 Burlington Dr.	Unknown	Michele Loudenback	Discharge	CLOSED
9/3/2019	1501 Camden Way	Unknown	Unknown	Yard Waste	CLOSED
9/3/2019	1523 Melrose	Unknown	Stuart Shumate	Yard Waste	CLOSED
9/3/2019	36th NW and Main	Unknown	Michele Loudenback	Yard Waste	CLOSED
9/4/2019	Northcliff St	Unknown	Unknown	<Unknown>	CLOSED
9/4/2019	OU Motel	Unknown	Michele Loudenback	Yard Waste	CLOSED
9/4/2019	1523 Melrose	Unknown	Unknown	Yard Waste	CLOSED
9/4/2019	Wiley and Melrose	Unknown	Unknown	Yard Waste	CLOSED
9/4/2019	2030 Allenhurst	Unknown	Unknown	Yard Waste	CLOSED
9/4/2019	2119 Elmjurts	Unknown	Unknown	Yard Waste	CLOSED
9/4/2019	St. Joseph's	Unknown	Unknown	Yard Waste	CLOSED
9/4/2019	Charleston's Steakhouse	Unknown	Unknown	Yard Waste	CLOSED
9/5/2019	Eufala and Pickard	Unknown	Unknown	Yard Waste	CLOSED
9/5/2019	Porter and Boyd	Unknown	Unknown	Yard Waste	CLOSED
9/5/2019	24th Ave NW and Radius	Unknown	Unknown	Yard Waste	CLOSED
9/5/2019	Allenhurst	Unknown	Unknown	Yard Waste	CLOSED
9/5/2019	24th Ave NE	Unknown	Unknown	Permitting	CLOSED
9/5/2019	800 Chautauqua Ave.	Unknown	Unknown	Yard Waste	CLOSED
9/5/2019	Melrose and Mercedes	Unknown	Unknown	<Unknown>	CLOSED
9/5/2019	Hidden Hills and Banbury Ct.	Unknown	Unknown	Yard Waste	CLOSED
9/6/2019	Hidden Hills	Unknown	Unknown	Drainage	CLOSED
9/6/2019	East Indian Point Circle	Unknown	Unknown	Illicit Discharge	CLOSED
9/6/2019	Summit Valley Sewer Interceptor	Unknown	Unknown	Permitting	CLOSED
9/6/2019	Boyd and Wiley	Unknown	Unknown	Yard Waste	CLOSED
9/6/2019	48th Ave NW and Main St.	Unknown	Unknown	Flood Protection	CLOSED
9/9/2019	N/A	Unknown	Unknown	Workshop	CLOSED
9/9/2019	Highland Village	Unknown	Unknown	Drainage	CLOSED
9/10/2019	339 Rosewood Dr.	Unknown	Unknown	Yard Waste	CLOSED
9/10/2019	1021 Mobile Circle	Unknown	Unknown	Yard Waste	CLOSED
9/10/2019	Woods and Main	Unknown	Unknown	Yard Waste	CLOSED
9/10/2019	5209 W. Tecumseh	Unknown	Unknown	Flood Protection	CLOSED
9/10/2019	Water Plant	Unknown	Unknown	Flood Protection	CLOSED
9/10/2019	Sam Noble Museum	Unknown	ODEQ	Yard Waste	CLOSED
9/10/2019	48th NW and Tecumseh	Unknown	Unknown	Yard Waste	CLOSED
9/11/2019	2650 48th Ave NW	Unknown	Unknown	Yard Waste	CLOSED
9/12/2019	Los Colinas	Unknown	Unknown	Sediment	CLOSED
9/16/2019	1637 Chamblee	Unknown	Unknown	Yard Waste	CLOSED

9/17/2019	Duffy and Asp	Unknown	Unknown	Yard Waste	CLOSED
9/18/2019	Melrose and Boyd	Unknown	Unknown	Yard Waste	CLOSED
9/18/2019	Perfect Swing	Unknown	Unknown	Yard Waste	CLOSED
9/19/2019	2203 Crestmont	Unknown	Unknown	Yard Waste	CLOSED
9/19/2019	Berry and Candy	Unknown	Unknown	Yard Waste	CLOSED
9/19/2019	Cresmont	Unknown	Unknown	Yard Waste	CLOSED
9/20/2019	India Village	Unknown	Unknown	Discharge	CLOSED
9/23/2019	Sunset and wiley	Unknown	Unknown	Yard Waste	CLOSED
9/24/2019	430 E. Comanche	Unknown	Unknown	Yard Waste	CLOSED
9/25/2019	Near 2104 Oakridge Dr	Unknown	Unknown	Sediment	OPEN
10/1/2019	Oakridge Estates	Unknown	Michele Loudenback	Permitting	OPEN
10/1/2019	Boyd and Porter	Unknown	Faith Haynes	Yard Waste	CLOSED
10/3/2019	Oakridge Rd.	Unknown	Michele Loudenback	Permitting	CLOSED
10/3/2019	Vicksburg and Alameda	Unknown	Faith Haynes	Yard Waste	CLOSED
10/3/2019	8000 E. Robinson	Unknown	Michele Loudenback	Permitting	CLOSED
10/4/2019	Hiland Village	Unknown	Michele Loudenback	Drainage	CLOSED
10/4/2019	Bishop Creek	Unknown	Michele Loudenback	Clean-up Event	CLOSED
10/7/2019	unknown	Unknown	Michele Loudenback	Rain Barrels	CLOSED
10/10/2019	Summit Valley Sewer Interceptor	Unknown	Michele Loudenback	Permitting	CLOSED
10/10/2019	Griffin	Unknown	Michele Loudenback	Clean-up Event	CLOSED
10/10/2019	Turnberry Apartments	Unknown	Michele Loudenback	Swimming Pool Discharge	CLOSED
10/15/2019	Cedar Creek	Unknown	Faith Haynes	Discharge	CLOSED
10/16/2019	12th And Robinson	Unknown	Michele Loudenback	Yard Waste	CLOSED
10/16/2019	Moore Norman Technology Center	Unknown	Michele Loudenback	Workshop	CLOSED
10/18/2019	Eufala and Webster	Unknown	Faith Haynes	Yard Waste	CLOSED
10/22/2019	818 W Symmes	Unknown	Michele Loudenback	Discharge	CLOSED
10/25/2019	unknown	Unknown	Michele Loudenback	Blitz Volunteer	CLOSED
10/28/2019	Andrews park	Unknown	Michele Loudenback	Erosion	CLOSED
10/29/2019	Macy Dr	Unknown	Carrie Evenson	Drainage	CLOSED
10/30/2019	N/A	Unknown	Michele Loudenback	Information	CLOSED
10/31/2019	24th Ave NE	Unknown	Michele Loudenback	Discharge	CLOSED

11/1/2019	Macy Dr	Unknown	Michele Loudenback	Drainage	CLOSED
11/1/2019	204 Stewart Ave	Unknown	Michele Loudenback	Drainage	CLOSED
11/6/2019	N/A	Unknown	Michele Loudenback	Information	CLOSED
11/7/2019	Gentry Estates	Unknown	Michele Loudenback	Permitting	CLOSED
11/7/2019	36th Ave NE and Sunvalley Dr.	Unknown	Michele Loudenback	Illicit Discharge	CLOSED
11/7/2019	N/A	Unknown	Unknown	Information	CLOSED
11/13/2019	McFarlin Methodist Church	Unknown	Michele Loudenback	Yard Waste	CLOSED
11/15/2019	O'Reilly	Unknown	Michele Loudenback	Illicit Discharge	CLOSED
11/19/2019	4317 Blue Sage Ct	Unknown	Michele Loudenback	Debris / Dumping	CLOSED
11/20/2019	I35 and Indian Hills	Unknown	Michele Loudenback	Erosion	CLOSED
11/20/2019	Bus Barn	Unknown	Faith Haynes	Yard Waste	CLOSED
11/20/2019	Artisan Crossing	Unknown	Michele Loudenback	Permitting	CLOSED
11/21/2019	Lakeview School	Unknown	Unknown	Illicit Discharge	CLOSED
11/22/2019	24th Ave NW	Unknown	Michele Loudenback	Erosion	CLOSED
11/26/2019	N/A	Unknown	Unknown	Rain Barrels	CLOSED
12/5/2019	1628 Chamblee	Unknown	Michele Loudenback	Discharge	CLOSED
12/10/2019	Oakridge Estates	Unknown	Michele Loudenback	Permitting	CLOSED
12/11/2019	Oakridge Estates	Unknown	Michele Loudenback	Discharge	CLOSED
12/11/2019	N/A	Unknown	Michele Loudenback	Information	CLOSED
12/12/2019	800 Chautauqua Ave.	Unknown	Michele Loudenback	Debris / Dumping	OPEN
12/12/2019	N/A	Unknown	Michele Loudenback	Rain Barrels	CLOSED
12/16/2019	N/A	Unknown	Michele Loudenback	Rain Barrels	CLOSED
12/18/2019	N/A	Unknown	Michele Loudenback	Information	CLOSED
12/20/2019	Buchanan	Unknown	Streets SW Drainage	Debris / Dumping	CLOSED
12/30/2019	12th And Robinson	Unknown	Faith Haynes	Tracking	CLOSED
12/30/2019	East Norman	Unknown	Michele Loudenback	Information	CLOSED
12/30/2019	Canadian Shores Mobile Home Park	Unknown	Michele Loudenback	Discharge	CLOSED
1/2/2020	N/A	Unknown	Michele Loudenback	Rain Barrels	CLOSED
1/2/2020	36th Ave NE and Tecumseh	Unknown	Michele Loudenback	Discharge	CLOSED

1/2/2020	207 Stanton Drive	Unknown	Michele Loudenback	Discharge	CLOSED
1/8/2020	1714 Canterbury Street	Unknown	Stuart Shumate	Discharge	CLOSED
1/13/2020	N/A	Unknown	Michele Loudenback	Rain Barrels	CLOSED
1/13/2020	3704 Quail Dr.	Unknown	Michele Loudenback	Discharge	CLOSED
1/16/2020	Main and Berry	Unknown	Michele Loudenback	Permitting	CLOSED
1/17/2020	Main and Berry	Unknown	Michele Loudenback	Permitting	CLOSED
1/24/2020	1014 Midland Valley	Unknown	Michele Loudenback	Drainage	CLOSED
1/27/2020	N/A	Unknown	Michele Loudenback	Rain Barrels	CLOSED
1/28/2020	Terra Apts	Unknown	Michele Loudenback	Debris / Dumping	CLOSED
1/28/2020	Lake Thunderbird State Park	Unknown	Michele Loudenback	Clean-up Event	CLOSED
1/29/2020	Victory Church	Unknown	Michele Loudenback	Permitting	CLOSED
2/3/2020	508 Meadow Ridge Cir	Unknown	Stuart Shumate	Discharge	OPEN
2/4/2020	4510 Northridge Rd.	Unknown	Michele Loudenback	Swimming Pool Discharge	OPEN
2/4/2020	N/A	Unknown	Michele Loudenback	Rain Barrels	CLOSED
2/7/2020	N/A	Unknown	Michele Loudenback	Rain Barrels	CLOSED
2/10/2020	2425 Queenston Ave.	Unknown	Michele Loudenback	Illicit Discharge	CLOSED
2/10/2020	1208 Barkley	Unknown	Michele Loudenback	Debris / Dumping	CLOSED
2/10/2020	Main Street	Unknown	Michele Loudenback	Information	CLOSED
2/10/2020	Acres and Porter	Unknown	Michele Loudenback	Illicit Discharge	CLOSED
2/12/2020	24th Ave NW and Legacy Trail	Unknown	Michele Loudenback	Discharge	OPEN
2/13/2020	Berry Rd and Nebraska	Unknown	Michele Loudenback	Illicit Discharge	CLOSED
3/2/2020	1616 Heron Dr.	Unknown	Michele Loudenback	Drainage	CLOSED
3/3/2020	Gray and Flood	Unknown	Michele Loudenback	Permitting	CLOSED
3/3/2020	N/A	Unknown	Unknown	Rain Barrels	CLOSED
3/4/2020	5669 Broadway Ave	Unknown	Michele Loudenback	Permitting	CLOSED
3/5/2020	Whittier	Unknown	Michele Loudenback	Drainage	CLOSED
3/5/2020	5669 Broadway Ave	Unknown	Michele Loudenback	Permitting	CLOSED
3/6/2020	1537 High Trail Rd.	Unknown	Unknown	Illicit Discharge	CLOSED

3/6/2020	East Norman	Unknown	Carrie Evenson	WQPZ	CLOSED
3/9/2020	Victory Church	Unknown	Michele Loudenback	Sediment	CLOSED
3/10/2020	36th And Tecumseh	Unknown	Michele Loudenback	Sediment	CLOSED
3/11/2020	4204 Classen Circle	Unknown	Michele Loudenback	Sewage Bypass	CLOSED
3/12/2020	Cockrill and johnson	Unknown	Michele Loudenback	Yard Waste	CLOSED
3/12/2020	N/A	Unknown	Unknown	Rain Barrels	CLOSED
3/12/2020	1505 Moreland	Unknown	Stuart Shumate	Yard Waste	CLOSED
3/16/2020	Timberdell and Jenkins	Unknown	Michele Loudenback	Permitting	CLOSED
3/18/2020	N/A	Unknown	Michele Loudenback	Information	CLOSED
3/18/2020	Hall Park	Unknown	Streets SW Drainage	Storm Drain Maintenance	CLOSED
3/18/2020	N/A	Unknown	Michele Loudenback	Rain Barrels	CLOSED
3/18/2020	Robinson and 72nd Ave NE	Unknown	Streets SW Drainage	Debris / Dumping	CLOSED
3/19/2020	10 mile flat	Unknown	Michele Loudenback	Flood Protection	CLOSED
3/19/2020	5669 Broadway Ave	Unknown	Michele Loudenback	Permitting	CLOSED
3/19/2020	12th Ave SE and Lindsey	Unknown	Michele Loudenback	Drainage	CLOSED
3/19/2020	12th Ave and Main	Unknown	Michele Loudenback	Debris / Dumping	CLOSED
3/20/2020	5669 Broadway Ave	Unknown	Michele Loudenback	Permitting	CLOSED
3/20/2020	725 East Rich	Unknown	Michele Loudenback	Drainage	CLOSED
3/23/2020	223 McCullough	Unknown	Michele Loudenback	Sediment	CLOSED
3/26/2020	400 S. Berry Rd	Unknown	Michele Loudenback	Yard Waste	CLOSED
3/30/2020	N/A	Unknown	Michele Loudenback	Information	CLOSED
3/30/2020	Berry and Nebraska	Unknown	Michele Loudenback	Yard Waste	CLOSED
3/31/2020	723 Painted Forest Rd.	Unknown	Michele Loudenback	Discharge	CLOSED
4/1/2020	N/A	Unknown	Unknown	Rain Barrels	CLOSED
4/1/2020	N/A	Unknown	Unknown	Rain Barrels	CLOSED
4/7/2020	Lindsey and Pickard	Unknown	Michele Loudenback	Sediment	CLOSED
4/8/2020	College and symmes	Unknown	Michele Loudenback	Yard Waste	CLOSED
4/9/2020	1628 Chamblee	Unknown	Michele Loudenback	Discharge	CLOSED
4/9/2020	N/A	Unknown	Unknown	Rain Barrels	CLOSED

4/14/2020	N/A	Unknown	Unknown	Rain Barrels	CLOSED
4/15/2020	Sprouts	Unknown	Michele Loudenback	Yard Waste	CLOSED
4/15/2020	Lahoma and Brooks	Unknown	Michele Loudenback	Yard Waste	CLOSED
4/16/2020	N/A	Unknown	Michele Loudenback	Permitting	CLOSED
4/20/2020	University and Symmes	Unknown	Michele Loudenback	Yard Waste	CLOSED
4/21/2020	24th Ave NW and Robinson	Unknown	Unknown	Yard Waste	CLOSED
4/21/2020	Ashton Grove	Unknown	Unknown	Discharge	CLOSED
4/21/2020	2401 Butler Dr.	Unknown	Unknown	Yard Waste	CLOSED
4/21/2020	2401 Butler Dr.	Unknown	Michele Loudenback	Yard Waste	CLOSED
4/23/2020	4317 Blue Sage Ct	Unknown	Michele Loudenback	Discharge	CLOSED
4/23/2020	1020 N. Proter	Unknown	Michele Loudenback	Sewage Bypass	CLOSED
4/27/2020	1505 Cadill Lane	Unknown	Unknown	Yard Waste	CLOSED
4/27/2020	N/A	Unknown	Unknown	Rain Barrels	CLOSED
4/28/2020	529 Laws	Unknown	Michele Loudenback	Swimming Pool Discharge	CLOSED
4/30/2020	24th Ave NE	Unknown	Unknown	Sediment	CLOSED
5/4/2020	1924 Dondore Drive	Unknown	Michele Loudenback	Discharge	CLOSED
5/4/2020	Windstone	Unknown	Unknown	Discharge	CLOSED
5/4/2020	Tecumseh and 12th	Unknown	Unknown	Permitting	CLOSED
5/6/2020	24th Ave NW and Main	Unknown	Unknown	Yard Waste	CLOSED
5/6/2020	3813 Montelena Cir	Unknown	Unknown	Swimming Pool Discharge	CLOSED
5/7/2020	Porter and Boyd	Unknown	Unknown	Yard Waste	CLOSED
5/8/2020	1924 Dondore Drive	Unknown	Unknown	<Unknown>	CLOSED
5/11/2020	404 Dayflower	Unknown	Unknown	Drainage	CLOSED
5/11/2020	Robinson and 24th ave nw	Unknown	Unknown	Yard Waste	CLOSED
5/11/2020	1924 Dondore Drive	Unknown	Unknown	Discharge	CLOSED
5/11/2020	Irving Middle School	Unknown	Michele Loudenback	<Unknown>	CLOSED
5/12/2020	2100 Oakridge	Unknown	Michele Loudenback	Property Maintenance	CLOSED
5/12/2020	N/A	Unknown	Unknown	Rain Barrels	CLOSED
5/14/2020	24th Ave NW and Rdaius Way	Unknown	Unknown	Drainage	CLOSED
5/15/2020	120th and Lindsey	Unknown	Unknown	Discharge	CLOSED
5/18/2020	N/A	Unknown	Carrie Evenson	Rain Barrels	CLOSED
5/20/2020	N/A	Unknown	Unknown	Rain Barrels	CLOSED
5/26/2020	N/A	Unknown	Michele Loudenback	Rain Barrels	CLOSED

5/26/2020	Sprouts	Unknown	Unknown	Sewage Bypass	CLOSED
6/1/2020	N/A	Unknown	Unknown	Rain Barrels	CLOSED
6/5/2020	48th Ave NW and Tecumseh	Unknown	Unknown	Discharge	CLOSED
6/8/2020	Ed Noble PArkway	Unknown	Unknown	Yard Waste	CLOSED
6/10/2020	Brookhaven	Unknown	Unknown	Swimming Pool Discharge	CLOSED
6/12/2020	12th Ave NE and Robinson	Unknown	Unknown	Sewage Bypass	CLOSED
6/15/2020	Varenna Landing	Unknown	Unknown	<Unknown>	CLOSED
6/15/2020	Colonial Estates Park	Unknown	Unknown	Fish Kill	CLOSED
6/16/2020	36th Ave NW and Rock Creek	Unknown	Unknown	Fertilizer	CLOSED
6/16/2020	Lowes Home Improvement	Unknown	Unknown	Yard Waste	CLOSED
6/16/2020	N/A	Unknown	Unknown	Rain Barrels	CLOSED
6/17/2020	Varenna Landing	Unknown	Unknown	Dust	CLOSED
6/17/2020	N/A	Unknown	Unknown	Permitting	CLOSED
6/18/2020	N/A	Unknown	Unknown	Information	CLOSED
6/18/2020	1522 Elk Circle	Unknown	Unknown	Illicit Discharge	CLOSED
6/19/2020	24th ve SE and Lindsey	Unknown	Unknown	Yard Waste	CLOSED
6/22/2020	N/A	Unknown	Unknown	Rain Barrels	CLOSED
6/23/2020	36th Ave NW and Robinson	Unknown	Unknown	Swimming Pool Discharge	CLOSED
6/23/2020	72nd & Cedar Lane	Unknown	Unknown	Illicit Discharge	CLOSED
6/24/2020	Brookhaven	Unknown	Unknown	Swimming Pool Discharge	CLOSED
6/24/2020	Constitution and 12th Ave SE	Unknown	Unknown	Sediment	CLOSED
6/25/2020	Lamp Post and Salem Court	Unknown	Unknown	Sediment	CLOSED
6/26/2020	Ed Noble PArkway	Unknown	Unknown	Yard Waste	CLOSED
6/29/2020	48th Ave NW & Indian Hills	Unknown	Unknown	Sediment	CLOSED

Appendix C

Lake Thunderbird TMDL Monitoring Reports

July 2019 to June 2020

Lake Thunderbird TMDL Monitoring Plan Implementation: Sample Year (SY) 2019- July Report

SY2019 Monthly Report

Lake Thunderbird TMDL Monitoring Plan Implementation:

July 2019 Monitoring Report

Oklahoma Water Resources Board
Water Quality Programs Division
Monitoring and Assessment Section
3800 N. Classen, Oklahoma City, Oklahoma 73118
405-530-8800

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SUMMARY OF JULY WATER QUALITY SAMPLING

Sampling for July 2019 occurred on the twenty-ninth of July and was considered a base flow collection. Water samples were collected at nine locations, with the exception of LT-1 as a result of pool conditions. Discharge measurements were not collected due to low water levels. Mesonet data shows 0.02 inches of precipitation occurring on the twenty-ninth, and no precipitation in the 72 hours prior to sampling, or in the 72 hours after the sampling event. The total rainfall amount in Norman for the month of July was 0.17 inches. All water level gauges were operational for the month, with the exception of LT-1 due to equipment malfunction.

RESULTS

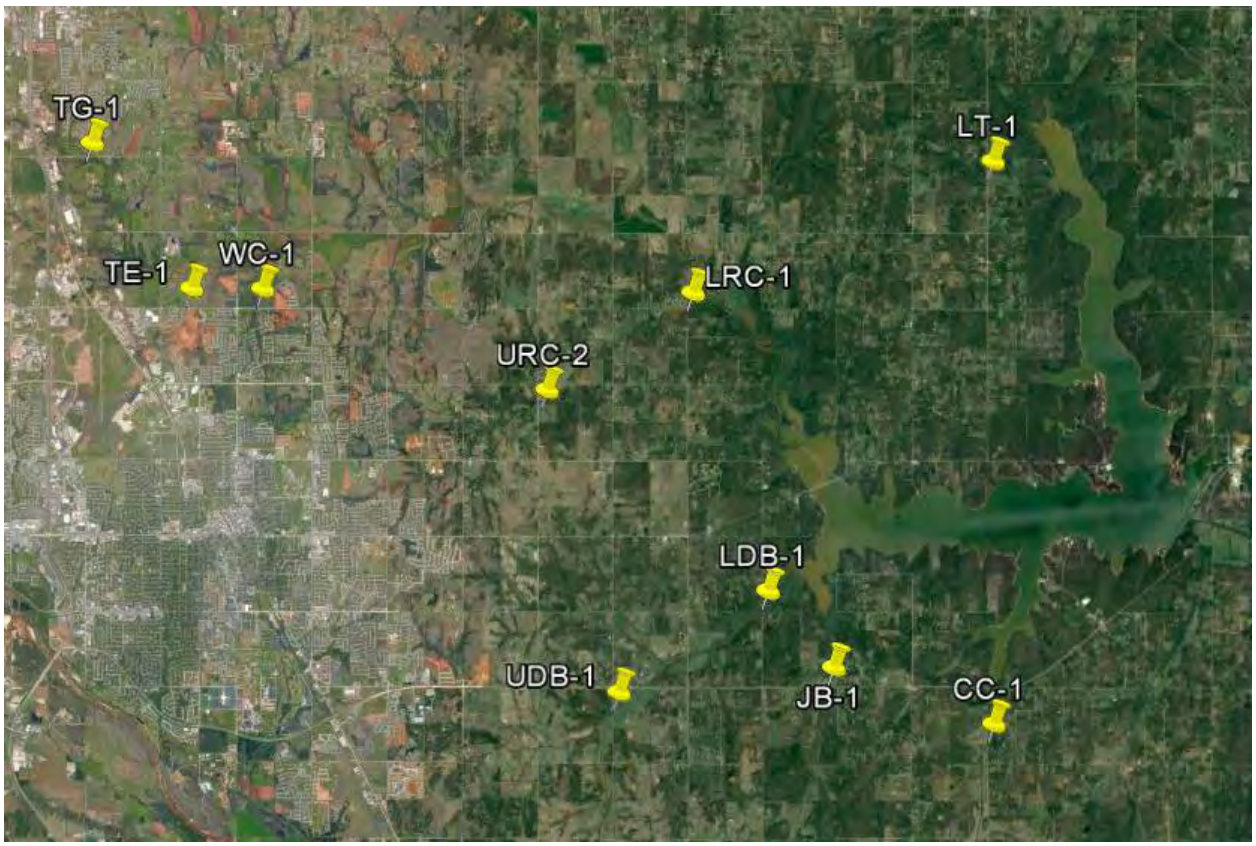

Figure 1 Monitoring Station Map

Monitoring Location ID	Monitoring Location Name	Date	Time	Field Crew	Water Temperature (°C)	Dissolved Oxygen (DO) (mg/l)	pH	Specific Conductance (mS/cm)	Turbidity (NTU)	Notes
CC-1	Clear Creek	07-29-2019	9:50	SD	24.39	9.52	8.14	627	4	Orifice buried, changed dcp. Low stream stage/high filamentous algae, so no flow taken
JB-1	Jim Blue Creek	07-29-2019	10:45	SD	24.50	2.56	7.78	962	11	
LDB-1	Lower Dave Blue Creek	07-29-2019	11:10	SD	25.74	4.81	8.09	947	27	
LRC-1	Lower Rock Creek	07-29-2019	12:05	SD	24.56	4.68	8.09	802	8	Orifice not buried. Changed dcp
LT-1	Lake Laterals	07-29-2019	11:35	SD	N/A	N/A	N/A	N/A	N/A	Did not sample. Small isolated pool on ds and us
TE-1	Little River Tributary	07-29-2019	14:10	SD	25.49	1.81	8.05	1202	5	
TG-1	Little River Tributary	07-29-2019	14:45	SD	28.28	8.82	8.14	1251	5	
UDB-1	Upper Dave Blue Creek	07-29-2019	9:05	SD	23.70	4.95	7.81	974	6	Changed dcp
URC-2	Upper Rock Creek	07-29-2019	12:45	SD	25.33	5.73	7.62	932	8	Changed dcp
WC-1	Woodcrest Creek	07-29-2019	13:40	SD	26.32	7.65	7.56	1110	7	Orifice buried, changed dcp

Table 1 Field Data Form

Monitoring Location ID	Monitoring Location Name	Nitrate and Nitrite (mg/l)	Kjeldahl Nitrogen (mg/l)	Phosphorus (mg/l)	Total Suspended Solids (mg/l)
CC-1	Clear Creek	0.06	0.19	0.024	<5.0
JB-1	Jim Blue Creek	0.05	0.97	0.163	6
LDB-1	Lower Dave Blue Creek	0.08	0.68	0.073	12
LRC-1	Lower Rock Creek	<0.05	0.26	0.035	<5.0
LT-1	Lake Laterals	N/A	N/A	N/A	N/A
TE-1	Little River Tributary	<0.05	0.49	0.031	<5.0
TG-1	Little River Tributary	<0.05	0.43	0.040	<5.0
UDB-1	Upper Dave Blue Creek	0.10	0.23	0.028	<5.0
URC-2	Upper Rock Creek	<0.05	0.34	0.045	<5.0
WC-1	Woodcrest Creek	<0.05	0.16	0.026	<5.0

Table 2 Laboratory Analysis Summary

Monitoring Location Name	Nitrate and Nitrite (mg/l)	Kjeldahl Nitrogen (mg/l)	Phosphorus (mg/l)	Total Suspended Solids (mg/l)
Field Blank	<0.05	<0.10	<0.010	<5.0
Duplicate	0.06	0.18	0.024	<5.0
Duplicate RPD	0%	5.41%	0%	0%

Table 3 QA/QC Data

Quality assurance/quality control (QA/QC) of the data includes a field blank and duplicate sample from each collection event, and is qualified by the OWRB. Relative Percent Difference (RPD) of the duplicate sample can be categorized into four levels, where Level 1 likely has no QA issues and Level 4 has major QA issues, and should be used with caution.

Monitoring Location ID	Monitoring Location Name	Discharge (cfs)	Stream Stage (ft)
CC-1	Clear Creek	0.90	20.47
JB-1	Jim Blue Creek	0.54	15.95
LDB-1	Lower Dave Blue Creek	2.65	16.14
LRC-1	Lower Rock Creek	9.58	18.23
LT-1	Lake Laterals	N/A	N/A
TE-1	Little River Tributary	6.75	12.36
TG-1	Little River Tributary	1.08	9.20
UDB-1	Upper Dave Blue Creek	0.06	17.22
URC-2	Upper Rock Creek	0.02	11.79
WC-1	Woodcrest Creek	0.02	7.75

Table 4 Station Discharge Summary

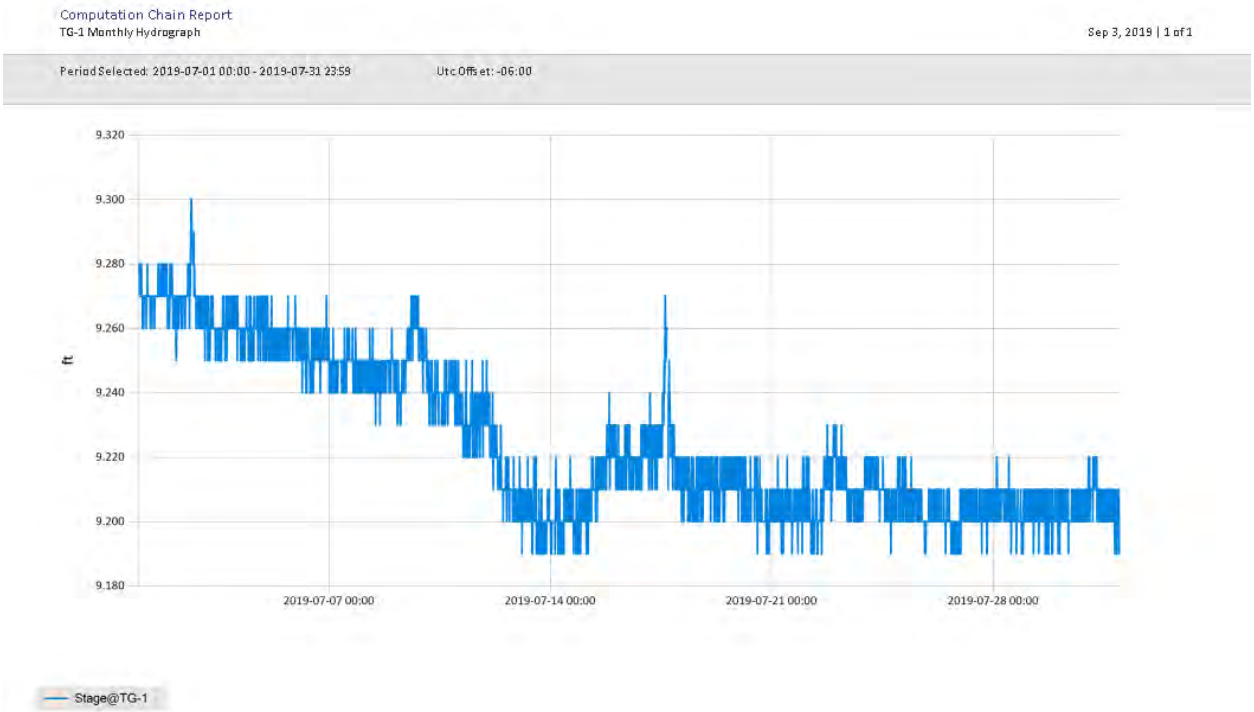

Figure 2 Monthly Hydrograph TG-1

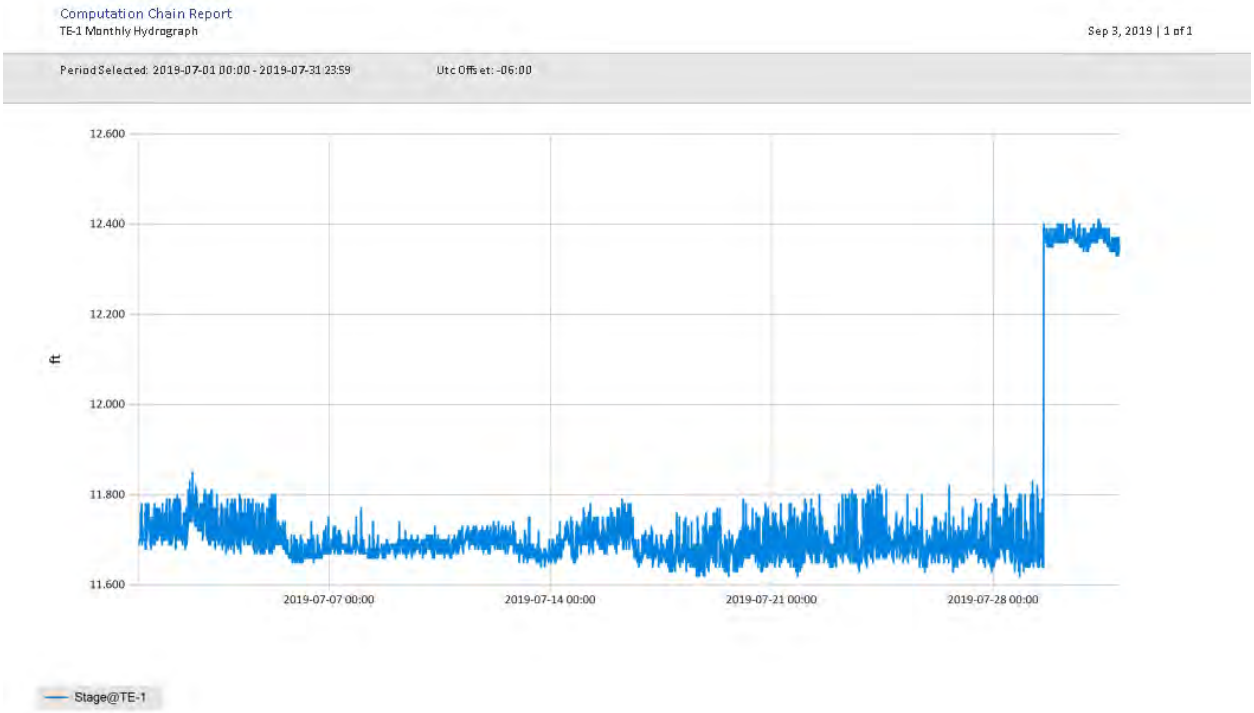

Figure 3 Monthly Hydrograph TE-1

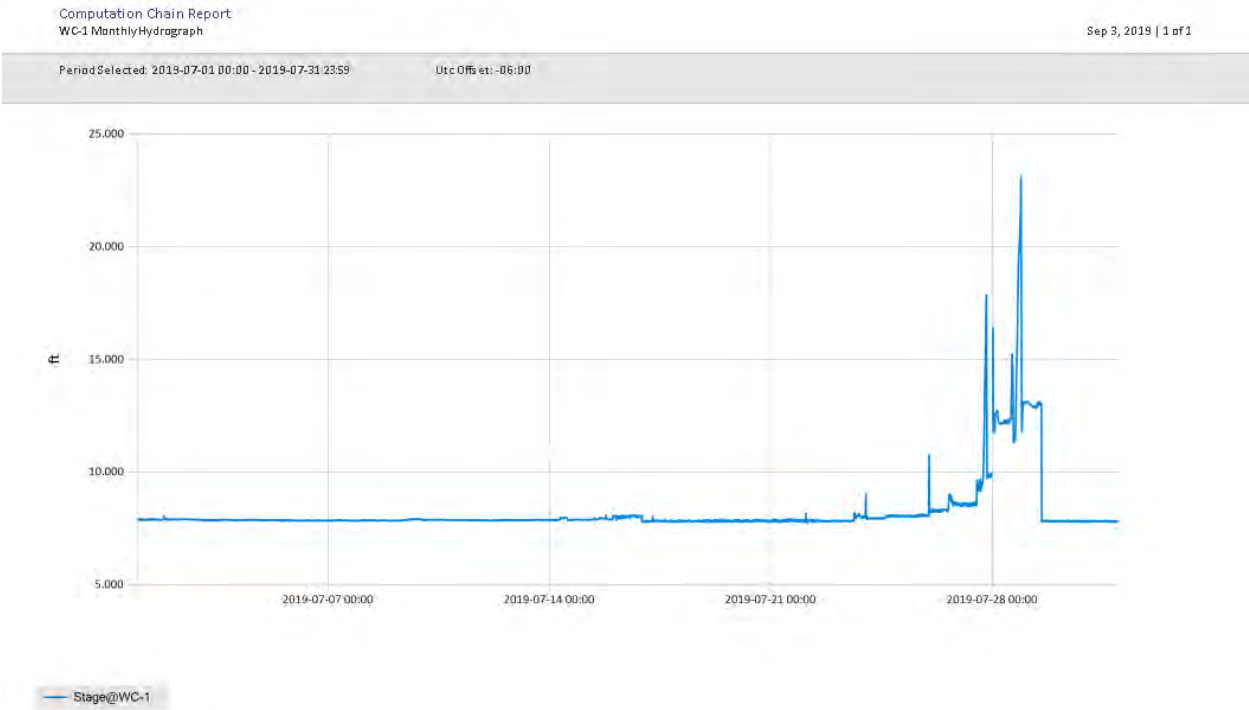

Figure 4 Monthly Hydrograph WC-1

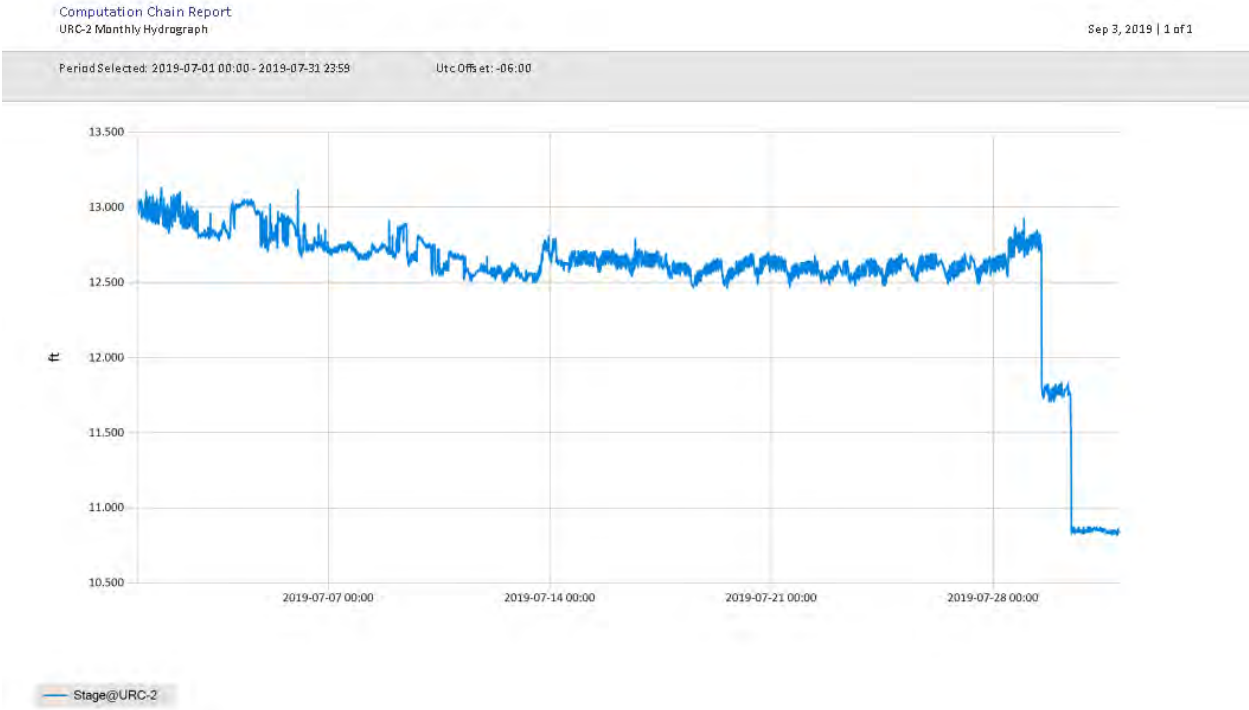

Figure 5 Monthly Hydrograph URC-2

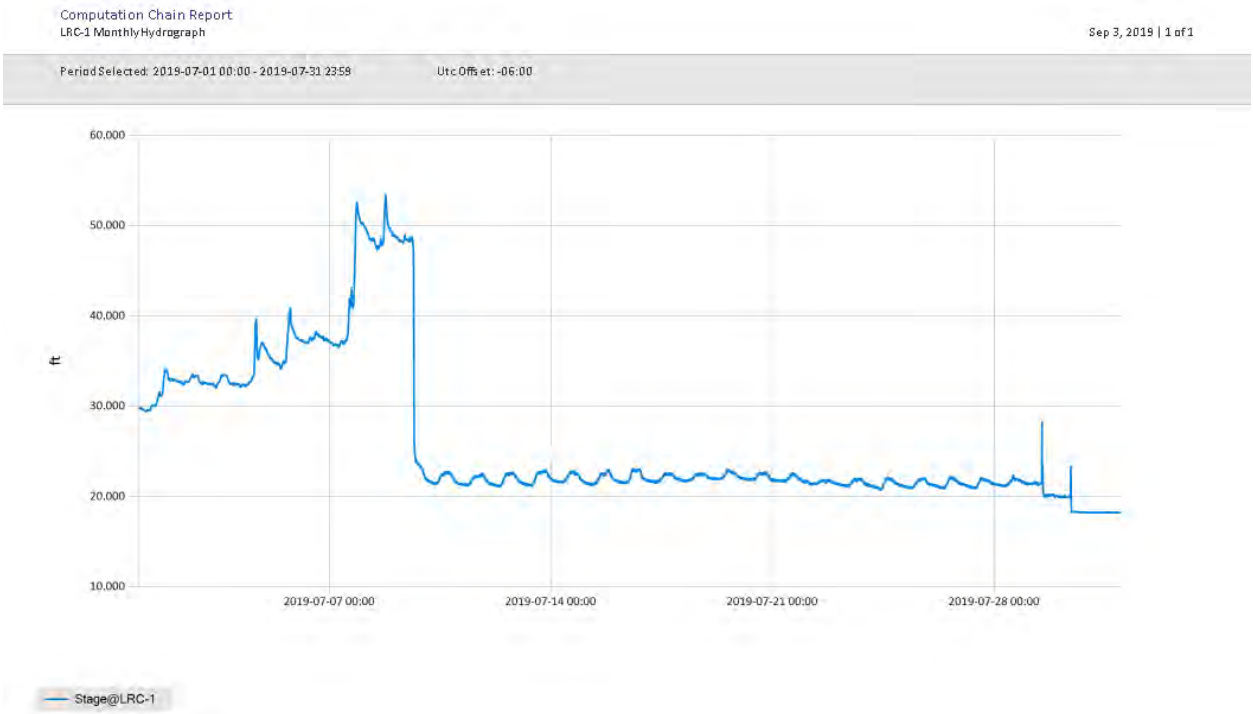

Figure 6 Monthly Hydrograph LRC-1

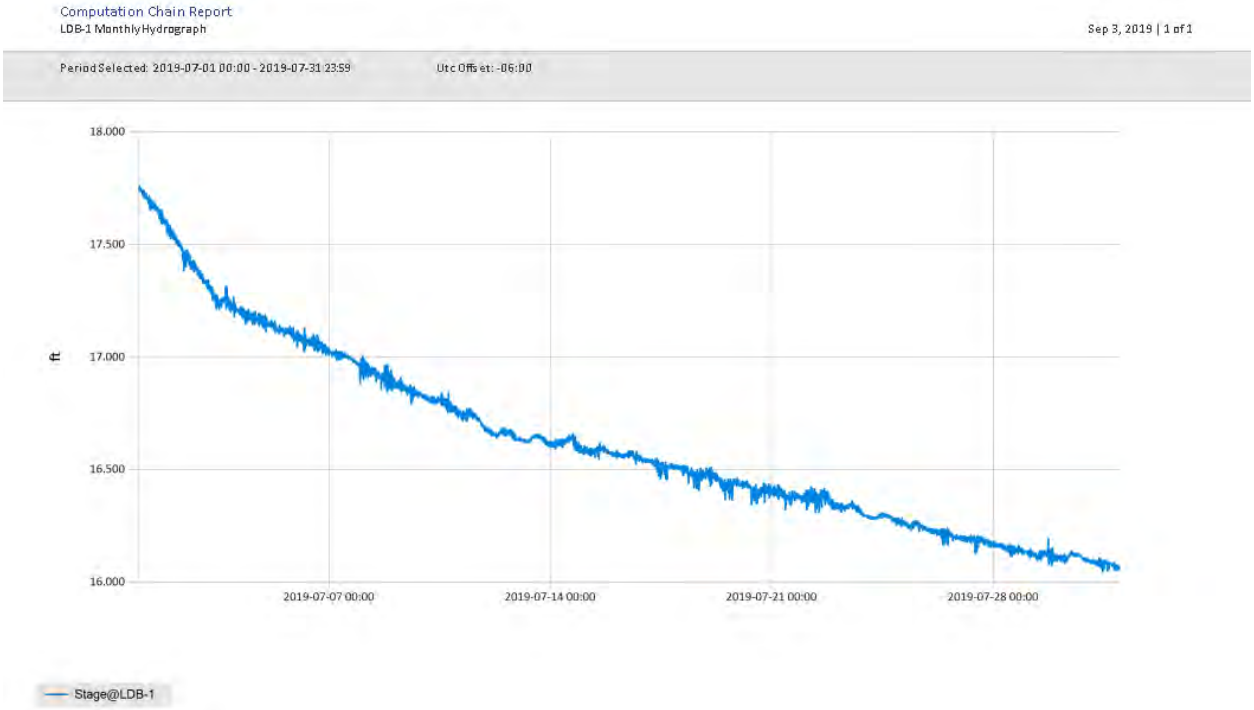

Figure 7 Monthly Hydrograph LDB-1

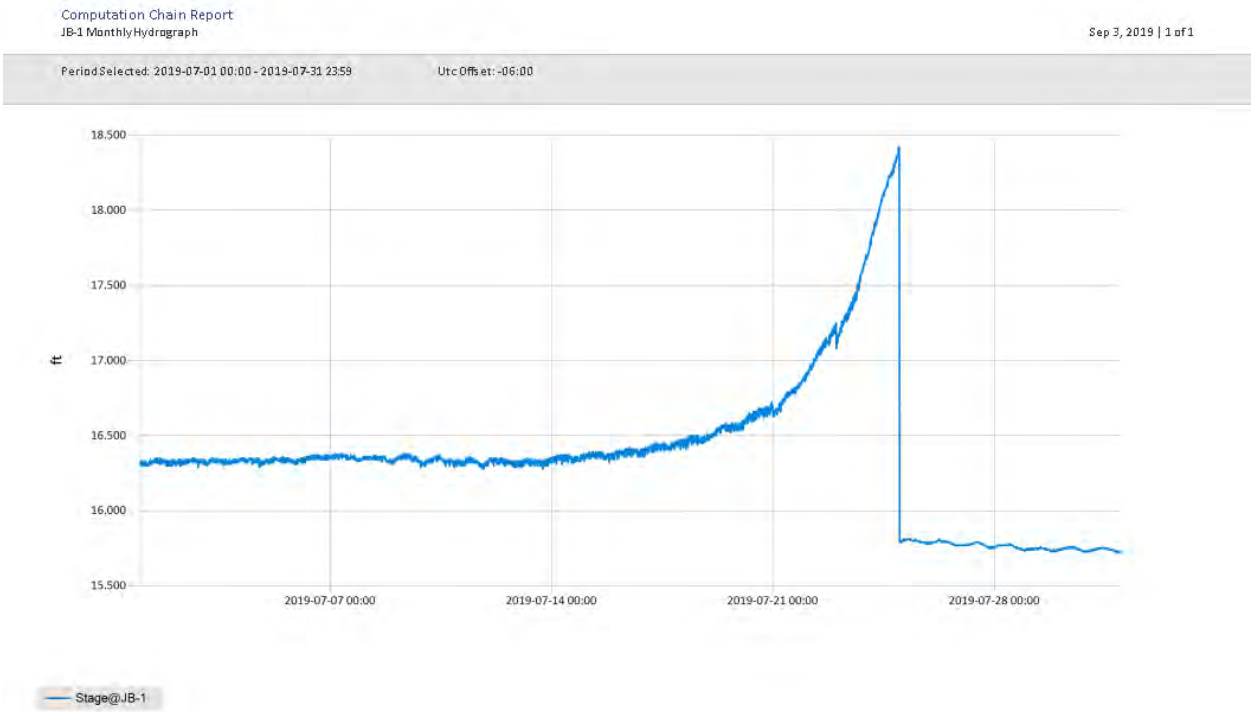

Figure 8 Monthly Hydrograph JB-1

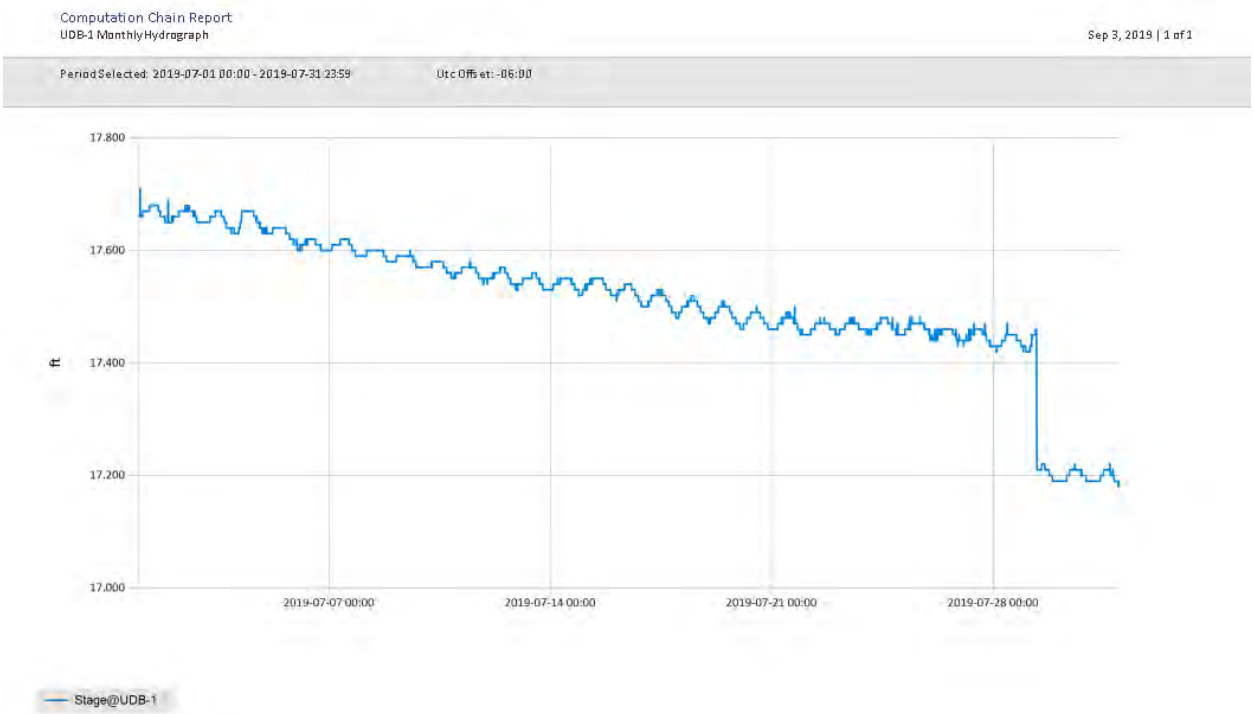

Figure 9 Monthly Hydrograph UDB-1

MESONET CLIMATOLOGICAL DATA SUMMARY — July 2019 — Time Zone: Midnight-Midnight CST

(NRMN) Norman — Nearest City: 2.1 NW Norman — County: Cleveland

Latitude: 35-14-09 — Longitude: 97-27-53 — Elevation: 1171 feet

DAY	TEMPERATURE (°F) MAX	MIN	AVG	DEWPT	DEG DAYS HDD	CDD	HUMIDITY (%) MAX	MIN	AVG	RAIN (in)	PRESSURE (in) STN	MSL	WIND SPEED (mph) DIR	AVG	MAX	SOLAR (MJ/m²)	4" SOIL TEMPERATURES SOD	BARE	MAX	MIN
1	88	70	79.2	69.0	0	14	93	53	72	0.00	28.76	30.01	SSE	7.2	18.9	27.51	80.9	86.3	93	80
2	91	73	80.8	70.6	0	17	94	51	73	0.15	28.68	29.93	S	8.6	21.0	26.00	80.7	85.5	91	81
3	89	72	79.7	71.2	0	16	91	57	76	0.00	28.65	29.89	S	8.6	23.7	23.78	80.4	85.5	92	80
4	90	73	81.5	72.4	0	17	91	57	75	0.00	28.67	29.91	SSE	9.3	21.6	23.15	80.4	85.7	91	81
5	90	75	82.2	73.3	0	17	89	58	75	0.00	28.77	30.02	SSE	8.5	21.0	23.93	80.9	86.9	92	82
6	88	69	79.0	70.7	0	14	94	57	77	0.00	28.83	30.08	NW	5.1	24.6	19.47	80.9	86.7	91	82
7	91	70	81.3	70.8	0	16	99	51	73	0.00	28.76	30.01	ESE	4.3	24.8	22.42	80.9	87.0	93	81
8	91	72	80.2	70.7	0	16	94	49	74	0.00	28.69	29.93	S	6.1	24.5	22.83	80.8	87.6	93	83
9	94	73	83.9	73.2	0	19	91	55	72	0.00	28.66	29.90	SSE	8.2	21.9	26.55	81.1	88.2	95	82
10	95	76	85.0	74.6	0	21	90	50	72	0.00	28.76	30.01	SSE	7.2	18.5	26.84	83.2	90.4	97	84
11	89*	69*	80.4*	67.0*	0*	14*	94*	41*	66*	0.00*	28.79*	30.04*	NE *	6.7*	20.4*	NA	82.7*	90.3*	96*	85*
12	88	65	77.9	63.6	0	11	96	41	64	0.00	28.72	29.96	E	5.0	19.9	29.69	80.8	88.6	95	82
13	90	66	79.5	65.6	0	13	97	41	66	0.00	28.73	29.98	ENE	5.3	22.5	29.52	80.6	88.6	95	82
14	88	71	79.7	70.3	0	15	94	54	74	0.00	28.74	29.98	ENE	7.3	21.1	22.70	81.4	88.5	93	84
15	91	68	79.9	68.8	0	15	97	45	71	0.00	28.68	29.92	N	5.3	19.7	25.38	80.8	87.9	94	82
16	100	70	86.0	70.7	0	20	95	36	64	0.00	28.67	29.92	S	5.5	17.9	27.00	81.9	89.8	97	83
17	96	77	86.7	71.2	0	22	79	44	61	0.00	28.70	29.94	S	10.0	24.3	27.11	82.4	91.2	96	86
18	96	78	86.1	70.2	0	22	81	43	61	0.00	28.66	29.90	S	11.7	28.0	28.37	81.9	90.6	96	86
19	97	77	86.5	69.2	0	22	80	36	58	0.00	28.65	29.89	S	11.7	27.3	28.67	82.0	90.5	96	85
20	97	77	86.1	68.9	0	22	82	37	59	0.00	28.64	29.88	S	10.7	27.1	28.53	82.2	90.5	96	85
21	99	75	86.8	68.2	0	22	85	33	57	0.00	28.67	29.91	SSW	9.2	25.4	27.96	82.6	90.5	96	85
22	87	70	78.6	65.7	0	14	96	37	67	0.00	28.84	30.09	NNE	11.6	25.9	19.27	82.2	88.3	92	85
23	85	64	74.8	57.5	0	10	79	36	57	0.00	28.94	30.19	NNE	7.7	22.4	28.57	80.7	85.9	92	80
24	87	57	74.4	56.7	0	7	97	33	58	0.00	28.90	30.16	E	4.6	17.0	28.83	79.8	85.7	93	78
25	87	65	76.7	56.5	0	11	80	32	52	0.00	28.88	30.13	SSE	7.5	33.5	28.34	79.5	86.1	92	80
26	88	64	76.5	57.4	0	11	74	31	53	0.00	28.90	30.15	SSE	6.9	16.6	26.23	79.4	85.7	92	80
27	91	68	79.8	60.8	0	15	78	34	55	0.00	28.89	30.14	SSE	7.6	20.2	26.81	80.1	86.0	92	80
28	95	72	83.8	64.8	0	19	79	35	55	0.00	28.77	30.02	SSE	9.4	24.3	25.90	81.1	87.2	93	82
29	98	75	84.3	70.3	0	21	91	37	65	0.02	28.71	29.96	S	7.3	21.2	24.71	83.2	88.8	95	84
30	96	72	83.9	70.2	0	19	97	39	67	0.00	28.78	30.03	ESE	5.6	16.8	27.12	84.4	89.6	96	83
31	98	73	85.9	68.3	0	20	83	36	58	0.00	28.78	30.02	SSE	8.0	21.9	27.15	84.7	90.3	96	85
	92*	71*	81.5*	67.7*	<- Monthly Averages ->						28.75*	30.00*	SSE*	7.7*	33.5*	26.01*	81.4*	88.1*	94*	82*

Temperature - Highest: 100*
Lowest: 57*

Degree Days - Total HDD: 0*
Total CDD: 509*

Rainfall: Monthly Total: 0.17* in.
Greatest 24 Hr: 0.15* in.

Humidity - Highest: 99*
Lowest: 31*

Number of Days With:
Tmax ≥ 90: 20*
Tmax ≤ 32: 0*
Tmin ≤ 32: 0*
Tmin ≤ 0: 0*
Rainfall ≥ 0.01 inch: 2*
Rainfall ≥ 0.10 inch: 1*
Avg Wind Speed ≥ 10 mph: 5*
Max Wind Speed ≥ 30 mph: 1*

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* Denotes incomplete record

Figure 10 July Mesonet Data

Lake Thunderbird TMDL Monitoring Plan Implementation: Sample Year (SY) 2019- August Report

SY2019 Monthly Report

Lake Thunderbird TMDL Monitoring Plan Implementation:

August 2019 Monitoring Report

Oklahoma Water Resources Board
Water Quality Programs Division
Monitoring and Assessment Section
3800 N. Classen, Oklahoma City, Oklahoma 73118
405-530-8800

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SUMMARY OF AUGUST WATER QUALITY SAMPLING

Sampling for August 2019 occurred on the twenty-sixth and was considered a base flow collection. Water samples were collected at nine locations, with the exclusion of LT-1 as a result of dry conditions. Discharge measurements were not collected due to average base flow water levels. Mesonet data shows 1.28 inches of precipitation occurring on the twenty-sixth, 2.71 inches of precipitation in the 72 hours prior to sampling, and 0.05 inches of precipitation in the 72 hours after the sampling event. The total rainfall amount in Norman for the month of August was 6.29 inches. All water level gauges were operational for the month, with the exception of LT-1 due to equipment malfunction.

RESULTS

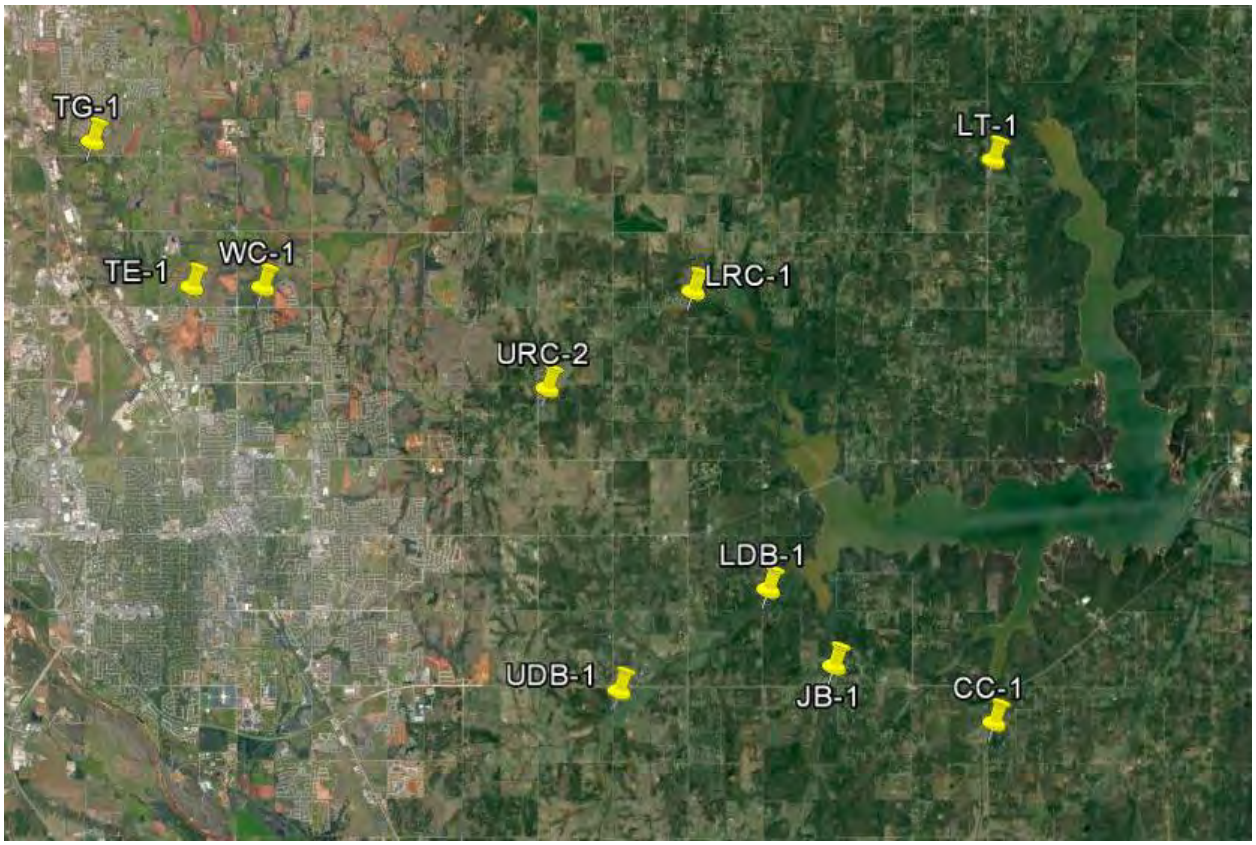

Figure 1 Monitoring Station Map

Monitoring Location ID	Monitoring Location Name	Date	Time	Field Crew	Water Temperature (°C)	Dissolved Oxygen (DO) (mg/l)	pH	Specific Conductance (mS/cm)	Turbidity (NTU)	Notes
CC-1	Clear Creek	08-26-2019	11:45	JW	28.2	8.96	8.20	648	7	
JB-1	Jim Blue Creek	08-26-2019	12:35	JW	26.9	4.38	7.62	614	29	
LDB-1	Lower Dave Blue Creek	08-26-2019	13:30	JW	26.0	1.58	7.85	428	55	
LRC-1	Lower Rock Creek	08-27-2019	11:40	JW	24.2	6.77	7.80	295	373	
LT-1	Lake Laterals	08-26-2019	15:00	JW	N/A	N/A	N/A	N/A	N/A	Completely dry
TE-1	Little River Tributary	08-27-2019	14:00	JW	24.3	6.83	7.87	270	91	
TG-1	Little River Tributary	08-27-2019	14:50	JW	25.2	7.18	8.07	358	153	
UDB-1	Upper Dave Blue Creek	08-26-2019	10:35	JW	24.5	4.69	7.64	440	35	
URC-2	Upper Rock Creek	08-27-2019	12:20	JW	24.1	6.09	7.88	258	310	
WC-1	Woodcrest Creek	08-27-2019	13:00	JW	24.9	7.66	8.26	242	46	

Table 1 Field Data Form

Monitoring Location ID	Monitoring Location Name	Nitrate and Nitrite (mg/l)	Kjeldahl Nitrogen (mg/l)	Phosphorus (mg/l)	Total Suspended Solids (mg/l)
CC-1	Clear Creek	0.18	0.40	0.089	6
JB-1	Jim Blue Creek	<0.05	2.39	0.314	20
LDB-1	Lower Dave Blue Creek	0.15	0.84	0.122	48
LRC-1	Lower Rock Creek	0.40	1.75	0.231	200
LT-1	Lake Laterals	N/A	N/A	N/A	N/A
TE-1	Little River Tributary	0.77	1.28	0.165	46
TG-1	Little River Tributary	0.30	1.09	0.188	38
UDB-1	Upper Dave Blue Creek	0.20	0.64	0.086	24
URC-2	Upper Rock Creek	0.52	1.58	0.230	112
WC-1	Woodcrest Creek	0.27	2.30	0.342	82

Table 2 Laboratory Analysis Summary

Monitoring Location Name	Nitrate and Nitrite (mg/l)	Kjeldahl Nitrogen (mg/l)	Phosphorus (mg/l)	Total Suspended Solids (mg/l)
Field Blank	<0.05	<0.10	<0.010	<5.0
Duplicate	0.18	0.42	0.090	6
Duplicate RPD	0%	4.88%	1.12%	0%

Table 3 QA/QC Data

Quality assurance/quality control (QA/QC) of the data includes a field blank and duplicate sample from each collection event, and is qualified by the OWRB. Relative Percent Difference (RPD) of the duplicate sample can be categorized into four levels, where Level 1 likely has no QA issues and Level 4 has major QA issues, and should be used with caution.

Monitoring Location ID	Monitoring Location Name	Discharge (cfs)	Stream Stage (ft)
CC-1	Clear Creek	0.88	20.42
JB-1	Jim Blue Creek	0.06	15.74
LDB-1	Lower Dave Blue Creek	1.91	15.89
LRC-1	Lower Rock Creek	19.63	18.73
LT-1	Lake Laterals	N/A	N/A
TE-1	Little River Tributary	0.49	11.79
TG-1	Little River Tributary	9.16	9.57
UDB-1	Upper Dave Blue Creek	0.12	17.4
URC-2	Upper Rock Creek	0.52	11.83
WC-1	Woodcrest Creek	0.13	8.31

Table 4 Station Discharge Summary

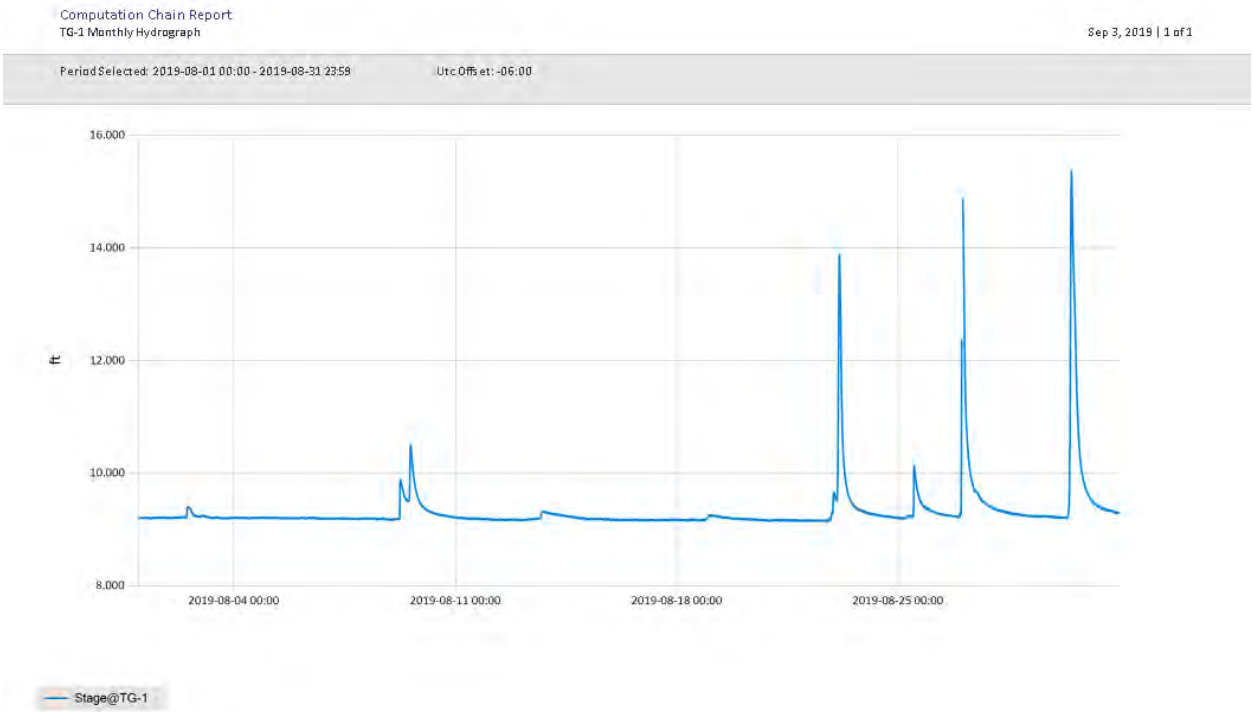

Figure 2 Monthly Hydrograph TG-1

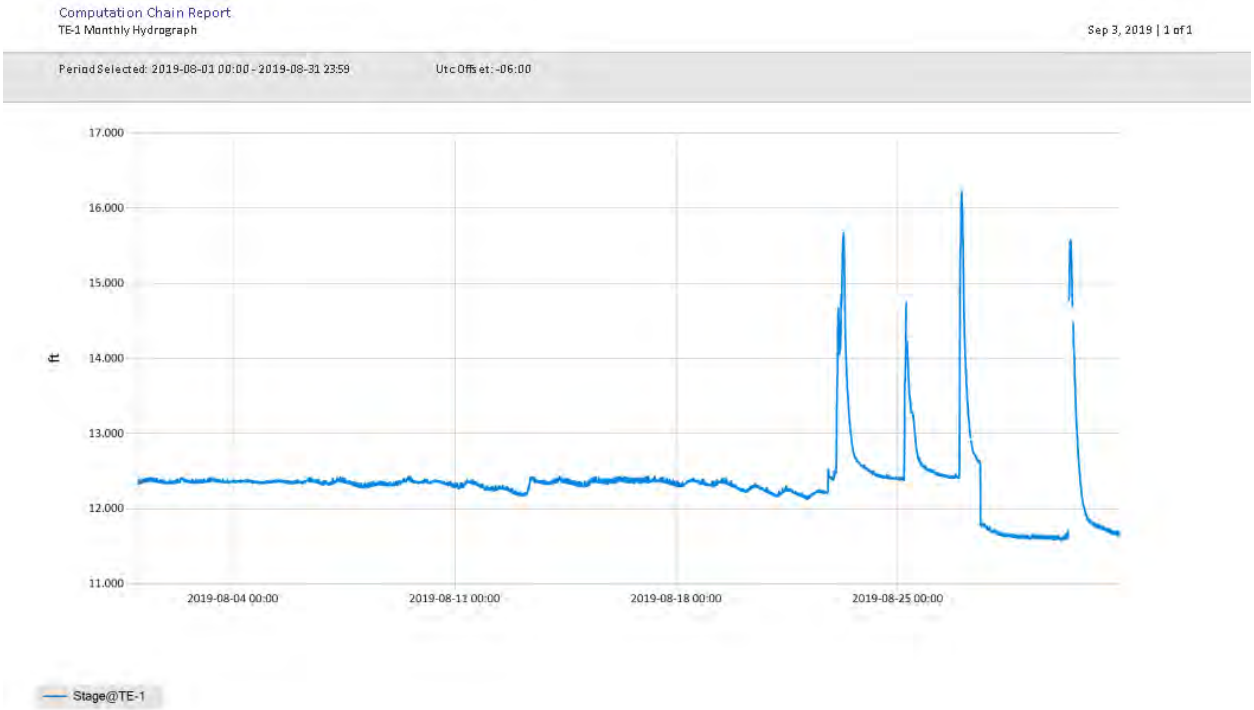

Figure 3 Monthly Hydrograph TE-1

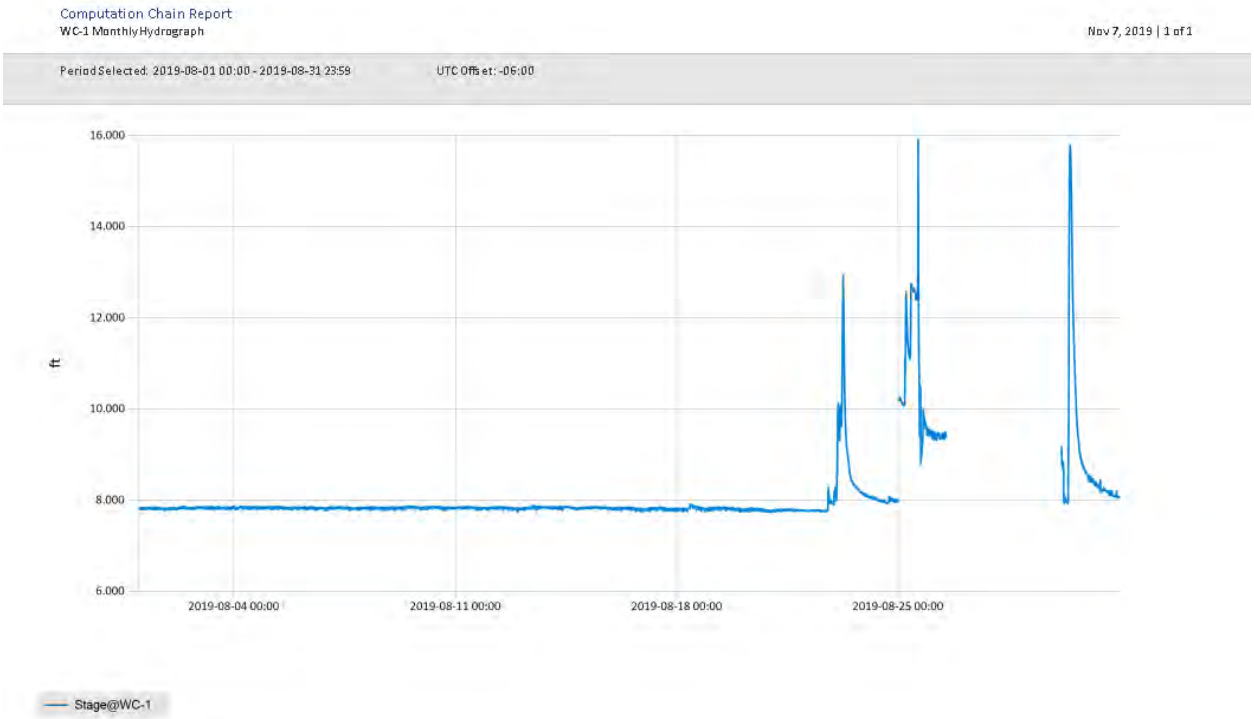

Figure 4 Monthly Hydrograph WC-1

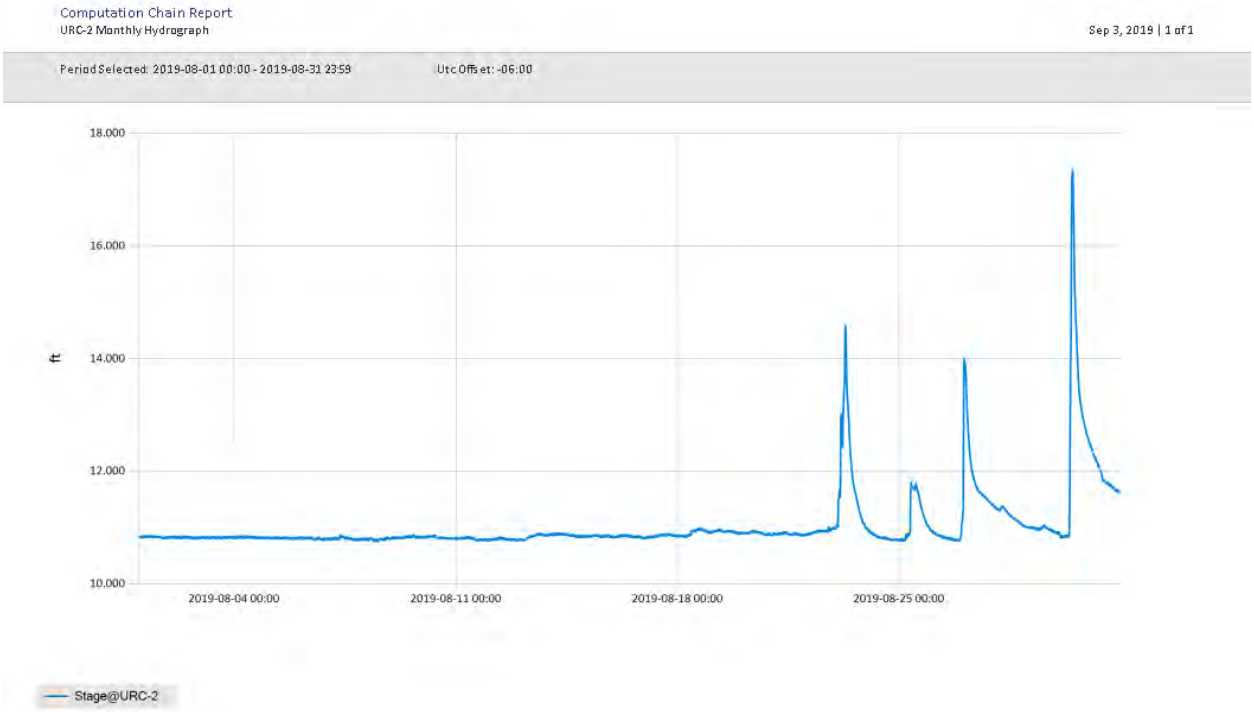

Figure 5 Monthly Hydrograph URC-2

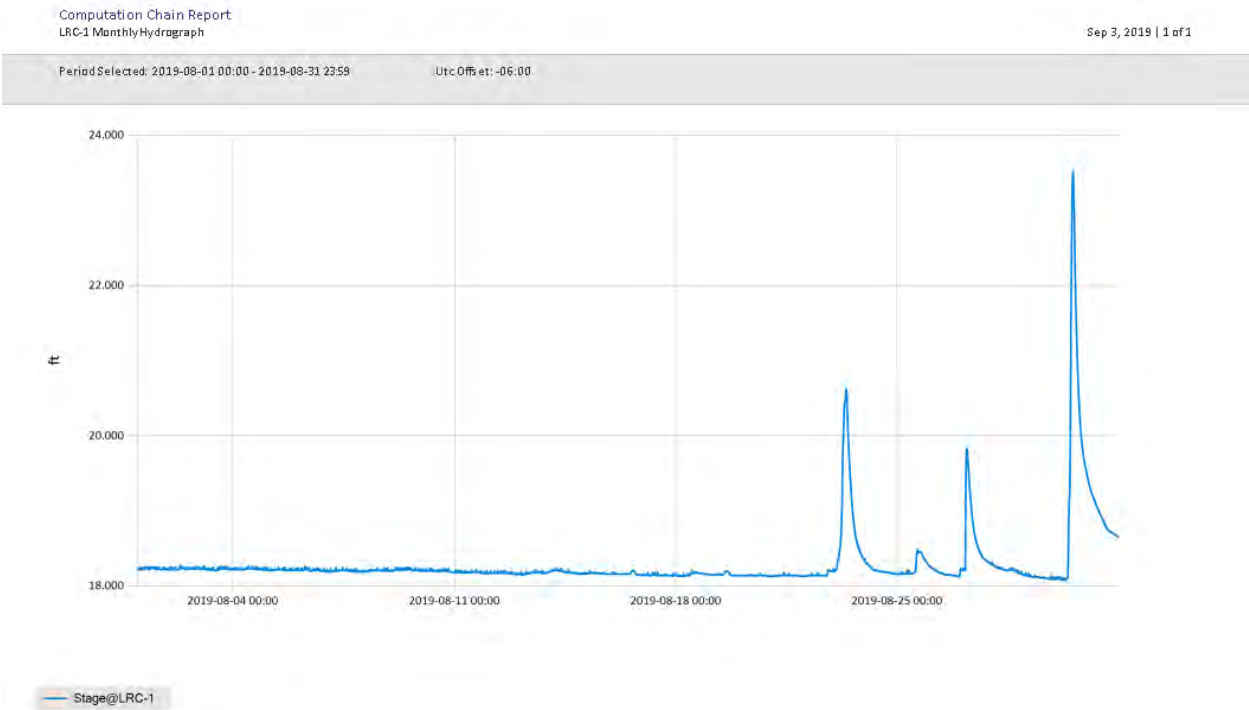

Figure 6 Monthly Hydrograph LRC-1

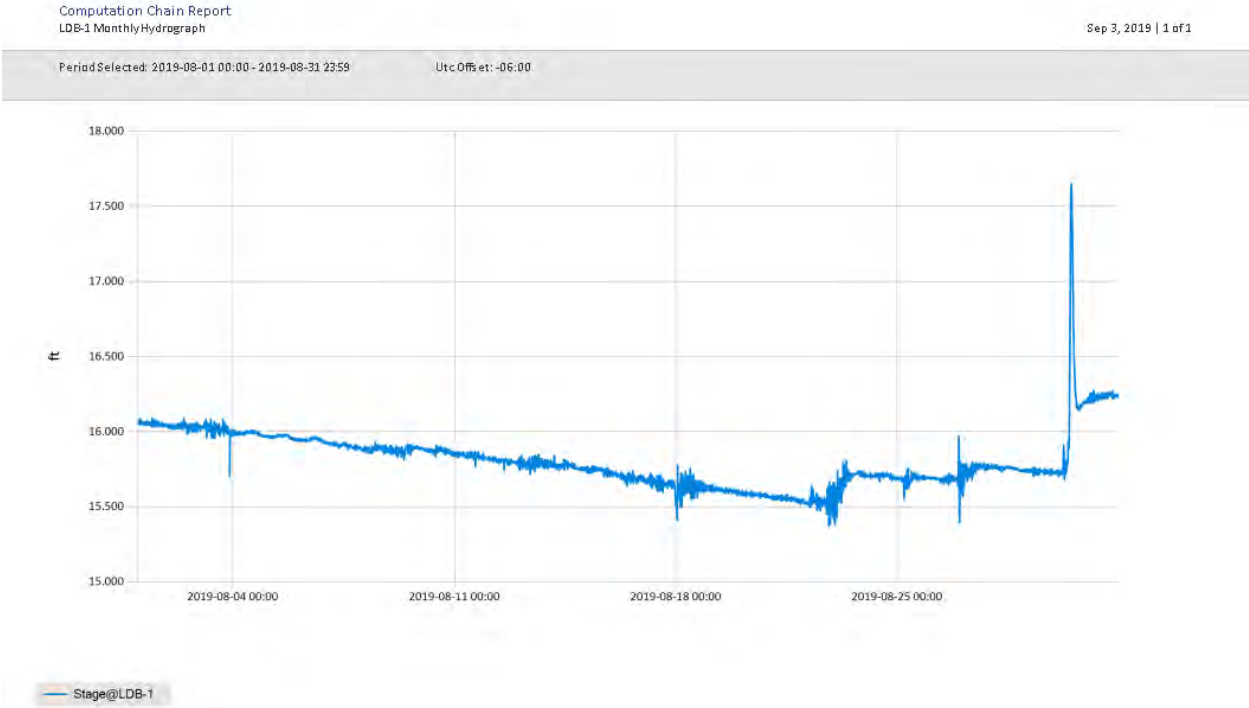

Figure 7 Monthly Hydrograph LDB-1

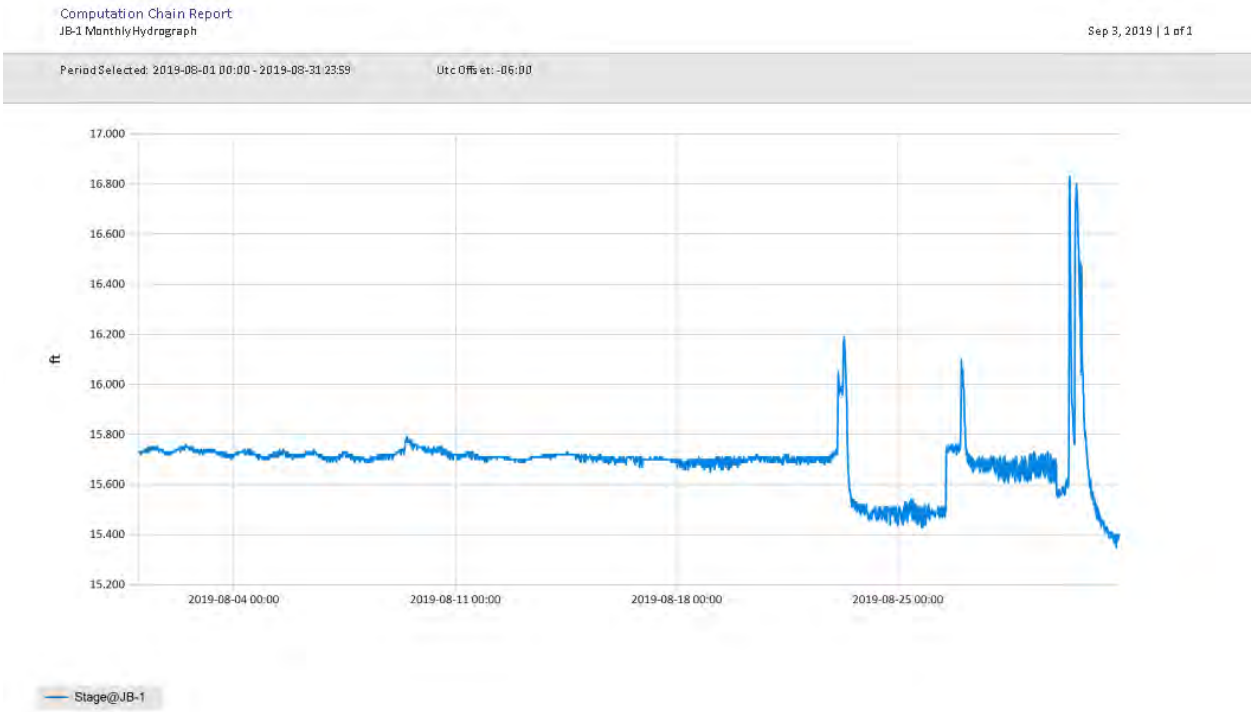

Figure 8 Monthly Hydrograph JB-1

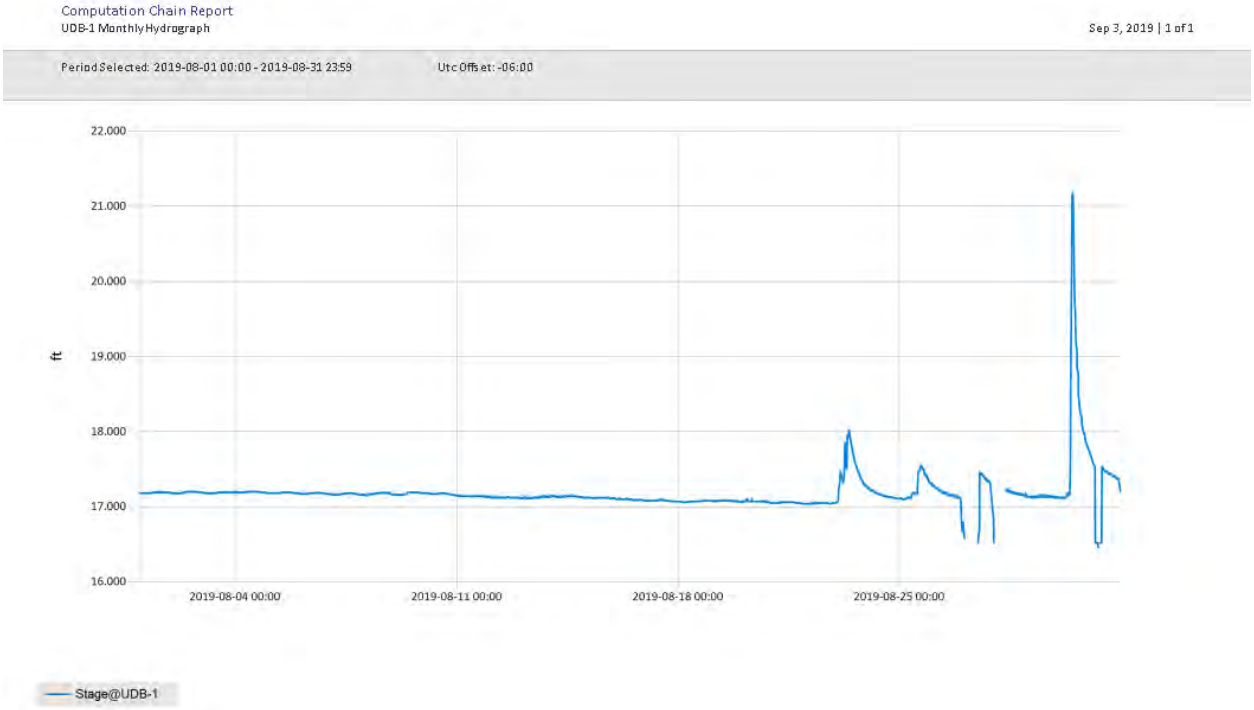

Figure 9 Monthly Hydrograph UDB-1

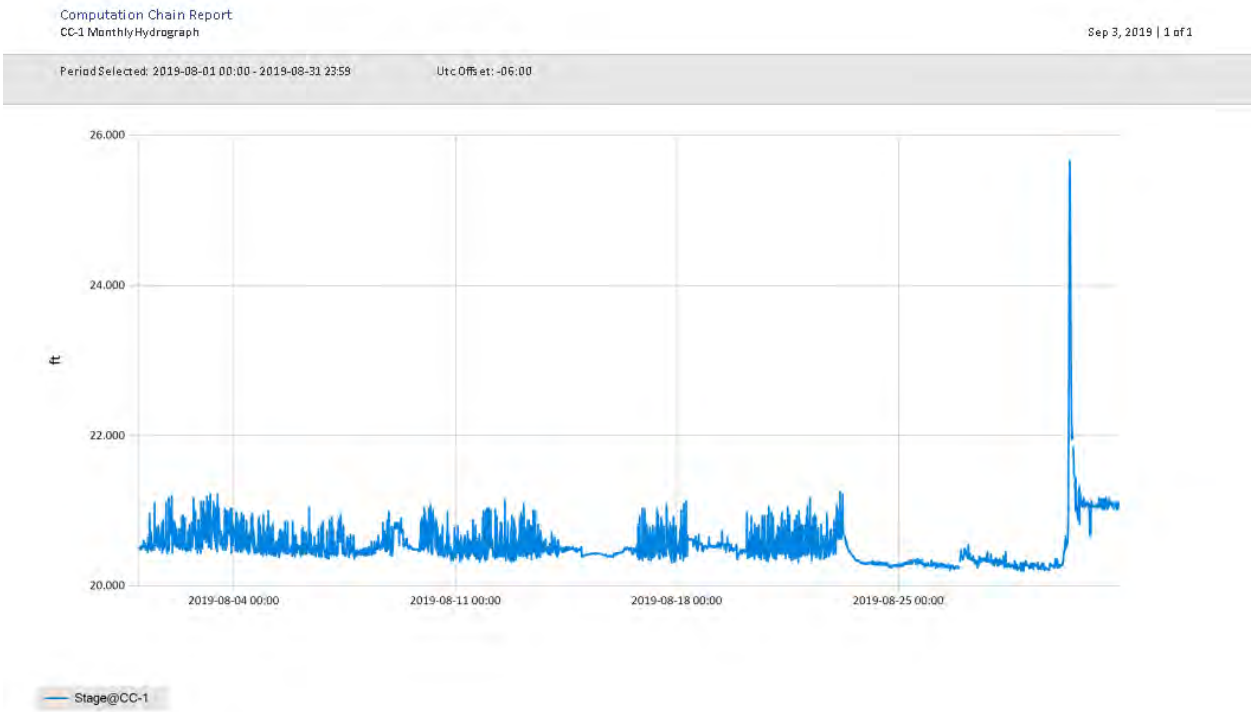

Figure 10 Monthly Hydrograph CC-1

MESONET CLIMATOLOGICAL DATA SUMMARY
(NRMN) Norman
Latitude: 35-14-09

August 2019
Nearest City: 2.1 NW Norman
Longitude: 97-27-53

Time Zone: Midnight-Midnight CST
County: Cleveland
Elevation: 1171 feet

DAY	TEMPERATURE (°F) MAX	MIN	AVG	DEWPT	DEG DAYS HDD	CDD	HUMIDITY (%) MAX	MIN	AVG	RAIN (in)	PRESSURE (in) STN	MSL	WIND SPEED (mph) DIR	AVG	MAX	SOLAR (MJ/m²)	4" SOIL TEMPERATURES SOD	BARE	MAX	MIN
1	97	75	85.0	69.4	0	21	80	42	61	0.00	28.77	30.02	SSE	8.6	19.7	21.75	84.7	89.9	95	85
2	92	76	83.0	71.0	0	19	87	52	68	0.01	28.74	29.98	SSE	9.3	21.1	15.65	83.7	87.9	90	85
3	84	71	77.4	69.8	0	13	93	55	78	0.00	28.74	29.98	E	8.0	25.0	10.78	82.2	85.6	88	84
4	91	68	79.5	69.7	0	14	98	48	74	0.00	28.76	30.01	E	4.6	16.2	20.63	82.3	85.4	91	80
5	96	70	83.2	69.9	0	18	98	40	67	0.00	28.73	29.98	SE	4.2	16.2	23.26	83.6	88.0	94	82
6	99	77	87.6	69.5	0	23	85	34	58	0.00	28.69	29.93	S	5.8	30.4	22.42	85.2	90.2	95	85
7	102*	77*	89.8*	69.8*	0*	25*	82*	33*	55*	0.00*	28.63*	29.87*	S *	7.9*	19.7*	NA	86.3*	91.5*	98*	85*
8	92	78	82.9	72.3	0	20	91	53	71	0.00	28.65	29.90	S	7.8	18.3	12.26	85.3	89.0	93	86
9	91	75	80.1	75.1	0	18	96	59	86	0.12	28.68	29.93	E	7.6	25.5	14.87	84.3	86.1	90	83
10	103	76	88.1	71.0	0	25	95	31	62	0.00	28.66	29.90	SSE	7.1	17.3	22.81	84.2	88.3	96	82
11	102	78	89.5	69.0	0	25	78	33	53	0.00	28.67	29.92	S	9.1	22.4	25.47	85.1	91.0	98	84
12	104	77	90.1	67.4	0	25	77	27	50	0.00	28.62	29.87	S	9.1	22.8	26.49	85.9	91.7	99	85
13	87	74	80.0	69.2	0	16	95	51	71	0.11	28.74	29.98	NNE	6.4	20.6	12.45	84.7	87.7	92	85
14	93	68	82.0	68.5	0	16	91	42	66	0.00	28.81	30.06	E	6.2	22.1	24.84	84.0	87.7	96	81
15	97	69	84.3	67.4	0	18	93	35	60	0.00	28.75	29.99	SSE	6.4	19.7	24.37	84.2	89.2	96	82
16	99	76	87.7	68.0	0	23	75	35	54	0.00	28.65	29.89	SSE	10.9	24.7	25.77	85.0	90.1	97	84
17	101	74	88.1	69.4	0	23	81	37	56	0.02	28.58	29.82	S	11.4	44.9	24.70	86.3	90.9	97	85
18	98	75	84.1	71.4	0	21	95	43	67	0.07	28.61	29.85	SSE	10.3	30.5	19.09	84.5	87.7	92	84
19	101	78	88.7	70.4	0	25	76	35	57	0.00	28.70	29.95	SSE	8.4	20.0	25.09	85.7	89.8	97	83
20	101	77	88.9	68.9	0	24	78	33	54	0.00	28.75	30.00	SSE	7.4	19.8	24.38	86.9	91.2	98	85
21	101	74	88.0	67.1	0	22	83	29	53	0.00	28.72	29.96	SSE	7.0	19.5	25.28	87.4	91.7	99	85
22	94	71	80.2	68.4	0	18	97	41	69	0.61	28.68	29.93	E	7.5	28.4	17.84	86.5	89.6	96	86
23	88	69	76.5	68.5	0	13	98	46	79	2.04	28.71	29.95	E	9.2	27.5	20.74	80.6	81.9	86	78
24	89	70	77.2	70.7	0	15	97	55	82	0.00	28.71	29.95	SE	6.2	27.3	16.75	81.6	80.1	85	77
25	88	66	77.0	69.8	0	12	97	57	80	0.67	28.61	29.85	SE	8.0	37.4	19.26	80.6	78.8	83	75
26	98	69	83.9	73.3	0	18	95	47	73	1.28	28.50	29.74	SSE	10.8	51.0	24.21	82.2	81.2	87	76
27	79	70	73.9	69.4	0	10	96	75	86	0.05	28.76	30.00	NE	6.2	23.7	7.60	78.7	78.1	80	77
28	88	66	77.1	66.4	0	12	89	52	71	0.00	28.83	30.08	E	4.0	12.0	22.40	79.4	78.4	85	73
29	92*	74*	82.8*	72.7*	0*	18*	91*	56*	73*	0.00*	28.75*	30.00*	SSE*	8.1*	20.3*	NA	80.8*	80.4*	85*	76*
30	80	66	72.5	68.0	0	8	98	73	86	1.31	28.82	30.07	SSE	8.2	31.4	8.47	78.2	76.8	80	74
31	83	67	73.4	68.9	0	10	98	66	87	0.00	28.84	30.09	ENE	5.7	16.7	16.38	77.1	77.2	82	73
	94*	73*	82.7*	69.7*	<- Monthly Averages ->						28.71*	29.95*	SSE*	7.7*	51.0*	19.86*	83.5*	86.2*	92*	81*

Temperature - Highest: 104*
Lowest: 66*

Degree Days - Total HDD: 0*
Total CDD: 566*

Rainfall: Monthly Total: 6.29* in.
Greatest 24 Hr: 2.04* in.

Humidity - Highest: 98*
Lowest: 27*

Number of Days With:
Tmax ≥ 90: 22*
Tmax ≤ 32: 0*
Tmin ≤ 32: 0*
Tmin ≤ 0: 0*
Rainfall ≥ 0.01 inch: 11*
Rainfall ≥ 0.10 inch: 7*
Avg Wind Speed ≥ 10 mph: 4*
Max Wind Speed ≥ 30 mph: 6*

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* Denotes incomplete record

Figure 11 August Mesonet Data

Lake Thunderbird TMDL Monitoring Plan Implementation: Sample Year (SY) 2019- September Report

SY2019 Monthly Report

Lake Thunderbird TMDL Monitoring Plan Implementation:

September 2019 Monitoring Report

Oklahoma Water Resources Board
Water Quality Programs Division
Monitoring and Assessment Section
3800 N. Classen, Oklahoma City, Oklahoma 73118
405-530-8800

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SUMMARY OF SEPTEMBER WATER QUALITY SAMPLING

Sampling for September 2019 consisted of two collections. The first sampling event occurred on the sixteenth and was considered a base flow collection. Water samples were collected at nine locations, with the exclusion of LT-1 as a result of dry conditions. Discharge measurements were not collected due to average base flow water levels. Mesonet data shows no precipitation occurring on the sixteenth, 0.60 inches of precipitation in the 72 hours prior to sampling, and no precipitation in the 72 hours after the sampling event. A second sampling event was conducted on the twenty-fourth and was considered a high flow collection. Water samples were collected at three monitoring locations via autosampler, as well as two stormwater outfalls. Mesonet data shows 1.09 inches of precipitation occurring on the twenty-fourth, 0.95 inches of precipitation in the 72 hours prior to sampling, and no precipitation in the 72 hours after the sampling event. The total rainfall amount in Norman for the month of September was 3.01 inches. All water level gauges were operational for the month, with the exception of LT-1 due to equipment malfunction.

RESULTS

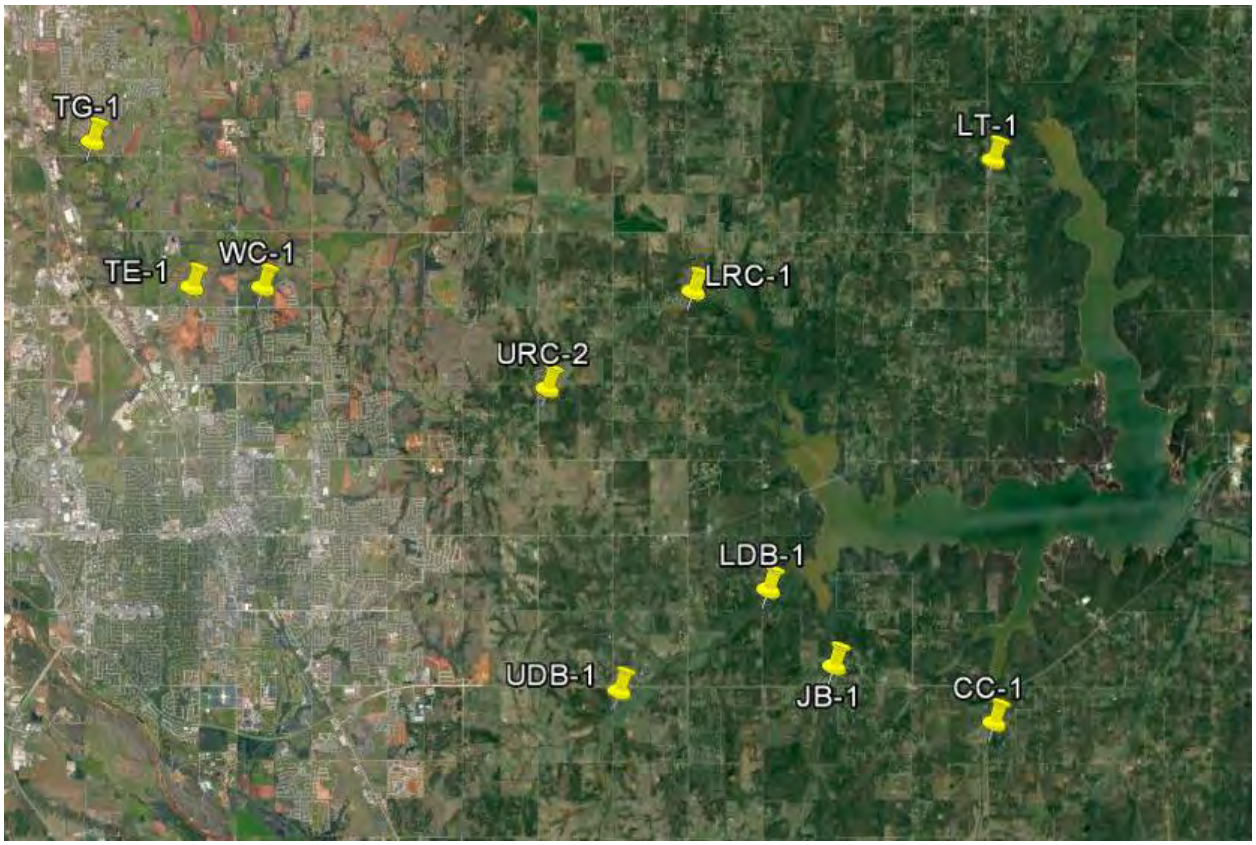

Figure 1 Monitoring Station Map

Monitoring Location ID	Monitoring Location Name	Date	Time	Field Crew	Water Temperature (°C)	Dissolved Oxygen (DO) (mg/l)	pH	Specific Conductance (mS/cm)	Turbidity (NTU)	Notes
CC-1	Clear Creek	09-16-2019	11:10	SD	25.1	8.05	8.19	689	7	None of RPs over water, estimated stage
JB-1	Jim Blue Creek	09-16-2019	11:30	SD	N/A	N/A	N/A	N/A	N/A	Disconnected pool at bridge
LDB-1	Lower Dave Blue Creek	09-16-2019	11:50	SD	25.2	4.12	8.22	742	22	No visible flow
LRC-1	Lower Rock Creek	09-16-2019	12:35	SD	23.3	5.63	7.99	749	7	
LT-1	Lake Laterals	09-16-2019	12:15	SD	N/A	N/A	N/A	N/A	N/A	Completely dry
TE-1	Little River Tributary	09-16-2019	13:55	SD	25.5	4.25	7.62	753	13	
TG-1	Little River Tributary	09-16-2019	14:20	SD	26.1	7.78	7.96	637	5	
UDB-1	Upper Dave Blue Creek	09-16-2019	10:45	SD	23.9	5.27	8.00	933	6	
URC-2	Upper Rock Creek	09-16-2019	12:55	SD	26.6	6.34	7.64	754	9	Bubbler barely in water, very low flow
WC-1	Woodcrest Creek	09-16-2019	13:30	SD	24.9	6.93	7.65	641	6	

Table 1 Field Data Form

Monitoring Location ID	Monitoring Location Name	Nitrate and Nitrite (mg/l)	Kjeldahl Nitrogen (mg/l)	Phosphorus (mg/l)	Total Suspended Solids (mg/l)
CC-1	Clear Creek	0.09	0.37	0.061	<5.0
JB-1	Jim Blue Creek	N/A	N/A	N/A	N/A
LDB-1	Lower Dave Blue Creek	<0.05	0.87	0.089	12
LRC-1	Lower Rock Creek	<0.05	0.32	0.040	<5.0
LT-1	Lake Laterals	N/A	N/A	N/A	N/A
TE-1	Little River Tributary	<0.05	0.60	0.036	<5.0
TG-1	Little River Tributary	0.07	0.50	0.057	<5.0
UDB-1	Upper Dave Blue Creek	<0.05	0.32	0.047	<5.0
URC-2	Upper Rock Creek	<0.05	0.70	0.062	<5.0
WC-1	Woodcrest Creek	0.05	0.37	0.059	<5.0

Table 2 Laboratory Analysis Summary

Monitoring Location Name	Nitrate and Nitrite (mg/l)	Kjeldahl Nitrogen (mg/l)	Phosphorus (mg/l)	Total Suspended Solids (mg/l)
Field Blank	<0.05	<0.10	<0.010	<5.0
Duplicate	0.09	0.36	0.062	<5.0
Duplicate RPD	0%	2.74%	1.63%	0%

Table 3 QA/QC Data

Quality assurance/quality control (QA/QC) of the data includes a field blank and duplicate sample from each collection event, and is qualified by the OWRB. Relative Percent Difference (RPD) of the duplicate sample can be categorized into four levels, where Level 1 likely has no QA issues and Level 4 has major QA issues, and should be used with caution.

Monitoring Location ID	Monitoring Location Name	Discharge (cfs)	Stream Stage (ft)
CC-1	Clear Creek	1.00	20.83
JB-1	Jim Blue Creek	0.00	15.90
LDB-1	Lower Dave Blue Creek	2.65	16.14
LRC-1	Lower Rock Creek	0.50	18.24
LT-1	Lake Laterals	N/A	N/A
TE-1	Little River Tributary	0.05	11.53
TG-1	Little River Tributary	3.32	9.27
UDB-1	Upper Dave Blue Creek	0.06	17.32
URC-2	Upper Rock Creek	0.02	11.10
WC-1	Woodcrest Creek	0.02	7.89

Table 4 Station Discharge Summary

Monitoring Location ID	Monitoring Location Name	Date	Time	Field Crew	Water Temperature (°C)	Dissolved Oxygen (DO) (mg/l)	pH	Specific Conductance (mS/cm)	Turbidity (NTU)	Notes
TE-1	Little River Tributary	09-24-2019	5:30	SD	N/A	N/A	8.52	384	626	T2 collected at 15.02, peak at 15.41 @ 05:45
TG-1	Little River Tributary	09-24-2019	5:45	SD	N/A	N/A	8.06	697	1000	T2 collected at 15.61, peak at 17.59 @ 06:30
WC-1	Woodcrest Creek	09-24-2019	5:35	SD	N/A	N/A	8.69	249	442	T1 collected at 10.24, peak at 10.30 @ 06:00
SW-10	Stormwater Outfall 10	09-25-2019	12:00	SD	N/A	N/A	7.83	420	7	
SW-11	Stormwater Outfall 11	09-25-2019	12:10	SD	N/A	N/A	7.75	94	49	

Table 5 Stormwater Field Data Form Where N/A Denotes a Sample from an Autosampler

Monitoring Location ID	Monitoring Location Name	Nitrate and Nitrite (mg/l)	Kjeldahl Nitrogen (mg/l)	Phosphorus (mg/l)	Total Suspended Solids (mg/l)
TE-1	Little River Tributary	0.20	1.17	0.360	420
TG-1	Little River Tributary	0.14	2.85	0.995	1660
WC-1	Woodcrest Creek	0.22	1.77	0.448	510
SW-10	Stormwater Outfall 10	0.11	1.09	0.153	254
SW-11	Stormwater Outfall 11	0.29	1.35	0.167	126

Table 6 Stormwater Laboratory Analysis Summary

Monitoring Location ID	Monitoring Location Name	Discharge (cfs)	Stream Stage (ft)
TE-1	Little River Tributary	207	15.02
TG-1	Little River Tributary	642	15.61
WC-1	Woodcrest Creek	41	10.24

Table 7 Stormwater Station Discharge Summary

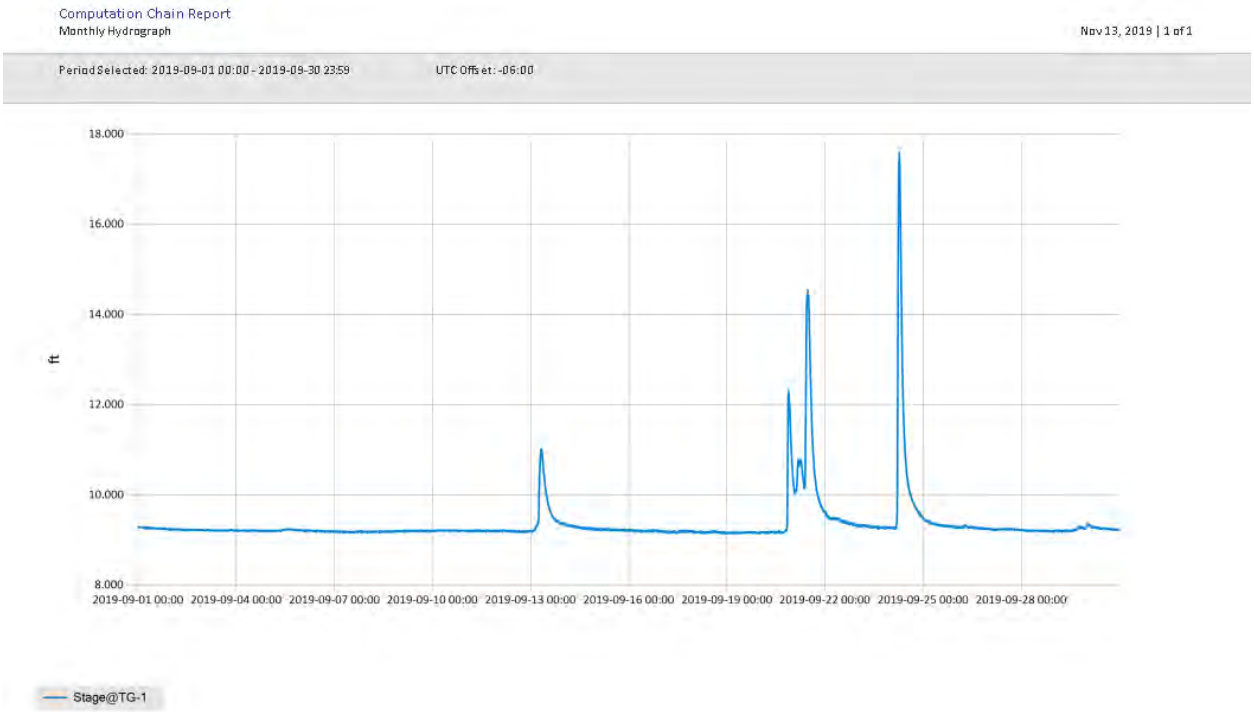

Figure 2 Monthly Hydrograph TG-1

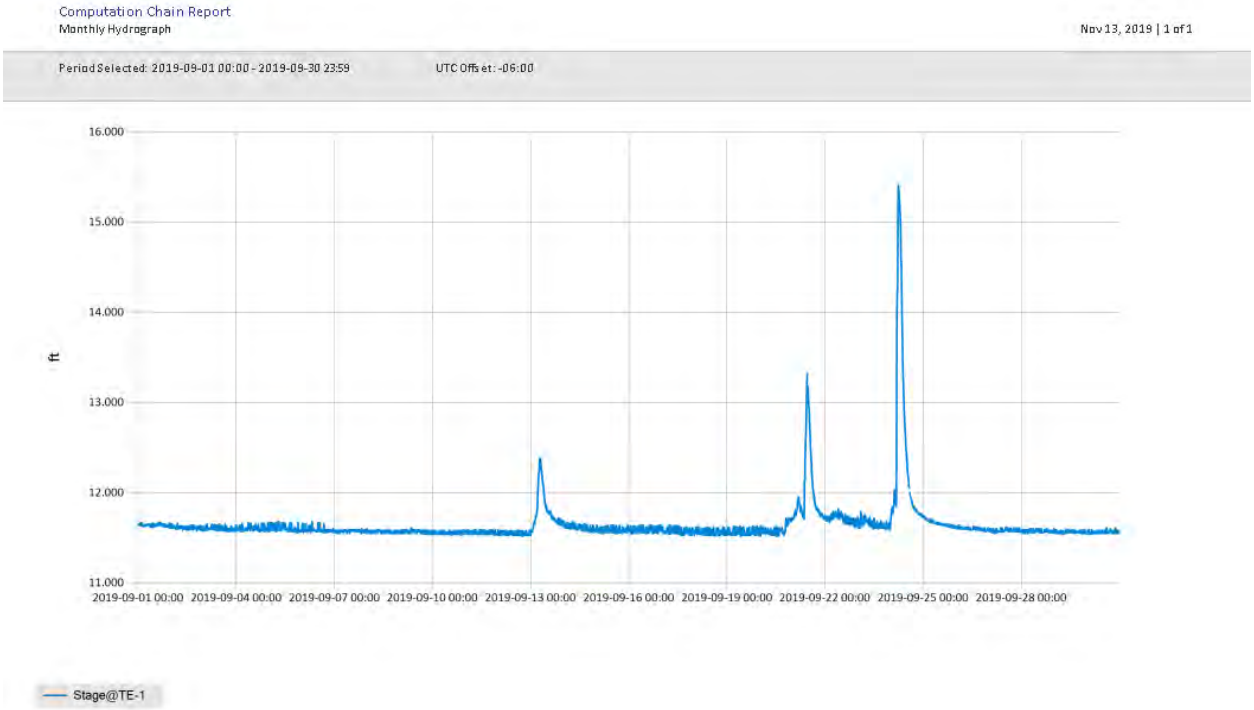

Figure 3 Monthly Hydrograph TE-1

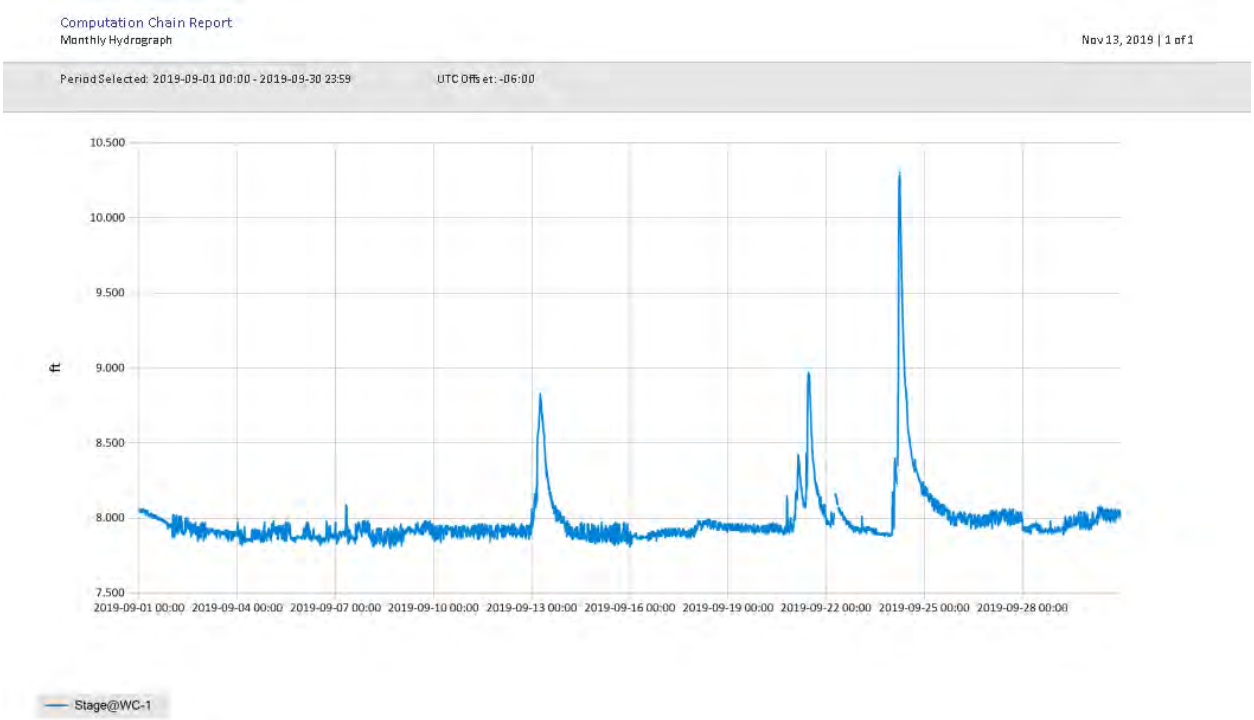

Figure 4 Monthly Hydrograph WC-1

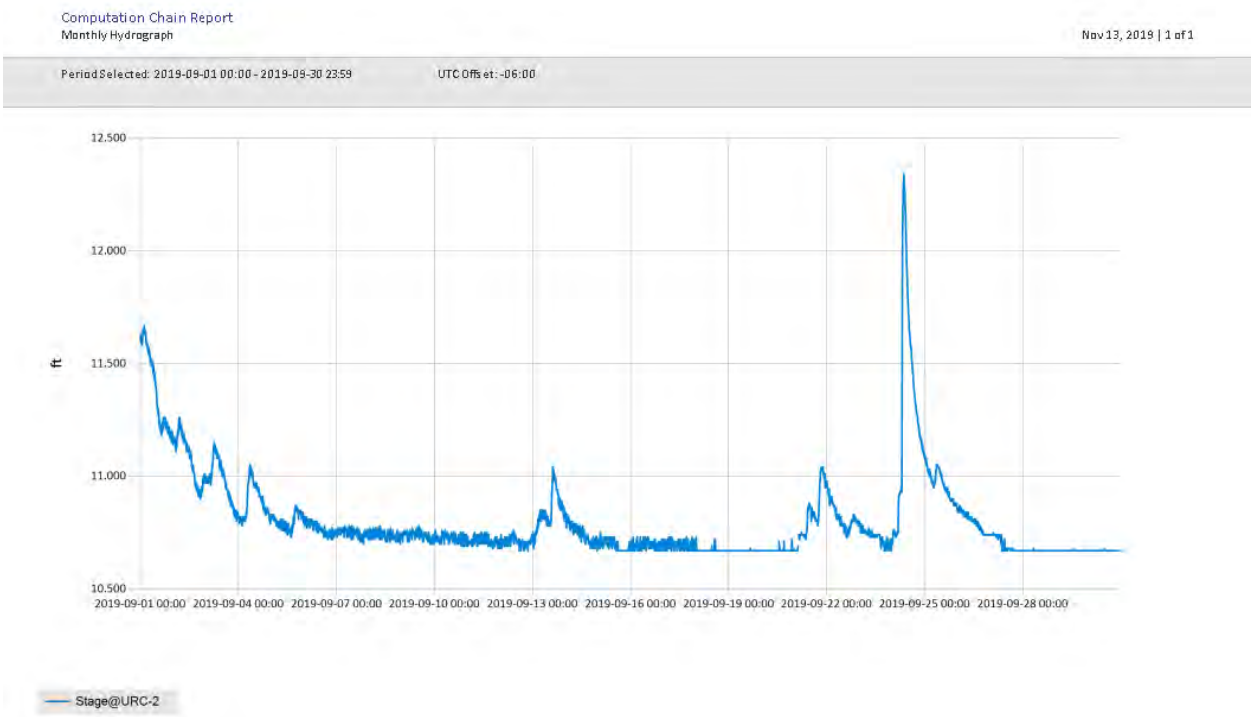

Figure 5 Monthly Hydrograph URC-2

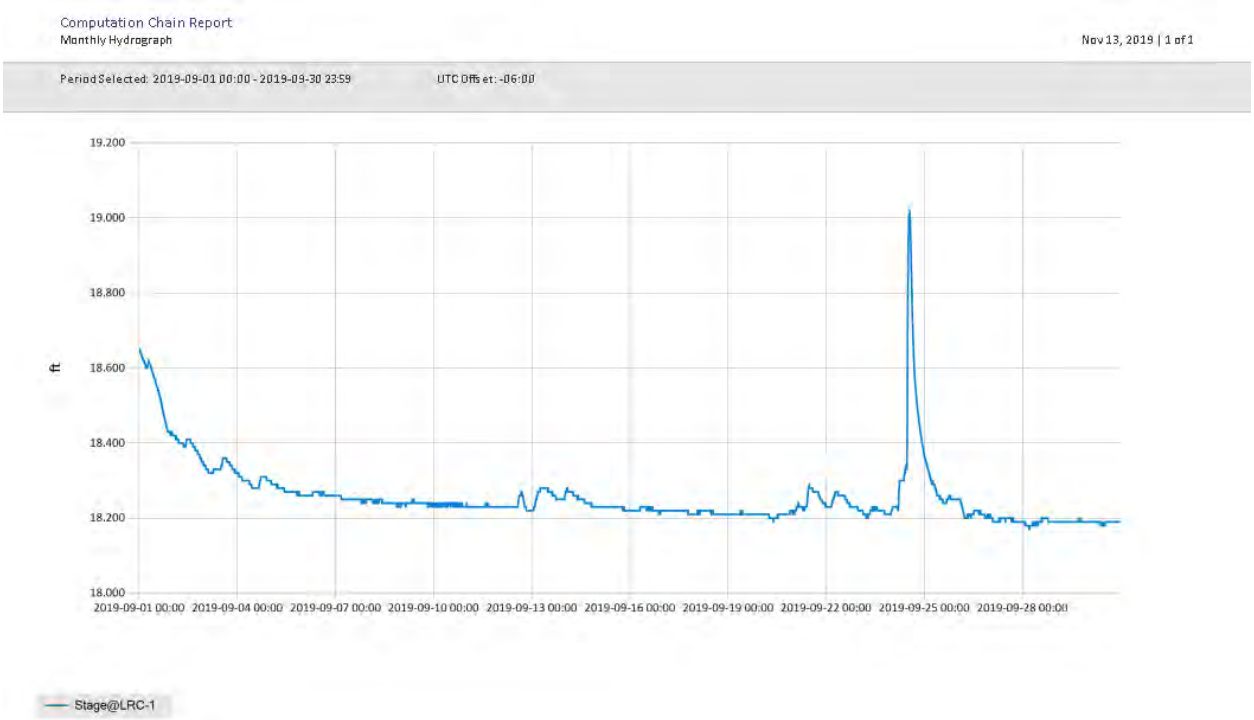

Figure 6 Monthly Hydrograph LRC-1

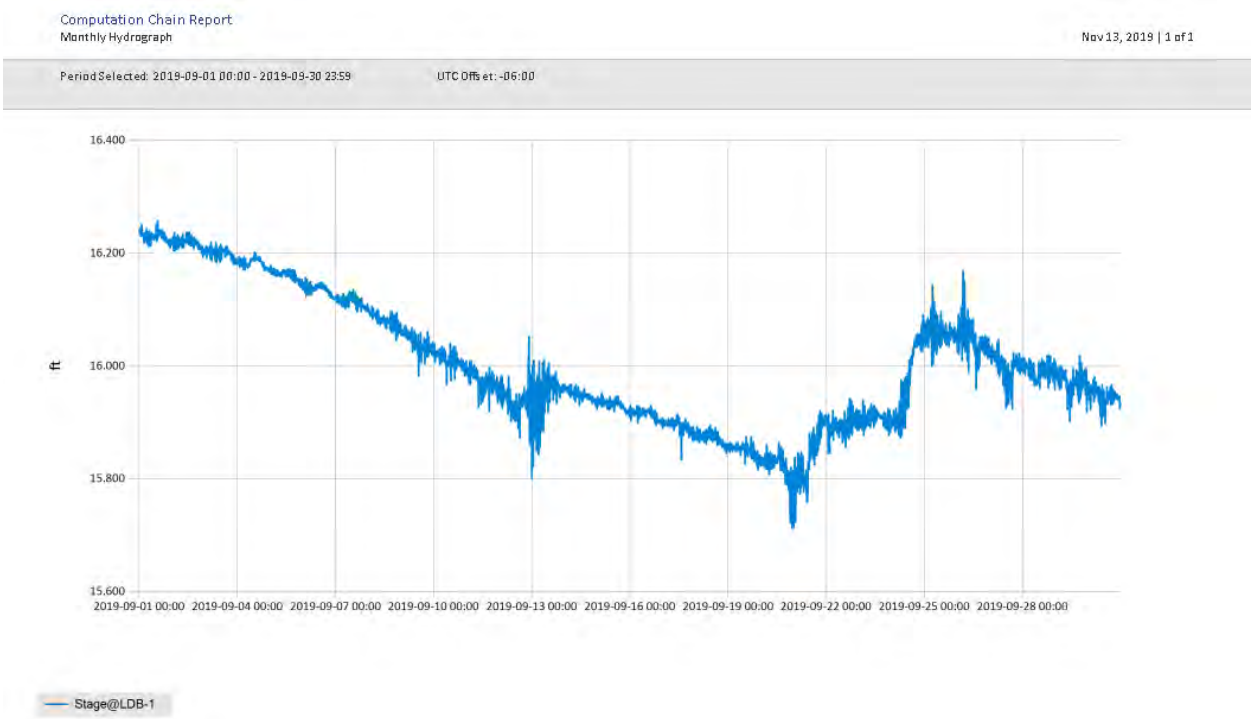

Figure 7 Monthly Hydrograph LDB-1

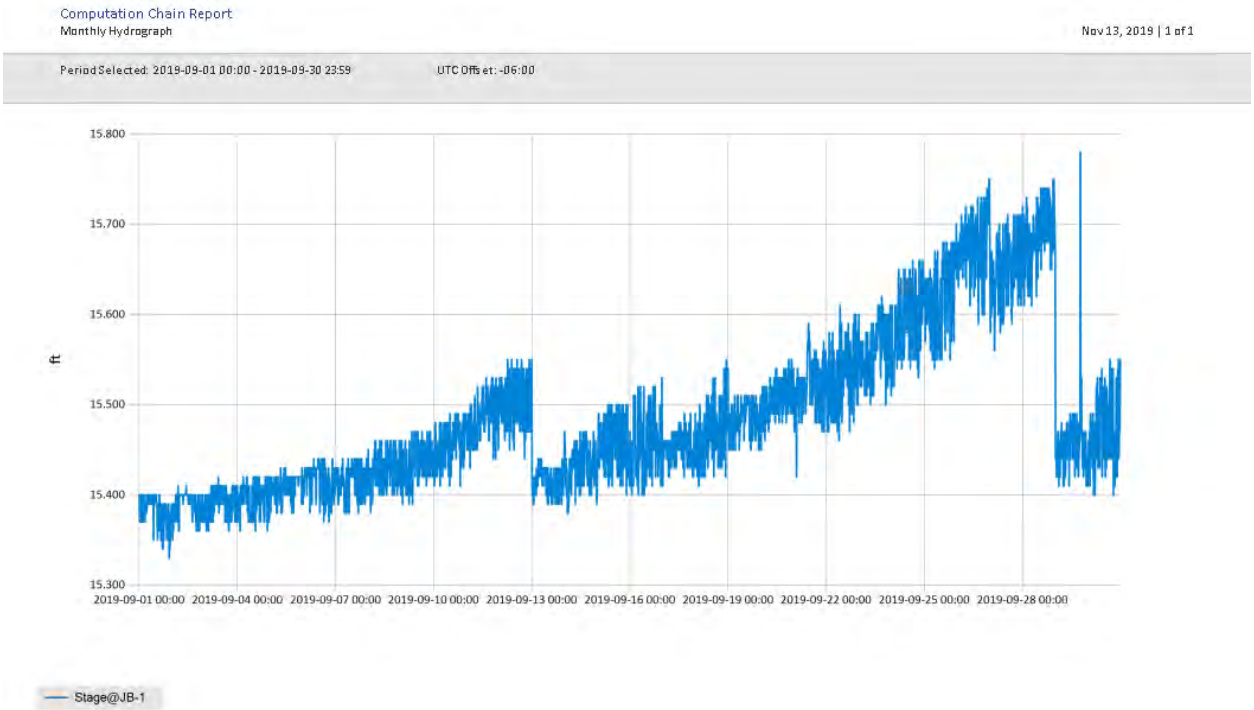

Figure 8 Monthly Hydrograph JB-1

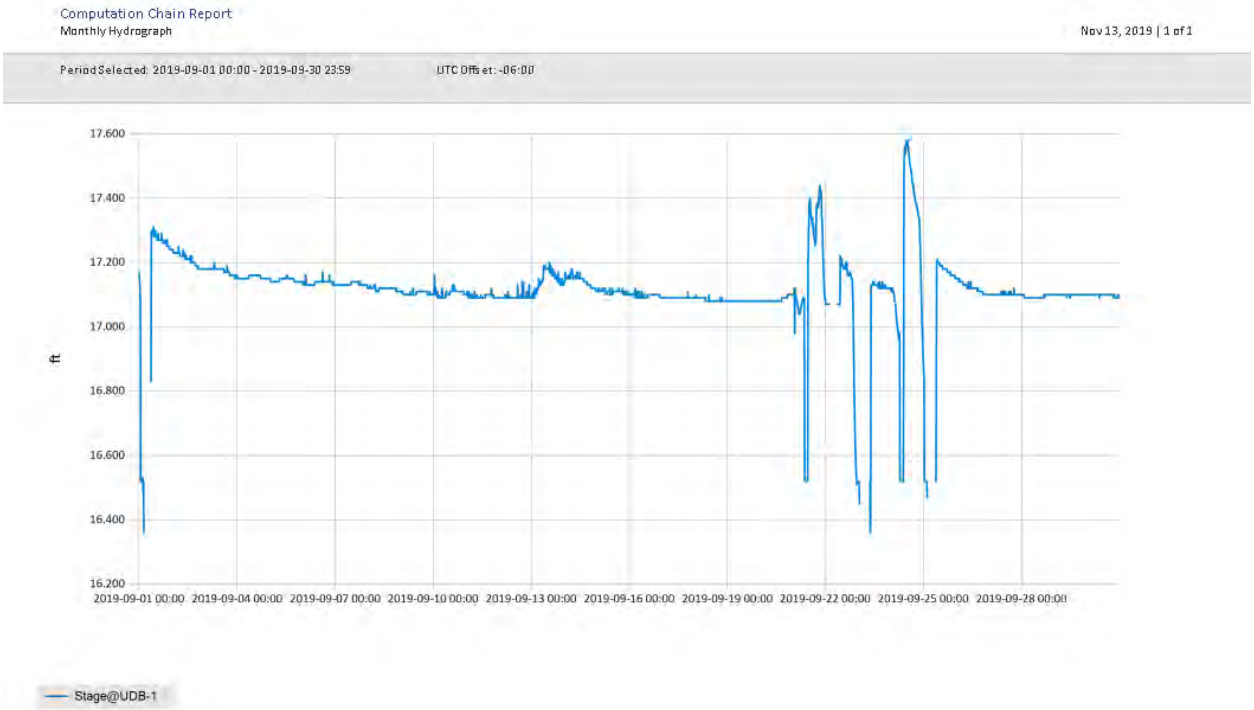

Figure 9 Monthly Hydrograph UDB-1

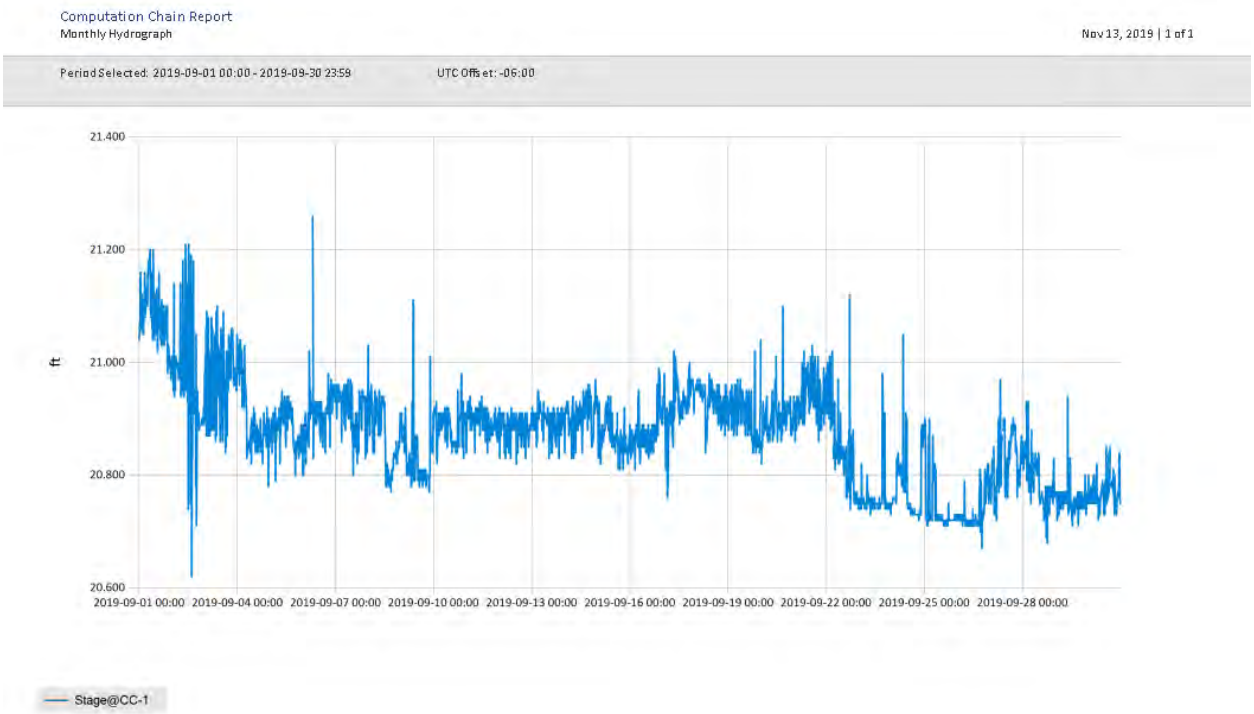

Figure 10 Monthly Hydrograph CC-1

MESONET CLIMATOLOGICAL DATA SUMMARY
(NRMN) Norman
Latitude: 35-14-09

September 2019
Nearest City: 2.1 NW Norman
Longitude: 97-27-53

Time Zone: Midnight-Midnight CST
County: Cleveland
Elevation: 1171 feet

DAY	TEMPERATURE (°F) MAX	MIN	AVG	DEWPT	DEG DAYS HDD	CDD	HUMIDITY (%) MAX	MIN	AVG	RAIN (in)	PRESSURE (in) STN	MSL	WIND SPEED (mph) DIR	AVG	MAX	SOLAR (MJ/m²)	4" SOIL TEMPERATURES SOD	BARE	MAX	MIN
1	89	68	78.1	69.1	0	14	95	51	76	0.00	28.83	30.08	SE	4.3	11.8	23.56	78.9	78.9	85	73
2	91	70	81.2	69.5	0	16	95	48	69	0.00	28.82	30.07	SSE	4.6	14.5	23.24	80.4	79.9	86	75
3	92	70	81.1	68.5	0	16	94	42	68	0.00	28.77	30.01	S	5.4	17.5	24.03	80.7	79.4	85	74
4	92	68	80.7	67.6	0	15	98	37	68	0.00	28.85	30.10	SE	3.6	15.3	23.84	80.9	79.8	86	74
5	92	69	81.3	65.6	0	16	91	36	62	0.00	28.84	30.09	SSE	5.0	16.2	23.42	80.7	80.9	89	74
6	95	69	82.4	65.3	0	17	84	34	59	0.00	28.80	30.05	S	5.1	16.2	23.50	80.5	82.8	91	75
7	94	70	82.9	66.1	0	17	86	35	60	0.00	28.73	29.98	S	5.2	19.2	23.04	80.7	84.3	92	77
8	93	70	82.1	63.9	0	17	73	31	55	0.00	28.68	29.93	SSE	8.6	22.5	21.28	79.9	84.0	90	78
9	91	73	81.6	65.7	0	17	74	43	60	0.00	28.72	29.96	SSE	9.5	27.6	22.91	79.6	84.1	91	78
10	90	73	81.0	68.1	0	16	83	48	66	0.00	28.78	30.03	SSE	10.0	23.8	22.14	79.8	84.7	91	79
11	89	72	80.7	67.2	0	15	86	44	65	0.00	28.80	30.05	S	10.3	24.1	21.21	79.5	84.3	90	79
12	91	69	79.9	68.0	0	15	95	48	69	0.10	28.80	30.05	S	10.2	27.0	20.72	79.5	84.4	90	79
13	83	67	73.4	68.2	0	10	97	61	85	0.60	28.93	30.19	E	4.7	16.4	15.93	79.0	80.1	84	77
14	90	68	79.0	67.5	0	14	98	45	71	0.00	28.89	30.15	SSE	5.8	18.1	20.95	79.2	78.7	83	74
15	92	72	81.4	66.2	0	17	78	39	61	0.00	28.84	30.09	SSE	5.3	15.1	21.38	79.6	80.3	88	74
16	91	72	81.3	67.2	0	17	82	45	63	0.00	28.80	30.05	SSE	5.4	17.0	21.44	79.9	82.7	91	76
17	91	69	80.9	66.4	0	15	88	44	63	0.00	28.74	29.99	SSE	6.0	20.8	21.16	79.9	83.6	90	77
18	91	69	80.1	68.5	0	15	93	49	69	0.00	28.71	29.96	SSE	5.2	18.2	21.48	80.0	84.3	92	77
19	89	70	78.9	68.0	0	14	95	46	71	0.00	28.70	29.95	SE	7.1	21.5	21.07	80.1	84.4	91	78
20	81	69	73.3	69.9	0	10	98	72	89	0.26	28.71	29.96	SSE	8.0	26.8	10.93	79.4	81.5	85	78
21	86	69	76.8	70.4	0	13	97	57	82	0.70	28.74	29.98	S	10.0	23.6	12.32	77.9	77.5	81	75
22	85	73	77.1	71.5	0	14	95	65	83	0.10	28.71	29.95	S	8.7	22.7	8.99	77.9	76.8	79	75
23	87	70	77.1	72.4	0	14	99	65	86	0.15	28.77	30.02	SE	5.1	14.6	12.24	78.6	77.9	82	74
24	86	73	77.8	71.6	0	14	99	58	83	1.09	28.65	29.89	S	6.6	21.3	14.51	78.9	78.8	83	76
25	92	71	81.0	71.2	0	16	95	51	74	0.00	28.58	29.82	S	8.6	22.2	20.25	79.3	78.4	83	74
26	87	68	78.0	67.6	0	13	90	55	71	0.00	28.63	29.87	SSE	11.2	27.6	18.37	79.3	77.2	80	74
27	91	74	81.3	67.4	0	17	79	49	64	0.00	28.51	29.75	S	11.8	33.5	20.12	78.7	77.0	82	73
28	88	74	79.6	70.8	0	16	90	58	75	0.00	28.62	29.87	S	9.4	21.9	15.02	78.9	78.6	84	75
29	87	74	79.5	71.2	0	15	87	62	76	0.01	28.72	29.96	SSE	10.8	26.4	12.05	78.8	78.9	83	76
30	87	74	79.5	69.9	0	15	84	58	73	0.00	28.73	29.97	S	11.0	25.3	14.49	78.5	79.7	85	75
	89	71	79.6	68.3	<- Monthly Averages ->						28.75	29.99	SSE	7.4	33.5	19.19	79.5	80.8	86	76

Temperature - Highest: 95
Lowest: 67

Degree Days - Total HDD: 0
Total CDD: 448

Rainfall: Monthly Total: 3.01 in.
Greatest 24 Hr: 1.09 in.

Humidity - Highest: 99
Lowest: 31

Number of Days With:
Tmax ≥ 90: 17
Tmax ≤ 32: 0
Tmin ≤ 32: 0
Tmin ≤ 0: 0
Rainfall ≥ 0.01 inch: 8
Rainfall ≥ 0.10 inch: 7
Avg Wind Speed ≥ 10 mph: 8
Max Wind Speed ≥ 30 mph: 1

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* Denotes incomplete record

Figure 11 September Mesonet Data

Lake Thunderbird TMDL Monitoring Plan Implementation: Sample Year (SY) 2019- October Report

SY2019 Monthly Report

Lake Thunderbird TMDL Monitoring Plan Implementation:

October 2019 Monitoring Report

Oklahoma Water Resources Board
Water Quality Programs Division
Monitoring and Assessment Section
3800 N. Classen, Oklahoma City, Oklahoma 73118
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SUMMARY OF OCTOBER WATER QUALITY SAMPLING

Sampling for October 2019 consisted of two collections. The first sampling event occurred on the fourteenth and was considered a base flow collection. Water samples were collected at eight locations, and discharge was measured at six locations. Samples were not collected at LT-1 as a result of dry conditions or JB-1 due to the channel being disconnected. Mesonet data shows no precipitation occurring on the fourteenth and no precipitation in the 72 hours prior to, or after the sampling event. A second sampling event was conducted on the twenty-fifth and was considered a high flow collection. Water samples were collected at one monitoring location via autosampler, as well as four stormwater outfalls. Mesonet data shows 1.89 inches of precipitation occurring on the twenty-fifth, 1.84 inches of precipitation in the 72 hours prior to sampling, and 0.20 inches of precipitation in the 72 hours after the sampling event. The total rainfall amount in Norman for the month of October was 4.92 inches. All water level gauges were operational for the month, with the exception of LT-1 due to equipment malfunction.

RESULTS

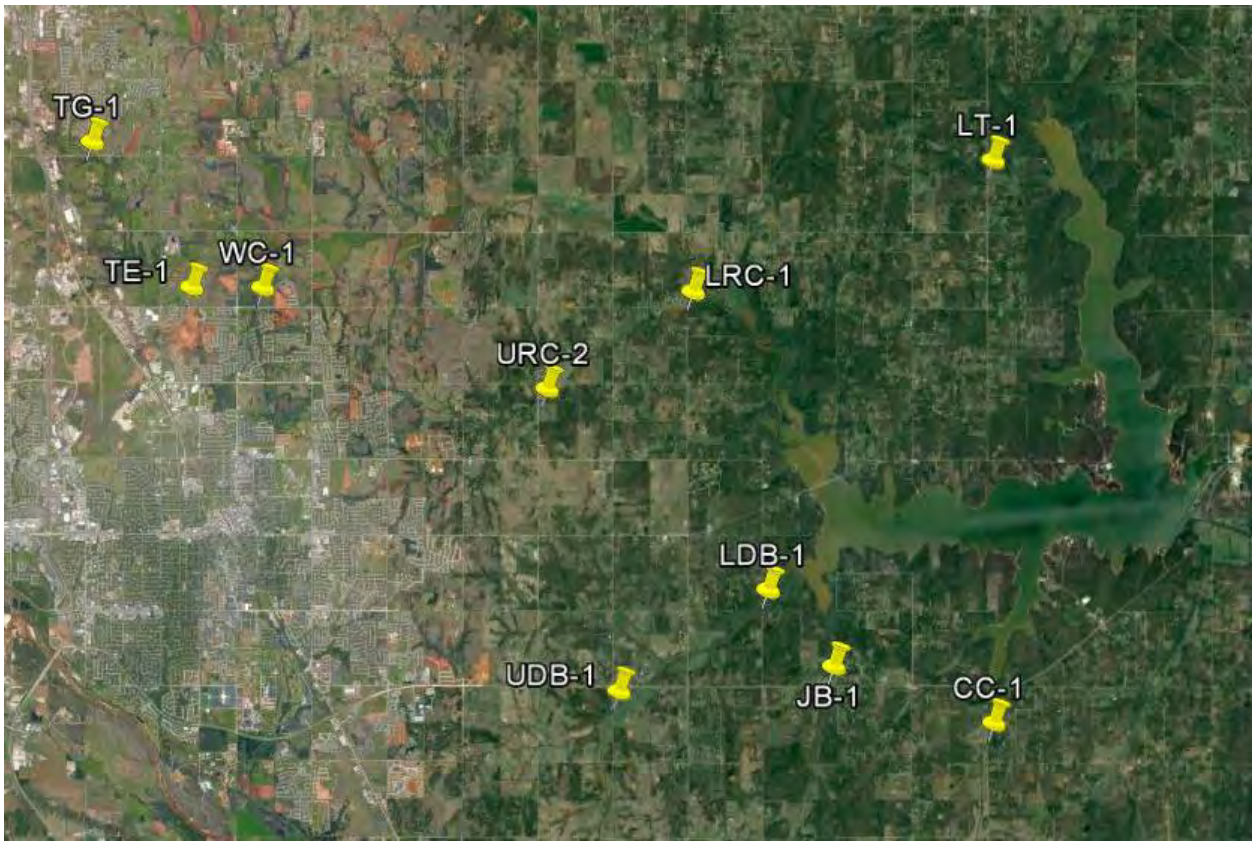

Figure 1 Monitoring Station Map

Monitoring Location ID	Monitoring Location Name	Date	Time	Field Crew	Water Temperature (°C)	Dissolved Oxygen (DO) (mg/l)	pH	Specific Conductance (mS/cm)	Turbidity (NTU)	Notes
CC-1	Clear Creek	10-14-2019	11:35	SD	15.6	9.94	8.15	690	6	
JB-1	Jim Blue Creek	10-14-2019	12:10	SD	N/A	N/A	N/A	N/A	N/A	Not connected just below bridge. RPs not over water, orifice barely in water. No collection/flow
LDB-1	Lower Dave Blue Creek	10-14-2019	13:05	SD	14.7	6.29	8.20	811	7	No visual flow
LRC-1	Lower Rock Creek	10-14-2019	14:20	SD	15.5	9.70	7.99	761	5	
LT-1	Lake Laterals	10-14-2019	13:40	SD	N/A	N/A	N/A	N/A	N/A	Completely dry
TE-1	Little River Tributary	10-14-2019	16:50	SD	15.6	7.06	7.86	1021	7	
TG-1	Little River Tributary	10-14-2019	17:15	SD	16.5	10.19	7.93	977	2	
UDB-1	Upper Dave Blue Creek	10-14-2019	10:15	SD	13.3	7.37	7.91	974	10	
URC-2	Upper Rock Creek	10-14-2019	15:20	SD	17.3	11.09	7.71	812	19	Used RP2, RP1 not over water. Recent cattle acivity in channel
WC-1	Woodcrest Creek	10-14-2019	16:15	SD	17.3	9.74	7.71	1031	4	

Table 1 Field Data Form

Monitoring Location ID	Monitoring Location Name	Nitrate and Nitrite (mg/l)	Kjeldahl Nitrogen (mg/l)	Phosphorus (mg/l)	Total Suspended Solids (mg/l)
CC-1	Clear Creek	0.12	0.24	0.038	<5.0
JB-1	Jim Blue Creek	N/A	N/A	N/A	N/A
LDB-1	Lower Dave Blue Creek	<0.05	0.37	0.055	<5.0
LRC-1	Lower Rock Creek	0.10	0.15	0.029	<5.0
LT-1	Lake Laterals	N/A	N/A	N/A	N/A
TE-1	Little River Tributary	<0.05	0.33	0.019	6
TG-1	Little River Tributary	<0.05	0.27	0.027	<5.0
UDB-1	Upper Dave Blue Creek	<0.05	0.22	0.039	14
URC-2	Upper Rock Creek	<0.05	0.99	0.055	12
WC-1	Woodcrest Creek	<0.05	0.17	0.035	<5.0

Table 2 Laboratory Analysis Summary

Monitoring Location Name	Nitrate and Nitrite (mg/l)	Kjeldahl Nitrogen (mg/l)	Phosphorus (mg/l)	Total Suspended Solids (mg/l)
Field Blank	<0.05	<0.10	<0.010	<5.0
Duplicate	0.12	0.20	0.037	<5.0
Duplicate RPD	0%	18.18%*	2.67%	0%

Table 3 QA/QC Data Where an Asterisk Denotes RPD2

Quality assurance/quality control (QA/QC) of the data includes a field blank and duplicate sample from each collection event, and is qualified by the OWRB. Relative Percent Difference (RPD) of the duplicate sample can be categorized into four levels, where Level 1 likely has no QA issues and Level 4 has major QA issues, and should be used with caution.

Monitoring Location ID	Monitoring Location Name	Discharge (cfs)	Stream Stage (ft)
CC-1	Clear Creek	0.41	20.55
JB-1	Jim Blue Creek	N/A	16.01
LDB-1	Lower Dave Blue Creek	1.41	15.74
LRC-1	Lower Rock Creek	0.79	18.27
LT-1	Lake Laterals	N/A	N/A
TE-1	Little River Tributary	0.01	11.50
TG-1	Little River Tributary	0.87	9.15
UDB-1	Upper Dave Blue Creek	0.12	17.31
URC-2	Upper Rock Creek	0.05	11.08
WC-1	Woodcrest Creek	0.02	7.84

Table 4 Station Discharge Summary

Monitoring Location ID	Monitoring Location Name	Date	Time	Field Crew	Water Temperature (°C)	Dissolved Oxygen (DO) (mg/l)	pH	Specific Conductance (mS/cm)	Turbidity (NTU)	Notes
LRC-1	Lower Rock Creek	10-25-2019	13:00	JM	N/A	N/A	7.62	290	372	T1 collected at 20.01, first peak at 20.48 @15:45, second peak on 10/26 @ 06:15 at 20.59; discharge at 20.01=46.97 cfs
SW-08	Stormwater Outfall 08	10-26-2019	10:30	JM	15.3	N/A	7.23	115	104	lots of vegetative debris in pool (potted plants etc)
SW-12	Stormwater Outfall 12	10-26-2019	11:30	JM	12.2	8.39	7.64	661	14	collected from current conditions
SW-13	Stormwater Outfall 13	10-26-2019	12:40	JM	12.3	N/A	7.67	228	34	peak about 6 inches higher than current conditions
SW-14	Stormwater Outfall 14	10-26-2019	11:00	JM	9.9	10.25	7.51	264	85	still flowing, bank scour shows water level didn't peak much higher than current condition

Table 5 Stormwater Field Data Form Where N/A Denotes a Sample from an Autosampler

Monitoring Location ID	Monitoring Location Name	Nitrate and Nitrite (mg/l)	Kjeldahl Nitrogen (mg/l)	Phosphorus (mg/l)	Total Suspended Solids (mg/l)
LRC-1	Lower Rock Creek	0.24	1.59	0.451	265
SW-08	Stormwater Outfall 08	0.93	4.24	0.486	218
SW-12	Stormwater Outfall 12	0.10	0.73	0.035	<5.0
SW-13	Stormwater Outfall 13	0.13	0.96	0.111	12
SW-14	Stormwater Outfall 14	0.81	1.36	0.265	22

Table 6 Stormwater Laboratory Analysis Summary

Discharge Measurement Summary

Date Generated: Wed Nov 20 2019

File Information	
File Name	CC1014.WAD
Start Date and Time	2019/10/14 08:30:27

Site Details	
Site Name	CLEAR CREEK
Operator(s)	JTW

System Information	
Sensor Type	FlowTracker
Serial #	P4709
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units	(English Units)
Distance	ft
Velocity	ft/s
Area	ft^2
Discharge	cfs

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.5%	2.5%
Velocity	4.9%	10.7%
Width	0.2%	0.2%
Method	2.5%	-
# Stations	3.0%	-
Overall	**6.3%**	**11.0%**

Summary

Averaging Int.	40	# Stations	17
Start Edge	LEW	Total Width	9.000
Mean SNR	44.7 dB	Total Area	3.049
Mean Temp	60.10 °F	Mean Depth	0.339
Disch. Equation	Mid-Section	Mean Velocity	0.1355
		Total Discharge	**0.4133**

Supplemental Data

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Mon Oct 14 08:29:37 CDT 2019	0.000	20.550		

Measurement Results

St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	08:30	0.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	*08:30*	*1.00*	*0.6*	*0.400*	*0.6*	*0.160*	*0.1204*	*1.00*	*0.1204*	*0.300*	*0.0361*	*8.7*
2	*08:31*	*1.50*	*0.6*	*0.400*	*0.6*	*0.160*	*0.1030*	*1.00*	*0.1030*	*0.200*	*0.0206*	*5.0*
3	*08:32*	*2.00*	*0.6*	*0.400*	*0.6*	*0.160*	*0.0722*	*1.00*	*0.0722*	*0.200*	*0.0144*	*3.5*
4	*08:33*	*2.50*	*0.6*	*0.400*	*0.6*	*0.160*	*0.0801*	*1.00*	*0.0801*	*0.200*	*0.0160*	*3.9*
5	*08:34*	*3.00*	*0.6*	*0.400*	*0.6*	*0.160*	*0.0495*	*1.00*	*0.0495*	*0.200*	*0.0099*	*2.4*
6	*08:35*	*3.50*	*0.6*	*0.300*	*0.6*	*0.120*	*0.0735*	*1.00*	*0.0735*	*0.150*	*0.0110*	*2.7*
7	*08:36*	*4.00*	*0.6*	*0.300*	*0.6*	*0.120*	*0.1047*	*1.00*	*0.1047*	*0.150*	*0.0157*	*3.8*
8	*08:37*	*4.50*	*0.6*	*0.300*	*0.6*	*0.120*	*0.0404*	*1.00*	*0.0404*	*0.150*	*0.0061*	*1.5*
9	*08:38*	*5.00*	*0.6*	*0.400*	*0.6*	*0.160*	*0.0856*	*1.00*	*0.0856*	*0.200*	*0.0171*	*4.1*
10	*08:40*	*5.50*	*0.6*	*0.400*	*0.6*	*0.160*	*0.1253*	*1.00*	*0.1253*	*0.200*	*0.0251*	*6.1*
11	*08:41*	*6.00*	*0.6*	*0.400*	*0.6*	*0.160*	*0.2792*	*1.00*	*0.2792*	*0.300*	*0.0837*	*20.3*
12	*08:44*	*7.00*	*0.6*	*0.400*	*0.6*	*0.160*	*0.1962*	*1.00*	*0.1962*	*0.300*	*0.0588*	*14.2*
13	*08:45*	*7.50*	*0.6*	*0.400*	*0.6*	*0.160*	*0.0499*	*1.00*	*0.0499*	*0.200*	*0.0100*	*2.4*
14	*08:46*	*8.00*	*0.6*	*0.300*	*0.6*	*0.120*	*0.2224*	*1.00*	*0.2224*	*0.150*	*0.0334*	*8.1*
15	*08:48*	*8.50*	*0.6*	*0.300*	*0.6*	*0.120*	*0.3694*	*1.00*	*0.3694*	*0.150*	*0.0554*	*13.4*
16	08:48	9.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Figure 2 Discharge Measurement Summary CC-1

Discharge Measurement Summary

Date Generated: Wed Nov 20 2019

File Information	
File Name	LRC1014.WAD
Start Date and Time	2019/10/14 11:11:54

Site Details	
Site Name	LOWER ROCK CREEK
Operator(s)	JTW

System Information	
Sensor Type	FlowTracker
Serial #	P4709
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units	(English Units)
Distance	ft
Velocity	ft/s
Area	ft^2
Discharge	cfs

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.3%	1.0%
Velocity	0.5%	2.9%
Width	0.1%	0.1%
Method	1.6%	-
# Stations	1.9%	-
Overall	**2.7%**	**3.2%**

Summary

Averaging Int.	40	# Stations	27
Start Edge	LEW	Total Width	16.000
Mean SNR	19.5 dB	Total Area	9.350
Mean Temp	59.33 °F	Mean Depth	0.584
Disch. Equation	Mid-Section	Mean Velocity	0.0847
		Total Discharge	**0.7916**

Supplemental Data

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Mon Oct 14 11:09:45 CDT 2019	0.000	18.270		

Measurement Results

St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	11:11	0.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	*11:11*	*1.00*	*0.6*	*0.300*	*0.6*	*0.120*	*-0.0138*	*1.00*	*-0.0138*	*0.225*	*-0.0031*	*-0.4*
2	11:13	1.50	0.6	0.300	0.6	0.120	0.0764	1.00	0.0764	0.150	0.0115	1.4
3	*11:14*	*2.00*	*0.6*	*0.400*	*0.6*	*0.160*	*0.0850*	*1.00*	*0.0850*	*0.200*	*0.0170*	*2.1*
4	*11:16*	*2.50*	*0.6*	*0.500*	*0.6*	*0.200*	*0.0696*	*1.00*	*0.0696*	*0.250*	*0.0174*	*2.2*
5	11:17	3.00	0.6	0.700	0.6	0.280	0.0938	1.00	0.0938	0.350	0.0328	4.1
6	11:18	3.50	0.6	0.700	0.6	0.280	0.1040	1.00	0.1040	0.350	0.0364	4.6
7	11:20	4.00	0.6	0.800	0.6	0.320	0.0942	1.00	0.0942	0.400	0.0377	4.8
8	11:21	4.50	0.6	0.900	0.6	0.360	0.0748	1.00	0.0748	0.450	0.0337	4.3
9	*11:22*	*5.00*	*0.6*	*0.900*	*0.6*	*0.360*	*0.0774*	*1.00*	*0.0774*	*0.450*	*0.0348*	*4.4*
10	11:23	5.50	0.6	0.900	0.6	0.360	0.1171	1.00	0.1171	0.450	0.0527	6.7
11	11:24	6.00	0.6	0.900	0.6	0.360	0.1099	1.00	0.1099	0.450	0.0495	6.2
12	11:25	6.50	0.6	0.900	0.6	0.360	0.0840	1.00	0.0840	0.450	0.0378	4.8
13	11:26	7.00	0.6	0.900	0.6	0.360	0.0735	1.00	0.0735	0.450	0.0331	4.2
14	11:27	7.50	0.6	0.900	0.6	0.360	0.0991	1.00	0.0991	0.450	0.0446	5.6
15	*11:29*	*8.00*	*0.6*	*0.800*	*0.6*	*0.320*	*0.1083*	*1.00*	*0.1083*	*0.400*	*0.0433*	*5.5*
16	*11:30*	*8.50*	*0.6*	*0.800*	*0.6*	*0.320*	*0.1056*	*1.00*	*0.1056*	*0.400*	*0.0423*	*5.3*
17	*11:31*	*9.00*	*0.6*	*0.700*	*0.6*	*0.280*	*0.1040*	*1.00*	*0.1040*	*0.350*	*0.0364*	*4.6*
18	*11:33*	*9.50*	*0.6*	*0.700*	*0.6*	*0.280*	*0.0974*	*1.00*	*0.0974*	*0.350*	*0.0341*	*4.3*
19	*11:34*	*10.00*	*0.6*	*0.700*	*0.6*	*0.280*	*0.1014*	*1.00*	*0.1014*	*0.350*	*0.0355*	*4.5*
20	*11:35*	*10.50*	*0.6*	*0.700*	*0.6*	*0.280*	*0.1010*	*1.00*	*0.1010*	*0.350*	*0.0354*	*4.5*
21	*11:36*	*11.00*	*0.6*	*0.600*	*0.6*	*0.240*	*0.0843*	*1.00*	*0.0843*	*0.300*	*0.0253*	*3.2*
22	*11:37*	*11.50*	*0.6*	*0.600*	*0.6*	*0.240*	*0.0761*	*1.00*	*0.0761*	*0.300*	*0.0228*	*2.9*
23	*11:38*	*12.00*	*0.6*	*0.600*	*0.6*	*0.240*	*0.0440*	*1.00*	*0.0440*	*0.300*	*0.0132*	*1.7*
24	*11:40*	*12.50*	*0.6*	*0.600*	*0.6*	*0.240*	*0.0512*	*1.00*	*0.0512*	*0.300*	*0.0154*	*1.9*
25	*11:41*	*13.00*	*0.6*	*0.500*	*0.6*	*0.200*	*0.0597*	*1.00*	*0.0597*	*0.875*	*0.0522*	*6.6*
26	11:41	16.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Figure 3 Discharge Measurement Summary LRC-1

Discharge Measurement Summary

Date Generated: Wed Nov 20 2019

File Information

File Name	UDB1014.WAD
Start Date and Time	2019/10/14 07:03:11

Site Details

Site Name	UPPER DAVE BLUE
Operator(s)	JTW

System Information

Sensor Type	FlowTracker
Serial #	P4709
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units	**(English Units)**
Distance	ft
Velocity	ft/s
Area	ft^2
Discharge	cfs

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.5%	7.0%
Velocity	3.2%	14.1%
Width	0.2%	0.2%
Method	2.7%	-
# Stations	1.9%	-
Overall	**4.7%**	**15.8%**

Summary

Averaging Int.	40	# Stations	27
Start Edge	REW	Total Width	14.500
Mean SNR	31.7 dB	Total Area	9.299
Mean Temp	55.43 °F	Mean Depth	0.641
Disch. Equation	Mid-Section	Mean Velocity	0.0128
		Total Discharge	**0.1193**

Supplemental Data

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Mon Oct 14 07:02:04 CDT 2019	0.000	17.310		

Measurement Results

St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	07:03	0.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	*07:03*	*1.00*	*0.6*	*0.300*	*0.6*	*0.120*	*-0.0745*	*1.00*	*-0.0745*	*0.300*	*-0.0223*	*-18.7*
2	*07:04*	*2.00*	*0.6*	*0.300*	*0.6*	*0.120*	*-0.0167*	*1.00*	*-0.0167*	*0.225*	*-0.0038*	*-3.2*
3	07:06	2.50	0.6	0.500	0.6	0.200	0.0174	1.00	0.0174	0.250	0.0043	3.6
4	*07:07*	*3.00*	*0.6*	*0.300*	*0.6*	*0.120*	*0.0289*	*1.00*	*0.0289*	*0.150*	*0.0043*	*3.6*
5	*07:08*	*3.50*	*0.6*	*0.500*	*0.6*	*0.200*	*0.0531*	*1.00*	*0.0531*	*0.250*	*0.0133*	*11.1*
6	07:10	4.00	0.6	0.500	0.6	0.200	0.0164	1.00	0.0164	0.250	0.0041	3.4
7	*07:13*	*4.50*	*0.6*	*0.800*	*0.6*	*0.320*	*0.0243*	*1.00*	*0.0243*	*0.400*	*0.0097*	*8.1*
8	07:14	5.00	0.6	0.800	0.6	0.320	0.0384	1.00	0.0384	0.400	0.0154	12.9
9	07:16	5.50	0.6	0.800	0.6	0.320	0.0240	1.00	0.0240	0.400	0.0096	8.0
10	*07:17*	*6.00*	*0.6*	*0.900*	*0.6*	*0.360*	*0.0194*	*1.00*	*0.0194*	*0.450*	*0.0087*	*7.3*
11	07:18	6.50	0.6	0.800	0.6	0.320	0.0131	1.00	0.0131	0.400	0.0052	4.4
12	07:19	7.00	0.6	1.000	0.6	0.400	0.0121	1.00	0.0121	0.500	0.0061	5.1
13	07:21	7.50	0.6	0.900	0.6	0.360	0.0157	1.00	0.0157	0.450	0.0071	5.9
14	07:22	8.00	0.6	0.900	0.6	0.360	0.0187	1.00	0.0187	0.450	0.0084	7.1
15	07:23	8.50	0.6	1.000	0.6	0.400	0.0141	1.00	0.0141	0.500	0.0071	5.9
16	07:24	9.00	0.6	0.900	0.6	0.360	0.0128	1.00	0.0128	0.450	0.0058	4.8
17	07:25	9.50	0.6	0.800	0.6	0.320	0.0253	1.00	0.0253	0.400	0.0101	8.5
18	*07:26*	*10.00*	*0.6*	*0.700*	*0.6*	*0.280*	*0.0177*	*1.00*	*0.0177*	*0.350*	*0.0062*	*5.2*
19	*07:27*	*10.50*	*0.6*	*0.800*	*0.6*	*0.320*	*0.0151*	*1.00*	*0.0151*	*0.400*	*0.0060*	*5.1*
20	07:28	11.00	0.6	0.900	0.6	0.360	0.0141	1.00	0.0141	0.450	0.0063	5.3
21	*07:29*	*11.50*	*0.6*	*0.900*	*0.6*	*0.360*	*0.0144*	*1.00*	*0.0144*	*0.450*	*0.0065*	*5.4*
22	*07:30*	*12.00*	*0.6*	*0.800*	*0.6*	*0.320*	*0.0082*	*1.00*	*0.0082*	*0.400*	*0.0033*	*2.8*
23	07:31	12.50	0.6	0.800	0.6	0.320	0.0125	1.00	0.0125	0.400	0.0050	4.2
24	07:32	13.00	0.6	0.500	0.6	0.200	-0.0157	1.00	-0.0157	0.250	-0.0039	-3.3
25	07:33	13.50	0.6	0.500	0.6	0.200	-0.0085	1.00	-0.0085	0.375	-0.0032	-2.7
26	07:33	14.50	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Figure 4 Discharge Measurement Summary UDB-1

Discharge Measurement Summary

Date Generated: Wed Nov 20 2019

File Information	
File Name	WC1014.WAD
Start Date and Time	2019/10/14 13:09:06

Site Details	
Site Name	WOODCREST
Operator(s)	JTW

System Information	
Sensor Type	FlowTracker
Serial #	P4709
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units	(English Units)
Distance	ft
Velocity	ft/s
Area	ft^2
Discharge	cfs

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.6%	3.4%
Velocity	5.9%	22.7%
Width	0.2%	0.2%
Method	2.9%	-
# Stations	2.4%	-
Overall	**7.1%**	**23.0%**

Summary

Averaging Int.	40	# Stations	21
Start Edge	LEW	Total Width	11.000
Mean SNR	39.9 dB	Total Area	4.750
Mean Temp	63.31 °F	Mean Depth	0.432
Disch. Equation	Mid-Section	Mean Velocity	0.0048
		Total Discharge	**0.0227**

Supplemental Data

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Mon Oct 14 13:08:02 CDT 2019	0.000	7.840		

Measurement Results

St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	13:09	0.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	13:09	1.00	0.6	0.300	0.6	0.120	-0.0072	1.00	-0.0072	0.225	-0.0016	-7.2
2	13:10	1.50	0.6	0.400	0.6	0.160	-0.0052	1.00	-0.0052	0.200	-0.0010	-4.6
3	13:11	2.00	0.6	0.500	0.6	0.200	0.0075	1.00	0.0075	0.250	0.0019	8.3
4	13:12	2.50	0.6	0.500	0.6	0.200	0.0049	1.00	0.0049	0.250	0.0012	5.4
5	13:13	3.00	0.6	0.500	0.6	0.200	0.0046	1.00	0.0046	0.250	0.0011	5.1
6	*13:14*	*3.50*	*0.6*	*0.500*	*0.6*	*0.200*	*0.0003*	*1.00*	*0.0003*	*0.250*	*0.0001*	*0.4*
7	13:15	4.00	0.6	0.500	0.6	0.200	0.0085	1.00	0.0085	0.250	0.0021	9.4
8	*13:16*	*4.50*	*0.6*	*0.500*	*0.6*	*0.200*	*-0.0007*	*1.00*	*-0.0007*	*0.250*	*-0.0002*	*-0.7*
9	13:18	5.00	0.6	0.400	0.6	0.160	0.0098	1.00	0.0098	0.200	0.0020	8.7
10	13:19	5.50	0.6	0.300	0.6	0.120	0.0089	1.00	0.0089	0.150	0.0013	5.9
11	*13:20*	*6.00*	*0.6*	*0.300*	*0.6*	*0.120*	*0.0013*	*1.00*	*0.0013*	*0.150*	*0.0002*	*0.9*
12	13:21	6.50	0.6	0.300	0.6	0.120	0.0010	1.00	0.0010	0.150	0.0001	0.7
13	13:22	7.00	0.6	0.400	0.6	0.160	-0.0010	1.00	-0.0010	0.200	-0.0002	-0.9
14	13:23	7.50	0.6	0.400	0.6	0.160	-0.0033	1.00	-0.0033	0.200	-0.0007	-2.9
15	*13:24*	*8.00*	*0.6*	*0.400*	*0.6*	*0.160*	*0.0105*	*1.00*	*0.0105*	*0.200*	*0.0021*	*9.3*
16	*13:25*	*8.50*	*0.6*	*0.700*	*0.6*	*0.280*	*0.0095*	*1.00*	*0.0095*	*0.350*	*0.0033*	*14.7*
17	*13:26*	*9.00*	*0.6*	*0.700*	*0.6*	*0.280*	*0.0128*	*1.00*	*0.0128*	*0.350*	*0.0045*	*19.8*
18	*13:27*	*9.50*	*0.6*	*0.700*	*0.6*	*0.280*	*0.0121*	*1.00*	*0.0121*	*0.350*	*0.0042*	*18.8*
19	*13:28*	*10.00*	*0.6*	*0.700*	*0.6*	*0.280*	*0.0039*	*1.00*	*0.0039*	*0.525*	*0.0021*	*9.1*
20	13:28	11.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Figure 5 Discharge Measurement Summary WC-1

Station Number:
Station Name: LDB

Meas. No: 0
Date: 10/14/2019

Party: jtw scd	Width: 29.9 ft	Processed by:
Boat/Motor:	Area: 72.2 ft²	Mean Velocity: 0.020 ft/s
Gage Height: 15.74 ft	G.H.Change: 0.000 ft	Discharge: 1.41 ft³/s

Area Method: Avg. Course	ADCP Depth: 0.270 ft	Index Vel.: 0.00 ft/s	Rating No.: 1
Nav. Method: Bottom Track	Shore Ens.:10	Adj.Mean Vel: 0.00 ft/s	Qm Rating: U
MagVar Method: None (0.0°)	Bottom Est: Power (0.1667)	Rated Area: 0.000 ft²	Diff.: 0.000%
Depth: Composite (BT)	Top Est: Power (0.1667)	Control1: Unspecified	
Discharge Method: None		Control2: Unspecified	
% Correction: 0.00		Control3: Unspecified	

Screening Thresholds:		ADCP:	
BT 3-Beam Solution: YES	Max. Vel.: 7.73 ft/s	Type/Freq.: RiverRay / 0 kHz	
WT 3-Beam Solution: YES	Max. Depth: 3.61 ft	Serial #: 645650	Firmware: 44.21
BT Error Vel.: 3.28 ft/s	Mean Depth: 2.41 ft	Bin Size: 50 cm	Blank: 50 cm
WT Error Vel.: 32.81 ft/s	% Meas.: 0.00	BT Mode: 0	BT Pings: 1
BT Up Vel.: 32.81 ft/s	Water Temp.: None	WT Mode: 1	WT Pings: 1
WT Up Vel.: 32.81 ft/s	ADCP Temp.: 60.6 °F	WV : 170	
Use Weighted Mean Depth: YES			

Performed Diag. Test: NO
Performed Moving Bed Test: NO
Performed Compass Calibration: YES Evaluation: YES
Meas. Location:

Project Name: ldb101419_0 edit.mmt
Software: 2.17

Tr.#		Edge Distance		#Ens.	Discharge						Width	Area	Time		Mean Vel.		% Bad	
		L	R		Top	Middle	Bottom	Left	Right	Total			Start	End	Boat	Water	Ens.	Bins
009	R	3	3	364	0.000	-0.812	0.141	0.989	1.13	1.41	30	72	10:12	10:16	0.13	0.02	44	12
Mean		3	3	364	0.000	-0.812	0.141	0.989	1.13	1.41	30	72	**Total**	00:03	0.13	0.02	44	12
SDev																		
SD/M																		

Figure 6 Discharge Measurement Summary LDB-1

Discharge Measurement Summary

Date Generated: Wed Nov 20 2019

File Information

File Name	URC1014.WAD
Start Date and Time	2019/10/14 12:08:54

Site Details

Site Name	UPPER ROCK CR
Operator(s)	JTW

System Information

Sensor Type	FlowTracker
Serial #	P4709
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units	**(English Units)**
Distance	ft
Velocity	ft/s
Area	ft^2
Discharge	cfs

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.9%	4.3%
Velocity	4.6%	49.1%
Width	0.3%	0.3%
Method	4.7%	-
# Stations	5.8%	-
Overall	**8.8%**	**49.3%**

Summary

Averaging Int.	40	# Stations	9
Start Edge	LEW	Total Width	5.000
Mean SNR	39.6 dB	Total Area	1.500
Mean Temp	62.82 °F	Mean Depth	0.300
Disch. Equation	Mid-Section	Mean Velocity	0.0340
		Total Discharge	**0.0509**

Supplemental Data

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Mon Oct 14 12:18:14 CDT 2019	5.000	11.080		

Measurement Results

St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	12:08	0.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	*12:08*	*1.00*	*0.6*	*0.300*	*0.6*	*0.120*	*0.0000*	*1.00*	*0.0000*	*0.225*	*0.0000*	*0.0*
2	*12:09*	*1.50*	*0.6*	*0.300*	*0.6*	*0.120*	*0.0030*	*1.00*	*0.0030*	*0.150*	*0.0004*	*0.9*
3	12:11	2.00	0.6	0.300	0.6	0.120	0.0531	1.00	0.0531	0.150	0.0080	15.6
4	12:12	2.50	0.6	0.300	0.6	0.120	0.0620	1.00	0.0620	0.150	0.0093	18.2
5	12:13	3.00	0.6	0.400	0.6	0.160	0.1447	1.00	0.1447	0.200	0.0289	56.8
6	*12:15*	*3.50*	*0.6*	*0.500*	*0.6*	*0.200*	*0.0226*	*1.00*	*0.0226*	*0.250*	*0.0057*	*11.1*
7	12:16	4.00	0.6	0.500	0.6	0.200	-0.0036	1.00	-0.0036	0.375	-0.0014	-2.7
8	12:16	5.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Figure 7 Discharge Measurement Summary URC-2

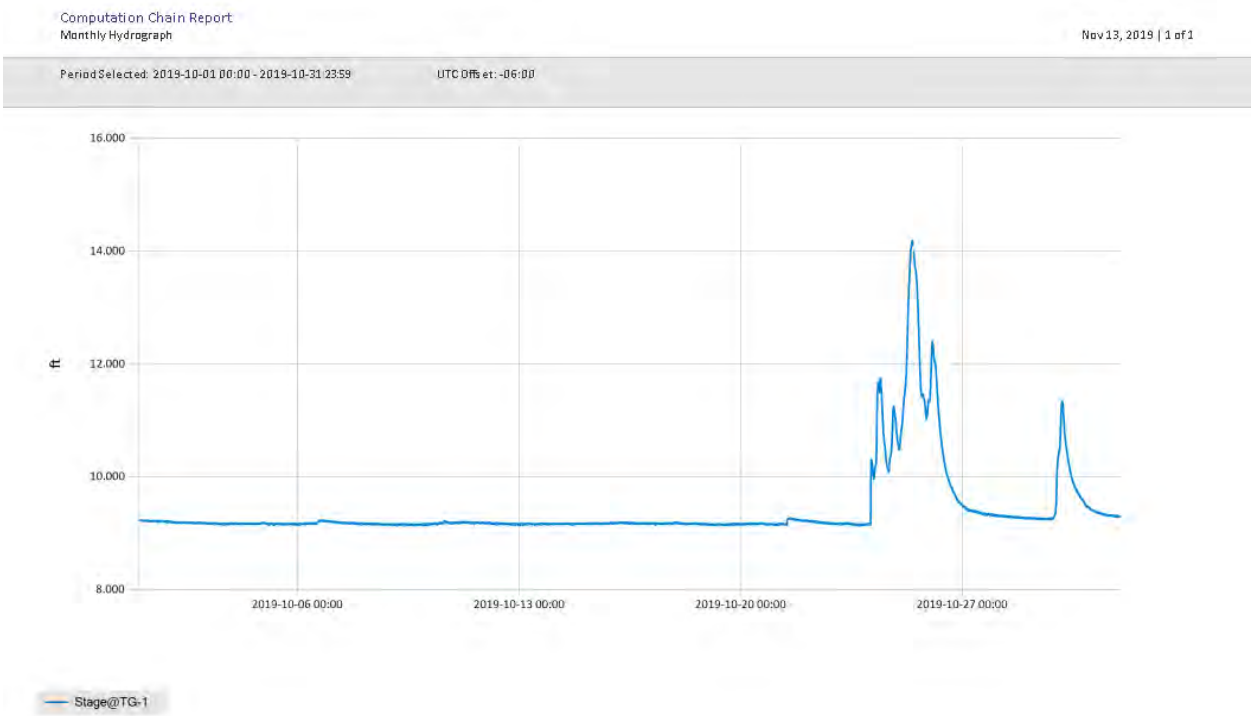

Figure 8 Monthly Hydrograph TG-1

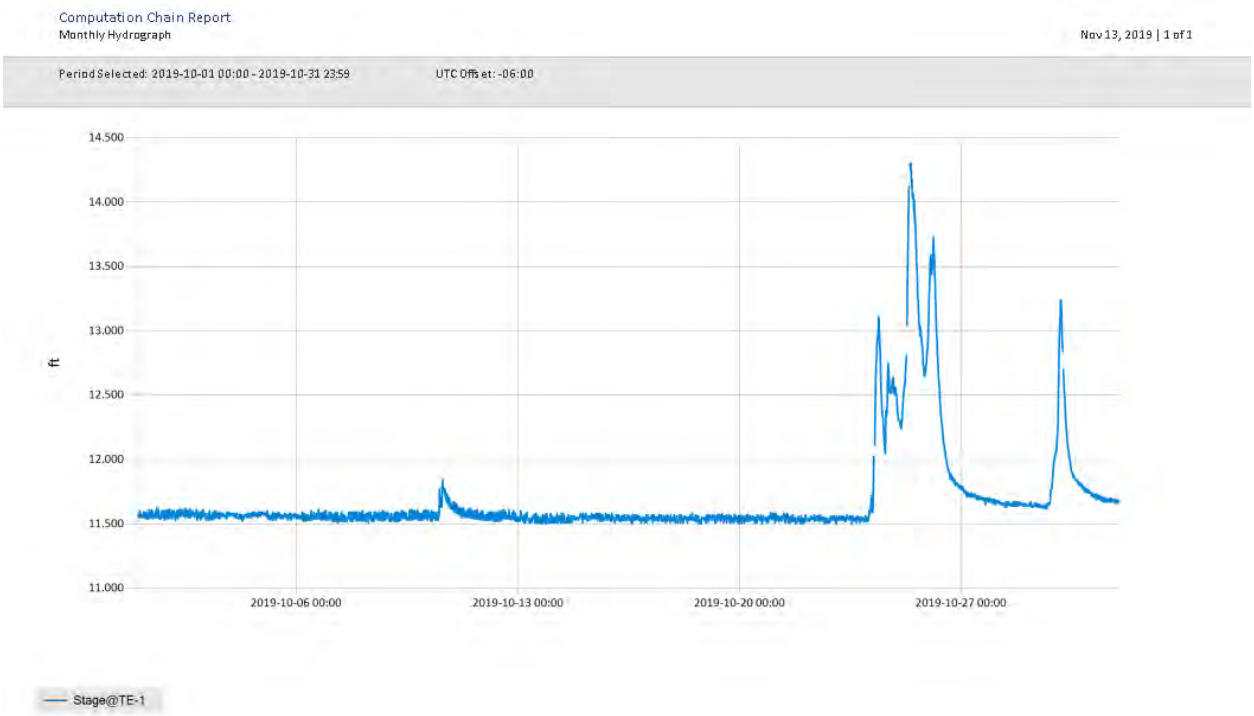

Figure 9 Monthly Hydrograph TE-1

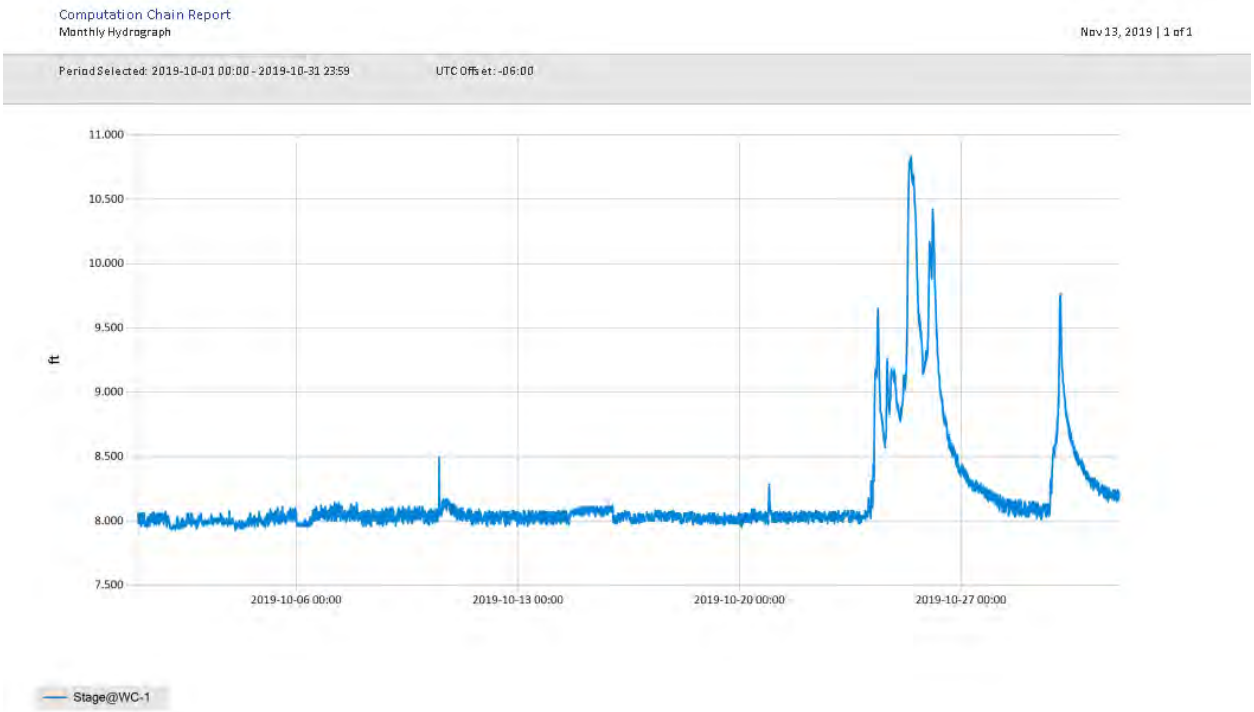

Figure 10 Monthly Hydrograph WC-1

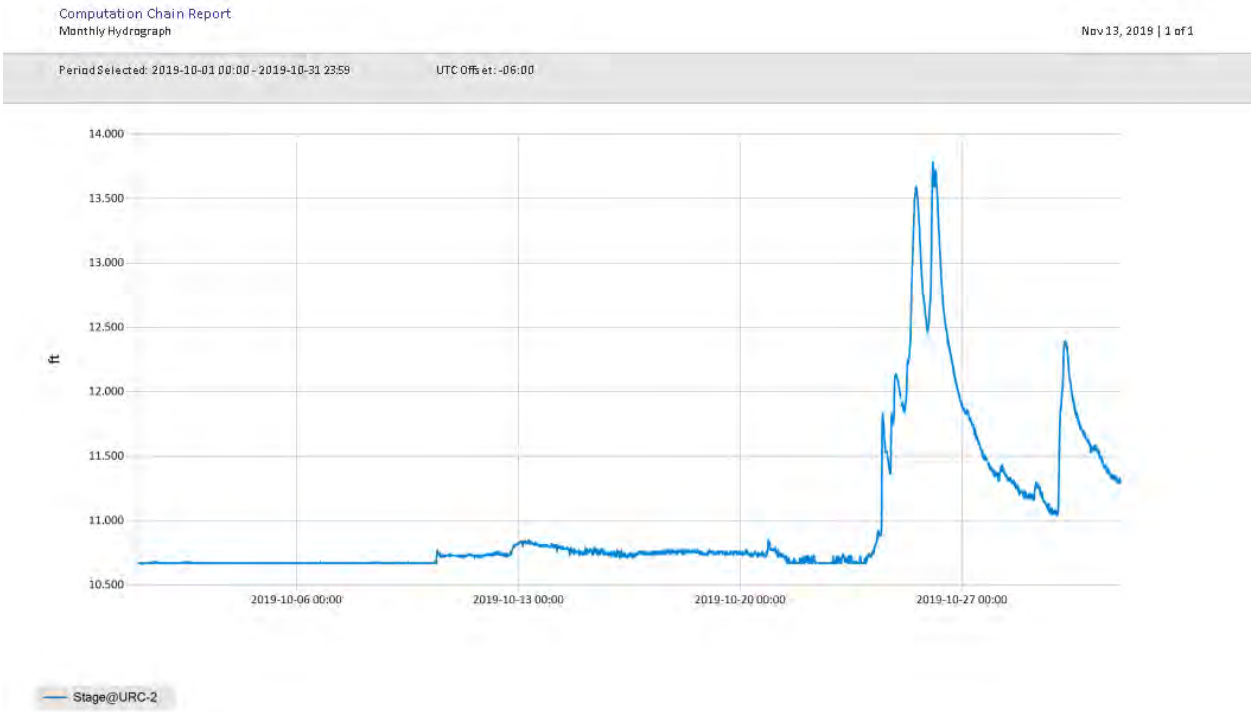

Figure 11 Monthly Hydrograph URC-2

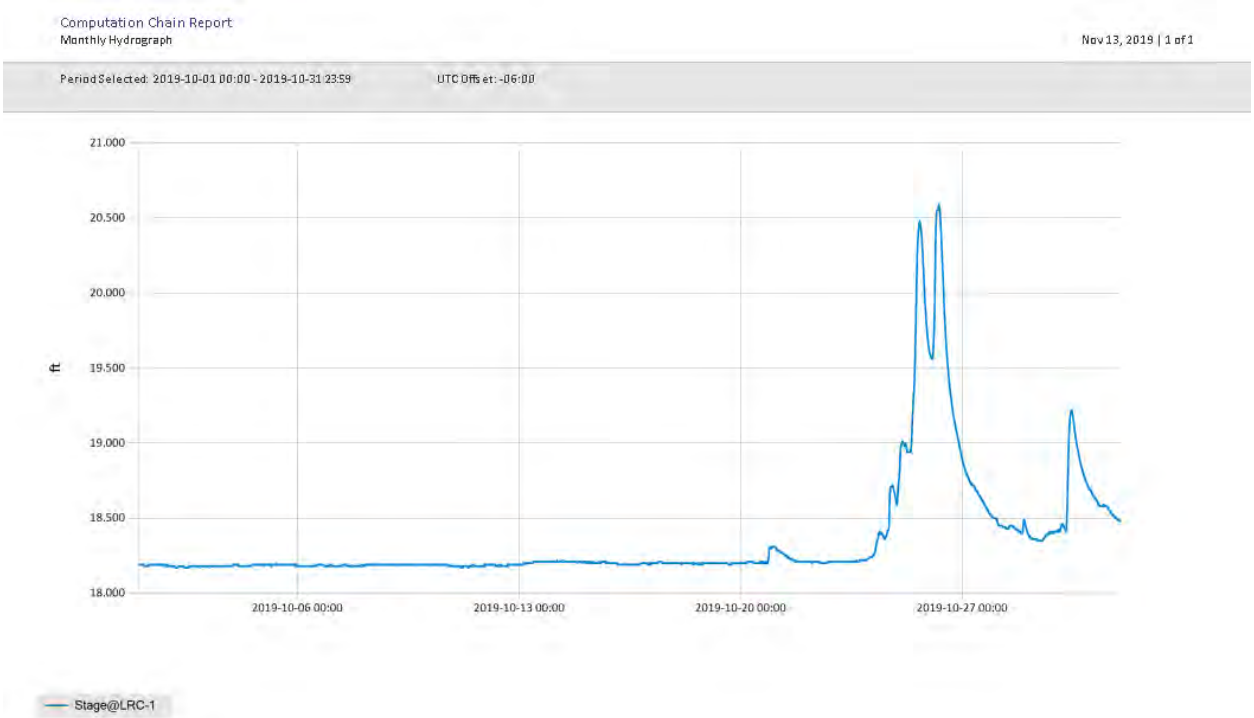

Figure 12 Monthly Hydrograph LRC-1

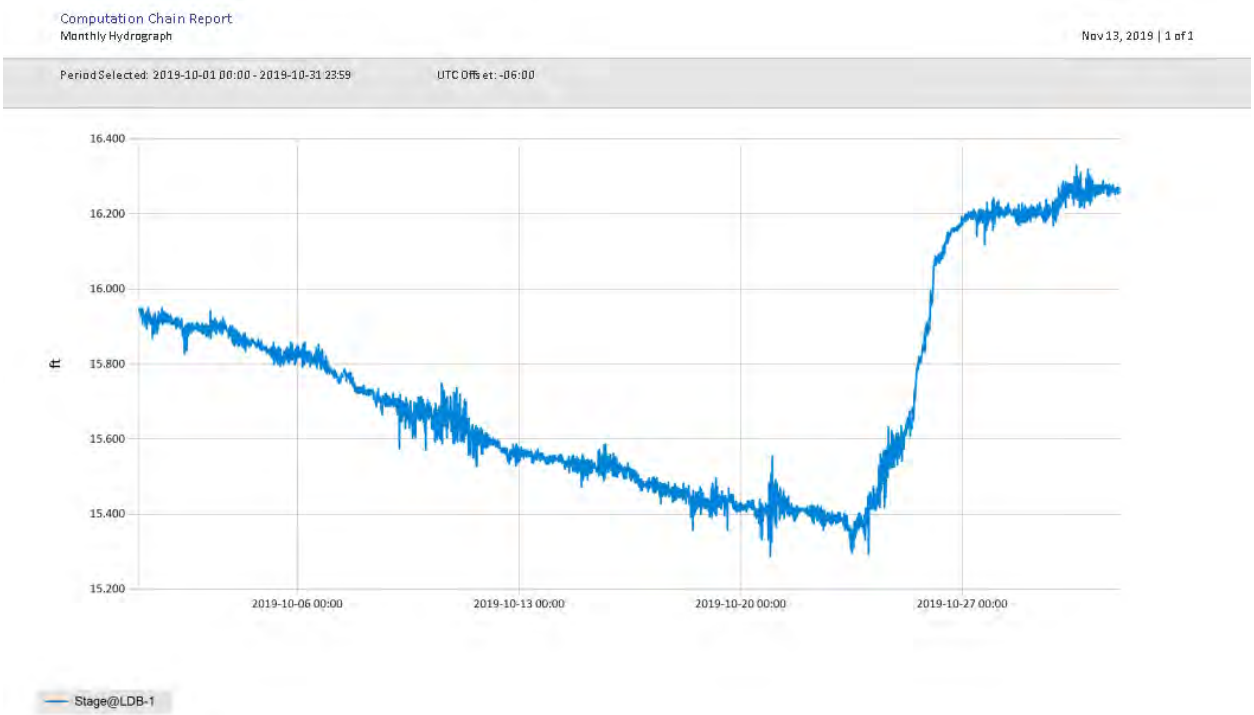

Figure 13 Monthly Hydrograph LDB-1

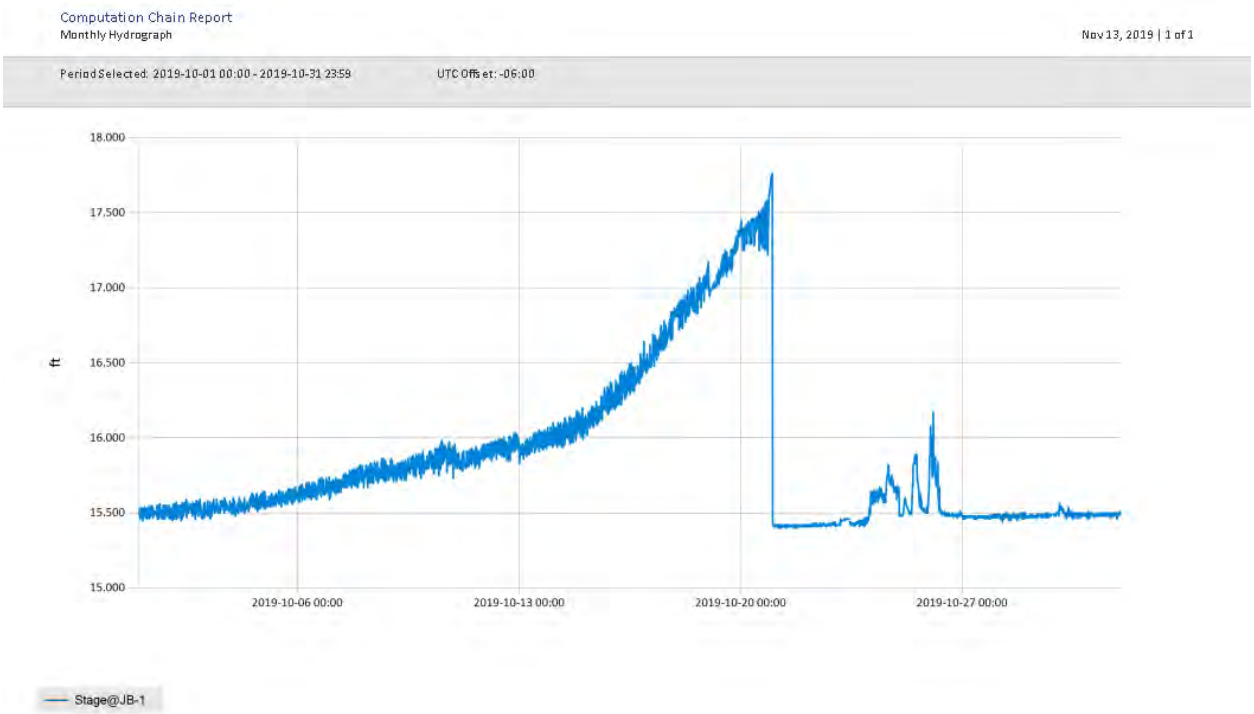

Figure 14 Monthly Hydrograph JB-1

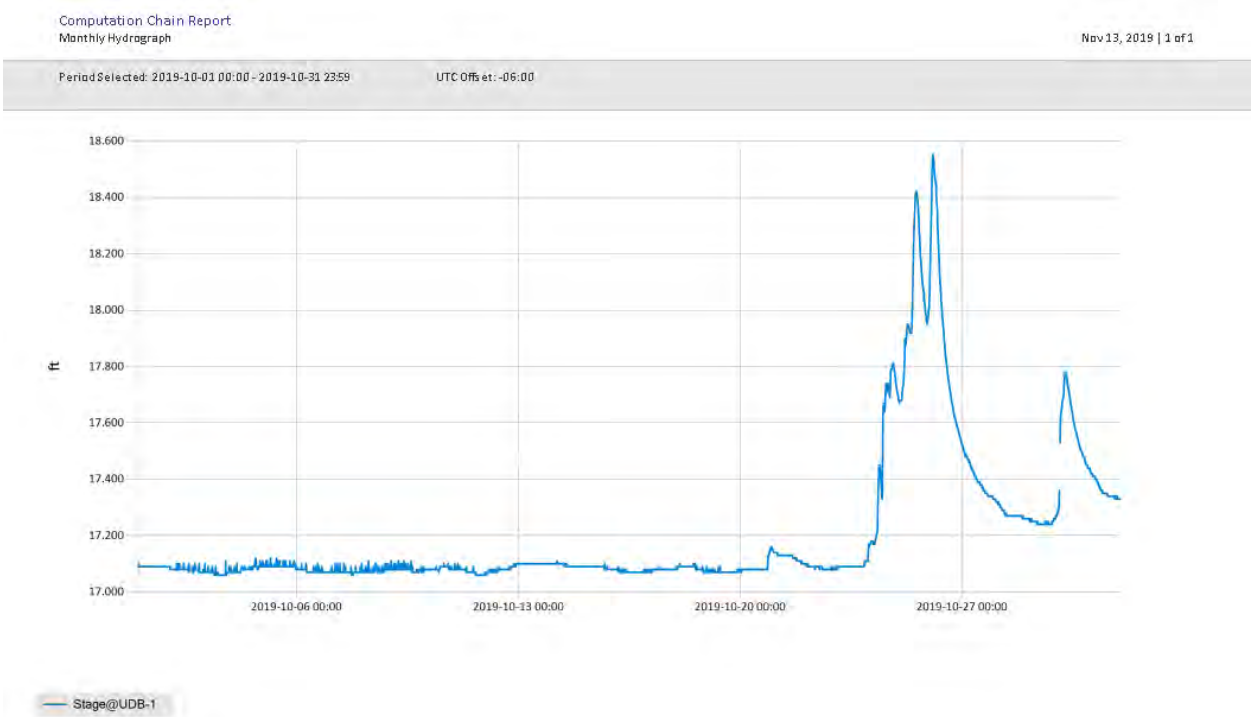

Figure 15 Monthly Hydrograph UDB-1

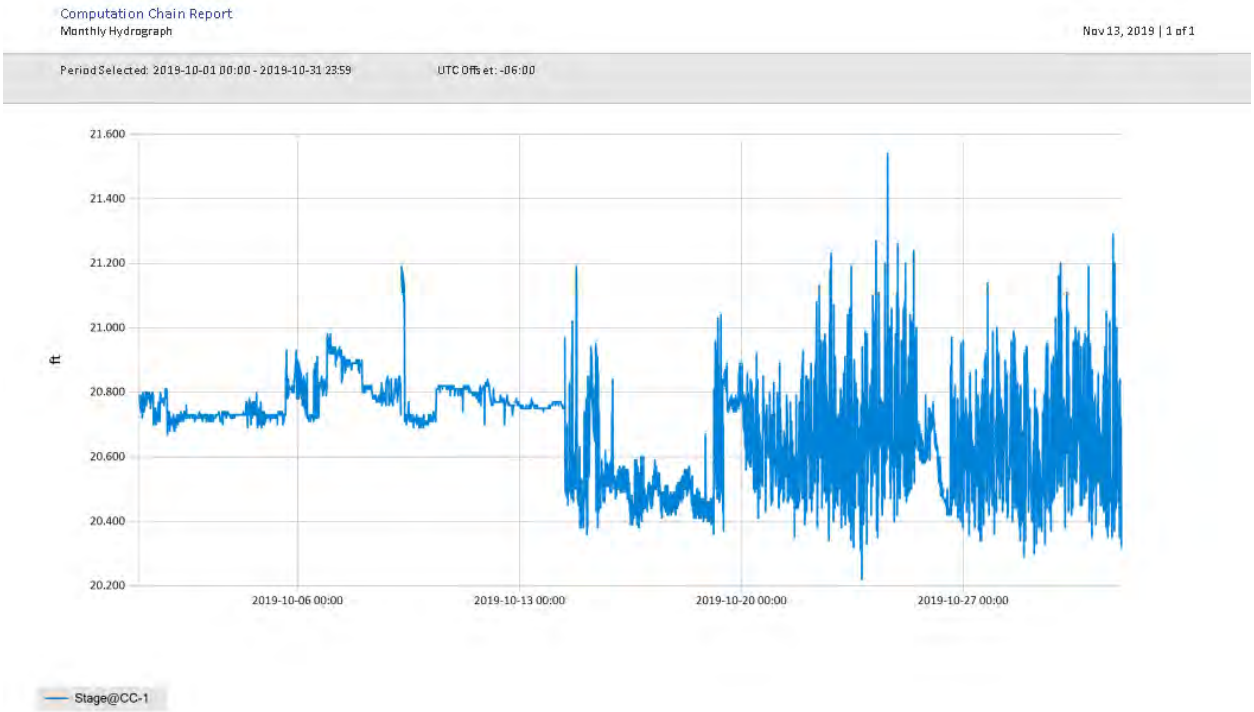

Figure 16 Monthly Hydrograph CC-1

MESONET CLIMATOLOGICAL DATA SUMMARY
(NRMN) Norman
Latitude: 35-14-09

October 2019
Nearest City: 2.1 NW Norman
Longitude: 97-27-53

Time Zone: Midnight-Midnight CST
County: Cleveland
Elevation: 1171 feet

DAY	TEMPERATURE (°F) MAX	MIN	AVG	DEWPT	DEG DAYS HDD	CDD	HUMIDITY (%) MAX	MIN	AVG	RAIN (in)	PRESSURE (in) STN	MSL	WIND SPEED (mph) DIR	AVG	MAX	SOLAR (MJ/m²)	4" SOIL TEMPERATURES SOD	BARE	MAX	MIN
1	87	74	79.8	68.9	0	15	89	56	70	0.00	28.70	29.94	SSE	10.0	27.3	16.97	78.5	80.8	87	76
2	89	73	80.1	67.8	0	16	86	49	67	0.00	28.70	29.95	S	9.5	23.4	19.64	78.3	81.6	88	76
3	77	57	68.6	62.0	0	2	91	65	80	0.00	28.88	30.13	NNE	9.9	19.8	15.30	77.3	79.8	85	76
4	84	56	68.3	61.8	0	5	94	58	81	0.00	28.89	30.14	NNE	6.0	15.0	16.43	75.3	77.2	84	71
5	88	67	74.3	64.6	0	12	96	47	74	0.00	28.73	29.97	SSE	9.6	24.5	12.71	76.0	78.1	84	74
6	69	54	61.5	53.3	4	0	93	48	75	0.00	28.83	30.08	NNE	11.1	33.2	8.72	73.5	73.6	77	69
7	71	46	57.9	42.8	6	0	87	32	61	0.00	28.99	30.25	NNE	5.8	17.4	20.24	69.9	70.1	78	63
8	75	43	60.7	45.6	6	0	96	35	61	0.00	28.82	30.07	SSE	6.7	21.7	19.56	67.7	69.1	77	62
9	81	60	69.9	58.9	0	5	86	58	69	0.02	28.59	29.83	SSE	12.7	29.2	11.43	68.9	70.6	76	67
10	79	43	63.1	54.3	4	0	92	54	74	0.14	28.62	29.86	NNW	16.3	37.9	12.79	69.8	70.6	73	64
11	55	34	44.3	25.3	21	0	85	24	50	0.00	29.02	30.28	NNW	13.7	36.4	19.88	63.0	62.2	68	57
12	66	30	48.5	26.8	17	0	89	19	50	0.00	28.90	30.15	SSW	6.2	20.9	19.84	60.2	60.0	68	52
13	78	42	58.9	39.0	5	0	74	26	51	0.00	28.72	29.97	S	6.6	17.2	18.66	61.4	62.9	72	55
14	79	54	65.8	55.3	0	1	94	46	70	0.00	28.68	29.93	SSE	9.5	24.7	13.80	64.2	66.3	72	61
15	82	53	69.0	58.0	0	3	99	41	70	0.00	28.69	29.94	S	10.8	30.9	12.50	67.8	70.7	77	68
16	66	42	53.0	36.0	11	0	94	31	55	0.00	28.92	30.18	N	6.6	17.8	18.54	64.5	65.9	72	60
17	77	43	59.4	39.6	5	0	92	23	52	0.00	28.73	29.97	SSE	7.4	21.1	18.40	62.6	64.6	72	58
18	75	48	61.3	44.3	3	0	88	27	57	0.04	28.53	29.77	SSE	10.7	25.8	17.74	63.3	65.5	72	60
19	74	47	60.1	49.1	4	0	95	41	69	0.00	28.53	29.77	N	7.0	26.1	17.30	63.9	66.0	72	61
20	83	44	63.5	50.7	2	0	99	34	68	0.10	28.46	29.69	SSE	8.5	34.9	16.73	63.0	65.5	73	59
21	70	40	55.5	29.8	10	0	82	16	41	0.00	28.65	29.89	WNW	9.2	32.1	17.89	61.9	62.7	69	57
22	71	37	54.3	28.5	11	0	67	18	41	0.00	28.88	30.13	WSW	5.9	23.2	17.65	59.1	60.5	68	54
23	78	49	63.1	45.3	2	0	88	38	53	0.05	28.72	29.96	S	9.0	32.9	14.94	60.0	62.5	69	56
24	58	42	47.2	45.6	15	0	97	88	94	1.79	28.88	30.13	NNE	15.5	38.1	1.40	59.4	58.2	65	53
25	46	41	42.9	41.8	22	0	98	95	96	1.89	28.91	30.16	N	13.9	27.9	1.51	54.3	52.1	53	51
26	64	44	52.1	41.1	11	0	97	39	69	0.19	28.62	29.86	NNW	7.0	19.3	16.24	56.0	55.7	62	52
27	74	43	55.2	41.3	7	0	84	28	63	0.00	28.65	29.89	SSE	9.7	23.6	16.96	57.1	56.6	63	52
28	46	35	40.9	35.5	25	0	92	71	81	0.01	28.82	30.07	N	10.1	21.1	3.58	55.3	50.7	55	48
29	38	32	35.7	33.1	30	0	97	80	90	0.45	28.87	30.13	NNE	10.8	20.5	2.32	52.4	45.7	48	45
30	37	28	34.5	31.1	32	0	97	71	87	0.24	28.93	30.18	NNW	16.7	33.6	2.41	50.0	45.8	46	45
31	47	23	34.2	18.1	30	0	83	24	56	0.00	29.10	30.36	NW	7.1	21.6	16.76	47.9	45.6	51	42
	70	46	57.5	45.0	<- Monthly Averages ->						28.77	30.02	SSE	9.7	38.1	14.16	63.9	64.4	70	59

Temperature - Highest: 89
Lowest: 23

Degree Days - Total HDD: 283
Total CDD: 59

Rainfall: Monthly Total: 4.92 in.
Greatest 24 Hr: 1.89 in.

Humidity - Highest: 99
Lowest: 16

Number of Days With:
Tmax ≥ 90: 0
Tmax ≤ 32: 0
Tmin ≤ 32: 4
Tmin ≤ 0: 0
Rainfall ≥ 0.01 inch: 11
Rainfall ≥ 0.10 inch: 7
Avg Wind Speed ≥ 10 mph: 12
Max Wind Speed ≥ 30 mph: 9

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* Denotes incomplete record

Figure 17 October Mesonet Data

Lake Thunderbird TMDL Monitoring Plan Implementation: Sample Year (SY) 2019- November Report

SY2019 Monthly Report

Lake Thunderbird TMDL Monitoring Plan Implementation:

November 2019 Monitoring Report

Oklahoma Water Resources Board
Water Quality Programs Division
Monitoring and Assessment Section
3800 N. Classen, Oklahoma City, Oklahoma 73118
405-530-8800

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SUMMARY OF NOVEMBER WATER QUALITY SAMPLING

Sampling for November 2019 occurred on the twelfth and was considered a base flow collection. Water samples were collected at all ten locations, and discharge measurements were collected at eight locations. Mesonet data shows no precipitation occurring on the twelfth, 0.02 inches of precipitation in the 72 hours prior to sampling, and no precipitation in the 72 hours after the sampling event. The total rainfall amount in Norman for the month of November was 2.09 inches. All water level gauges were operational for the month, with the exception of LT-1 due to equipment malfunction.

RESULTS

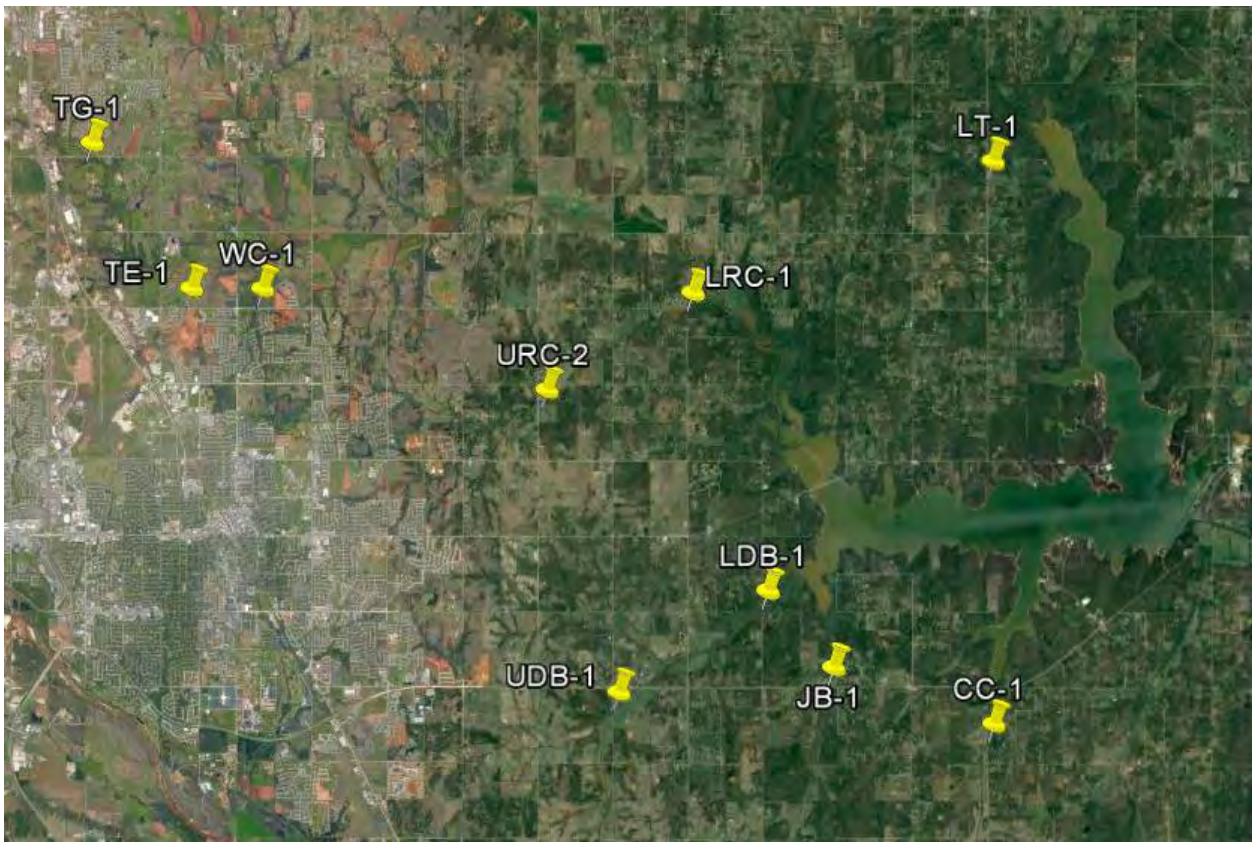

Figure 1 Monitoring Station Map

Monitoring Location ID	Monitoring Location Name	Date	Time	Field Crew	Water Temperature (°C)	Dissolved Oxygen (DO) (mg/l)	pH	Specific Conductance (mS/cm)	Turbidity (NTU)	Notes
CC-1	Clear Creek	11-12-2019	10:42	LO	3.5	12.01	7.96	714	7	used RP2
JB-1	Jim Blue Creek	11-12-2019	11:12	LO	3.4	8.92	7.55	882	21	frozen, RPs not over w ater
LDB-1	Lower Dave Blue Creek	11-12-2019	11:40	LO	5.9	6.64	7.88	861	4	
LRC-1	Lower Rock Creek	11-12-2019	11:55	SD	3.1	10.05	7.64	683	8	icy edges, ice around bridge area
LT-1	Lake Laterals	11-12-2019	13:26	LO	5.6	8.09	7.45	508	5	frozen
TE-1	Little River Tributary	11-12-2019	9:45	SD	2.7	10.91	7.81	820	34	upstream frozen
TG-1	Little River Tributary	11-12-2019	8:50	SD	2.3	9.99	7.56	933	6	edges frozen
UDB-1	Upper Dave Blue Creek	11-12-2019	9:10	LO	2.5	8.75	7.71	884	4	
URC-2	Upper Rock Creek	11-12-2019	11:15	SD	6.1	5.68	7.46	600	29	
WC-1	Woodcrest Creek	11-12-2019	10:35	SD	4.4	7.35	7.50	775	7	icy edges

Table 1 Field Data Form

Monitoring Location Name	Nitrate and Nitrite (mg/l)	Kjeldahl Nitrogen (mg/l)	Phosphorus (mg/l)	Total Suspended Solids (mg/l)
Clear Creek	0.08	0.13	0.033	<5.0
Jim Blue Creek	0.06	0.36	0.112	<5.0
Lower Dave Blue Creek	<0.05	0.38	0.057	<5.0
Lower Rock Creek	<0.05	0.30	0.059	<5.0
Lake Laterals	<0.05	0.55	0.041	<5.0
Little River Tributary	<0.05	0.47	0.049	14.0
Little River Tributary	0.06	0.36	0.084	10.0
Upper Dave Blue Creek	<0.05	0.28	0.081	<5.0
Upper Rock Creek	<0.05	0.69	0.105	18.0
Woodcrest Creek	<0.05	0.49	0.124	<5.0

Table 2 Laboratory Analysis Summary

Monitoring Location Name	Nitrate and Nitrite (mg/l)	Kjeldahl Nitrogen (mg/l)	Phosphorus (mg/l)	Total Suspended Solids (mg/l)
Field Blank	<0.05	<0.10	<0.010	<5.0
Duplicate	0.07	0.13	0.032	<5.0
Duplicate RPD	13.33%*	0%	3.08%	0%

Table 3 QA/QC Data Where an Asterisk Denotes RPD 2

Quality assurance/quality control (QA/QC) of the data includes a field blank and duplicate sample from each collection event, and is qualified by the OWRB. Relative Percent Difference (RPD) of the duplicate sample can be categorized into four levels, where Level 1 likely has no QA issues and Level 4 has major QA issues, and should be used with caution.

Monitoring Location ID	Monitoring Location Name	Discharge (cfs)	Stream Stage (ft)
CC-1	Clear Creek	0.67	20.55
JB-1	Jim Blue Creek	0	15.48
LDB-1	Lower Dave Blue Creek	4.12	16.51
LRC-1	Lower Rock Creek	1.07	18.58
LT-1	Lake Laterals	0.12	4.38
TE-1	Little River Tributary	0.10	11.37
TG-1	Little River Tributary	1.08	9.09
UDB-1	Upper Dave Blue Creek	0.40	17.42
URC-2	Upper Rock Creek	0.22	10.93
WC-1	Woodcrest Creek	0.10	7.75

Table 4 Station Discharge Summary

Discharge Measurement Summary

Date Generated: Wed Nov 20 2019

File Information	
File Name	CC1112.WAD
Start Date and Time	2019/11/12 10:30:28

Site Details	
Site Name	CC
Operator(s)	JTW

System Information	
Sensor Type	FlowTracker
Serial #	P4709
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units	(English Units)
Distance	ft
Velocity	ft/s
Area	ft^2
Discharge	cfs

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.5%	3.0%
Velocity	2.3%	11.4%
Width	0.2%	0.2%
Method	2.4%	-
# Stations	3.1%	-
Overall	**4.7%**	**11.8%**

Summary

Averaging Int.	40	# Stations	16
Start Edge	LEW	Total Width	10.000
Mean SNR	32.7 dB	Total Area	2.674
Mean Temp	37.93 °F	Mean Depth	0.267
Disch. Equation	Mid-Section	Mean Velocity	0.2519
		Total Discharge	**0.6736**

Supplemental Data

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Tue Nov 12 10:29:27 CST 2019	0.000	20.550		

Measurement Results

St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	10:30	0.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	10:30	1.00	0.6	0.300	0.6	0.120	0.1053	1.00	0.1053	0.225	0.0237	3.5
2	*10:31*	*1.50*	*0.6*	*0.300*	*0.6*	*0.120*	*0.0794*	*1.00*	*0.0794*	*0.225*	*0.0179*	*2.7*
3	10:34	2.50	0.6	0.300	0.6	0.120	0.3186	1.00	0.3186	0.225	0.0716	10.6
4	*10:35*	*3.00*	*0.6*	*0.300*	*0.6*	*0.120*	*0.1447*	*1.00*	*0.1447*	*0.150*	*0.0217*	*3.2*
5	*10:37*	*3.50*	*0.6*	*0.400*	*0.6*	*0.160*	*0.2014*	*1.00*	*0.2014*	*0.200*	*0.0403*	*6.0*
6	*10:38*	*4.00*	*0.6*	*0.300*	*0.6*	*0.120*	*0.2362*	*1.00*	*0.2362*	*0.150*	*0.0354*	*5.3*
7	*10:39*	*4.50*	*0.6*	*0.300*	*0.6*	*0.120*	*0.2877*	*1.00*	*0.2877*	*0.150*	*0.0431*	*6.4*
8	*10:40*	*5.00*	*0.6*	*0.300*	*0.6*	*0.120*	*0.3888*	*1.00*	*0.3888*	*0.150*	*0.0583*	*8.7*
9	10:42	5.50	0.6	0.300	0.6	0.120	0.2365	1.00	0.2365	0.150	0.0355	5.3
10	10:43	6.00	0.6	0.300	0.6	0.120	0.2963	1.00	0.2963	0.150	0.0444	6.6
11	10:44	6.50	0.6	0.300	0.6	0.120	0.2674	1.00	0.2674	0.225	0.0601	8.9
12	10:46	7.50	0.6	0.300	0.6	0.120	0.6276	1.00	0.6276	0.225	0.1412	21.0
13	10:47	8.00	0.6	0.300	0.6	0.120	0.3671	1.00	0.3671	0.150	0.0550	8.2
14	10:48	8.50	0.6	0.300	0.6	0.120	0.0846	1.00	0.0846	0.300	0.0254	3.8
15	10:48	10.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Figure 2 Discharge Measurement Summary CC-1

Discharge Measurement Summary

Date Generated: Wed Nov 20 2019

File Information	
File Name	UDB1112.WAD
Start Date and Time	2019/11/12 09:19:58

Site Details	
Site Name	UDB
Operator(s)	JTW

System Information	
Sensor Type	FlowTracker
Serial #	P4709
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units	(English Units)
Distance	ft
Velocity	ft/s
Area	ft^2
Discharge	cfs

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.3%	3.3%
Velocity	1.6%	5.3%
Width	0.1%	0.1%
Method	2.0%	-
# Stations	1.8%	-
Overall	**3.3%**	**6.3%**

Summary

Averaging Int.	40	# Stations	28
Start Edge	LEW	Total Width	15.000
Mean SNR	20.3 dB	Total Area	11.425
Mean Temp	35.91 °F	Mean Depth	0.762
Disch. Equation	Mid-Section	Mean Velocity	0.0354
		Total Discharge	**0.4040**

Supplemental Data

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Tue Nov 12 09:17:31 CST 2019	0.000	17.420		

Measurement Results

St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	09:19	0.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	*09:19*	*1.00*	*0.6*	*0.500*	*0.6*	*0.200*	*-0.0374*	*1.00*	*-0.0374*	*0.500*	*-0.0187*	*-4.6*
2	*09:21*	*2.00*	*0.6*	*0.500*	*0.6*	*0.200*	*0.0125*	*1.00*	*0.0125*	*0.375*	*0.0047*	*1.2*
3	*09:22*	*2.50*	*0.6*	*0.900*	*0.6*	*0.360*	*0.0033*	*1.00*	*0.0033*	*0.450*	*0.0015*	*0.4*
4	*09:24*	*3.00*	*0.6*	*0.900*	*0.6*	*0.360*	*0.0190*	*1.00*	*0.0190*	*0.450*	*0.0086*	*2.1*
5	*09:25*	*3.50*	*0.6*	*0.800*	*0.6*	*0.320*	*0.0184*	*1.00*	*0.0184*	*0.400*	*0.0073*	*1.8*
6	*09:26*	*4.00*	*0.6*	*0.900*	*0.6*	*0.360*	*0.0190*	*1.00*	*0.0190*	*0.450*	*0.0086*	*2.1*
7	*09:27*	*4.50*	*0.6*	*0.900*	*0.6*	*0.360*	*0.0210*	*1.00*	*0.0210*	*0.450*	*0.0094*	*2.3*
8	*09:28*	*5.00*	*0.6*	*0.900*	*0.6*	*0.360*	*0.0217*	*1.00*	*0.0217*	*0.450*	*0.0097*	*2.4*
9	*09:29*	*5.50*	*0.6*	*1.000*	*0.6*	*0.400*	*0.0259*	*1.00*	*0.0259*	*0.500*	*0.0130*	*3.2*
10	*09:30*	*6.00*	*0.6*	*0.900*	*0.6*	*0.360*	*0.0249*	*1.00*	*0.0249*	*0.450*	*0.0112*	*2.8*
11	*09:32*	*6.50*	*0.6*	*1.100*	*0.6*	*0.440*	*0.0420*	*1.00*	*0.0420*	*0.550*	*0.0231*	*5.7*
12	*09:33*	*7.00*	*0.6*	*1.200*	*0.6*	*0.480*	*0.0338*	*1.00*	*0.0338*	*0.600*	*0.0203*	*5.0*
13	*09:34*	*7.50*	*0.6*	*1.200*	*0.6*	*0.480*	*0.0331*	*1.00*	*0.0331*	*0.600*	*0.0199*	*4.9*
14	09:35	8.00	0.6	1.200	0.6	0.480	0.0344	1.00	0.0344	0.600	0.0207	5.1
15	09:36	8.50	0.6	1.100	0.6	0.440	0.0512	1.00	0.0512	0.550	0.0282	7.0
16	*09:37*	*9.00*	*0.6*	*1.300*	*0.6*	*0.520*	*0.0689*	*1.00*	*0.0689*	*0.650*	*0.0448*	*11.1*
17	*09:38*	*9.50*	*0.6*	*1.100*	*0.6*	*0.440*	*0.0801*	*1.00*	*0.0801*	*0.550*	*0.0440*	*10.9*
18	*09:40*	*10.00*	*0.6*	*0.600*	*0.6*	*0.240*	*0.1047*	*1.00*	*0.1047*	*0.300*	*0.0314*	*7.8*
19	*09:41*	*10.50*	*0.6*	*0.800*	*0.6*	*0.320*	*0.1083*	*1.00*	*0.1083*	*0.400*	*0.0433*	*10.7*
20	*09:42*	*11.00*	*0.6*	*0.800*	*0.6*	*0.320*	*0.0676*	*1.00*	*0.0676*	*0.400*	*0.0270*	*6.7*
21	*09:43*	*11.50*	*0.6*	*0.700*	*0.6*	*0.280*	*0.0371*	*1.00*	*0.0371*	*0.350*	*0.0130*	*3.2*
22	09:44	12.00	0.6	0.600	0.6	0.240	0.0489	1.00	0.0489	0.300	0.0147	3.6
23	*09:46*	*12.50*	*0.6*	*0.700*	*0.6*	*0.280*	*0.0141*	*1.00*	*0.0141*	*0.350*	*0.0049*	*1.2*
24	09:47	13.00	0.6	0.500	0.6	0.200	0.0118	1.00	0.0118	0.250	0.0030	0.7
25	*09:48*	*13.50*	*0.6*	*0.400*	*0.6*	*0.160*	*0.0157*	*1.00*	*0.0157*	*0.200*	*0.0031*	*0.8*
26	*09:49*	*14.00*	*0.6*	*0.400*	*0.6*	*0.160*	*0.0246*	*1.00*	*0.0246*	*0.300*	*0.0074*	*1.8*
27	09:49	15.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Figure 3 Discharge Measurement Summary UDB-1

Discharge Measurement Summary

Date Generated: Wed Nov 20 2019

File Information	
File Name	LT1112.WAD
Start Date and Time	2019/11/12 12:18:05

Site Details	
Site Name	LT
Operator(s)	JTW

System Information	
Sensor Type	FlowTracker
Serial #	P4709
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units	(English Units)
Distance	ft
Velocity	ft/s
Area	ft^2
Discharge	cfs

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.4%	5.7%
Velocity	12.6%	67.2%
Width	0.4%	0.4%
Method	6.4%	-
# Stations	2.8%	-
Overall	**14.4%**	**67.4%**

Summary

Averaging Int.	40	# Stations	18
Start Edge	LEW	Total Width	20.000
Mean SNR	38.4 dB	Total Area	31.101
Mean Temp	40.59 °F	Mean Depth	1.555
Disch. Equation	Mid-Section	Mean Velocity	0.0038
		Total Discharge	**0.1197**

Supplemental Data

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Tue Nov 12 12:42:16 CST 2019	20.000	4.380		

Measurement Results

St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	12:18	0.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	*12:18*	*3.00*	*0.6*	*1.100*	*0.6*	*0.440*	*-0.0207*	*1.00*	*-0.0207*	*2.200*	*-0.0455*	*-38.0*
2	12:19	4.00	0.6	1.400	0.6	0.560	-0.0033	1.00	-0.0033	1.400	-0.0046	-3.8
3	12:20	5.00	0.6	1.500	0.6	0.600	0.0141	1.00	0.0141	1.500	0.0212	17.7
4	*12:21*	*6.00*	*0.6*	*1.200*	*0.6*	*0.480*	*-0.0236*	*1.00*	*-0.0236*	*1.200*	*-0.0283*	*-23.7*
5	12:22	7.00	0.6	1.500	0.6	0.600	-0.0075	1.00	-0.0075	1.500	-0.0113	-9.5
6	12:24	8.00	0.6	2.100	0.6	0.840	-0.0108	1.00	-0.0108	2.100	-0.0227	-19.0
7	12:26	9.00	0.6	2.300	0.6	0.920	0.0079	1.00	0.0079	2.300	0.0181	15.1
8	12:27	10.00	0.6	2.200	0.6	0.880	0.0174	1.00	0.0174	2.200	0.0383	32.0
9	12:28	11.00	0.6	2.200	0.6	0.880	0.0049	1.00	0.0049	2.200	0.0108	9.0
10	12:29	12.00	0.6	2.200	0.6	0.880	0.0154	1.00	0.0154	2.200	0.0339	28.3
11	*12:30*	*13.00*	*0.6*	*2.200*	*0.6*	*0.880*	*0.0157*	*1.00*	*0.0157*	*2.200*	*0.0346*	*28.9*
12	12:31	14.00	0.6	2.200	0.6	0.880	0.0039	1.00	0.0039	2.200	0.0087	7.2
13	12:33	15.00	0.6	2.100	0.6	0.840	0.0121	1.00	0.0121	2.100	0.0255	21.3
14	*12:34*	*16.00*	*0.6*	*2.000*	*0.6*	*0.800*	*0.0164*	*1.00*	*0.0164*	*2.000*	*0.0328*	*27.4*
15	12:35	17.00	0.6	1.700	0.6	0.680	0.0085	1.00	0.0085	1.700	0.0145	12.1
16	12:36	18.00	0.6	1.400	0.6	0.560	-0.0030	1.00	-0.0030	2.100	-0.0062	-5.2
17	12:36	20.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Figure 4 Discharge Measurement Summary LT-1

Discharge Measurement Summary

Date Generated: Wed Nov 20 2019

File Information

File Name	LRC1112.WAD
Start Date and Time	2019/11/12 10:29:03

Site Details

Site Name	LRC111219
Operator(s)	ZMM

System Information

Sensor Type	FlowTracker
Serial #	P4713
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units	**(English Units)**
Distance	ft
Velocity	ft/s
Area	ft^2
Discharge	cfs

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.2%	1.1%
Velocity	0.7%	3.5%
Width	0.1%	0.1%
Method	2.0%	-
# Stations	2.3%	-
Overall	**3.3%**	**3.8%**

Summary

Averaging Int.	40	# Stations	22
Start Edge	LEW	Total Width	22.000
Mean SNR	18.7 dB	Total Area	18.399
Mean Temp	36.68 °F	Mean Depth	0.836
Disch. Equation	Mid-Section	Mean Velocity	0.0580
		Total Discharge	**1.0665**

Supplemental Data

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Tue Nov 12 10:33:09 CST 2019	5.000	18.580		

Measurement Results

St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	10:29	0.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	10:29	2.00	0.6	0.400	0.6	0.160	0.0210	1.00	0.0210	0.600	0.0126	1.2
2	10:30	3.00	0.6	0.400	0.6	0.160	0.0574	1.00	0.0574	0.400	0.0230	2.2
3	*10:32*	*4.00*	*0.6*	*0.600*	*0.6*	*0.240*	*0.0633*	*1.00*	*0.0633*	*0.600*	*0.0380*	*3.6*
4	*10:33*	*5.00*	*0.6*	*1.000*	*0.6*	*0.400*	*0.0725*	*1.00*	*0.0725*	*1.000*	*0.0725*	*6.8*
5	*10:34*	*6.00*	*0.6*	*1.200*	*0.6*	*0.480*	*0.0633*	*1.00*	*0.0633*	*1.200*	*0.0760*	*7.1*
6	*10:35*	*7.00*	*0.6*	*1.300*	*0.6*	*0.520*	*0.0692*	*1.00*	*0.0692*	*1.300*	*0.0900*	*8.4*
7	*10:37*	*8.00*	*0.6*	*1.300*	*0.6*	*0.520*	*0.0827*	*1.00*	*0.0827*	*1.300*	*0.1075*	*10.1*
8	*10:38*	*9.00*	*0.6*	*1.300*	*0.6*	*0.520*	*0.0781*	*1.00*	*0.0781*	*1.300*	*0.1015*	*9.5*
9	*10:39*	*10.00*	*0.6*	*1.300*	*0.6*	*0.520*	*0.0679*	*1.00*	*0.0679*	*1.300*	*0.0883*	*8.3*
10	*10:40*	*11.00*	*0.6*	*1.300*	*0.6*	*0.520*	*0.0692*	*1.00*	*0.0692*	*1.300*	*0.0900*	*8.4*
11	*10:41*	*12.00*	*0.6*	*1.300*	*0.6*	*0.520*	*0.0577*	*1.00*	*0.0577*	*1.300*	*0.0751*	*7.0*
12	*10:42*	*13.00*	*0.6*	*1.100*	*0.6*	*0.440*	*0.0630*	*1.00*	*0.0630*	*1.100*	*0.0693*	*6.5*
13	*10:43*	*14.00*	*0.6*	*1.100*	*0.6*	*0.440*	*0.0610*	*1.00*	*0.0610*	*1.100*	*0.0671*	*6.3*
14	10:45	15.00	0.6	1.000	0.6	0.400	0.0636	1.00	0.0636	1.000	0.0636	6.0
15	*10:46*	*16.00*	*0.6*	*0.900*	*0.6*	*0.360*	*0.0584*	*1.00*	*0.0584*	*0.900*	*0.0526*	*4.9*
16	*10:48*	*17.00*	*0.6*	*0.800*	*0.6*	*0.320*	*0.0328*	*1.00*	*0.0328*	*0.800*	*0.0262*	*2.5*
17	*10:49*	*18.00*	*0.6*	*0.700*	*0.6*	*0.280*	*-0.0007*	*1.00*	*-0.0007*	*0.700*	*-0.0005*	*0.0*
18	*10:51*	*19.00*	*0.6*	*0.500*	*0.6*	*0.200*	*0.0197*	*1.00*	*0.0197*	*0.500*	*0.0098*	*0.9*
19	*10:53*	*20.00*	*0.6*	*0.400*	*0.6*	*0.160*	*0.0033*	*1.00*	*0.0033*	*0.400*	*0.0013*	*0.1*
20	*10:54*	*21.00*	*0.6*	*0.300*	*0.6*	*0.120*	*0.0085*	*1.00*	*0.0085*	*0.300*	*0.0026*	*0.2*
21	10:54	22.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Figure 5 Discharge Measurement Summary LRC-1

Discharge Measurement Summary

Date Generated: Wed Nov 20 2019

File Information	
File Name	TE111219.WAD
Start Date and Time	2019/11/12 08:16:54

Site Details	
Site Name	TE111219
Operator(s)	ZMM

System Information	
Sensor Type	FlowTracker
Serial #	P4713
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units	(English Units)
Distance	ft
Velocity	ft/s
Area	ft^2
Discharge	cfs

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.6%	11.5%
Velocity	5.2%	17.5%
Width	0.3%	0.3%
Method	4.5%	-
# Stations	2.4%	-
Overall	**7.4%**	**20.9%**

Summary

Averaging Int.	40	# Stations	21
Start Edge	LEW	Total Width	13.500
Mean SNR	39.0 dB	Total Area	10.425
Mean Temp	36.15 °F	Mean Depth	0.772
Disch. Equation	Mid-Section	Mean Velocity	0.0096
		Total Discharge	**0.1003**

Supplemental Data

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Tue Nov 12 08:14:28 CST 2019	0.000	11.370		

Measurement Results

St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	08:16	0.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	*08:16*	*4.00*	*0.6*	*0.300*	*0.6*	*0.120*	*-0.0394*	*1.00*	*-0.0394*	*0.675*	*-0.0266*	*-26.5*
2	*08:19*	*4.50*	*0.6*	*1.300*	*0.6*	*0.520*	*-0.0240*	*1.00*	*-0.0240*	*0.650*	*-0.0156*	*-15.5*
3	08:20	5.00	0.6	1.300	0.6	0.520	-0.0020	1.00	-0.0020	0.650	-0.0013	-1.3
4	08:21	5.50	0.6	1.200	0.6	0.480	0.0062	1.00	0.0062	0.600	0.0037	3.7
5	08:22	6.00	0.6	1.200	0.6	0.480	0.0171	1.00	0.0171	0.600	0.0102	10.2
6	08:24	6.50	0.6	1.400	0.6	0.560	0.0043	1.00	0.0043	0.700	0.0030	3.0
7	*08:25*	*7.00*	*0.6*	*1.400*	*0.6*	*0.560*	*0.0220*	*1.00*	*0.0220*	*0.700*	*0.0154*	*15.3*
8	*08:26*	*7.50*	*0.6*	*1.500*	*0.6*	*0.600*	*0.0043*	*1.00*	*0.0043*	*0.750*	*0.0032*	*3.2*
9	08:27	8.00	0.6	1.400	0.6	0.560	-0.0056	1.00	-0.0056	0.700	-0.0039	-3.9
10	08:28	8.50	0.6	1.400	0.6	0.560	0.0043	1.00	0.0043	0.700	0.0030	3.0
11	*08:30*	*9.00*	*0.6*	*1.300*	*0.6*	*0.520*	*0.0312*	*1.00*	*0.0312*	*0.650*	*0.0203*	*20.2*
12	08:31	9.50	0.6	1.300	0.6	0.520	0.0413	1.00	0.0413	0.650	0.0269	26.8
13	*08:32*	*10.00*	*0.6*	*1.100*	*0.6*	*0.440*	*0.0482*	*1.00*	*0.0482*	*0.550*	*0.0265*	*26.4*
14	*08:33*	*10.50*	*0.6*	*0.900*	*0.6*	*0.360*	*0.0420*	*1.00*	*0.0420*	*0.450*	*0.0189*	*18.8*
15	08:34	11.00	0.6	0.700	0.6	0.280	0.0177	1.00	0.0177	0.350	0.0062	6.2
16	08:35	11.50	0.6	0.700	0.6	0.280	0.0138	1.00	0.0138	0.350	0.0048	4.8
17	08:36	12.00	0.6	0.500	0.6	0.200	0.0131	1.00	0.0131	0.250	0.0033	3.3
18	08:38	12.50	0.6	0.500	0.6	0.200	0.0072	1.00	0.0072	0.250	0.0018	1.8
19	08:39	13.00	0.6	0.400	0.6	0.160	0.0023	1.00	0.0023	0.200	0.0005	0.5
20	08:39	13.50	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Figure 6 Discharge Measurement Summary TE-1

Discharge Measurement Summary

Date Generated: Wed Nov 20 2019

File Information	
File Name	TG111219.WAD
Start Date and Time	2019/11/12 07:19:32

Site Details	
Site Name	TG111219
Operator(s)	ZMM

System Information	
Sensor Type	FlowTracker
Serial #	P4713
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units	(English Units)
Distance	ft
Velocity	ft/s
Area	ft^2
Discharge	cfs

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.1%	1.2%
Velocity	0.9%	4.4%
Width	0.1%	0.1%
Method	2.1%	-
# Stations	2.5%	-
Overall	**3.6%**	**4.7%**

Summary

Averaging Int.	40	# Stations	20
Start Edge	LEW	Total Width	19.000
Mean SNR	18.8 dB	Total Area	18.600
Mean Temp	35.37 °F	Mean Depth	0.979
Disch. Equation	Mid-Section	Mean Velocity	0.0582
		Total Discharge	**1.0824**

Supplemental Data

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Tue Nov 12 07:28:53 CST 2019	8.000	9.090		

Measurement Results

St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	07:19	0.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	*07:19*	*1.00*	*0.6*	*0.300*	*0.6*	*0.120*	*0.0095*	*1.00*	*0.0095*	*0.300*	*0.0029*	*0.3*
2	*07:21*	*2.00*	*0.6*	*0.600*	*0.6*	*0.240*	*-0.0223*	*1.00*	*-0.0223*	*0.600*	*-0.0134*	*-1.2*
3	*07:22*	*3.00*	*0.6*	*0.700*	*0.6*	*0.280*	*0.0272*	*1.00*	*0.0272*	*0.700*	*0.0191*	*1.8*
4	*07:23*	*4.00*	*0.6*	*1.000*	*0.6*	*0.400*	*0.0453*	*1.00*	*0.0453*	*1.000*	*0.0453*	*4.2*
5	*07:25*	*5.00*	*0.6*	*1.200*	*0.6*	*0.480*	*0.0676*	*1.00*	*0.0676*	*1.200*	*0.0811*	*7.5*
6	*07:26*	*6.00*	*0.6*	*1.200*	*0.6*	*0.480*	*0.0761*	*1.00*	*0.0761*	*1.200*	*0.0913*	*8.4*
7	*07:28*	*7.00*	*0.6*	*1.200*	*0.6*	*0.480*	*0.0679*	*1.00*	*0.0679*	*1.200*	*0.0815*	*7.5*
8	*07:29*	*8.00*	*0.6*	*1.200*	*0.6*	*0.480*	*0.0663*	*1.00*	*0.0663*	*1.200*	*0.0795*	*7.3*
9	*07:30*	*9.00*	*0.6*	*1.300*	*0.6*	*0.520*	*0.0810*	*1.00*	*0.0810*	*1.300*	*0.1053*	*9.7*
10	*07:31*	*10.00*	*0.6*	*1.300*	*0.6*	*0.520*	*0.0817*	*1.00*	*0.0817*	*1.300*	*0.1062*	*9.8*
11	*07:33*	*11.00*	*0.6*	*1.400*	*0.6*	*0.560*	*0.0692*	*1.00*	*0.0692*	*1.400*	*0.0969*	*9.0*
12	*07:34*	*12.00*	*0.6*	*1.300*	*0.6*	*0.520*	*0.0702*	*1.00*	*0.0702*	*1.300*	*0.0913*	*8.4*
13	*07:35*	*13.00*	*0.6*	*1.200*	*0.6*	*0.480*	*0.0846*	*1.00*	*0.0846*	*1.200*	*0.1016*	*9.4*
14	*07:36*	*14.00*	*0.6*	*1.100*	*0.6*	*0.440*	*0.0702*	*1.00*	*0.0702*	*1.100*	*0.0772*	*7.1*
15	07:38	15.00	0.6	1.100	0.6	0.440	0.0646	1.00	0.0646	1.100	0.0711	6.6
16	07:39	16.00	0.6	1.000	0.6	0.400	0.0463	1.00	0.0463	1.000	0.0463	4.3
17	*07:40*	*17.00*	*0.6*	*0.900*	*0.6*	*0.360*	*0.0177*	*1.00*	*0.0177*	*0.900*	*0.0159*	*1.5*
18	*07:41*	*18.00*	*0.6*	*0.600*	*0.6*	*0.240*	*-0.0279*	*1.00*	*-0.0279*	*0.600*	*-0.0167*	*-1.5*
19	07:41	19.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Figure 7 Discharge Measurement Summary TG-1

Discharge Measurement Summary

Date Generated: Wed Nov 20 2019

File Information	
File Name	URC1112.WAD
Start Date and Time	2019/11/12 09:52:37

Site Details	
Site Name	URC111219
Operator(s)	ZMM

System Information	
Sensor Type	FlowTracker
Serial #	P4713
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units	(English Units)
Distance	ft
Velocity	ft/s
Area	ft^2
Discharge	cfs

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.7%	3.8%
Velocity	2.6%	21.7%
Width	0.2%	0.2%
Method	3.5%	-
# Stations	4.6%	-
Overall	**6.5%**	**22.0%**

Summary

Averaging Int.	40	# Stations	11
Start Edge	LEW	Total Width	8.000
Mean SNR	43.2 dB	Total Area	2.250
Mean Temp	42.39 °F	Mean Depth	0.281
Disch. Equation	Mid-Section	Mean Velocity	0.0965
		Total Discharge	**0.2172**

Supplemental Data

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Tue Nov 12 09:49:47 CST 2019	0.000	10.930		

Measurement Results

St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	09:52	0.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	*09:52*	*3.50*	*0.6*	*0.300*	*0.6*	*0.120*	*0.0600*	*1.00*	*0.0600*	*0.600*	*0.0360*	*16.6*
2	*09:54*	*4.00*	*0.6*	*0.300*	*0.6*	*0.120*	*0.0568*	*1.00*	*0.0568*	*0.150*	*0.0085*	*3.9*
3	09:58	4.50	0.6	0.400	0.6	0.160	0.0535	1.00	0.0535	0.200	0.0107	4.9
4	09:59	5.00	0.6	0.400	0.6	0.160	0.2133	1.00	0.2133	0.200	0.0426	19.6
5	10:00	5.50	0.6	0.500	0.6	0.200	0.2352	1.00	0.2352	0.250	0.0588	27.1
6	10:01	6.00	0.6	0.500	0.6	0.200	0.2402	1.00	0.2402	0.250	0.0600	27.6
7	*10:02*	*6.50*	*0.6*	*0.500*	*0.6*	*0.200*	*0.0213*	*1.00*	*0.0213*	*0.250*	*0.0053*	*2.5*
8	10:03	7.00	0.6	0.400	0.6	0.160	-0.0187	1.00	-0.0187	0.200	-0.0037	-1.7
9	10:04	7.50	0.6	0.300	0.6	0.120	-0.0075	1.00	-0.0075	0.150	-0.0011	-0.5
10	10:04	8.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Figure 8 Discharge Measurement Summary URC-2

Discharge Measurement Summary

Date Generated: Wed Nov 20 2019

File Information	
File Name	WC111219.WAD
Start Date and Time	2019/11/12 09:14:16

Site Details	
Site Name	WC111219
Operator(s)	ZMM

System Information	
Sensor Type	FlowTracker
Serial #	P4713
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units	(English Units)
Distance	ft
Velocity	ft/s
Area	ft^2
Discharge	cfs

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.7%	5.5%
Velocity	2.1%	23.5%
Width	0.2%	0.2%
Method	3.6%	-
# Stations	3.9%	-
Overall	**5.8%**	**24.1%**

Summary

Averaging Int.	40	# Stations	13
Start Edge	LEW	Total Width	7.000
Mean SNR	45.3 dB	Total Area	2.300
Mean Temp	39.10 °F	Mean Depth	0.329
Disch. Equation	Mid-Section	Mean Velocity	0.0424
		Total Discharge	**0.0975**

Supplemental Data

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Tue Nov 12 09:14:04 CST 2019	1.500	7.750		

Measurement Results

St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	09:14	0.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	*09:14*	*1.50*	*0.6*	*0.300*	*0.6*	*0.120*	*0.0026*	*1.00*	*0.0026*	*0.300*	*0.0008*	*0.8*
2	09:15	2.00	0.6	0.300	0.6	0.120	0.0292	1.00	0.0292	0.150	0.0044	4.5
3	*09:17*	*2.50*	*0.6*	*0.300*	*0.6*	*0.120*	*0.0075*	*1.00*	*0.0075*	*0.150*	*0.0011*	*1.2*
4	09:18	3.00	0.6	0.400	0.6	0.160	0.1401	1.00	0.1401	0.200	0.0280	28.7
5	09:19	3.50	0.6	0.500	0.6	0.200	0.1188	1.00	0.1188	0.250	0.0297	30.5
6	09:20	4.00	0.6	0.400	0.6	0.160	0.0820	1.00	0.0820	0.200	0.0164	16.8
7	09:21	4.50	0.6	0.500	0.6	0.200	0.0436	1.00	0.0436	0.250	0.0109	11.2
8	*09:22*	*5.00*	*0.6*	*0.400*	*0.6*	*0.160*	*0.0292*	*1.00*	*0.0292*	*0.200*	*0.0058*	*6.0*
9	*09:23*	*5.50*	*0.6*	*0.400*	*0.6*	*0.160*	*0.0207*	*1.00*	*0.0207*	*0.200*	*0.0041*	*4.2*
10	*09:24*	*6.00*	*0.6*	*0.400*	*0.6*	*0.160*	*-0.0223*	*1.00*	*-0.0223*	*0.200*	*-0.0045*	*-4.6*
11	09:25	6.50	0.6	0.400	0.6	0.160	0.0033	1.00	0.0033	0.200	0.0007	0.7
12	09:25	7.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Figure 9 Discharge Measurement Summary WC-1

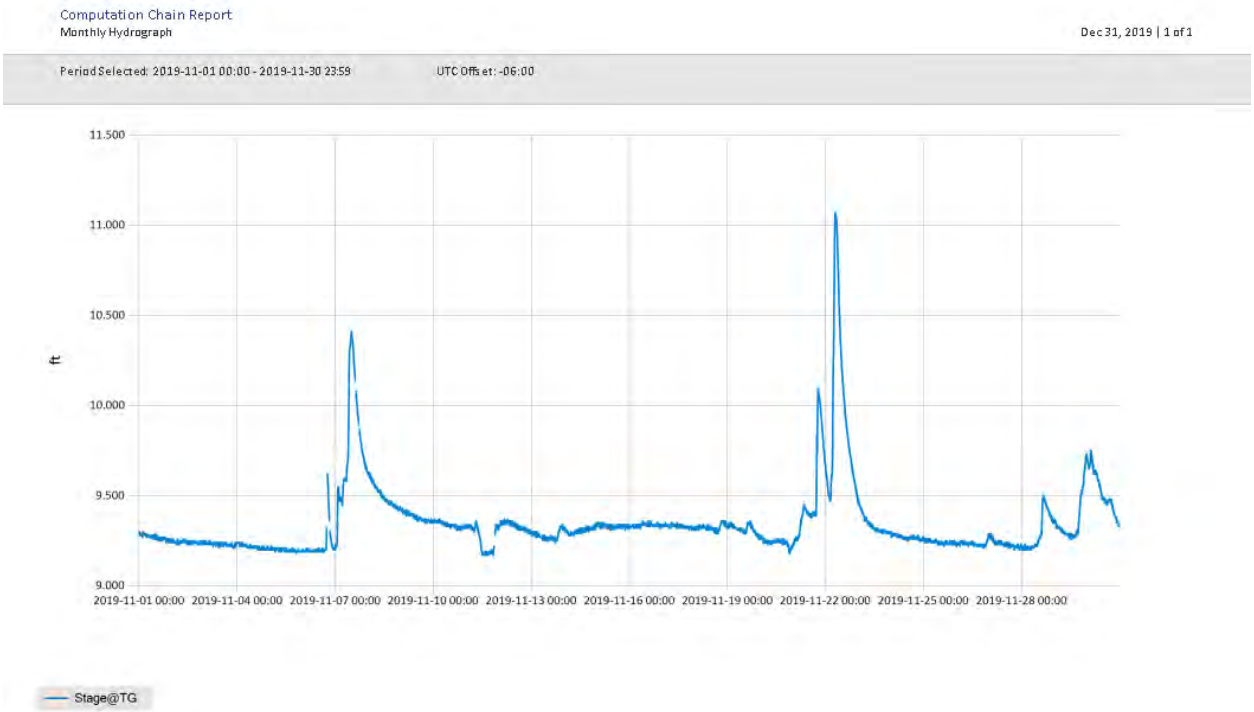

Figure 10 Monthly Hydrograph TG-1

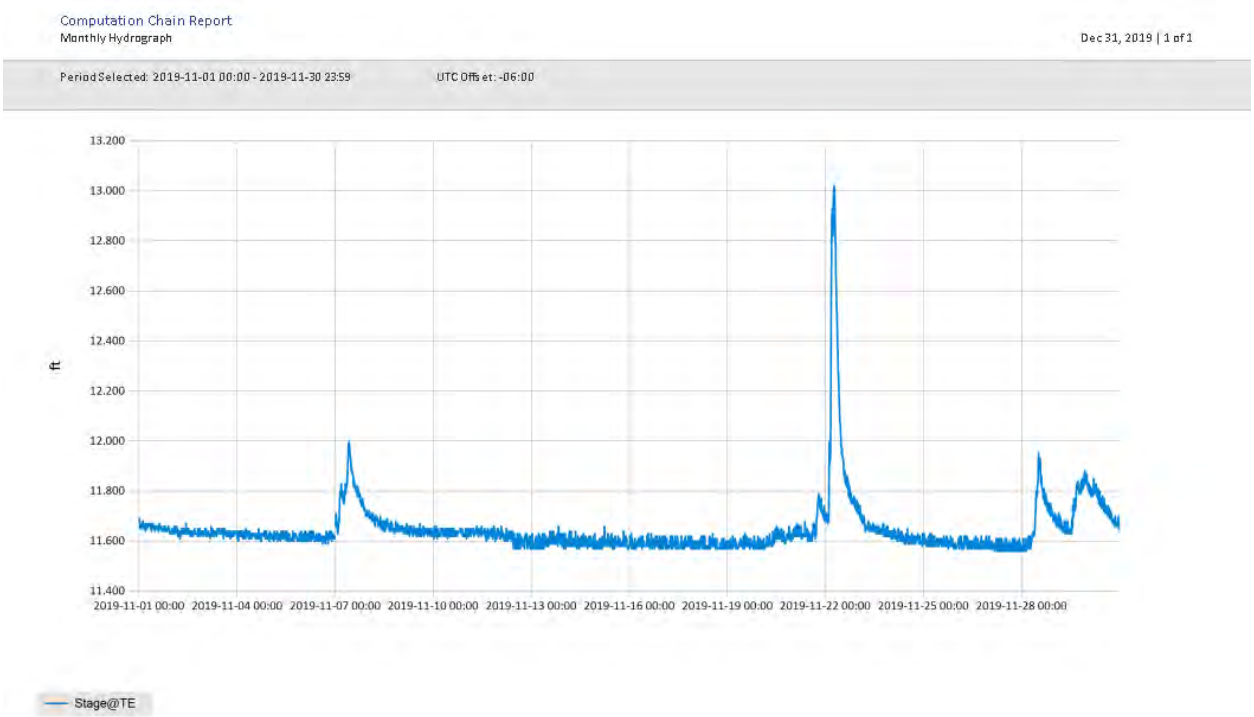

Figure 11 Monthly Hydrograph TE-1

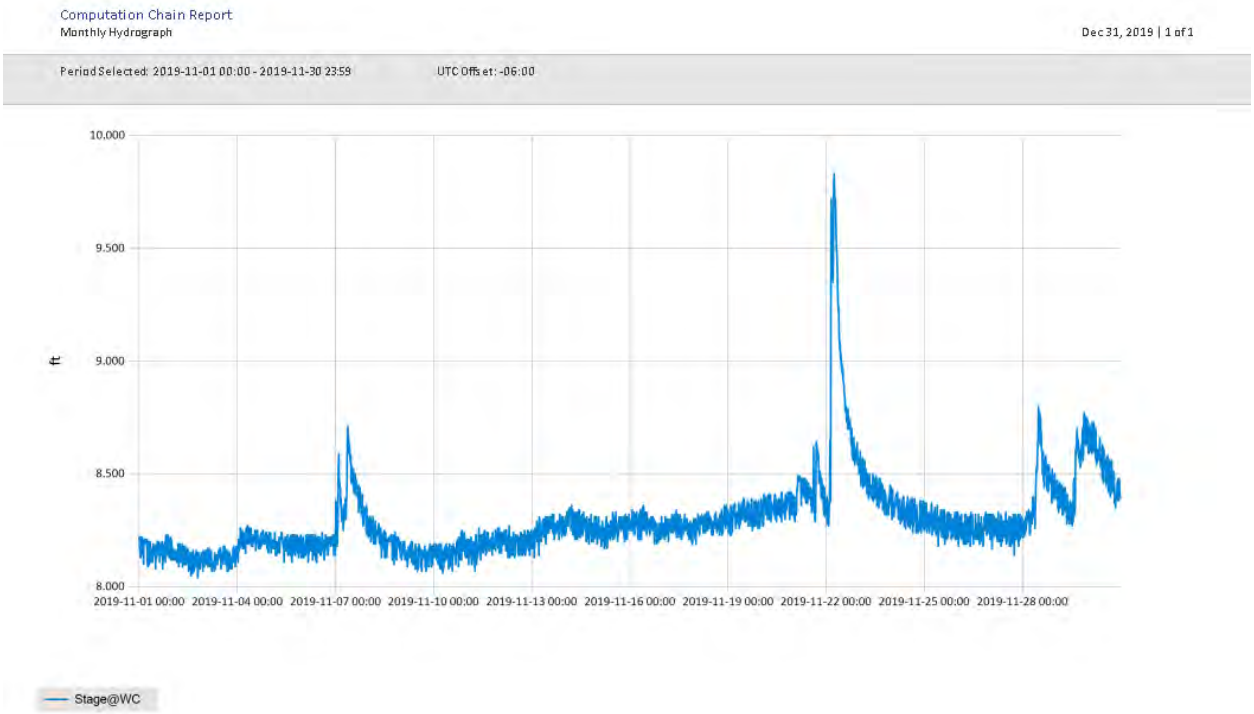

Figure 12 Monthly Hydrograph WC-1

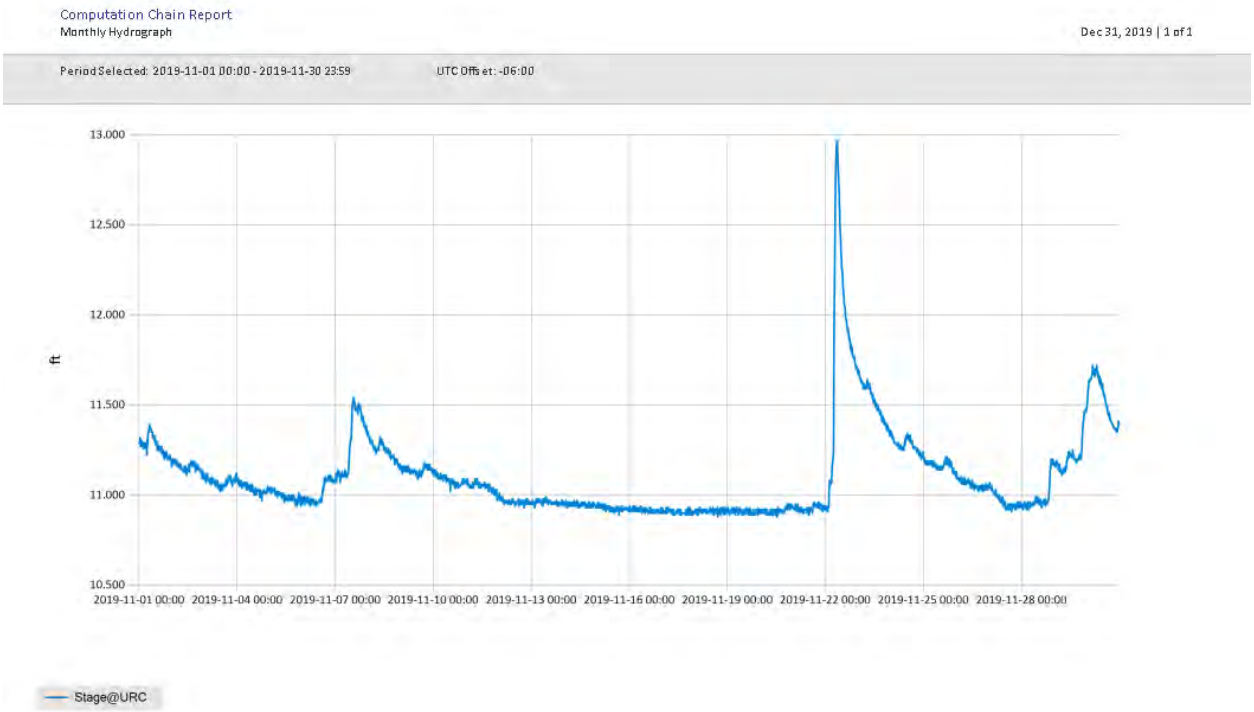

Figure 13 Monthly Hydrograph URC-2

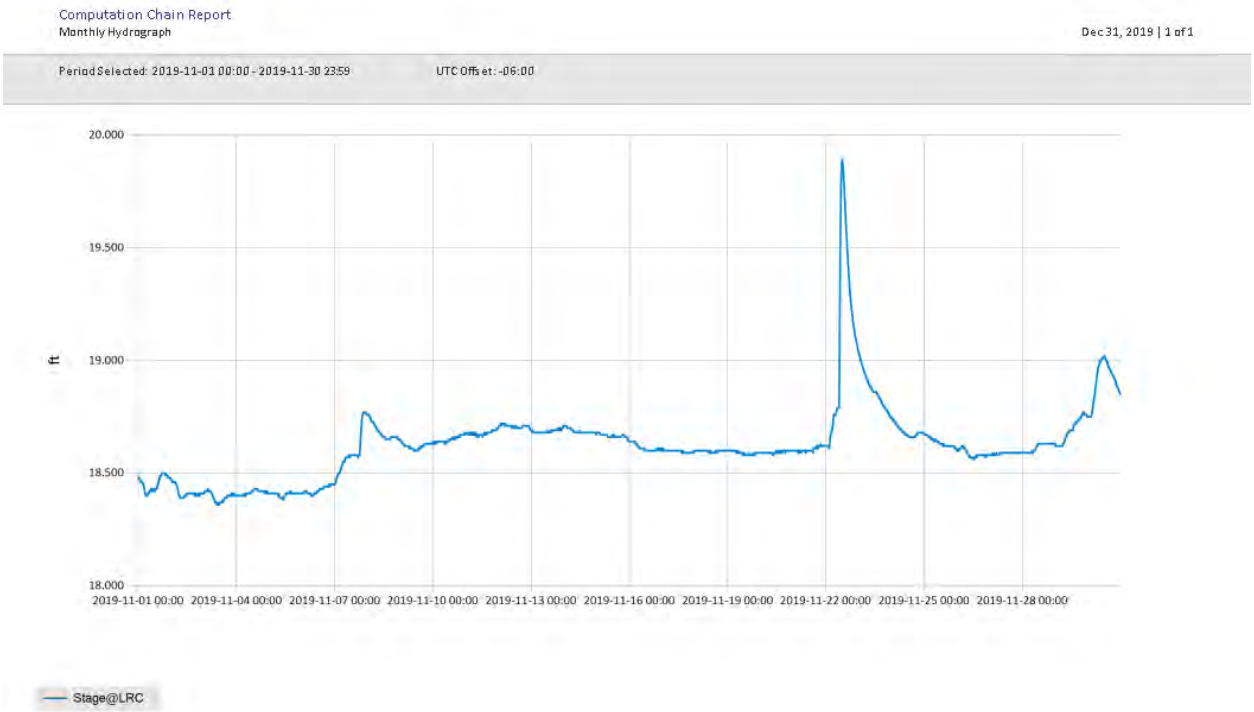

Figure 14 Monthly Hydrograph LRC-1

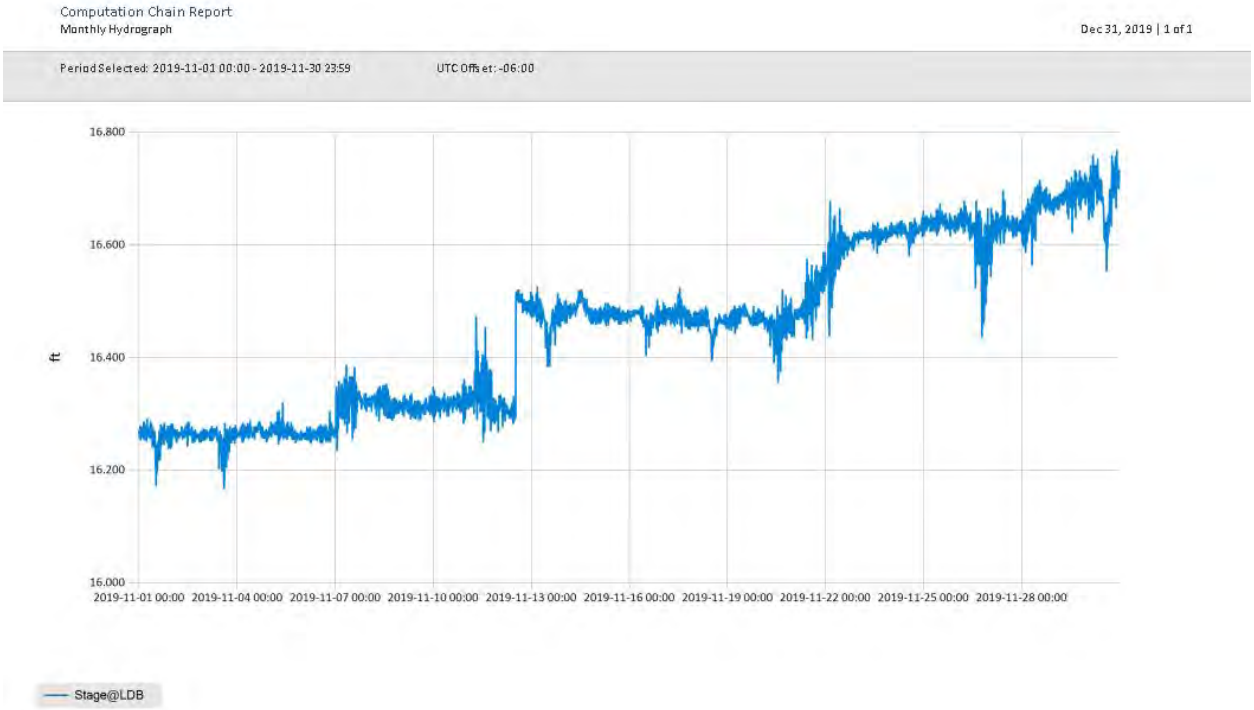

Figure 15 Monthly Hydrograph LDB-1

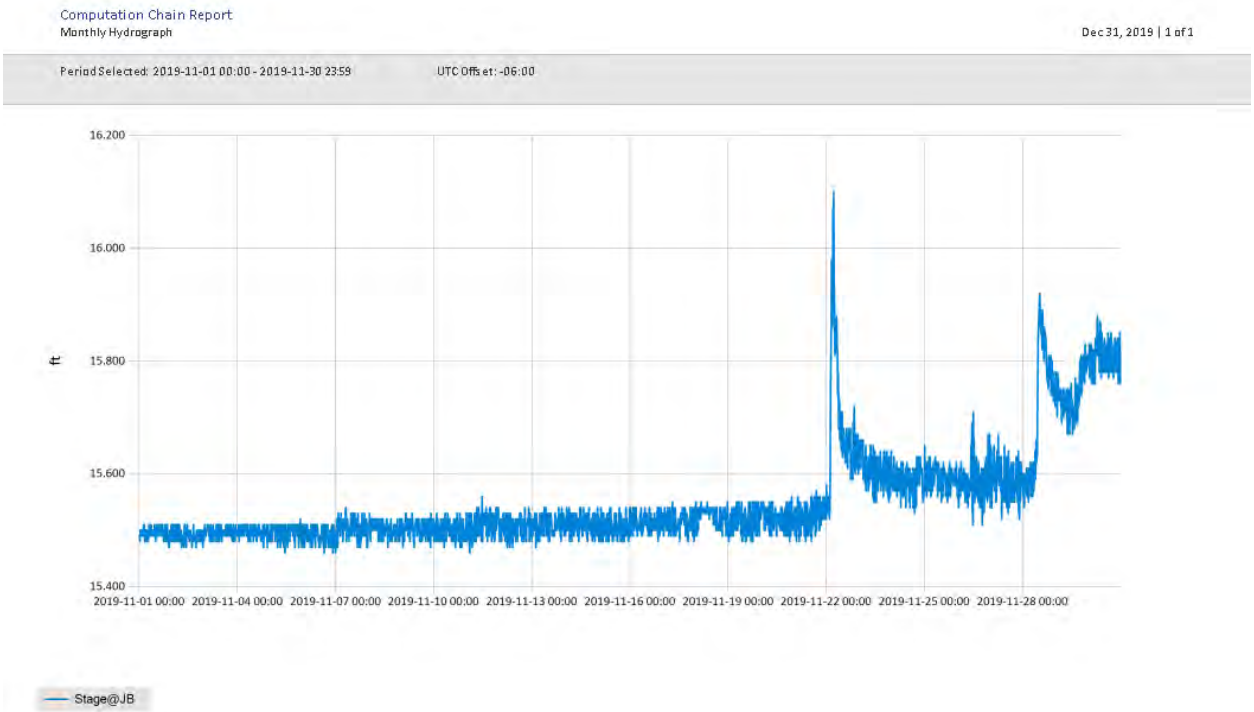

Figure 16 Monthly Hydrograph JB-1

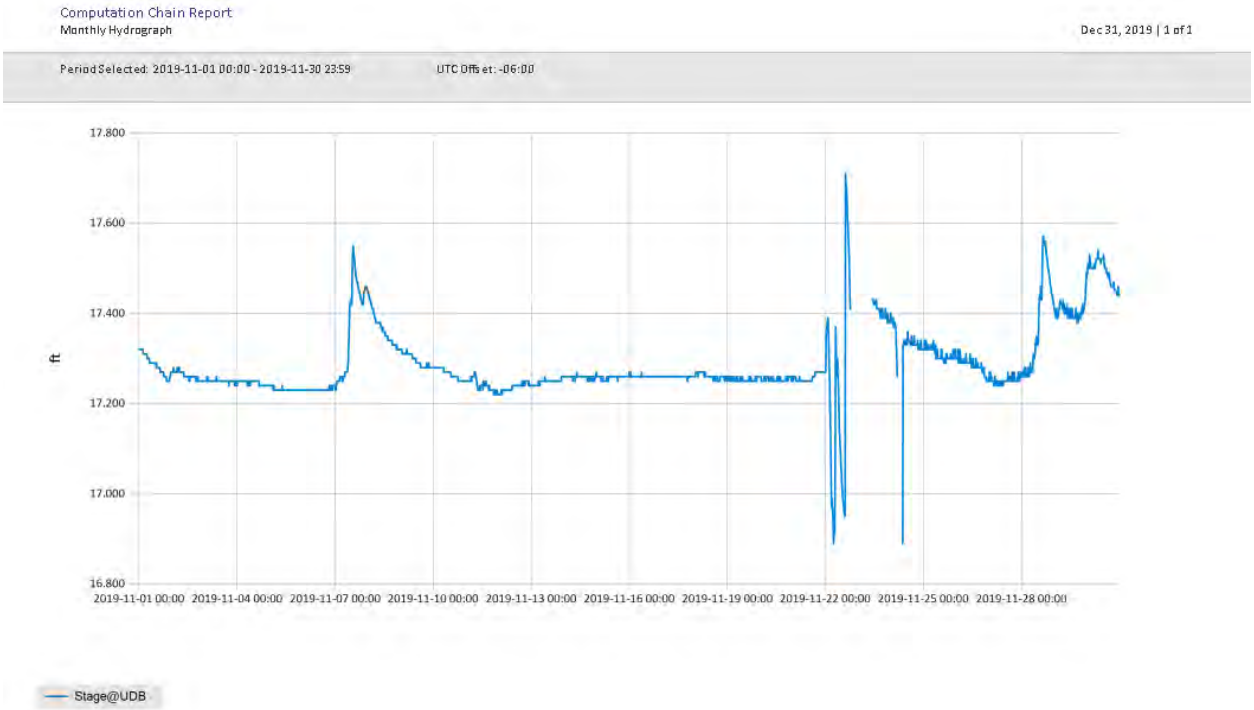

Figure 17 Monthly Hydrograph UDB-1

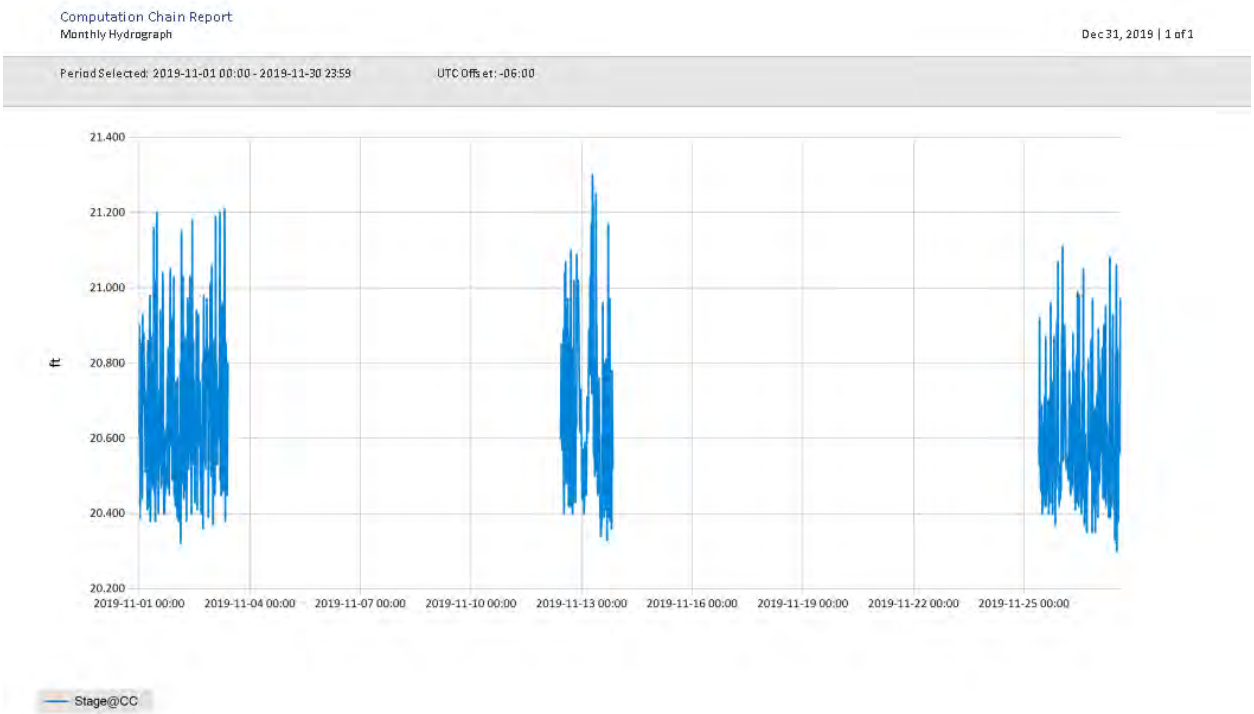

Figure 18 Monthly Hydrograph CC-1

MESONET CLIMATOLOGICAL DATA SUMMARY
(NRMN) Norman
Latitude: 35-14-09

November 2019
Nearest City: 2.1 NW Norman
Longitude: 97-27-53

Time Zone: Midnight-Midnight CST
County: Cleveland
Elevation: 1171 feet

DAY	TEMPERATURE (°F) MAX	MIN	AVG	DEWPT	DEG DAYS HDD	CDD	HUMIDITY (%) MAX	MIN	AVG	RAIN (in)	PRESSURE (in) STN	MSL	WIND SPEED (mph) DIR	AVG	MAX	SOLAR (MJ/m²)	4" SOIL TEMPERATURES SOD	BARE	MAX	MIN
1	61	32	44.4	22.9	19	0	72	20	46	0.00	28.99	30.24	S	7.4	28.4	16.56	48.6	45.8	52	41
2	57	31	42.9	28.8	21	0	91	25	63	0.00	29.12	30.38	NW	4.2	17.0	16.20	49.5	46.8	54	41
3	68	36	51.4	32.9	13	0	74	29	52	0.00	28.83	30.08	S	8.8	26.0	15.22	50.1	47.3	53	42
4	68*	42*	53.1*	43.6*	10*	0*	91*	47*	71*	0.00*	28.74*	29.99*	SSE*	6.2*	17.2*	NA	52.6*	50.8*	58*	46*
5	68	42	55.1	43.2	10	0	83	45	66	0.00	28.95	30.21	NE	6.2	18.3	14.39	54.2	53.0	59	47
6	66	57	61.2	58.9	4	0	97	71	92	0.20	28.88	30.13	S	5.4	26.0	3.24	57.3	58.0	60	56
7	59	31	37.4	32.2	20	0	97	64	82	0.26	29.12	30.39	N	14.8	33.8	3.08	54.2	51.6	60	46
8	52	30	40.2	25.2	24	0	83	33	57	0.00	29.12	30.38	NNE	4.6	11.1	11.68	50.7	46.7	52	43
9	70	36	51.9	42.0	12	0	91	43	71	0.00	28.89	30.14	S	6.6	19.7	14.72	51.7	48.9	56	43
10	74	46	59.8	51.5	5	0	98	52	76	0.01	28.70	29.94	S	8.0	20.7	13.35	54.8	53.9	60	49
11	59	20	35.0	26.9	26	0	93	53	73	0.01	29.04	30.30	N	20.2	48.1	1.99	52.4	48.4	56	41
12	36	14	24.5	7.5	40	0	78	24	51	0.00	29.27	30.54	N	7.8	26.4	15.10	45.5	38.6	41	37
13	51	23	35.9	15.0	28	0	70	22	45	0.00	28.86	30.11	S	9.9	27.3	14.40	44.9	38.9	42	37
14	55	25	39.2	27.5	25	0	90	39	65	0.00	29.05	30.31	N	5.9	24.9	14.00	45.7	41.4	47	38
15	58	25	42.5	28.7	23	0	96	32	63	0.00	29.08	30.34	SSE	3.7	13.1	14.32	46.1	43.2	50	38
16	63	37	49.3	31.0	15	0	72	30	51	0.00	28.87	30.12	SSE	8.8	22.7	13.03	47.6	44.9	50	40
17	64	34	48.9	33.5	16	0	83	36	57	0.00	28.78	30.03	SSE	7.0	25.4	13.09	49.4	47.0	52	43
18	73	35	52.9	35.7	11	0	87	28	56	0.00	28.65	29.90	SW	6.9	26.6	13.24	49.2	47.3	53	42
19	77	38	58.6	38.4	8	0	90	25	53	0.00	28.66	29.91	SSE	7.1	22.2	13.56	50.5	50.2	57	44
20	72	57	63.0	55.5	0	0	93	53	77	0.06	28.61	29.85	SSE	12.1	30.9	6.90	53.8	55.0	59	52
21	65	41	51.6	48.7	12	0	96	75	90	0.21	28.74	29.99	N	12.3	25.7	2.49	55.4	55.3	59	50
22	41	31	37.9	35.5	29	0	97	83	91	0.71	28.86	30.11	NNW	10.6	31.4	2.46	50.5	48.2	50	47
23	54	31	41.4	34.2	22	0	95	51	77	0.00	28.80	30.05	WNW	7.1	19.5	12.66	48.7	47.9	52	44
24	69	30	49.1	32.2	15	0	97	25	59	0.01	28.65	29.89	SSW	6.4	21.3	13.59	47.9	47.6	53	42
25	65	32	48.8	36.7	16	0	94	35	66	0.00	28.38	29.62	SSE	3.3	13.9	12.16	49.0	48.1	54	43
26	70	38	52.6	34.2	11	0	92	14	54	0.00	28.33	29.56	WSW	13.0	45.5	8.21	49.4	47.9	52	45
27	47	28	39.5	23.8	28	0	83	36	55	0.00	28.99	30.25	N	8.7	30.9	10.73	47.6	44.0	48	40
28	41	37	39.0	37.1	26	0	99	61	93	0.35	29.03	30.28	ESE	6.9	18.8	1.46	47.3	44.2	45	43
29	56	41	44.9	44.7	16	0	100	97	99	0.24	28.76	30.01	SE	5.8	22.6	1.33	47.8	46.0	48	45
30	64	40	52.7	34.6	13	0	100	18	58	0.03	28.50	29.74	WSW	14.5	42.2	12.41	49.8	49.5	53	47
	61*	35*	46.8*	34.7*	<- Monthly Averages ->						28.84*	30.09*	SSE*	8.3*	48.1*	10.54*	50.1*	47.9*	53*	44*

Temperature - Highest: 77*
Lowest: 14*

Degree Days - Total HDD: 518*
Total CDD: 0*

Rainfall: Monthly Total: 2.09* in.
Greatest 24 Hr: 0.71* in.

Humidity - Highest: 100*
Lowest: 14*

Number of Days With:
Tmax ≥ 90: 0*
Tmax ≤ 32: 0*
Tmin ≤ 32: 14*
Tmin ≤ 0: 0*
Rainfall ≥ 0.01 inch: 11*
Rainfall ≥ 0.10 inch: 6*
Avg Wind Speed ≥ 10 mph: 7*
Max Wind Speed ≥ 30 mph: 7*

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* Denotes incomplete record

Figure 19 November Mesonet Data

Lake Thunderbird TMDL Monitoring Plan Implementation: Sample Year (SY) 2019- December Report

OWRB

the water agency

SY2019 Monthly Report

Lake Thunderbird TMDL Monitoring Plan Implementation:

December 2019 Monitoring Report

Oklahoma Water Resources Board
Water Quality Programs Division
Monitoring and Assessment Section
3800 N. Classen, Oklahoma City, Oklahoma 73118
405-530-8800

Contact
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SUMMARY OF DECEMBER WATER QUALITY SAMPLING

Sampling for December 2019 occurred on the seventeenth and was considered a base flow collection. Water samples were collected at all ten locations, and discharge measurements were collected at nine locations. Mesonet data shows no precipitation occurring on the seventeenth, 0.02 inches of precipitation in the 72 hours prior to sampling, and no precipitation in the 72 hours after the sampling event. The total rainfall amount in Norman for the month of December was 0.58 inches. All water level gauges were operational for the month, with the exception of LT-1 and CC-1 due to equipment malfunction.

RESULTS

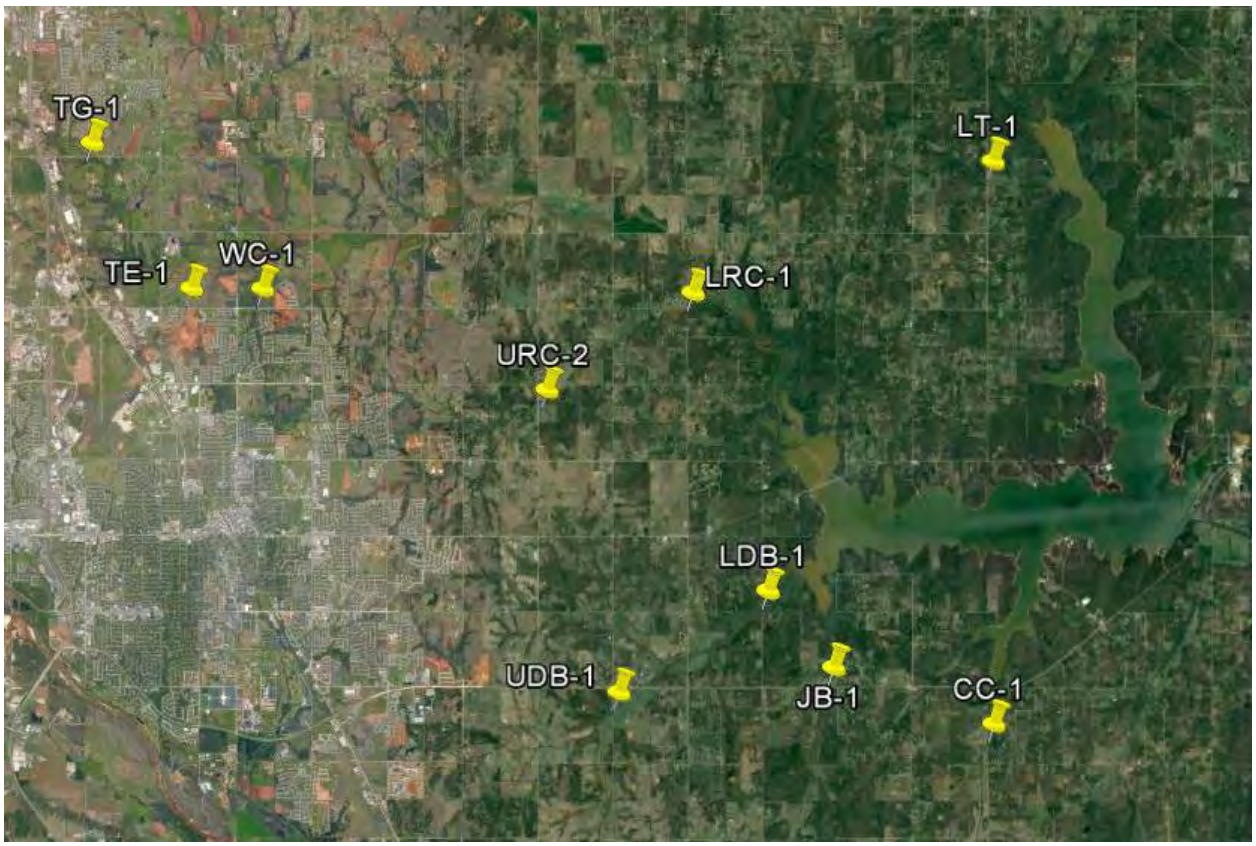

Figure 1 Monitoring Station Map

Monitoring Location ID	Monitoring Location Name	Date	Time	Field Crew	Water Temperature (°C)	Dissolved Oxygen (DO) (mg/l)	pH	Specific Conductance (mS/cm)	Turbidity (NTU)	Notes
CC-1	Clear Creek	12-17-2019	10:10	SD	3.3	13.34	7.93	713	4	None of rps over water, estimated from rp2 which was closest to edge of water
JB-1	Jim Blue Creek	12-17-2019	10:55	SD	2.7	12.42	7.65	961	2	rp1 not over water
LDB-1	Lower Dave Blue Creek	12-17-2019	11:30	SD	4.0	14.03	7.93	890	7	
LRC-1	Lower Rock Creek	12-17-2019	13:00	SD	3.6	12.10	7.61	490	10	
LT-1	Lake Laterals	12-17-2019	12:10	SD	4.9	7.01	7.40	569	2	downstream completely frozen
TE-1	Little River Tributary	12-17-2019	15:00	SD	6.5	13.44	7.90	1137	21	
TG-1	Little River Tributary	12-17-2019	15:45	SD	4.2	14.48	7.90	1205	5	
UDB-1	Upper Dave Blue Creek	12-17-2019	9:05	SD	2.0	11.31	7.68	1003	9	
URC-2	Upper Rock Creek	12-17-2019	13:45	SD	5.1	11.09	7.49	394	11	rp1 not over water, used rp2
WC-1	Woodcrest Creek	12-17-2019	14:30	SD	6.0	7.57	7.54	1082	3	changed dcp

Table 1 Field Data Form

Monitoring Location ID	Monitoring Location Name	Nitrate and Nitrite (mg/l)	Kjeldahl Nitrogen (mg/l)	Phosphorus (mg/l)	Total Suspended Solids (mg/l)
CC-1	Clear Creek	0.16	0.12	0.020	<5.0
JB-1	Jim Blue Creek	<0.05	0.23	0.021	<5.0
LDB-1	Lower Dave Blue Creek	0.06	0.44	0.036	<5.0
LRC-1	Lower Rock Creek	0.32	0.79	0.057	10.0
LT-1	Lake Laterals	<0.05	0.34	0.030	12.0
TE-1	Little River Tributary	<0.05	0.51	0.039	16.0
TG-1	Little River Tributary	0.10	0.32	0.033	12.0
UDB-1	Upper Dave Blue Creek	<0.05	0.13	0.026	<5.0
URC-2	Upper Rock Creek	0.35	0.95	0.054	8.0
WC-1	Woodcrest Creek	<0.05	0.37	0.063	<5.0

Table 2 Laboratory Analysis Summary

Monitoring Location Name	Nitrate and Nitrite (mg/l)	Kjeldahl Nitrogen (mg/l)	Phosphorus (mg/l)	Total Suspended Solids (mg/l)
Field Blank	<0.05	<0.10	<0.010	<5.0
Duplicate	0.16	0.11	0.019	<5.0
Duplicate RPD	0%	8.70%	5.13%	0%

Table 3 QA/QC Data

Quality assurance/quality control (QA/QC) of the data includes a field blank and duplicate sample from each collection event, and is qualified by the OWRB. Relative Percent Difference (RPD) of the duplicate sample can be categorized into four levels, where Level 1 likely has no QA issues and Level 4 has major QA issues, and should be used with caution.

Monitoring Location ID	Monitoring Location Name	Discharge (cfs)	Stream Stage (ft)
CC-1	Clear Creek	0.41	20.39
JB-1	Jim Blue Creek	0.21	15.76
LDB-1	Lower Dave Blue Creek	2.08	16.53
LRC-1	Lower Rock Creek	1.90	18.64
LT-1	Lake Laterals	0.04	4.29
TE-1	Little River Tributary	0.29	11.34
TG-1	Little River Tributary	0.71	9.00
UDB-1	Upper Dave Blue Creek	0.41	17.26
URC-2	Upper Rock Creek	0.44	11.00
WC-1	Woodcrest Creek	0.08	7.73

Table 4 Station Discharge Summary

Discharge Measurement Summary

Date Generated: Wed Dec 18 2019

File Information	
File Name	CC121719.WAD
Start Date and Time	2019/12/17 09:55:20

Site Details	
Site Name	CC121719
Operator(s)	ZMM

System Information	
Sensor Type	FlowTracker
Serial #	P4709
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units	(English Units)
Distance	ft
Velocity	ft/s
Area	ft^2
Discharge	cfs

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.7%	6.6%
Velocity	3.3%	48.3%
Width	0.2%	0.2%
Method	3.5%	-
# Stations	4.6%	-
Overall	**6.8%**	**48.7%**

Summary

Averaging Int.	40	# Stations	11
Start Edge	LEW	Total Width	8.000
Mean SNR	38.8 dB	Total Area	1.600
Mean Temp	37.38 °F	Mean Depth	0.200
Disch. Equation	Mid-Section	Mean Velocity	0.2568
		Total Discharge	**0.4109**

Supplemental Data

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Tue Dec 17 10:01:44 CST 2019	3.000	20.390		

Measurement Results

St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	09:55	0.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	*10:00*	*1.50*	*0.6*	*0.300*	*0.6*	*0.120*	*0.3471*	*1.00*	*0.3471*	*0.300*	*0.1041*	*25.3*
2	*10:02*	*2.00*	*0.6*	*0.300*	*0.6*	*0.120*	*0.7871*	*1.00*	*0.7871*	*0.150*	*0.1180*	*28.7*
3	*10:02*	*2.50*	*0.6*	*0.300*	*0.6*	*0.120*	*0.0089*	*1.00*	*0.0089*	*0.150*	*0.0013*	*0.3*
4	*10:05*	*3.00*	*0.6*	*0.200*	*0.6*	*0.080*	*0.2749*	*1.00*	*0.2749*	*0.200*	*0.0550*	*13.4*
5	*10:07*	*4.50*	*0.6*	*0.200*	*0.6*	*0.080*	*0.0000*	*1.00*	*0.0000*	*0.200*	*0.0000*	*0.0*
6	*10:09*	*5.00*	*0.6*	*0.200*	*0.6*	*0.080*	*0.5673*	*1.00*	*0.5673*	*0.100*	*0.0568*	*13.8*
7	*10:12*	*5.50*	*0.6*	*0.300*	*0.6*	*0.120*	*0.0075*	*1.00*	*0.0075*	*0.150*	*0.0011*	*0.3*
8	*10:13*	*6.00*	*0.6*	*0.300*	*0.6*	*0.120*	*0.4974*	*1.00*	*0.4974*	*0.150*	*0.0746*	*18.1*
9	*10:14*	*6.50*	*0.6*	*0.200*	*0.6*	*0.080*	*0.0000*	*1.00*	*0.0000*	*0.200*	*0.0000*	*0.0*
10	10:14	8.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Figure 2 Discharge Measurement Summary CC-1

Discharge Measurement Summary

Date Generated: Wed Dec 18 2019

File Information	
File Name	JB121719.WAD
Start Date and Time	2019/12/17 10:46:04

Site Details	
Site Name	JB121719
Operator(s)	ZMM

System Information	
Sensor Type	FlowTracker
Serial #	P4709
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units	(English Units)
Distance	ft
Velocity	ft/s
Area	ft^2
Discharge	cfs

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.7%	5.6%
Velocity	2.6%	11.4%
Width	0.2%	0.2%
Method	3.6%	-
# Stations	5.8%	-
Overall	**7.4%**	**12.7%**

Summary

Averaging Int.	40	# Stations	9
Start Edge	LEW	Total Width	4.000
Mean SNR	32.6 dB	Total Area	2.200
Mean Temp	36.45 °F	Mean Depth	0.550
Disch. Equation	Mid-Section	Mean Velocity	0.0949
		Total Discharge	**0.2088**

Supplemental Data

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Tue Dec 17 10:44:12 CST 2019	0.000	15.760		

Measurement Results

St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	10:46	0.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	*10:47*	*0.50*	*0.6*	*0.200*	*0.6*	*0.080*	*0.0003*	*1.00*	*0.0003*	*0.100*	*0.0000*	*0.0*
2	*10:52*	*1.00*	*0.6*	*0.600*	*0.6*	*0.240*	*0.0000*	*1.00*	*0.0000*	*0.300*	*0.0000*	*0.0*
3	10:53	1.50	0.6	0.800	0.6	0.320	0.0869	1.00	0.0869	0.400	0.0348	16.7
4	10:54	2.00	0.6	0.800	0.6	0.320	0.0932	1.00	0.0932	0.400	0.0373	17.8
5	*10:56*	*2.50*	*0.6*	*0.800*	*0.6*	*0.320*	*0.1440*	*1.00*	*0.1440*	*0.400*	*0.0576*	*27.6*
6	*10:57*	*3.00*	*0.6*	*0.800*	*0.6*	*0.320*	*0.1558*	*1.00*	*0.1558*	*0.400*	*0.0623*	*29.9*
7	*10:59*	*3.50*	*0.6*	*0.400*	*0.6*	*0.160*	*0.0840*	*1.00*	*0.0840*	*0.200*	*0.0168*	*8.0*
8	10:59	4.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Figure 3 Discharge Measurement Summary JB-1

Discharge Measurement Summary

Date Generated: Wed Dec 18 2019

File Information	
File Name	UDB1217.WAD
Start Date and Time	2019/12/17 08:51:42

Site Details	
Site Name	UDB121719
Operator(s)	ZMM

System Information	
Sensor Type	FlowTracker
Serial #	P4709
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units	(English Units)
Distance	ft
Velocity	ft/s
Area	ft^2
Discharge	cfs

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.3%	2.7%
Velocity	1.6%	9.4%
Width	0.1%	0.1%
Method	1.9%	-
# Stations	1.7%	-
Overall	**3.2%**	**9.8%**

Summary

Averaging Int.	40	# Stations	31
Start Edge	LEW	Total Width	15.000
Mean SNR	17.7 dB	Total Area	11.750
Mean Temp	35.19 °F	Mean Depth	0.783
Disch. Equation	Mid-Section	Mean Velocity	0.0347
		Total Discharge	**0.4080**

Supplemental Data

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Tue Dec 17 09:00:35 CST 2019	4.000	17.260		

Measurement Results

St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	08:51	0.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	*08:51*	*0.50*	*0.6*	*0.300*	*0.6*	*0.120*	*0.0000*	*1.00*	*0.0000*	*0.150*	*0.0000*	*0.0*
2	*08:53*	*1.00*	*0.6*	*0.400*	*0.6*	*0.160*	*-0.0003*	*1.00*	*-0.0003*	*0.200*	*-0.0001*	*0.0*
3	*08:54*	*1.50*	*0.6*	*0.600*	*0.6*	*0.240*	*0.0000*	*1.00*	*0.0000*	*0.300*	*0.0000*	*0.0*
4	*08:55*	*2.00*	*0.6*	*0.700*	*0.6*	*0.280*	*0.0098*	*1.00*	*0.0098*	*0.350*	*0.0034*	*0.8*
5	*08:56*	*2.50*	*0.6*	*0.800*	*0.6*	*0.320*	*0.0066*	*1.00*	*0.0066*	*0.400*	*0.0026*	*0.6*
6	*08:58*	*3.00*	*0.6*	*1.000*	*0.6*	*0.400*	*0.0167*	*1.00*	*0.0167*	*0.500*	*0.0084*	*2.1*
7	08:59	3.50	0.6	0.700	0.6	0.280	0.0174	1.00	0.0174	0.350	0.0061	1.5
8	*09:00*	*4.00*	*0.6*	*1.000*	*0.6*	*0.400*	*0.0007*	*1.00*	*0.0007*	*0.500*	*0.0003*	*0.1*
9	*09:02*	*4.50*	*0.6*	*1.000*	*0.6*	*0.400*	*0.0207*	*1.00*	*0.0207*	*0.500*	*0.0103*	*2.5*
10	09:03	5.00	0.6	0.800	0.6	0.320	0.0190	1.00	0.0190	0.400	0.0076	1.9
11	09:05	5.50	0.6	1.000	0.6	0.400	0.0269	1.00	0.0269	0.500	0.0135	3.3
12	*09:06*	*6.00*	*0.6*	*0.900*	*0.6*	*0.360*	*0.0223*	*1.00*	*0.0223*	*0.450*	*0.0100*	*2.5*
13	09:07	6.50	0.6	1.200	0.6	0.480	0.0322	1.00	0.0322	0.600	0.0193	4.7
14	09:08	7.00	0.6	1.200	0.6	0.480	0.0551	1.00	0.0551	0.600	0.0331	8.1
15	09:09	7.50	0.6	1.200	0.6	0.480	0.0505	1.00	0.0505	0.600	0.0303	7.4
16	09:10	8.00	0.6	1.200	0.6	0.480	0.0344	1.00	0.0344	0.600	0.0207	5.1
17	*09:11*	*8.50*	*0.6*	*1.100*	*0.6*	*0.440*	*0.0226*	*1.00*	*0.0226*	*0.550*	*0.0125*	*3.1*
18	*09:13*	*9.00*	*0.6*	*1.200*	*0.6*	*0.480*	*0.0627*	*1.00*	*0.0627*	*0.600*	*0.0376*	*9.2*
19	*09:14*	*9.50*	*0.6*	*1.000*	*0.6*	*0.400*	*0.0866*	*1.00*	*0.0866*	*0.500*	*0.0433*	*10.6*
20	09:16	10.00	0.6	0.800	0.6	0.320	0.0390	1.00	0.0390	0.400	0.0156	3.8
21	*09:17*	*10.50*	*0.6*	*0.800*	*0.6*	*0.320*	*0.1178*	*1.00*	*0.1178*	*0.400*	*0.0471*	*11.5*
22	*09:18*	*11.00*	*0.6*	*0.800*	*0.6*	*0.320*	*0.0741*	*1.00*	*0.0741*	*0.400*	*0.0297*	*7.3*
23	*09:19*	*11.50*	*0.6*	*0.700*	*0.6*	*0.280*	*0.0663*	*1.00*	*0.0663*	*0.350*	*0.0232*	*5.7*
24	*09:20*	*12.00*	*0.6*	*0.700*	*0.6*	*0.280*	*0.0505*	*1.00*	*0.0505*	*0.350*	*0.0177*	*4.3*
25	*09:21*	*12.50*	*0.6*	*0.700*	*0.6*	*0.280*	*0.0144*	*1.00*	*0.0144*	*0.350*	*0.0051*	*1.2*
26	*09:23*	*13.00*	*0.6*	*0.500*	*0.6*	*0.200*	*0.0052*	*1.00*	*0.0052*	*0.250*	*0.0013*	*0.3*
27	09:24	13.50	0.6	0.500	0.6	0.200	0.0082	1.00	0.0082	0.250	0.0021	0.5
28	*09:25*	*14.00*	*0.6*	*0.400*	*0.6*	*0.160*	*0.0177*	*1.00*	*0.0177*	*0.200*	*0.0035*	*0.9*
29	09:26	14.50	0.6	0.300	0.6	0.120	0.0256	1.00	0.0256	0.150	0.0038	0.9
30	09:26	15.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Figure 4 Discharge Measurement Summary UDB-1

Discharge Measurement Summary

Date Generated: Wed Dec 18 2019

File Information	
File Name	LT121719.WAD
Start Date and Time	2019/12/17 12:10:53

Site Details	
Site Name	LT121719
Operator(s)	ZMM

System Information	
Sensor Type	FlowTracker
Serial #	P4709
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units	(English Units)
Distance	ft
Velocity	ft/s
Area	ft^2
Discharge	cfs

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.7%	1.7%
Velocity	3.6%	31.7%
Width	0.2%	0.2%
Method	3.3%	-
# Stations	4.2%	-
Overall	**6.6%**	**31.8%**

Summary

Averaging Int.	40	# Stations	12
Start Edge	LEW	Total Width	6.500
Mean SNR	37.4 dB	Total Area	2.100
Mean Temp	40.78 °F	Mean Depth	0.323
Disch. Equation	Mid-Section	Mean Velocity	0.0197
		Total Discharge	**0.0413**

Supplemental Data

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Tue Dec 17 12:08:20 CST 2019	0.000	4.290		

Measurement Results

St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	12:10	0.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	*12:10*	*1.50*	*0.6*	*0.300*	*0.6*	*0.120*	*0.0236*	*1.00*	*0.0236*	*0.300*	*0.0071*	*17.2*
2	12:12	2.00	0.6	0.400	0.6	0.160	0.0299	1.00	0.0299	0.200	0.0060	14.5
3	*12:13*	*2.50*	*0.6*	*0.400*	*0.6*	*0.160*	*0.0016*	*1.00*	*0.0016*	*0.200*	*0.0003*	*0.8*
4	*12:14*	*3.00*	*0.6*	*0.400*	*0.6*	*0.160*	*0.0046*	*1.00*	*0.0046*	*0.200*	*0.0009*	*2.2*
5	*12:15*	*3.50*	*0.6*	*0.400*	*0.6*	*0.160*	*0.0003*	*1.00*	*0.0003*	*0.200*	*0.0001*	*0.2*
6	*12:17*	*4.00*	*0.6*	*0.400*	*0.6*	*0.160*	*-0.0007*	*1.00*	*-0.0007*	*0.200*	*-0.0001*	*-0.3*
7	*12:19*	*4.50*	*0.6*	*0.400*	*0.6*	*0.160*	*0.0394*	*1.00*	*0.0394*	*0.200*	*0.0079*	*19.1*
8	*12:21*	*5.00*	*0.6*	*0.400*	*0.6*	*0.160*	*0.0545*	*1.00*	*0.0545*	*0.200*	*0.0109*	*26.4*
9	*12:23*	*5.50*	*0.6*	*0.400*	*0.6*	*0.160*	*0.0003*	*1.00*	*0.0003*	*0.200*	*0.0001*	*0.2*
10	*12:25*	*6.00*	*0.6*	*0.400*	*0.6*	*0.160*	*0.0410*	*1.00*	*0.0410*	*0.200*	*0.0082*	*19.9*
11	12:25	6.50	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Figure 5 Discharge Measurement Summary LT-1

Discharge Measurement Summary

Date Generated: Wed Dec 18 2019

File Information	
File Name	LRC1217.WAD
Start Date and Time	2019/12/17 12:49:57

Site Details	
Site Name	LRC121719
Operator(s)	ZMM

System Information	
Sensor Type	FlowTracker
Serial #	P4709
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units	(English Units)
Distance	ft
Velocity	ft/s
Area	ft^2
Discharge	cfs

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.2%	1.1%
Velocity	0.8%	4.5%
Width	0.2%	0.2%
Method	2.3%	-
# Stations	2.1%	-
Overall	**3.3%**	**4.7%**

Summary

Averaging Int.	40	# Stations	24
Start Edge	LEW	Total Width	24.000
Mean SNR	29.3 dB	Total Area	17.050
Mean Temp	38.24 °F	Mean Depth	0.710
Disch. Equation	Mid-Section	Mean Velocity	0.1112
		Total Discharge	**1.8960**

Supplemental Data

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Tue Dec 17 12:49:14 CST 2019	0.000	18.640		

Measurement Results

St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	12:49	0.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	*12:49*	*1.00*	*0.6*	*0.400*	*0.6*	*0.160*	*-0.0085*	*1.00*	*-0.0085*	*0.400*	*-0.0034*	*-0.2*
2	*12:51*	*2.00*	*0.6*	*0.500*	*0.6*	*0.200*	*0.0033*	*1.00*	*0.0033*	*0.500*	*0.0016*	*0.1*
3	*12:53*	*3.00*	*0.6*	*0.600*	*0.6*	*0.240*	*0.0000*	*1.00*	*0.0000*	*0.600*	*0.0000*	*0.0*
4	12:54	4.00	0.6	0.800	0.6	0.320	0.0886	1.00	0.0886	0.800	0.0709	3.7
5	*12:55*	*5.00*	*0.6*	*0.900*	*0.6*	*0.360*	*0.1106*	*1.00*	*0.1106*	*0.900*	*0.0995*	*5.2*
6	*12:56*	*6.00*	*0.6*	*1.000*	*0.6*	*0.400*	*0.1424*	*1.00*	*0.1424*	*1.000*	*0.1424*	*7.5*
7	*12:57*	*7.00*	*0.6*	*1.100*	*0.6*	*0.440*	*0.1558*	*1.00*	*0.1558*	*1.100*	*0.1714*	*9.0*
8	*12:58*	*8.00*	*0.6*	*1.100*	*0.6*	*0.440*	*0.1923*	*1.00*	*0.1923*	*1.100*	*0.2115*	*11.2*
9	*12:59*	*9.00*	*0.6*	*1.100*	*0.6*	*0.440*	*0.1818*	*1.00*	*0.1818*	*1.100*	*0.1999*	*10.5*
10	*13:00*	*10.00*	*0.6*	*1.100*	*0.6*	*0.440*	*0.2001*	*1.00*	*0.2001*	*1.100*	*0.2202*	*11.6*
11	*13:01*	*11.00*	*0.6*	*1.100*	*0.6*	*0.440*	*0.2096*	*1.00*	*0.2096*	*1.100*	*0.2306*	*12.2*
12	*13:02*	*12.00*	*0.6*	*1.000*	*0.6*	*0.400*	*0.2028*	*1.00*	*0.2028*	*1.000*	*0.2028*	*10.7*
13	*13:03*	*13.00*	*0.6*	*1.000*	*0.6*	*0.400*	*0.1755*	*1.00*	*0.1755*	*1.000*	*0.1755*	*9.3*
14	*13:05*	*14.00*	*0.6*	*0.900*	*0.6*	*0.360*	*0.0587*	*1.00*	*0.0587*	*0.900*	*0.0529*	*2.8*
15	*13:06*	*15.00*	*0.6*	*0.800*	*0.6*	*0.320*	*0.0056*	*1.00*	*0.0056*	*0.800*	*0.0045*	*0.2*
16	*13:07*	*16.00*	*0.6*	*0.800*	*0.6*	*0.320*	*-0.0121*	*1.00*	*-0.0121*	*0.800*	*-0.0097*	*-0.5*
17	*13:08*	*17.00*	*0.6*	*0.600*	*0.6*	*0.240*	*0.0476*	*1.00*	*0.0476*	*0.600*	*0.0285*	*1.5*
18	*13:10*	*18.00*	*0.6*	*0.600*	*0.6*	*0.240*	*0.0400*	*1.00*	*0.0400*	*0.600*	*0.0240*	*1.3*
19	13:11	19.00	0.6	0.500	0.6	0.200	0.0410	1.00	0.0410	0.500	0.0205	1.1
20	*13:13*	*20.00*	*0.6*	*0.400*	*0.6*	*0.160*	*-0.0003*	*1.00*	*-0.0003*	*0.400*	*-0.0001*	*0.0*
21	*13:14*	*21.00*	*0.6*	*0.300*	*0.6*	*0.120*	*0.0689*	*1.00*	*0.0689*	*0.300*	*0.0207*	*1.1*
22	13:15	22.00	0.6	0.300	0.6	0.120	0.0709	1.00	0.0709	0.450	0.0319	1.7
23	13:15	24.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Figure 6 Discharge Measurement Summary LRC-1

Discharge Measurement Summary

Date Generated: Wed Dec 18 2019

File Information

File Name	TE121719.WAD
Start Date and Time	2019/12/17 14:50:47

Site Details

Site Name	TE121719
Operator(s)	ZMM

System Information

Sensor Type	FlowTracker
Serial #	P4709
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units	**(English Units)**
Distance	ft
Velocity	ft/s
Area	ft^2
Discharge	cfs

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.2%	1.8%
Velocity	1.0%	4.7%
Width	0.1%	0.1%
Method	2.1%	-
# Stations	2.3%	-
Overall	**3.4%**	**5.1%**

Summary

Averaging Int.	40	# Stations	22
Start Edge	LEW	Total Width	14.000
Mean SNR	38.4 dB	Total Area	9.050
Mean Temp	43.06 °F	Mean Depth	0.646
Disch. Equation	Mid-Section	Mean Velocity	0.0321
		Total Discharge	**0.2909**

Supplemental Data

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Tue Dec 17 14:56:55 CST 2019	5.500	11.340		

Measurement Results

St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	14:50	0.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	14:50	3.50	0.6	0.400	0.6	0.160	-0.0036	1.00	-0.0036	0.800	-0.0029	-1.0
2	14:53	4.00	0.6	0.500	0.6	0.200	0.0207	1.00	0.0207	0.250	0.0052	1.8
3	*14:54*	*4.50*	*0.6*	*0.800*	*0.6*	*0.320*	*0.0423*	*1.00*	*0.0423*	*0.400*	*0.0169*	*5.8*
4	14:56	5.00	0.6	1.000	0.6	0.400	0.0384	1.00	0.0384	0.500	0.0192	6.6
5	*14:57*	*5.50*	*0.6*	*0.900*	*0.6*	*0.360*	*0.0404*	*1.00*	*0.0404*	*0.450*	*0.0182*	*6.2*
6	*14:58*	*6.00*	*0.6*	*1.000*	*0.6*	*0.400*	*0.0492*	*1.00*	*0.0492*	*0.500*	*0.0246*	*8.5*
7	*14:59*	*6.50*	*0.6*	*1.000*	*0.6*	*0.400*	*0.0594*	*1.00*	*0.0594*	*0.500*	*0.0297*	*10.2*
8	15:00	7.00	0.6	1.100	0.6	0.440	0.0443	1.00	0.0443	0.550	0.0244	8.4
9	*15:01*	*7.50*	*0.6*	*1.300*	*0.6*	*0.520*	*0.0440*	*1.00*	*0.0440*	*0.650*	*0.0286*	*9.8*
10	*15:02*	*8.00*	*0.6*	*1.400*	*0.6*	*0.560*	*0.0476*	*1.00*	*0.0476*	*0.700*	*0.0333*	*11.4*
11	*15:03*	*8.50*	*0.6*	*1.300*	*0.6*	*0.520*	*0.0262*	*1.00*	*0.0262*	*0.650*	*0.0171*	*5.9*
12	15:04	9.00	0.6	1.000	0.6	0.400	0.0279	1.00	0.0279	0.500	0.0139	4.8
13	15:05	9.50	0.6	0.800	0.6	0.320	0.0253	1.00	0.0253	0.400	0.0101	3.5
14	15:06	10.00	0.6	0.800	0.6	0.320	0.0440	1.00	0.0440	0.400	0.0176	6.0
15	15:07	10.50	0.6	0.700	0.6	0.280	0.0413	1.00	0.0413	0.350	0.0145	5.0
16	15:08	11.00	0.6	0.700	0.6	0.280	0.0344	1.00	0.0344	0.350	0.0121	4.1
17	15:09	11.50	0.6	0.600	0.6	0.240	0.0187	1.00	0.0187	0.300	0.0056	1.9
18	15:10	12.00	0.6	0.600	0.6	0.240	0.0197	1.00	0.0197	0.300	0.0059	2.0
19	15:11	12.50	0.6	0.400	0.6	0.160	0.0030	1.00	0.0030	0.200	0.0006	0.2
20	15:12	13.00	0.6	0.400	0.6	0.160	-0.0118	1.00	-0.0118	0.300	-0.0035	-1.2
21	15:12	14.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Figure 7 Discharge Measurement Summary TE-1

Discharge Measurement Summary

Date Generated: Wed Dec 18 2019

File Information	
File Name	TG121719.WAD
Start Date and Time	2019/12/17 15:32:23

Site Details	
Site Name	TG121719
Operator(s)	ZMM

System Information	
Sensor Type	FlowTracker
Serial #	P4709
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units	(English Units)
Distance	ft
Velocity	ft/s
Area	ft^2
Discharge	cfs

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.2%	1.8%
Velocity	1.3%	6.8%
Width	0.2%	0.2%
Method	2.5%	-
# Stations	2.6%	-
Overall	**4.0%**	**7.2%**

Summary

Averaging Int.	40	# Stations	19
Start Edge	LEW	Total Width	18.000
Mean SNR	23.4 dB	Total Area	16.701
Mean Temp	39.07 °F	Mean Depth	0.928
Disch. Equation	Mid-Section	Mean Velocity	0.0424
		Total Discharge	**0.7073**

Supplemental Data

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Tue Dec 17 15:45:33 CST 2019	13.000	9.000		

Measurement Results

St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	15:32	0.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	*15:32*	*1.00*	*0.6*	*0.500*	*0.6*	*0.200*	*-0.0636*	*1.00*	*-0.0636*	*0.500*	*-0.0318*	*-4.5*
2	*15:33*	*2.00*	*0.6*	*0.800*	*0.6*	*0.320*	*-0.0341*	*1.00*	*-0.0341*	*0.800*	*-0.0273*	*-3.9*
3	*15:34*	*3.00*	*0.6*	*1.000*	*0.6*	*0.400*	*0.0456*	*1.00*	*0.0456*	*1.000*	*0.0456*	*6.4*
4	*15:36*	*4.00*	*0.6*	*1.200*	*0.6*	*0.480*	*0.0771*	*1.00*	*0.0771*	*1.200*	*0.0925*	*13.1*
5	*15:37*	*5.00*	*0.6*	*1.100*	*0.6*	*0.440*	*0.0686*	*1.00*	*0.0686*	*1.100*	*0.0754*	*10.7*
6	*15:38*	*6.00*	*0.6*	*1.100*	*0.6*	*0.440*	*0.0702*	*1.00*	*0.0702*	*1.100*	*0.0772*	*10.9*
7	*15:39*	*7.00*	*0.6*	*1.100*	*0.6*	*0.440*	*0.0748*	*1.00*	*0.0748*	*1.100*	*0.0823*	*11.6*
8	*15:40*	*8.00*	*0.6*	*1.200*	*0.6*	*0.480*	*0.0627*	*1.00*	*0.0627*	*1.200*	*0.0752*	*10.6*
9	*15:41*	*9.00*	*0.6*	*1.100*	*0.6*	*0.440*	*0.0656*	*1.00*	*0.0656*	*1.100*	*0.0722*	*10.2*
10	*15:42*	*10.00*	*0.6*	*1.200*	*0.6*	*0.480*	*0.0482*	*1.00*	*0.0482*	*1.200*	*0.0579*	*8.2*
11	*15:43*	*11.00*	*0.6*	*1.100*	*0.6*	*0.440*	*0.0407*	*1.00*	*0.0407*	*1.100*	*0.0448*	*6.3*
12	*15:44*	*12.00*	*0.6*	*1.000*	*0.6*	*0.400*	*0.0561*	*1.00*	*0.0561*	*1.000*	*0.0561*	*7.9*
13	*15:45*	*13.00*	*0.6*	*1.000*	*0.6*	*0.400*	*0.0531*	*1.00*	*0.0531*	*1.000*	*0.0531*	*7.5*
14	*15:46*	*14.00*	*0.6*	*1.000*	*0.6*	*0.400*	*0.0361*	*1.00*	*0.0361*	*1.000*	*0.0361*	*5.1*
15	*15:47*	*15.00*	*0.6*	*0.900*	*0.6*	*0.360*	*-0.0010*	*1.00*	*-0.0010*	*0.900*	*-0.0009*	*-0.1*
16	*15:48*	*16.00*	*0.6*	*0.700*	*0.6*	*0.280*	*0.0098*	*1.00*	*0.0098*	*0.700*	*0.0069*	*1.0*
17	*15:49*	*17.00*	*0.6*	*0.700*	*0.6*	*0.280*	*-0.0115*	*1.00*	*-0.0115*	*0.700*	*-0.0080*	*-1.1*
18	15:49	18.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Figure 8 Discharge Measurement Summary TG-1

Discharge Measurement Summary

Date Generated: Wed Dec 18 2019

File Information	
File Name	URC1217.WAD
Start Date and Time	2019/12/17 13:35:38

Site Details	
Site Name	URC121719
Operator(s)	ZMM

System Information	
Sensor Type	FlowTracker
Serial #	P4709
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units	(English Units)
Distance	ft
Velocity	ft/s
Area	ft^2
Discharge	cfs

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.7%	3.1%
Velocity	2.8%	8.6%
Width	0.2%	0.2%
Method	3.6%	-
# Stations	3.9%	-
Overall	**6.1%**	**9.2%**

Summary

Averaging Int.	40	# Stations	13
Start Edge	LEW	Total Width	6.000
Mean SNR	40.9 dB	Total Area	2.800
Mean Temp	40.70 °F	Mean Depth	0.467
Disch. Equation	Mid-Section	Mean Velocity	0.1569
		Total Discharge	**0.4393**

Supplemental Data

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Tue Dec 17 13:36:53 CST 2019	1.000	11.000		

Measurement Results

St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	13:35	0.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	*13:35*	*0.50*	*0.6*	*0.300*	*0.6*	*0.120*	*-0.0558*	*1.00*	*-0.0558*	*0.150*	*-0.0084*	*-1.9*
2	*13:36*	*1.00*	*0.6*	*0.500*	*0.6*	*0.200*	*-0.0449*	*1.00*	*-0.0449*	*0.250*	*-0.0112*	*-2.6*
3	*13:38*	*1.50*	*0.6*	*0.600*	*0.6*	*0.240*	*-0.0479*	*1.00*	*-0.0479*	*0.300*	*-0.0144*	*-3.3*
4	13:39	2.00	0.6	0.700	0.6	0.280	0.0174	1.00	0.0174	0.350	0.0061	1.4
5	*13:39*	*2.50*	*0.6*	*0.700*	*0.6*	*0.280*	*0.2087*	*1.00*	*0.2087*	*0.350*	*0.0730*	*16.6*
6	*13:41*	*3.00*	*0.6*	*0.600*	*0.6*	*0.240*	*0.3681*	*1.00*	*0.3681*	*0.300*	*0.1104*	*25.1*
7	*13:42*	*3.50*	*0.6*	*0.600*	*0.6*	*0.240*	*0.4534*	*1.00*	*0.4534*	*0.300*	*0.1360*	*31.0*
8	*13:43*	*4.00*	*0.6*	*0.500*	*0.6*	*0.200*	*0.2959*	*1.00*	*0.2959*	*0.250*	*0.0740*	*16.8*
9	*13:44*	*4.50*	*0.6*	*0.400*	*0.6*	*0.160*	*0.2402*	*1.00*	*0.2402*	*0.200*	*0.0480*	*10.9*
10	13:45	5.00	0.6	0.400	0.6	0.160	0.1411	1.00	0.1411	0.200	0.0282	6.4
11	13:46	5.50	0.6	0.300	0.6	0.120	-0.0171	1.00	-0.0171	0.150	-0.0026	-0.6
12	13:46	6.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Figure 9 Discharge Measurement Summary URC-2

Discharge Measurement Summary

Date Generated: Wed Dec 18 2019

File Information	
File Name	WC121719.WAD
Start Date and Time	2019/12/17 14:15:58

Site Details	
Site Name	WC121719
Operator(s)	ZMM

System Information	
Sensor Type	FlowTracker
Serial #	P4709
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units	(English Units)
Distance	ft
Velocity	ft/s
Area	ft^2
Discharge	cfs

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.6%	7.3%
Velocity	2.7%	29.6%
Width	0.2%	0.2%
Method	3.2%	-
# Stations	3.9%	-
Overall	**5.8%**	**30.5%**

Summary

Averaging Int.	40	# Stations	13
Start Edge	LEW	Total Width	7.000
Mean SNR	30.6 dB	Total Area	1.950
Mean Temp	42.38 °F	Mean Depth	0.279
Disch. Equation	Mid-Section	Mean Velocity	0.0389
		Total Discharge	**0.0758**

Supplemental Data

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Tue Dec 17 14:26:19 CST 2019	5.000	7.730		

Measurement Results

St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	14:15	0.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	14:15	1.50	0.6	0.200	0.6	0.080	0.0705	1.00	0.0705	0.200	0.0141	18.6
2	*14:17*	*2.00*	*0.6*	*0.200*	*0.6*	*0.080*	*0.1516*	*1.00*	*0.1516*	*0.100*	*0.0152*	*20.0*
3	*14:18*	*2.50*	*0.6*	*0.200*	*0.6*	*0.080*	*0.1437*	*1.00*	*0.1437*	*0.100*	*0.0144*	*19.0*
4	*14:19*	*3.00*	*0.6*	*0.400*	*0.6*	*0.160*	*-0.0003*	*1.00*	*-0.0003*	*0.200*	*-0.0001*	*-0.1*
5	*14:23*	*3.50*	*0.6*	*0.400*	*0.6*	*0.160*	*0.0279*	*1.00*	*0.0279*	*0.200*	*0.0056*	*7.4*
6	*14:24*	*4.00*	*0.6*	*0.400*	*0.6*	*0.160*	*0.0535*	*1.00*	*0.0535*	*0.200*	*0.0107*	*14.1*
7	14:25	4.50	0.6	0.400	0.6	0.160	0.0614	1.00	0.0614	0.200	0.0123	16.2
8	14:26	5.00	0.6	0.400	0.6	0.160	0.0194	1.00	0.0194	0.200	0.0039	5.1
9	*14:28*	*5.50*	*0.6*	*0.400*	*0.6*	*0.160*	*0.0351*	*1.00*	*0.0351*	*0.200*	*0.0070*	*9.3*
10	*14:28*	*6.00*	*0.6*	*0.400*	*0.6*	*0.160*	*-0.0282*	*1.00*	*-0.0282*	*0.200*	*-0.0056*	*-7.4*
11	*14:30*	*6.50*	*0.6*	*0.300*	*0.6*	*0.120*	*-0.0108*	*1.00*	*-0.0108*	*0.150*	*-0.0016*	*-2.1*
12	14:30	7.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Figure 10 Discharge Measurement Summary WC-1

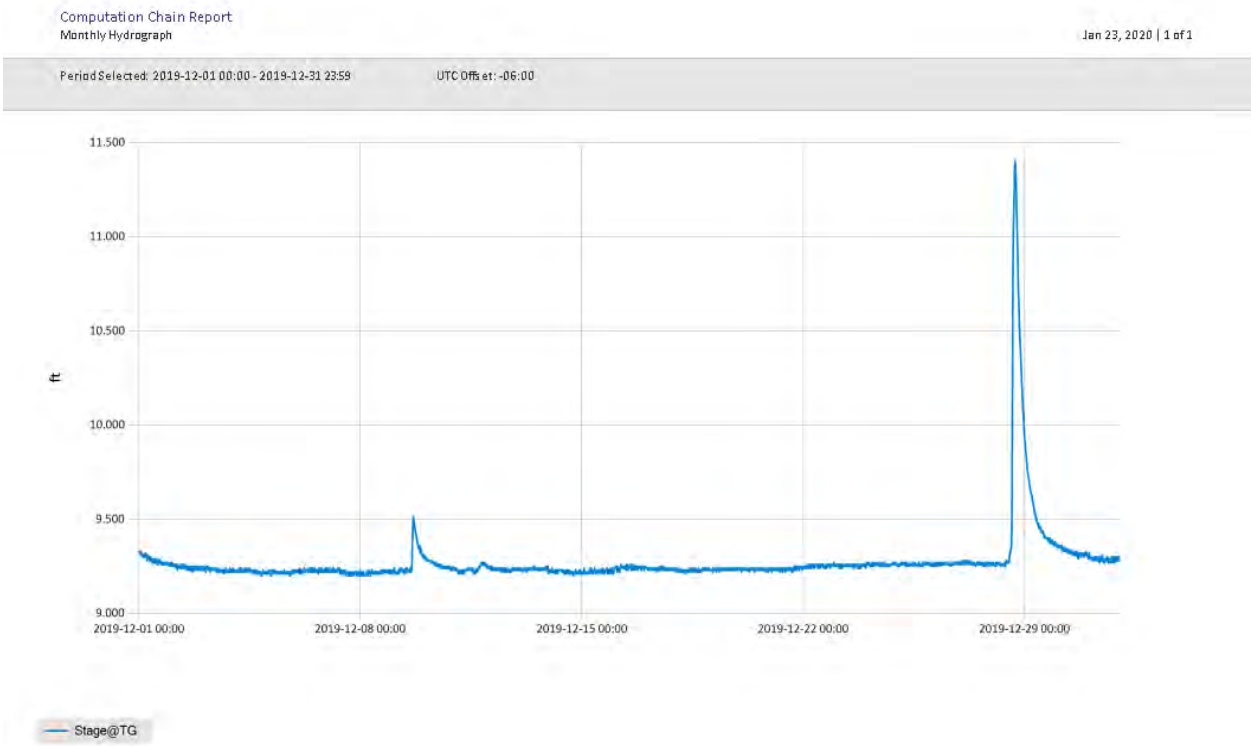

Figure 11 Monthly Hydrograph TG-1

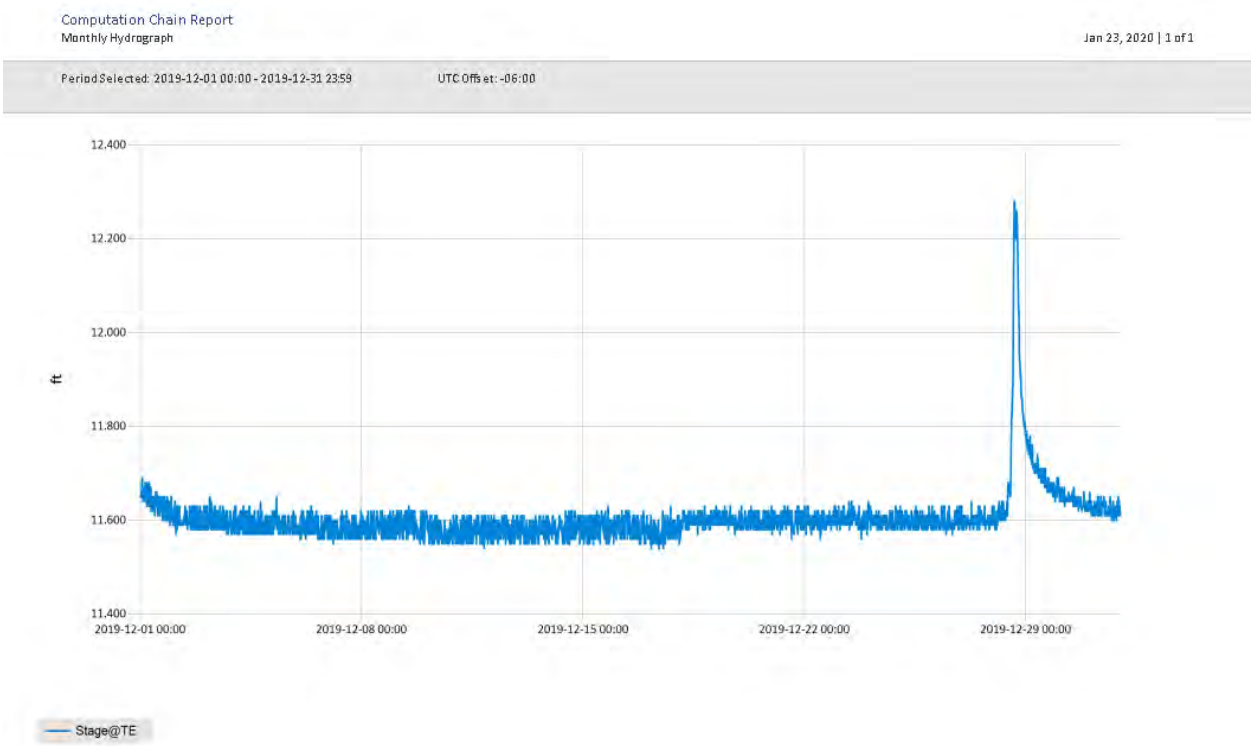

Figure 12 Monthly Hydrograph TE-1

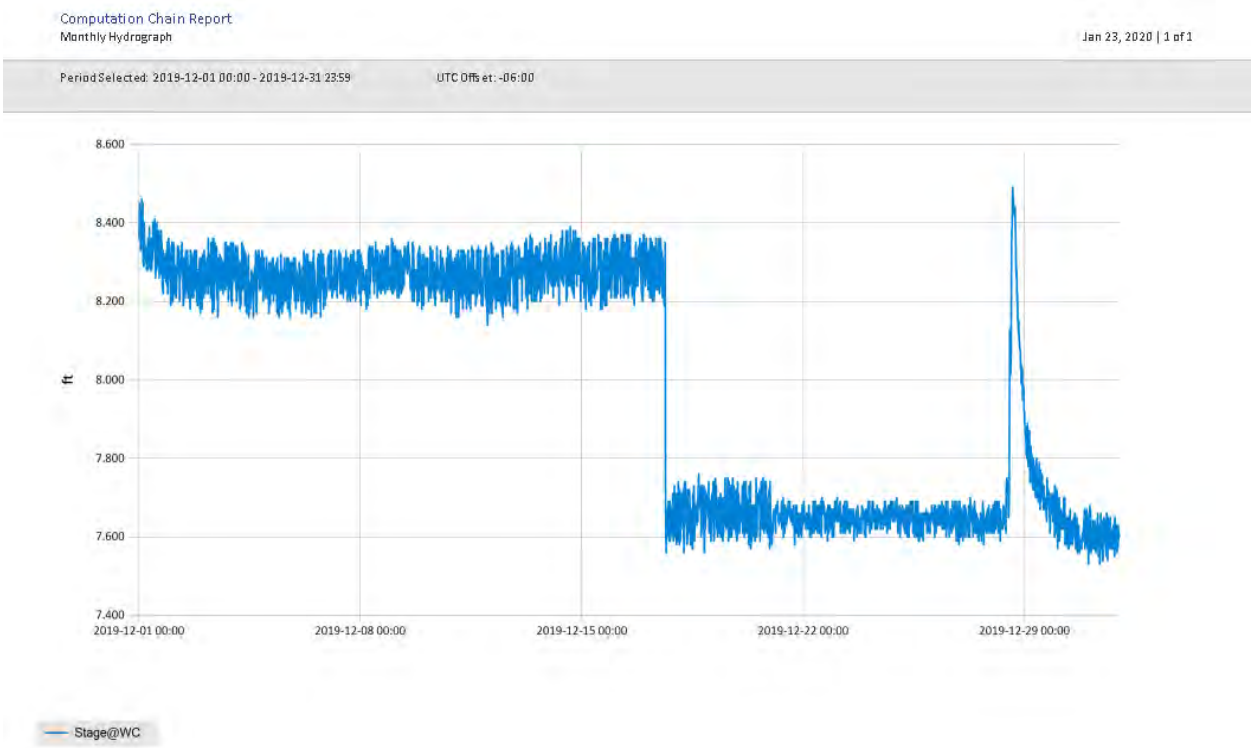

Figure 13 Monthly Hydrograph WC-1

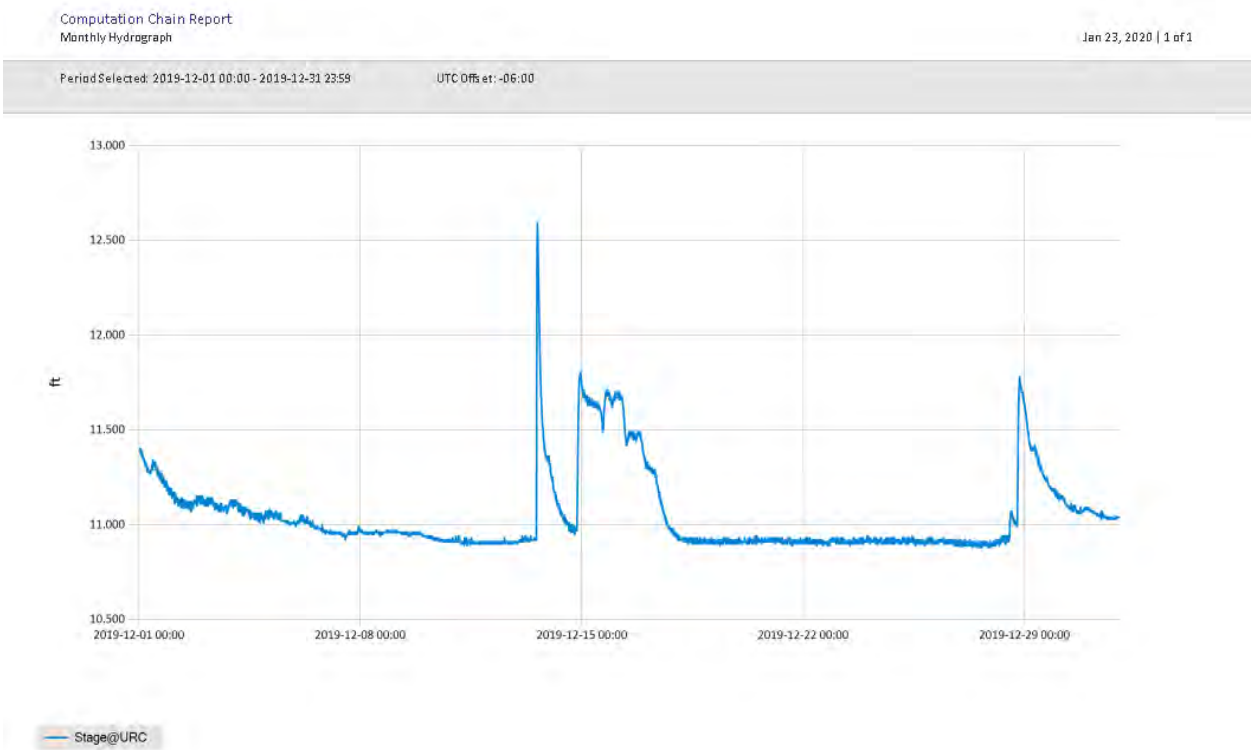

Figure 14 Monthly Hydrograph URC-2

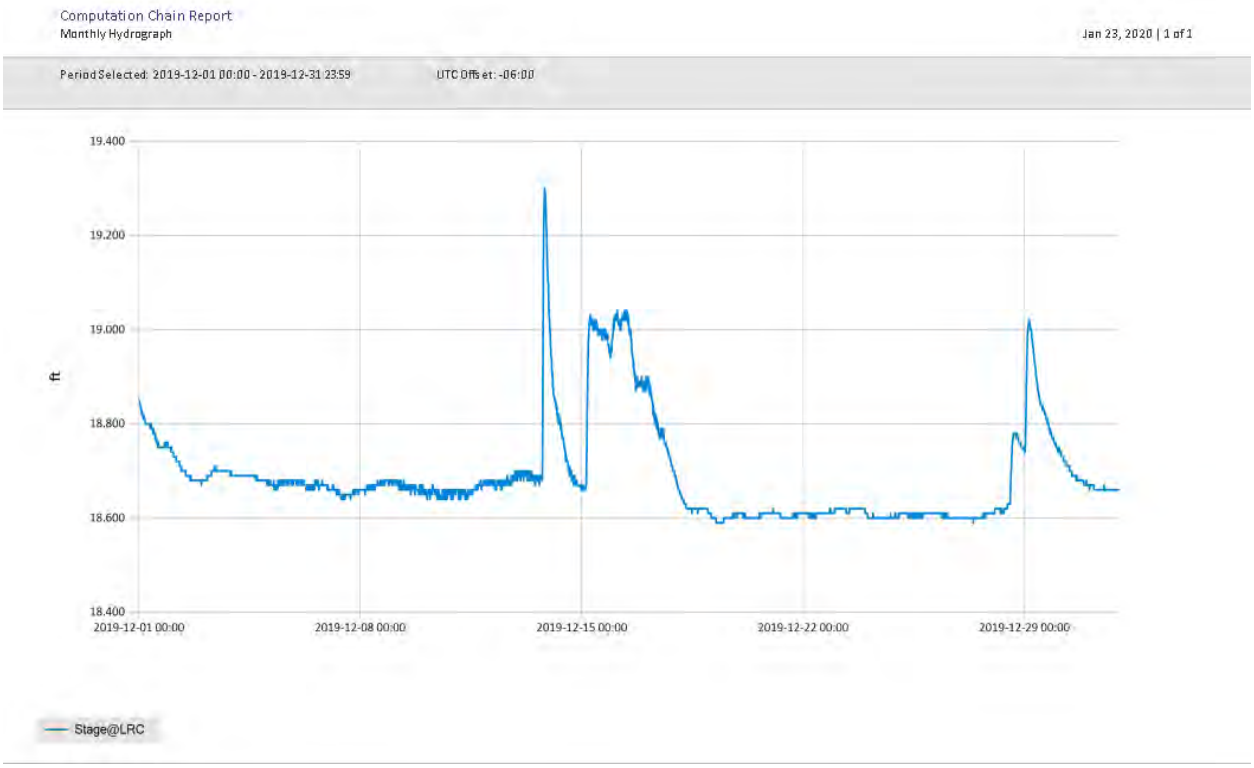

Figure 15 Monthly Hydrograph LRC-1

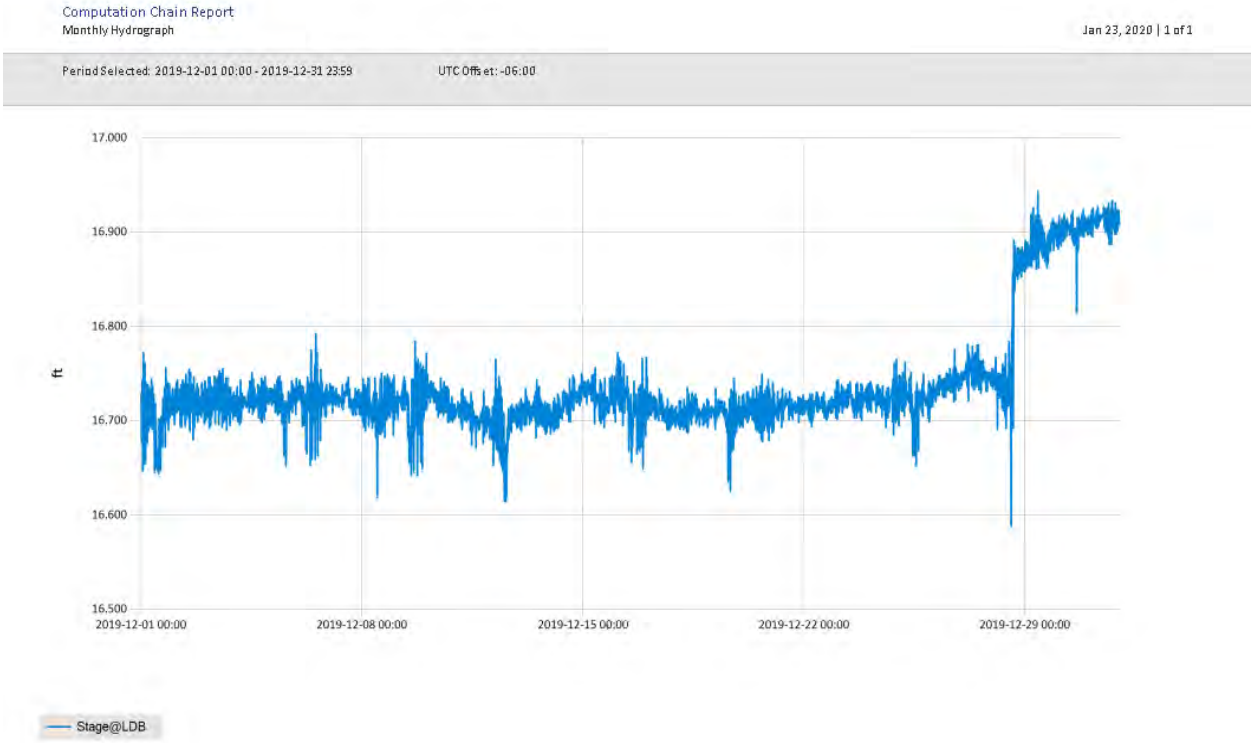

Figure 16 Monthly Hydrograph LDB-1

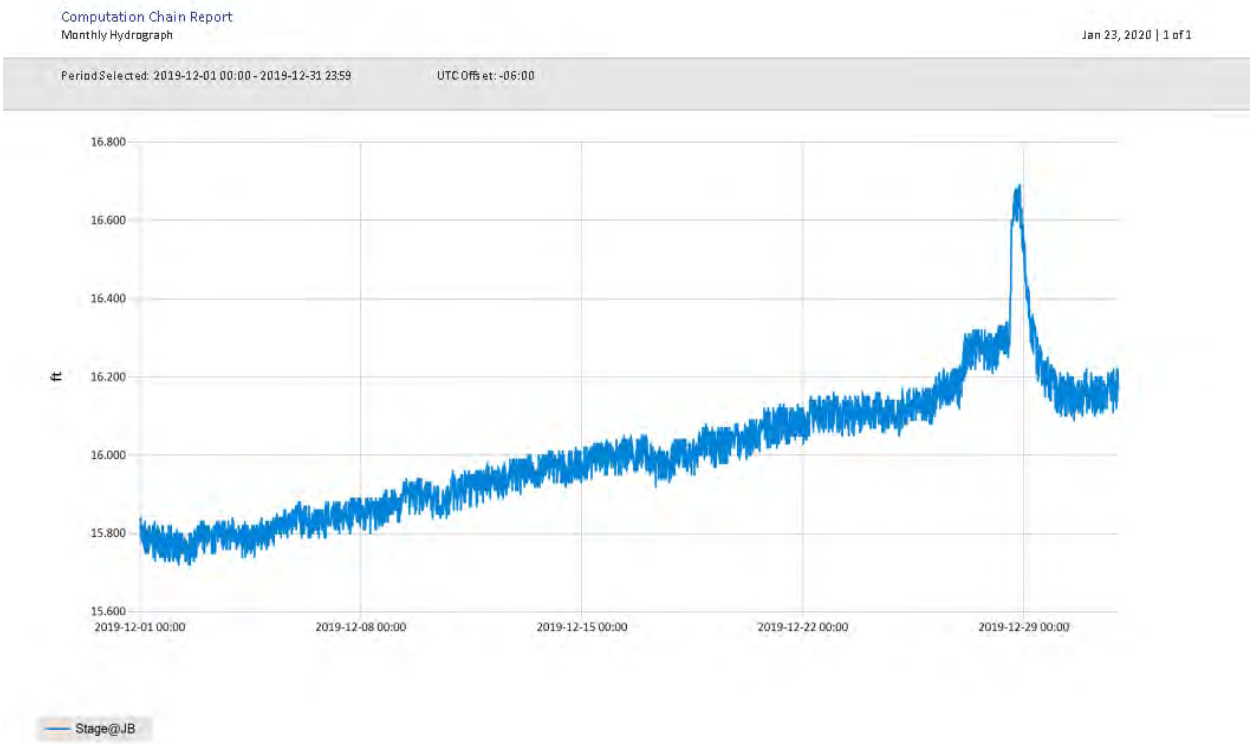

Figure 17 Monthly Hydrograph JB-1

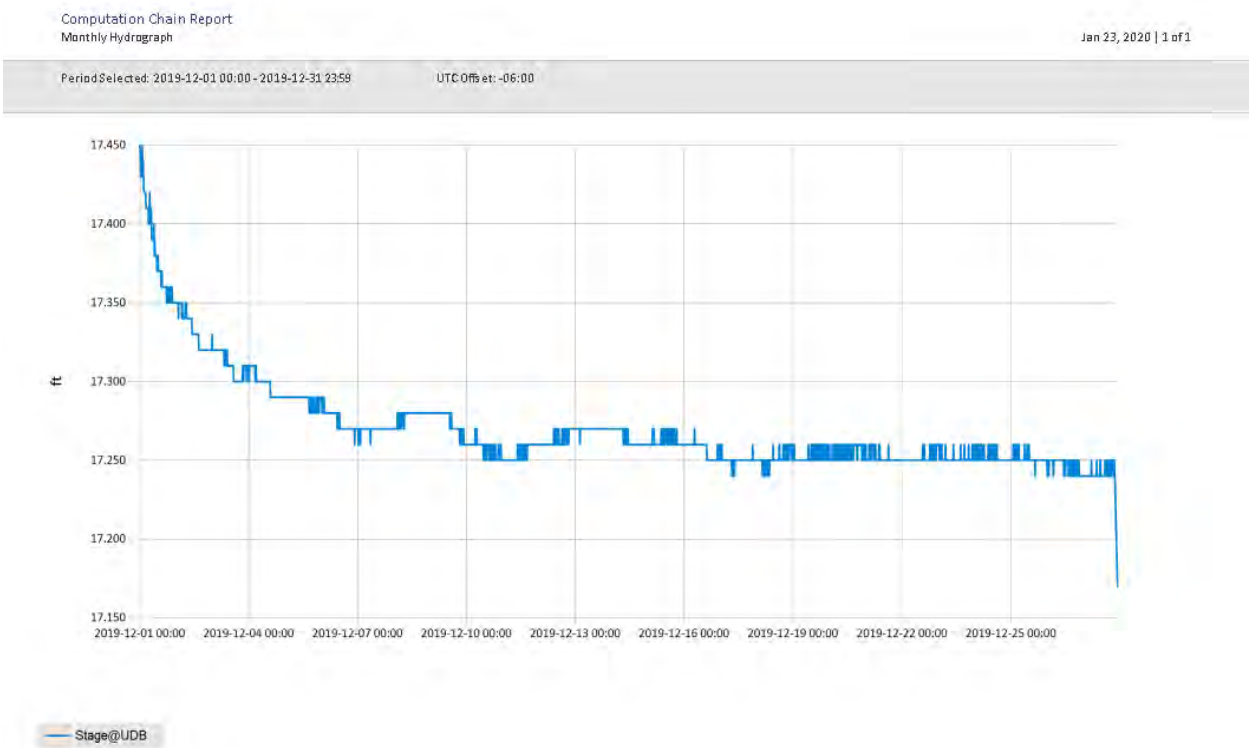

Figure 18 Monthly Hydrograph UDB-1

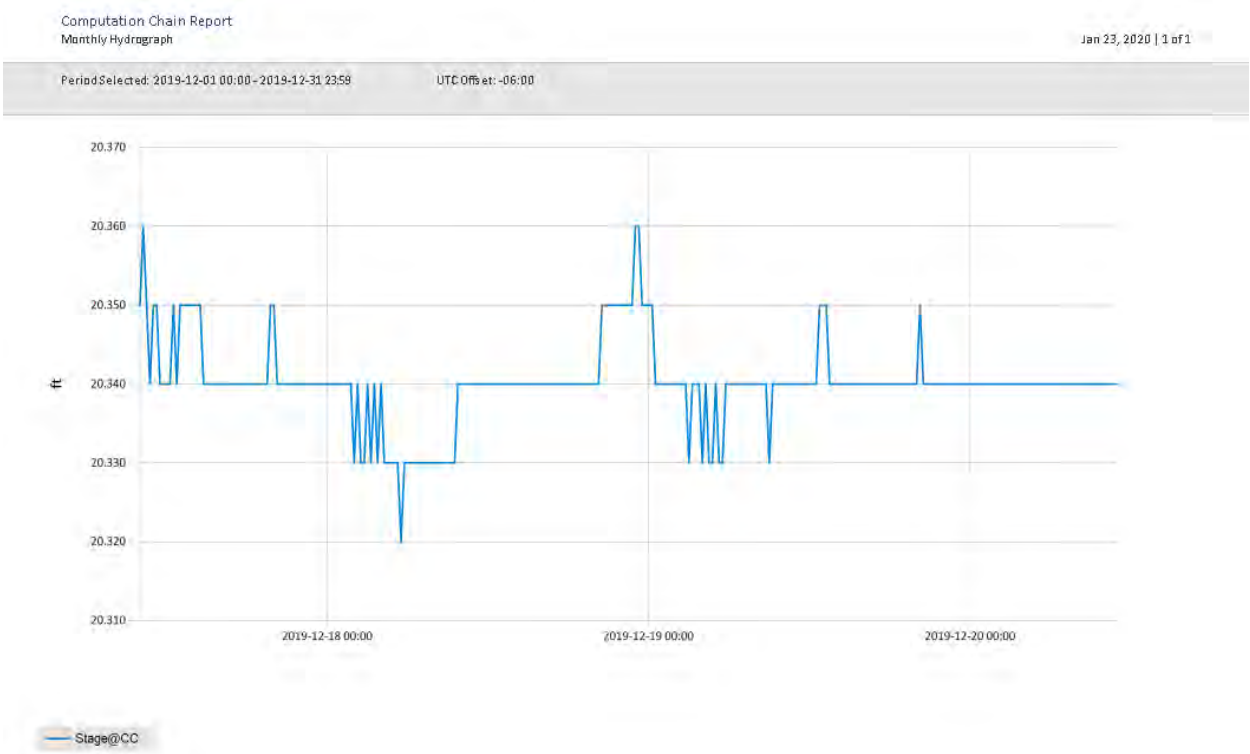

Figure 19 Monthly Hydrograph CC-1

MESONET CLIMATOLOGICAL DATA SUMMARY
(NRMN) Norman
Latitude: 35-14-09

December 2019
Nearest City: 2.1 NW Norman
Longitude: 97-27-53

Time Zone: Midnight-Midnight CST
County: Cleveland
Elevation: 1171 feet

DAY	TEMPERATURE (°F) MAX	MIN	AVG	DEWPT	DEG DAYS HDD	CDD	HUMIDITY (%) MAX	MIN	AVG	RAIN (in)	PRESSURE (in) STN	MSL	WIND SPEED (mph) DIR	AVG	MAX	SOLAR (MJ/m²)	4" SOIL TEMPERATURES SOD	BARE	MAX	MIN
1	51	35	41.4	22.5	22	0	58	35	47	0.00	28.84	30.09	NW	16.4	34.9	12.62	46.1	45.1	49	42
2	51	28	39.9	24.0	25	0	84	34	55	0.00	28.95	30.21	SSE	6.0	18.6	9.36	45.2	42.4	47	39
3	62	36	46.1	30.4	16	0	82	29	56	0.00	28.72	29.97	S	6.2	17.2	11.62	46.0	43.4	49	39
4	64	31	49.4	33.1	18	0	90	31	57	0.00	28.79	30.04	SSE	4.0	11.6	8.81	46.1	44.3	49	38
5	71	49	57.6	39.2	5	0	75	36	51	0.00	28.62	29.87	SSE	8.3	19.9	11.51	49.2	49.0	54	45
6	55	35	44.7	34.3	20	0	78	55	67	0.00	28.99	30.25	N	12.8	33.6	11.23	48.9	47.4	50	44
7	60	28	43.8	28.4	21	0	93	22	61	0.00	28.97	30.22	SSE	5.1	19.5	11.06	46.6	43.9	49	39
8	67	46	55.4	44.3	9	0	84	45	68	0.00	28.54	29.78	S	10.7	26.0	6.31	48.5	47.2	51	44
9	59	33	45.4	30.6	19	0	74	46	56	0.00	28.62	29.87	N	13.9	34.6	3.86	48.8	46.3	49	41
10	47	28	36.0	14.2	27	0	62	23	42	0.00	29.06	30.32	NNE	4.8	16.3	10.61	45.5	41.4	47	38
11	54	27	39.8	26.7	24	0	81	43	60	0.00	29.13	30.39	S	8.7	21.6	11.79	44.1	41.1	46	38
12	56	38	45.7	33.0	18	0	77	43	62	0.00	28.88	30.13	S	9.7	25.8	11.81	45.5	43.3	48	40
13	60	32	44.7	35.9	19	0	97	42	74	0.00	28.64	29.88	W	2.5	10.8	10.77	46.2	44.9	51	40
14	50	34	41.2	32.3	23	0	91	50	71	0.00	28.63	29.87	NE	6.2	14.8	5.30	45.6	43.3	47	41
15	38	32	34.4	33.1	30	0	98	90	95	0.02	28.61	29.85	NNW	9.0	23.3	1.78	44.4	40.8	42	40
16	33	26	30.2	27.1	35	0	98	80	89	0.00	28.85	30.10	NNW	14.1	29.0	2.18	42.7	38.5	40	37
17	48	19	31.8	21.8	31	0	94	35	70	0.00	29.11	30.37	NW	6.4	17.7	11.98	41.2	37.5	41	35
18	57	23	38.2	15.9	25	0	78	16	45	0.00	29.07	30.33	SW	3.9	12.1	12.16	40.2	37.6	42	34
19	57	30	42.7	17.0	22	0	63	17	38	0.00	29.00	30.25	S	8.2	24.5	11.59	40.8	38.6	43	35
20	51	39	43.3	30.2	20	0	88	44	61	0.00	29.01	30.26	SSE	8.5	18.9	5.80	42.5	40.8	44	38
21	44	40	42.4	39.8	23	0	98	84	91	0.00	29.07	30.33	SSE	3.4	9.3	1.73	44.4	43.4	44	43
22	51	30	39.1	36.5	24	0	100	60	91	0.00	28.99	30.24	SW	4.4	12.6	7.64	44.8	43.8	48	41
23	62	24	44.7	33.1	22	0	100	35	69	0.01	28.83	30.08	SSE	6.0	17.8	10.04	43.4	42.4	48	37
24	69	39	53.9	34.3	11	0	80	24	51	0.00	28.69	29.94	SSE	9.1	21.6	11.26	45.6	46.1	51	41
25	71	48	57.9	40.1	5	0	80	31	54	0.00	28.61	29.85	S	10.5	26.2	11.32	47.7	49.6	55	45
26	67	40	51.2	41.7	12	0	100	28	75	0.00	28.78	30.03	S	5.8	16.1	8.32	49.2	50.9	55	48
27	55	37	45.2	40.3	19	0	94	76	83	0.02	28.82	30.07	ENE	7.3	17.0	3.64	48.0	48.3	50	47
28	60	47	56.3	54.1	12	0	97	86	92	0.53	28.46	29.70	SSE	11.1	33.0	0.92	50.8	51.7	54	49
29	47	33	39.7	30.7	25	0	92	45	72	0.00	28.59	29.83	WNW	11.1	27.2	9.94	48.3	45.7	50	42
30	49	30	37.0	22.6	26	0	83	31	59	0.00	28.84	30.09	WNW	10.3	28.5	12.29	44.7	40.8	45	38
31	52	26	38.2	19.7	26	0	79	20	52	0.00	28.90	30.16	WNW	6.2	17.1	12.48	42.6	39.9	45	37
	55	34	43.8	31.2	<- Monthly Averages ->						28.83	30.08	SSE	8.1	34.9	8.77	45.6	43.9	48	41

Temperature - Highest: 71
Lowest: 19

Degree Days - Total HDD: 635
Total CDD: 0

Rainfall: Monthly Total: 0.58 in.
Greatest 24 Hr: 0.53 in.

Humidity - Highest: 100
Lowest: 16

Number of Days With:
Tmax ≥ 90: 0
Tmax ≤ 32: 0
Tmin ≤ 32: 15
Tmin ≤ 0: 0
Rainfall ≥ 0.01 inch: 4
Rainfall ≥ 0.10 inch: 1
Avg Wind Speed ≥ 10 mph: 9
Max Wind Speed ≥ 30 mph: 4

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* Denotes incomplete record

Figure 20 December Mesonet Data

Lake Thunderbird TMDL Monitoring Plan Implementation: Sample Year (SY) 2019- January Report

SY2019 Monthly Report

Lake Thunderbird TMDL Monitoring Plan Implementation:

January 2020 Monitoring Report

Oklahoma Water Resources Board
Water Quality Programs Division
Monitoring and Assessment Section
3800 N. Classen, Oklahoma City, Oklahoma 73118
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SUMMARY OF JANUARY WATER QUALITY SAMPLING

Sampling for January 2020 occurred on two separate days. Four samples were collected on the seventeenth via autosampler, and the other six samples were collected on the twenty-first at base flow conditions. Discharge measurements were collected at three locations. Mesonet data shows 1.30 inches of precipitation on the seventeenth, 0.88 inches of precipitation in the 72 hours prior to sampling, and no precipitation in the 72 hours between sampling events. Mesonet shows 0.09 inches of precipitation on the twenty-first, and 0.37 inches of precipitation in the 72 hours after the sampling event. The total rainfall amount in Norman for the month of January was 3.63 inches. All water level gauges were operational for the month, with the exception of LT-1, CC-1, and UDB-1 due to equipment malfunction.

RESULTS

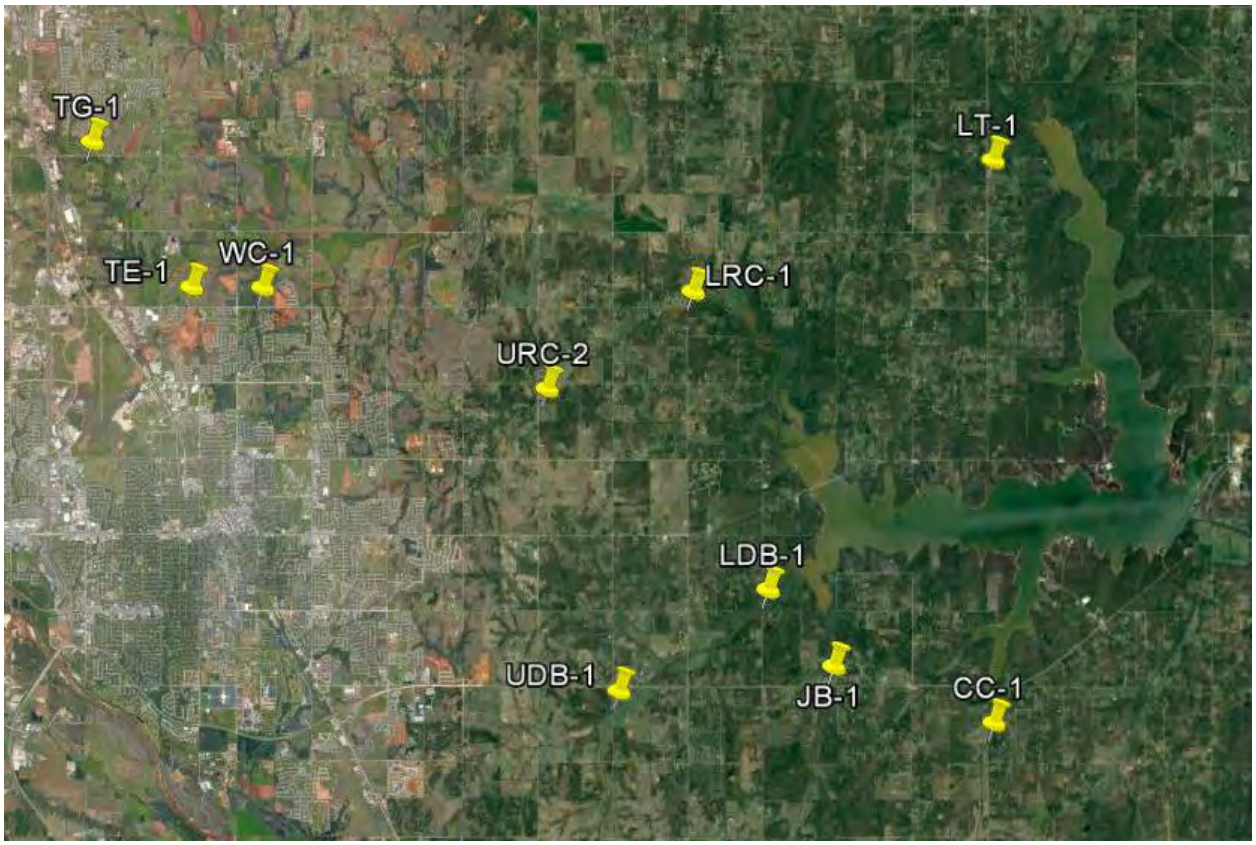

Figure 1 Monitoring Station Map

Monitoring Location ID	Monitoring Location Name	Date	Time	Field Crew	Water Temperature (°C)	Dissolved Oxygen (DO) (mg/l)	pH	Specific Conductance (mS/cm)	Turbidity (NTU)	Notes
CC-1	Clear Creek	01-21-2020	10:45	SD	5.3	12.13	7.75	685	7	
JB-1	Jim Blue Creek	01-21-2020	12:00	SD	4.5	12.01	7.53	760	7	No RPs over water. Channel shifted far REW. LEW frozen pool. Same DCP as Dec.
LDB-1	Lower Dave Blue Creek	01-21-2020	12:50	SD	4.5	11.61	7.58	706	14	
LRC-1	Lower Rock Creek	01-17-2020	7:00	SD	*	*	7.71	219	1000	Autosampler collected T3 at 7:00 @ 22.09, peak at 8:15 @ 23.03
LT-1	Lake Laterals	01-21-2020	13:25	SD	5.1	9.96	7.35	377	15	Lots of limbs cut down on upstream
TE-1	Little River Tributary	01-17-2020	4:00	SD	*	*	7.55	328	361	Autosampler collected T1 at 4:00 @14.17, peak at 5:15 @ 14.95
TG-1	Little River Tributary	01-17-2020	5:00	SD	*	*	7.55	248	998	Autosampler collected T3 at 5:00 @ 16.92, peak at 6:15 @18.25
UDB-1	Upper Dave Blue Creek	01-21-2020	8:55	SD	3.7	11.76	7.30	826	8	DCP not working upon arrival. Same stage as July visit
URC-2	Upper Rock Creek	01-17-2020	5:30	SD	*	*	7.53	231	1000	Autosampler collected T3 at 5:30 @ 15.5, peak at 6:30 @ 16.08
WC-1	Woodcrest Creek	01-21-2020	15:40	SD	5.6	11.49	7.49	919	11	Autosampler tubing clogged, did not collect on 1/17; Triggered T3 at 5:00 @ 11.51, peak at 5:30 @11.72

Table 1 Field Data Form Where an Asterisk Denotes a Sample from an Autosampler

Monitoring Location ID	Monitoring Location Name	Nitrate and Nitrite (mg/l)	Kjeldahl Nitrogen (mg/l)	Phosphorus (mg/l)	Total Suspended Solids (mg/l)
CC-1	Clear Creek	0.18	0.24	0.029	<5.0
JB-1	Jim Blue Creek	<0.05	0.30	0.028	10.0
LDB-1	Lower Dave Blue Creek	0.34	0.49	0.054	<5.0
LRC-1	Lower Rock Creek	0.38	3.12	0.935	967
LT-1	Lake Laterals	<0.05	0.40	0.029	6.0
TE-1	Little River Tributary	0.76	1.52	0.370	284
TG-1	Little River Tributary	0.46	3.02	0.915	1330
UDB-1	Upper Dave Blue Creek	0.17	1.88	0.036	12.0
URC-2	Upper Rock Creek	0.37	4.28	1.175	1790
WC-1	Woodcrest Creek	0.39	0.60	0.096	<5.0

Table 2 Laboratory Analysis Summary

Monitoring Location Name	Nitrate and Nitrite (mg/l)	Kjeldahl Nitrogen (mg/l)	Phosphorus (mg/l)	Total Suspended Solids (mg/l)
Field Blank	<0.05	<0.10	<0.010	<5.0
Duplicate	0.19	0.27	0.028	<5.0
Duplicate RPD	5.41%	11.76%	3.51%	0%

Table 3 QA/QC Data

Quality assurance/quality control (QA/QC) of the data includes a field blank and duplicate sample from each collection event, and is qualified by the OWRB. Relative Percent Difference (RPD) of the duplicate sample can be categorized into four levels, where Level 1 likely has no QA issues and Level 4 has major QA issues, and should be used with caution.

Monitoring Location ID	Monitoring Location Name	Discharge (cfs)	Stream Stage (ft)
CC-1	Clear Creek	1.30	20.46
JB-1	Jim Blue Creek	1.45	15.94
LDB-1	Lower Dave Blue Creek	115.00	17.69
LRC-1	Lower Rock Creek	91.00	22.09
LT-1	Lake Laterals	0.50	4.44
TE-1	Little River Tributary	116.00	14.17
TG-1	Little River Tributary	924.00	16.92
UDB-1	Upper Dave Blue Creek	0.34	17.46
URC-2	Upper Rock Creek	86.00	15.50
WC-1	Woodcrest Creek	0.08	7.80

Table 4 Station Discharge Summary

Discharge Measurement Summary

Date Generated: Wed Jan 22 2020

File Information

File Name	CC0121.WAD
Start Date and Time	2020/01/21 11:04:03

Site Details

Site Name	CC
Operator(s)	SCD

System Information

Sensor Type	FlowTracker
Serial #	P4709
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units	**(English Units)**
Distance	ft
Velocity	ft/s
Area	ft^2
Discharge	cfs

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.4%	1.8%
Velocity	1.6%	6.9%
Width	0.1%	0.1%
Method	2.1%	-
# Stations	3.3%	-
Overall	**4.4%**	**7.2%**

Summary

Averaging Int.	40	# Stations	15
Start Edge	LEW	Total Width	7.000
Mean SNR	48.0 dB	Total Area	2.099
Mean Temp	41.46 °F	Mean Depth	0.300
Disch. Equation	Mid-Section	Mean Velocity	0.6188
		Total Discharge	**1.2989**

Supplemental Data

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Tue Jan 21 11:06:17 CST 2020	1.500	20.460		

Measurement Results

St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	11:04	0.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	*11:04*	*0.50*	*0.6*	*0.550*	*0.6*	*0.220*	*0.3963*	*1.00*	*0.3963*	*0.275*	*0.1090*	*8.4*
2	*11:05*	*1.00*	*0.6*	*0.350*	*0.6*	*0.140*	*0.7631*	*1.00*	*0.7631*	*0.175*	*0.1336*	*10.3*
3	11:06	1.50	0.6	0.300	0.6	0.120	0.8127	1.00	0.8127	0.150	0.1218	9.4
4	11:07	2.00	0.6	0.300	0.6	0.120	0.6995	1.00	0.6995	0.150	0.1049	8.1
5	*11:08*	*2.50*	*0.6*	*0.300*	*0.6*	*0.120*	*0.6647*	*1.00*	*0.6647*	*0.150*	*0.0997*	*7.7*
6	11:09	3.00	0.6	0.300	0.6	0.120	0.9252	1.00	0.9252	0.150	0.1387	10.7
7	*11:10*	*3.50*	*0.6*	*0.300*	*0.6*	*0.120*	*0.5925*	*1.00*	*0.5925*	*0.150*	*0.0888*	*6.8*
8	11:12	4.00	0.6	0.300	0.6	0.120	0.2556	1.00	0.2556	0.150	0.0383	3.0
9	11:13	4.50	0.6	0.300	0.6	0.120	0.7149	1.00	0.7149	0.150	0.1072	8.3
10	11:14	5.00	0.6	0.300	0.6	0.120	0.6860	1.00	0.6860	0.150	0.1029	7.9
11	11:14	5.50	0.6	0.300	0.6	0.120	0.5279	1.00	0.5279	0.150	0.0791	6.1
12	11:15	6.00	0.6	0.300	0.6	0.120	0.5643	1.00	0.5643	0.150	0.0846	6.5
13	11:16	6.50	0.6	0.300	0.6	0.120	0.6024	1.00	0.6024	0.150	0.0903	7.0
14	11:16	7.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Figure 2 Discharge Measurement Summary CC-1

Discharge Measurement Summary

Date Generated: Wed Jan 22 2020

File Information

File Name	JB0121.WAD
Start Date and Time	2020/01/21 12:14:38

Site Details

Site Name	JB
Operator(s)	SCD

System Information

Sensor Type	FlowTracker
Serial #	P4709
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units	**(English Units)**
Distance	ft
Velocity	ft/s
Area	ft^2
Discharge	cfs

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.6%	2.8%
Velocity	1.7%	9.5%
Width	0.2%	0.2%
Method	3.1%	-
# Stations	5.8%	-
Overall	**6.8%**	**9.9%**

Summary

Averaging Int.	40	# Stations	9
Start Edge	LEW	Total Width	4.000
Mean SNR	45.3 dB	Total Area	2.125
Mean Temp	39.96 °F	Mean Depth	0.531
Disch. Equation	Mid-Section	Mean Velocity	0.6824
		Total Discharge	**1.4503**

Supplemental Data

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Tue Jan 21 12:14:09 CST 2020	1.000	15.940		

Measurement Results

St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	12:14	0.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	12:14	0.50	0.6	0.700	0.6	0.280	0.8638	1.00	0.8638	0.350	0.3024	20.9
2	12:15	1.00	0.6	0.600	0.6	0.240	1.1175	1.00	1.1175	0.300	0.3353	23.1
3	12:16	1.50	0.6	0.550	0.6	0.220	0.6486	1.00	0.6486	0.275	0.1783	12.3
4	12:17	2.00	0.6	0.600	0.6	0.240	0.6696	1.00	0.6696	0.300	0.2009	13.9
5	*12:18*	*2.50*	*0.6*	*0.700*	*0.6*	*0.280*	*0.5942*	*1.00*	*0.5942*	*0.350*	*0.2080*	*14.3*
6	*12:19*	*3.00*	*0.6*	*0.600*	*0.6*	*0.240*	*0.5650*	*1.00*	*0.5650*	*0.300*	*0.1695*	*11.7*
7	*12:21*	*3.50*	*0.6*	*0.500*	*0.6*	*0.200*	*0.2234*	*1.00*	*0.2234*	*0.250*	*0.0559*	*3.9*
8	12:21	4.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Figure 3 Discharge Measurement Summary JB-1

Discharge Measurement Summary

Date Generated: Wed Jan 22 2020

File Information	
File Name	LT0121.WAD
Start Date and Time	2020/01/21 13:36:44

Site Details	
Site Name	LT
Operator(s)	SCD

System Information	
Sensor Type	FlowTracker
Serial #	P4709
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units	(English Units)
Distance	ft
Velocity	ft/s
Area	ft^2
Discharge	cfs

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.6%	2.1%
Velocity	1.7%	23.5%
Width	0.2%	0.2%
Method	3.1%	-
# Stations	3.1%	-
Overall	**4.9%**	**23.7%**

Summary

Averaging Int.	40	# Stations	16
Start Edge	LEW	Total Width	11.000
Mean SNR	28.0 dB	Total Area	4.150
Mean Temp	40.94 °F	Mean Depth	0.377
Disch. Equation	Mid-Section	Mean Velocity	0.1208
		Total Discharge	**0.5011**

Supplemental Data

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Tue Jan 21 13:36:23 CST 2020	1.000	4.440		

Measurement Results

St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	13:36	0.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	*13:36*	*1.00*	*0.6*	*0.200*	*0.6*	*0.080*	*-0.0003*	*1.00*	*-0.0003*	*0.200*	*-0.0001*	*0.0*
2	*13:39*	*2.00*	*0.6*	*0.300*	*0.6*	*0.120*	*-0.0003*	*1.00*	*-0.0003*	*0.300*	*-0.0001*	*0.0*
3	*13:40*	*3.00*	*0.6*	*0.500*	*0.6*	*0.200*	*0.0000*	*1.00*	*0.0000*	*0.375*	*0.0000*	*0.0*
4	*13:41*	*3.50*	*0.6*	*0.500*	*0.6*	*0.200*	*0.0016*	*1.00*	*0.0016*	*0.250*	*0.0004*	*0.1*
5	*13:41*	*4.00*	*0.6*	*0.500*	*0.6*	*0.200*	*0.2119*	*1.00*	*0.2119*	*0.250*	*0.0530*	*10.6*
6	*13:42*	*4.50*	*0.6*	*0.500*	*0.6*	*0.200*	*0.1719*	*1.00*	*0.1719*	*0.250*	*0.0430*	*8.6*
7	*13:43*	*5.00*	*0.6*	*0.500*	*0.6*	*0.200*	*-0.0246*	*1.00*	*-0.0246*	*0.250*	*-0.0062*	*-1.2*
8	*13:44*	*5.50*	*0.6*	*0.500*	*0.6*	*0.200*	*0.4564*	*1.00*	*0.4564*	*0.250*	*0.1141*	*22.8*
9	*13:45*	*6.00*	*0.6*	*0.500*	*0.6*	*0.200*	*0.4692*	*1.00*	*0.4692*	*0.250*	*0.1173*	*23.4*
10	*13:46*	*6.50*	*0.6*	*0.500*	*0.6*	*0.200*	*0.3196*	*1.00*	*0.3196*	*0.250*	*0.0799*	*15.9*
11	*13:47*	*7.00*	*0.6*	*0.500*	*0.6*	*0.200*	*0.1496*	*1.00*	*0.1496*	*0.375*	*0.0561*	*11.2*
12	*13:48*	*8.00*	*0.6*	*0.400*	*0.6*	*0.160*	*0.0866*	*1.00*	*0.0866*	*0.400*	*0.0346*	*6.9*
13	*13:49*	*9.00*	*0.6*	*0.400*	*0.6*	*0.160*	*0.0230*	*1.00*	*0.0230*	*0.400*	*0.0092*	*1.8*
14	*13:50*	*10.00*	*0.6*	*0.350*	*0.6*	*0.140*	*-0.0003*	*1.00*	*-0.0003*	*0.350*	*-0.0001*	*0.0*
15	13:50	11.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Figure 4 Discharge Measurement Summary LT-1

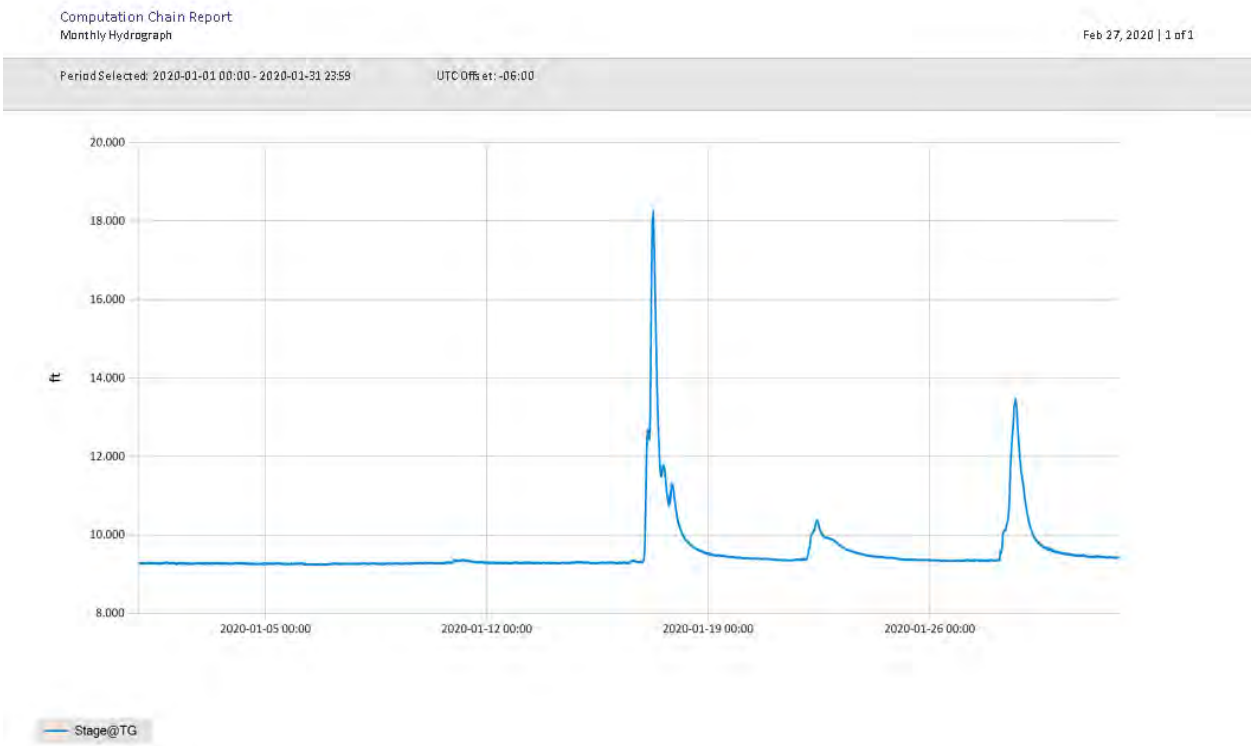

Figure 5 Monthly Hydrograph TG-1

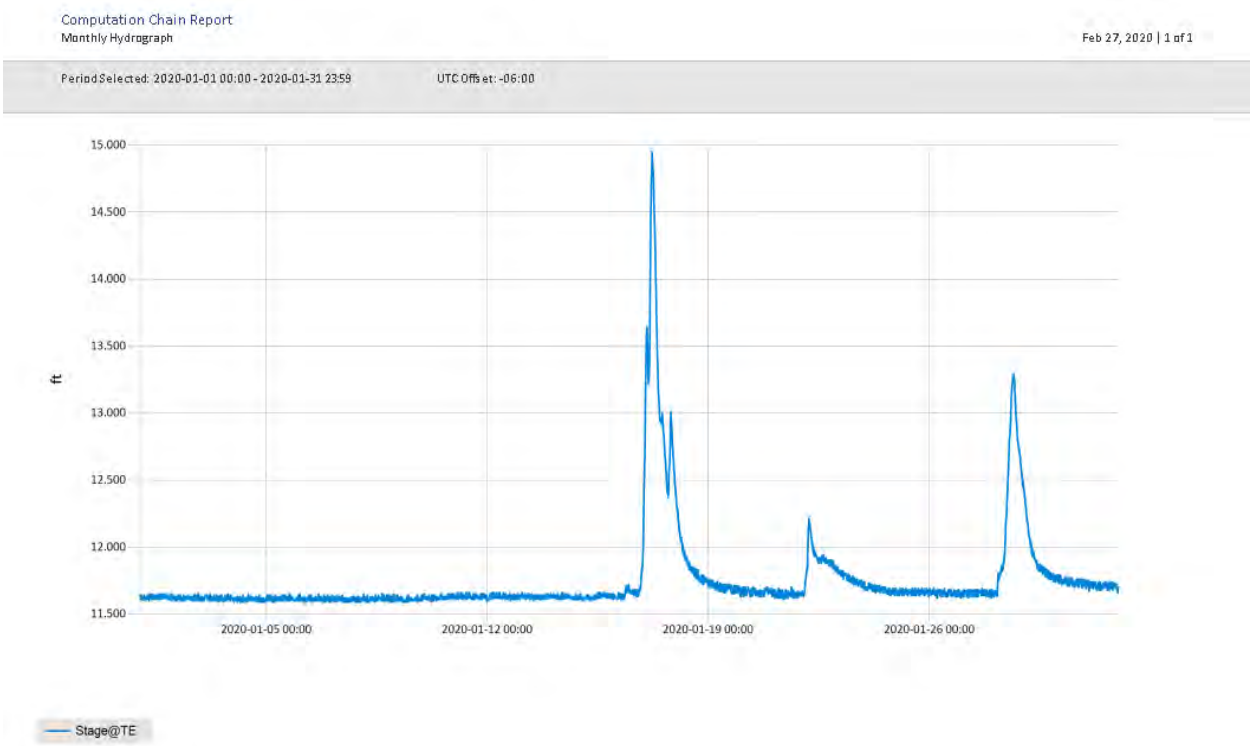

Figure 6 Monthly Hydrograph TE-1

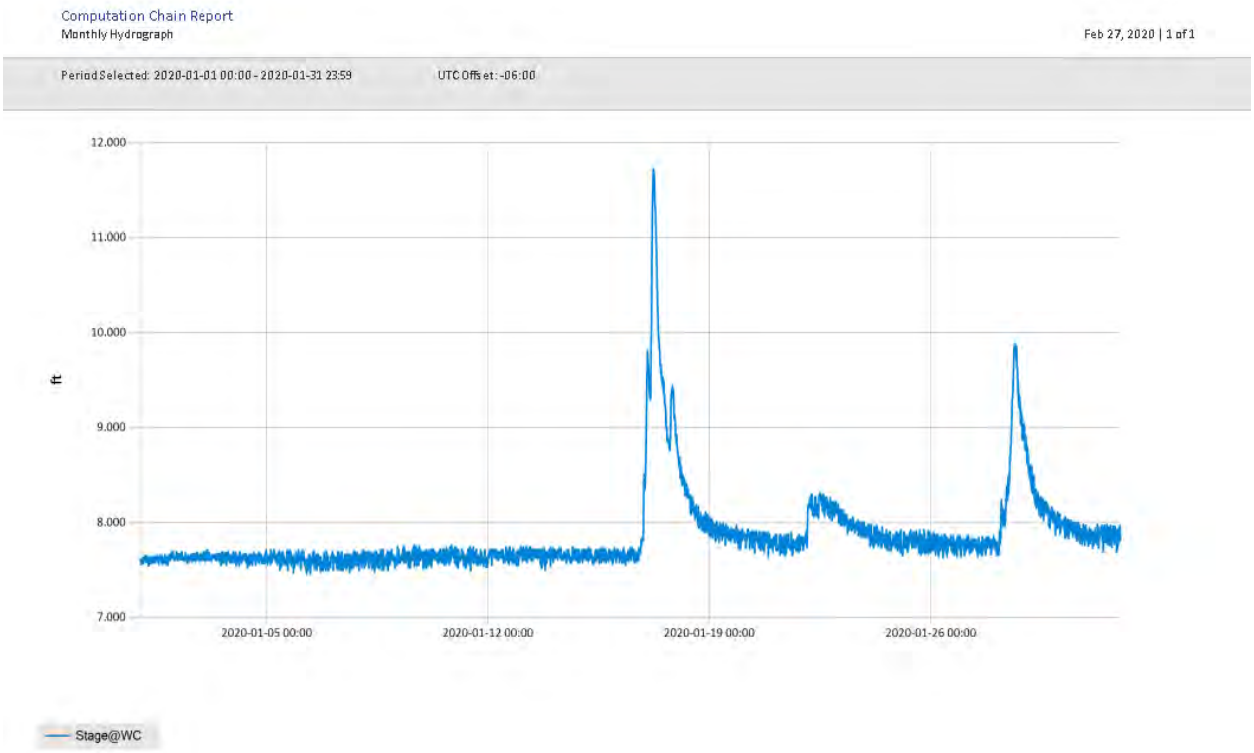

Figure 7 Monthly Hydrograph WC-1

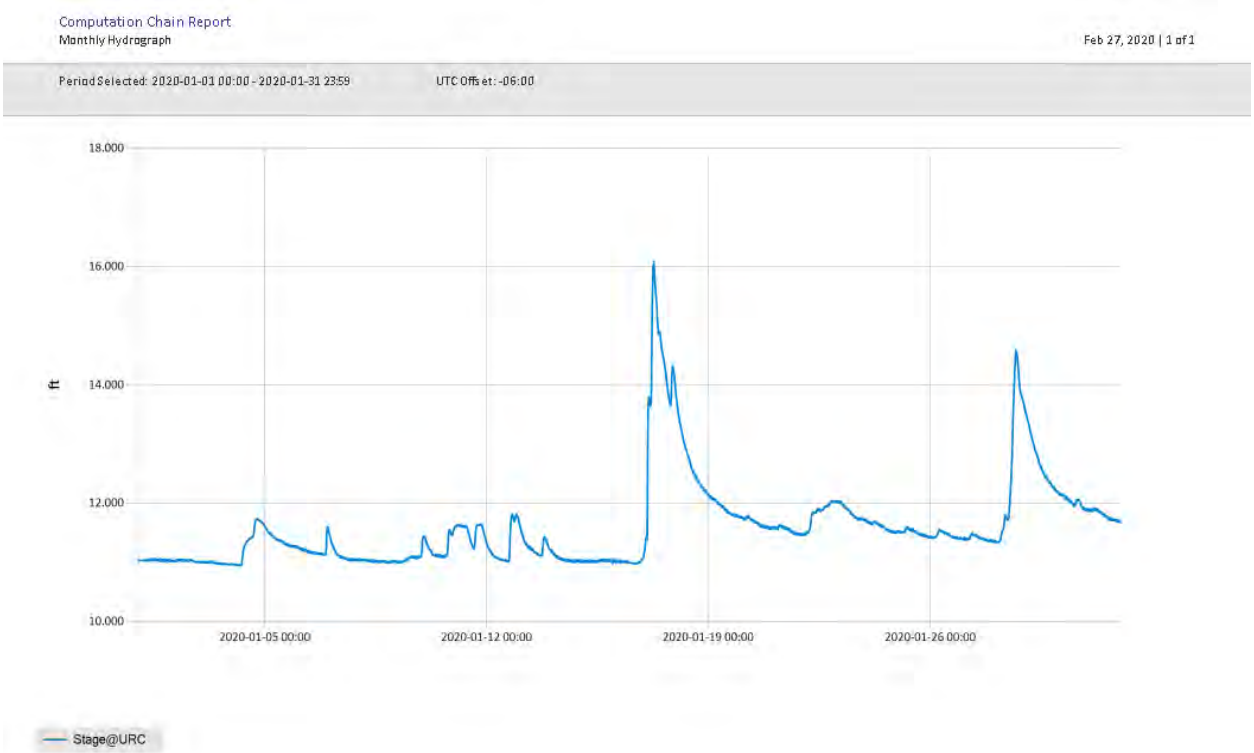

Figure 8 Monthly Hydrograph URC-2

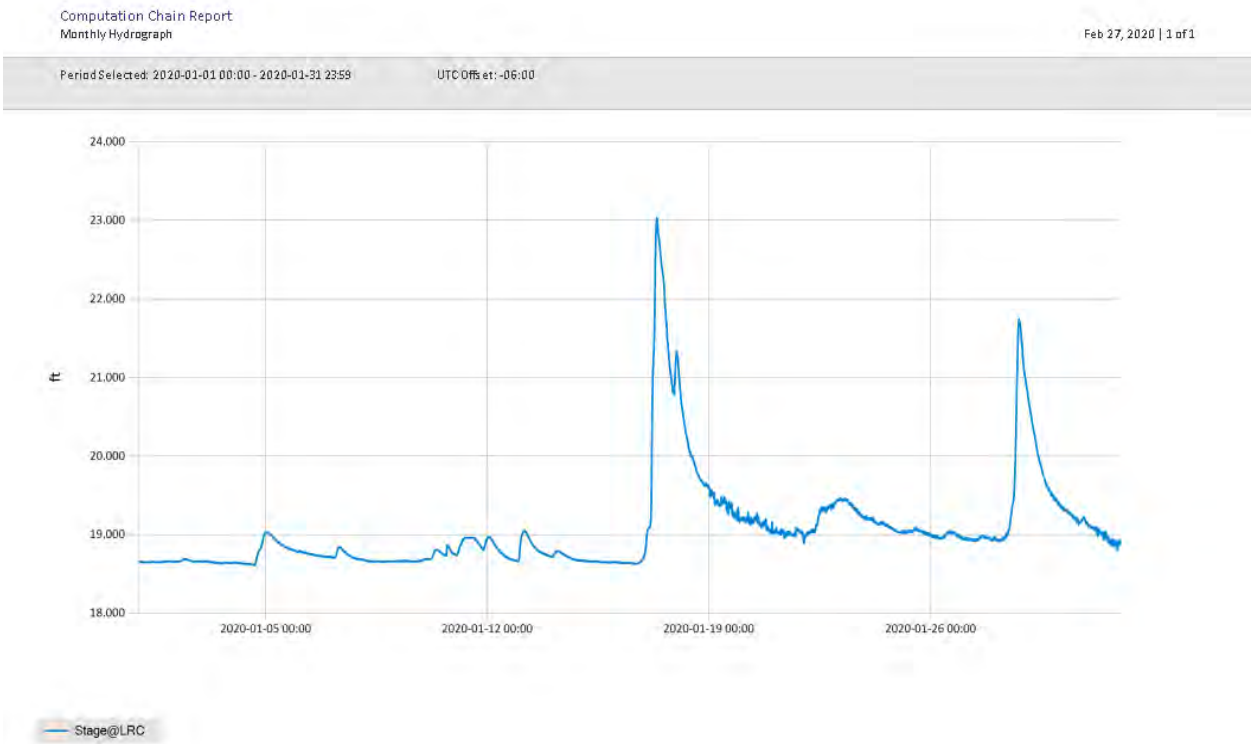

Figure 9 Monthly Hydrograph LRC-1

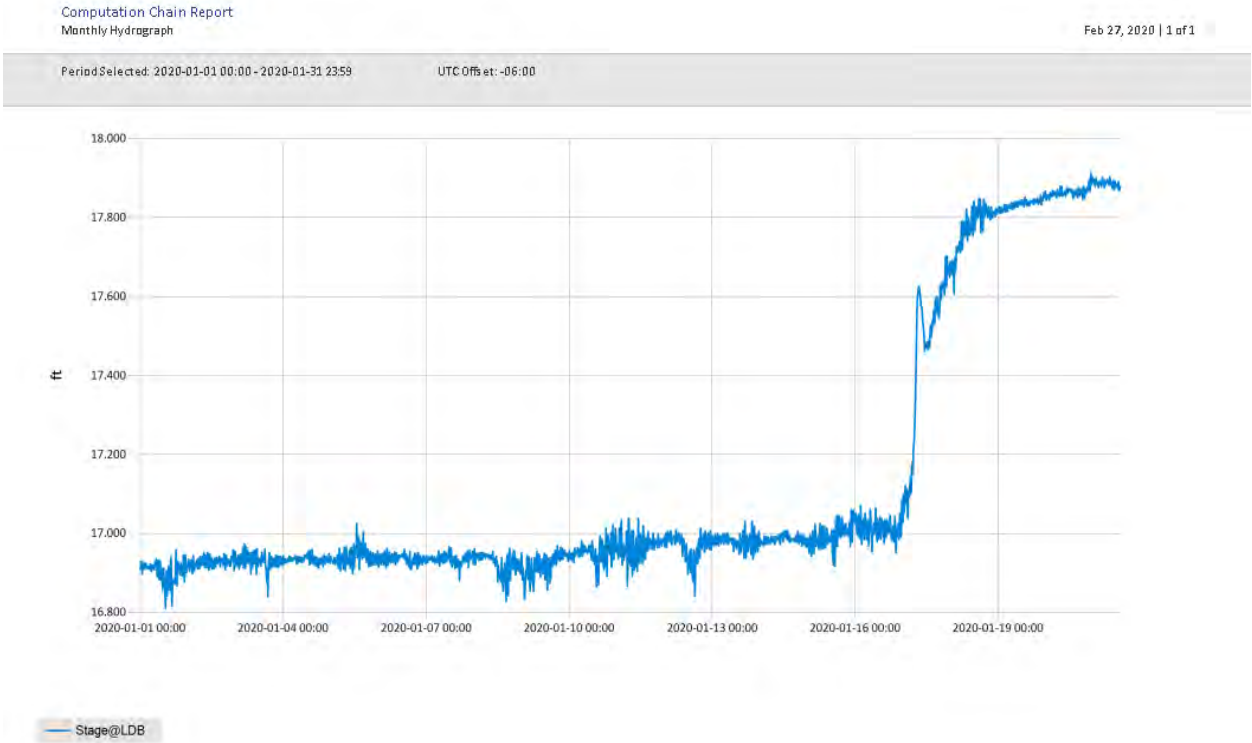

Figure 10 Monthly Hydrograph LDB-1

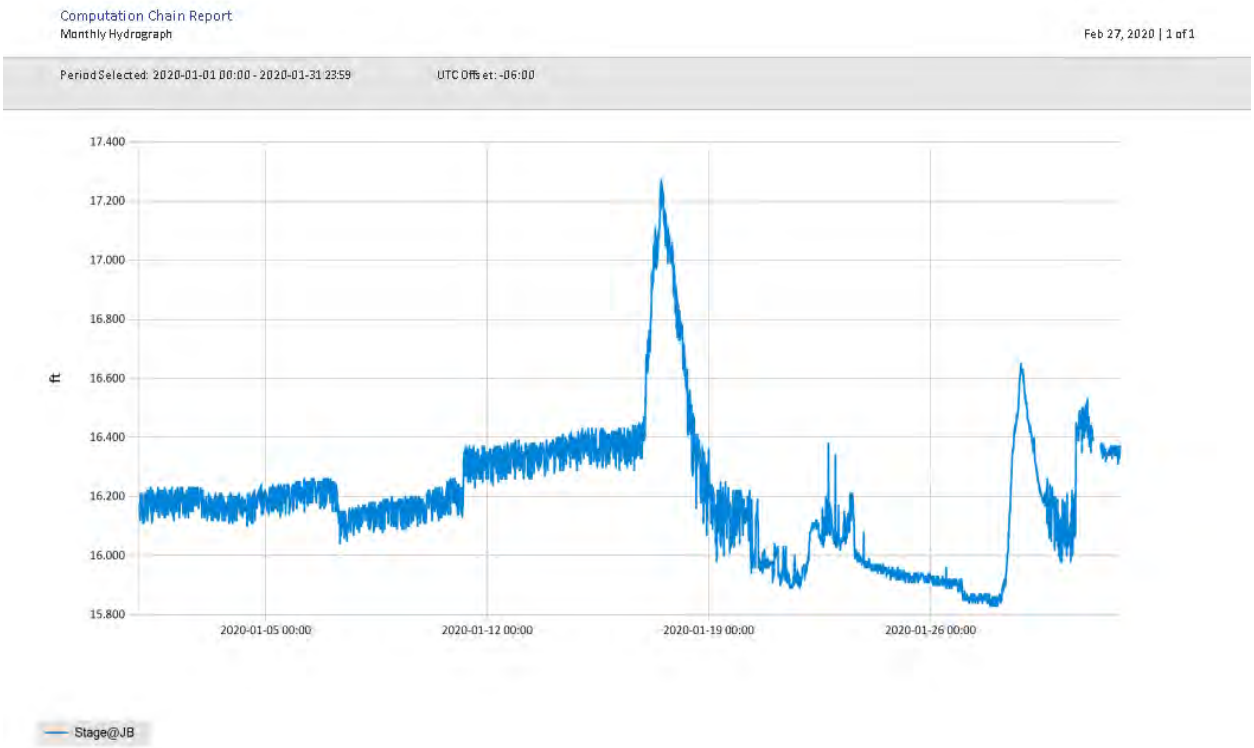

Figure 11 Monthly Hydrograph JB-1

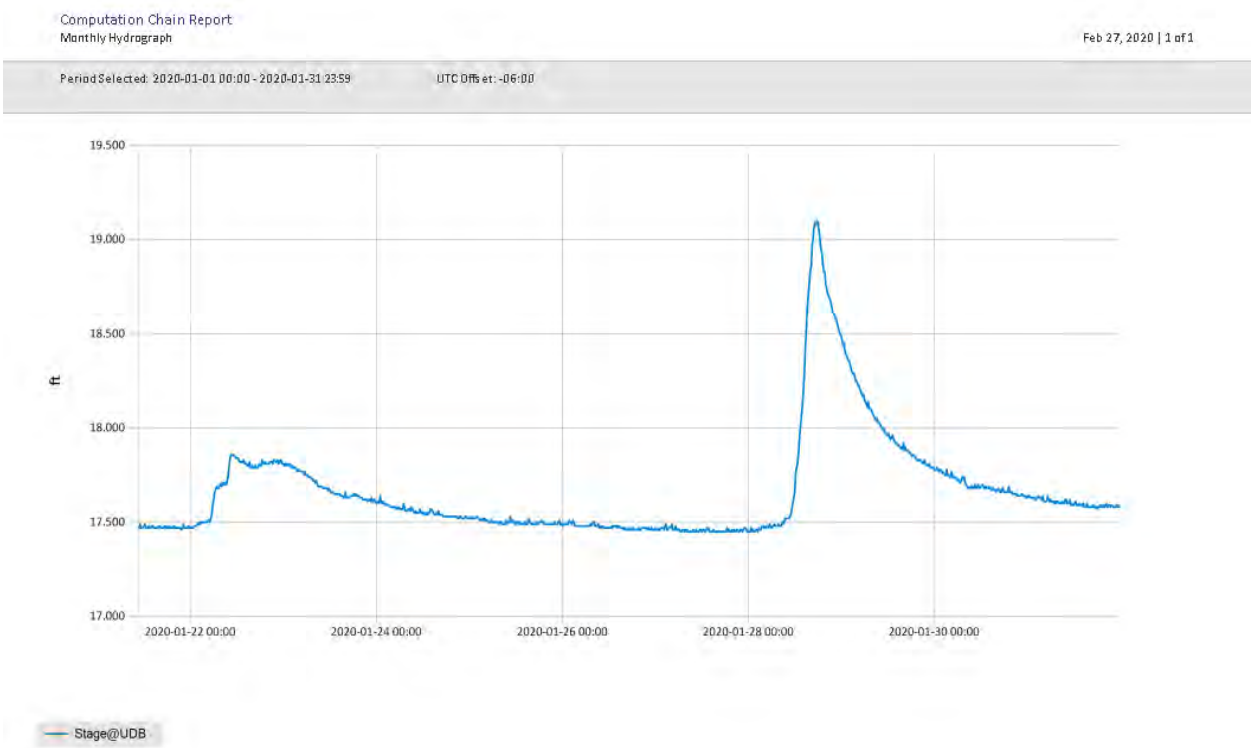

Figure 12 Monthly Hydrograph UDB-1

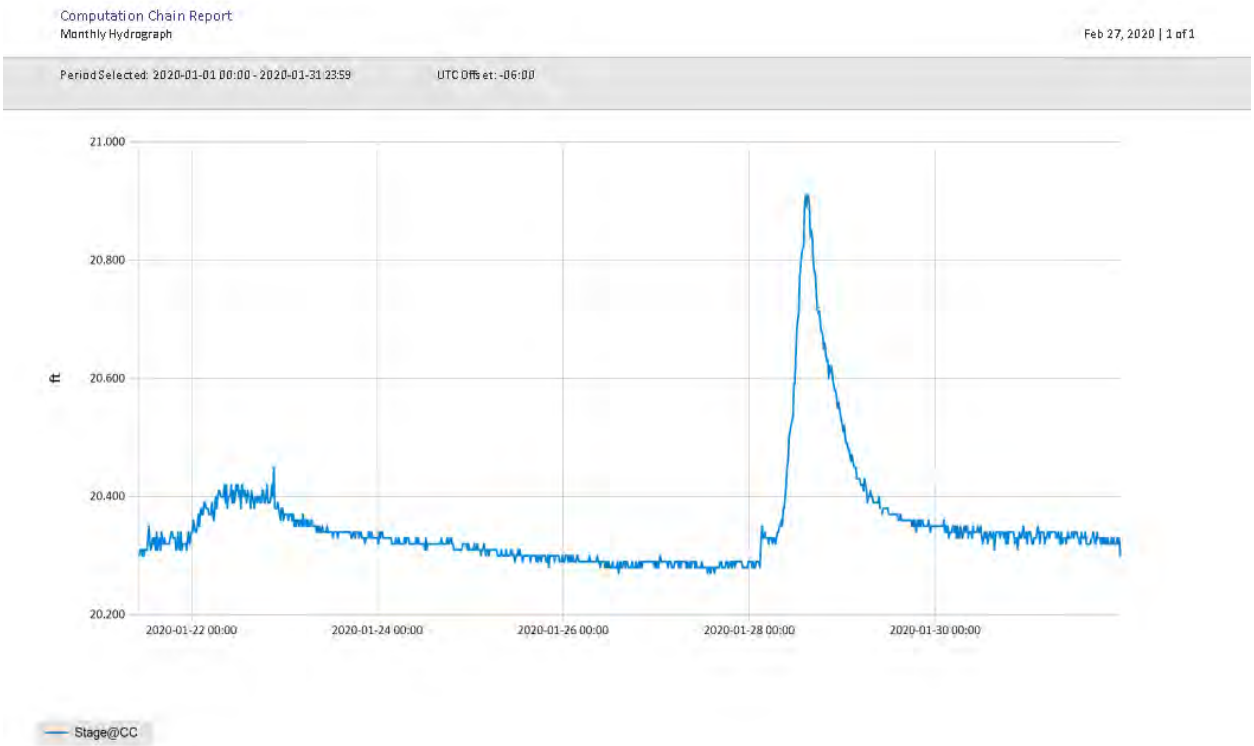

Figure 13 Monthly Hydrograph CC-1

MESONET CLIMATOLOGICAL DATA SUMMARY
(NRMN) Norman
Latitude: 35-14-09

January 2020
Nearest City: 2.1 NW Norman
Longitude: 97-27-53

Time Zone: Midnight-Midnight CST
County: Cleveland
Elevation: 1171 feet

DAY	TEMPERATURE (°F) MAX	MIN	AVG	DEWPT	DEG DAYS HDD	CDD	HUMIDITY (%) MAX	MIN	AVG	RAIN (in)	PRESSURE (in) STN	MSL	WIND SPEED (mph) DIR	AVG	MAX	SOLAR (MJ/m²)	4" SOIL TEMPERATURES SOD	BARE	MAX	MIN
1	56	35	45.3	30.9	20	0	79	41	58	0.00	28.52	29.76	S	11.8	33.3	8.24	43.0	40.5	44	37
2	58	44	49.8	42.4	14	0	93	50	77	0.00	28.34	29.57	SSE	6.7	21.3	7.57	46.0	45.5	50	43
3	55	36	44.0	34.4	20	0	86	41	71	0.00	28.73	29.98	NNW	10.5	25.0	9.93	46.2	44.9	48	42
4	53	27	40.7	24.8	25	0	89	28	57	0.00	29.01	30.26	SSE	5.2	19.2	12.34	44.0	42.2	47	38
5	61	32	46.1	29.1	18	0	87	31	54	0.00	28.95	30.20	NNE	9.6	33.1	12.48	44.4	42.8	48	39
6	59	27	41.2	25.4	22	0	83	31	56	0.00	28.93	30.18	NW	5.8	24.1	12.36	43.2	41.9	47	37
7	62	25	44.5	20.7	21	0	81	16	44	0.00	29.04	30.30	S	6.1	21.1	12.82	42.4	41.5	47	37
8	64	35	49.2	24.9	16	0	55	22	40	0.00	28.84	30.09	S	11.3	33.5	11.96	43.3	42.9	48	38
9	70	53	60.0	52.6	4	0	97	54	77	0.00	28.63	29.88	S	11.8	30.7	6.12	47.8	49.7	54	45
10	73	29	54.5	50.7	14	0	97	58	88	0.02	28.57	29.82	SSE	15.6	41.5	4.82	51.3	53.4	58	48
11	38	23	28.2	20.5	35	0	91	51	74	0.00	28.83	30.08	NNW	12.3	34.9	9.08	44.6	43.0	48	40
12	57	29	40.5	32.0	22	0	94	42	74	0.00	28.81	30.06	SSE	11.1	30.0	12.34	42.9	41.5	47	37
13	54	36	45.0	44.0	20	0	99	88	96	0.02	28.82	30.07	SSE	9.4	21.8	2.78	44.6	43.8	47	41
14	68	52	57.3	51.9	5	0	98	51	84	0.00	28.77	30.01	SSE	9.1	26.0	10.99	48.9	51.0	56	47
15	61	42	53.8	48.2	14	0	99	58	82	0.00	28.84	30.09	NNE	11.7	26.4	8.32	51.1	53.1	55	51
16	42	29	34.9	26.2	30	0	96	46	72	0.88	29.20	30.47	NNE	12.9	28.7	3.85	46.9	46.1	51	42
17	50	36	42.6	41.8	22	0	98	95	97	1.30	28.87	30.13	S	9.9	30.7	1.78	44.9	44.0	46	42
18	51	29	41.6	28.1	25	0	98	32	62	0.00	29.05	30.31	N	13.9	38.1	13.76	45.7	46.3	49	44
19	51	24	36.3	23.2	27	0	92	29	63	0.00	29.26	30.52	WNW	4.0	14.5	9.95	42.0	43.3	46	41
20	54	23	36.8	22.4	26	0	85	32	58	0.00	29.25	30.52	ENE	4.7	15.7	13.77	41.3	42.7	48	39
21	44	25	34.1	24.7	31	0	93	54	69	0.09	29.12	30.38	SE	8.4	22.2	6.09	40.8	39.9	42	38
22	38	34	37.2	36.3	29	0	99	93	97	0.37	28.73	29.97	SSE	11.6	29.0	1.38	41.1	40.1	41	39
23	56	35	43.4	34.9	20	0	100	34	76	0.00	28.74	29.98	NW	9.6	27.7	11.68	42.8	43.6	48	41
24	51	33	40.3	29.9	23	0	86	43	68	0.00	28.84	30.09	NW	10.5	28.8	14.23	42.5	44.1	48	41
25	64	30	46.0	34.6	18	0	91	40	67	0.00	28.76	30.01	ESE	7.2	18.3	12.34	42.9	44.4	50	39
26	62	36	46.6	36.9	16	0	95	39	72	0.00	28.75	30.00	NNW	4.8	16.4	14.01	45.0	46.9	53	42
27	67	30	48.0	38.8	17	0	98	37	75	0.00	28.71	29.95	SE	5.8	18.9	13.94	44.7	45.5	52	39
28	47	34	40.5	39.3	25	0	97	93	96	0.94	28.64	29.89	N	12.8	27.7	1.31	45.5	45.8	47	44
29	40	33	35.7	32.0	29	0	95	78	86	0.00	28.86	30.11	N	11.4	26.7	5.07	42.6	43.4	45	42
30	40	27	35.1	30.5	31	0	99	71	84	0.00	28.87	30.12	NNE	3.0	8.8	5.15	42.2	43.1	45	41
31	52*	30*	38.9*	30.6*	24*	0*	97*	44*	74*	0.01*	28.87*	30.12*	NW *	5.9*	21.6*	NA	42.1*	44.0*	49*	40*
	55*	33*	43.2*	33.6*	<- Monthly Averages ->						28.84*	30.09*	SSE*	9.2*	41.5*	9.02*	44.4*	44.5*	48*	41*

Temperature - Highest: 73*
Lowest: 23*

Degree Days - Total HDD: 661*
Total CDD: 0*

Rainfall: Monthly Total: 3.63* in.
Greatest 24 Hr: 1.30* in.

Humidity - Highest: 100*
Lowest: 16*

Number of Days With:
Tmax ≥ 90: 0*
Tmax ≤ 32: 0*
Tmin ≤ 32: 16*
Tmin ≤ 0: 0*
Rainfall ≥ 0.01 inch: 8*
Rainfall ≥ 0.10 inch: 4*
Avg Wind Speed ≥ 10 mph: 14*
Max Wind Speed ≥ 30 mph: 9*

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* Denotes incomplete record

Figure 14 January Mesonet Data

Lake Thunderbird TMDL Monitoring Plan Implementation: Sample Year (SY) 2019- February Report

OWRB

the water agency

SY2019 Monthly Report

Lake Thunderbird TMDL Monitoring Plan Implementation:

February 2020 Monitoring Report

Oklahoma Water Resources Board
Water Quality Programs Division
Monitoring and Assessment Section
3800 N. Classen, Oklahoma City, Oklahoma 73118
405-530-8800

Contact
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SUMMARY OF FEBRUARY WATER QUALITY SAMPLING

Sampling for February 2020 occurred on the eighteenth and was considered a base flow collection. Water samples were collected at all ten locations, and discharge measurements were collected at three locations. Mesonet data shows no precipitation occurring on the eighteenth, 0.01 inches of precipitation in the 72 hours prior to sampling, and no precipitation in the 72 hours after the sampling event. The total rainfall amount in Norman for the month of February was 0.99 inches. All water level gauges were operational for the month, except for LT-1 and LDB-1 due to equipment malfunction.

RESULTS

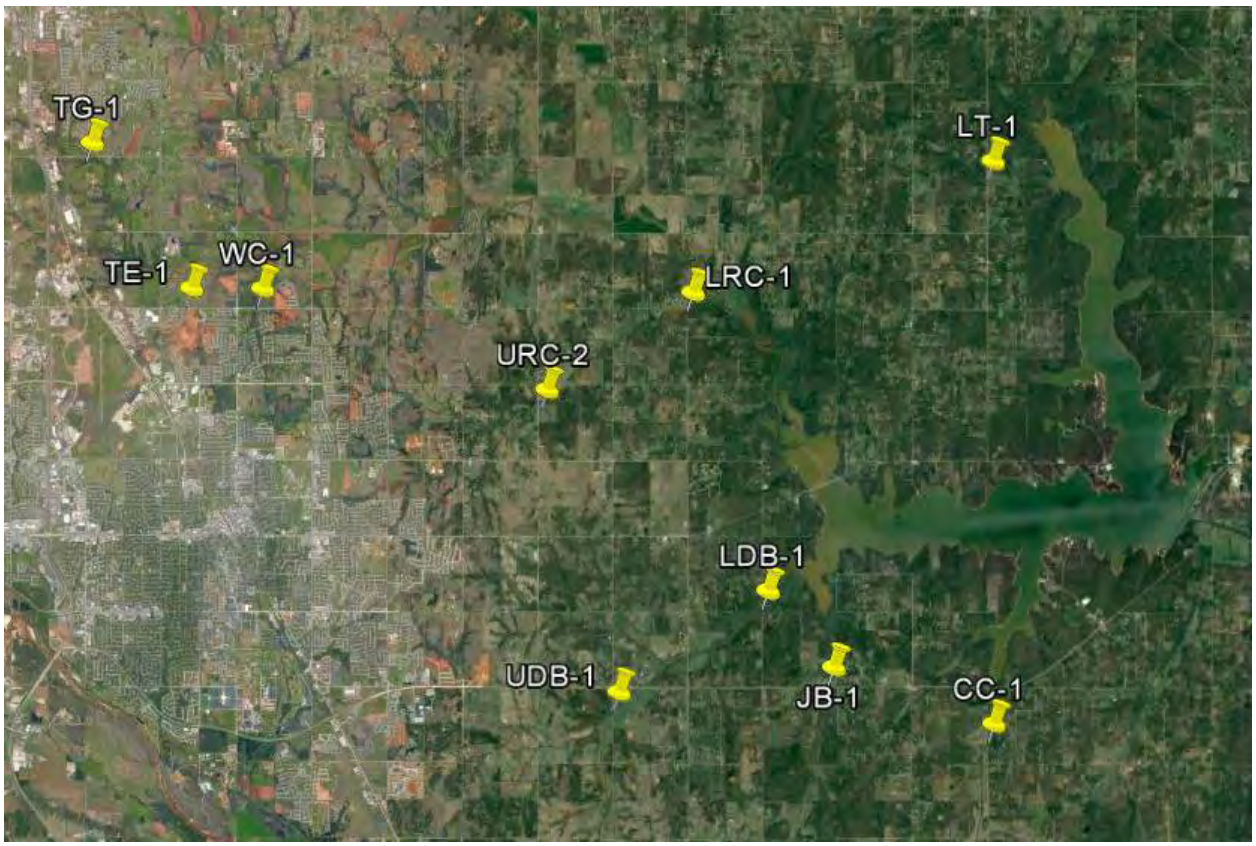

Figure 1 Monitoring Station Map

Monitoring Location ID	Monitoring Location Name	Date	Time	Field Crew	Water Temperature (°C)	Dissolved Oxygen (DO) (mg/l)	pH	Specific Conductance (mS/cm)	Turbidity (NTU)	Notes
CC-1	Clear Creek	02-18-2020	9:10	LO	8.5	11.30	7.62	711	6	
JB-1	Jim Blue Creek	02-18-2020	9:50	LO	7.9	10.59	7.48	818	3	Neither RP over water
LDB-1	Lower Dave Blue Creek	02-18-2020	10:20	LO	9.4	13.23	7.73	924	5	Not able to connect to DCP
LRC-1	Lower Rock Creek	02-18-2020	12:10	LO	9.5	11.54	7.77	775	8	
LT-1	Lake Laterals	02-18-2020	11:30	LO	9.4	9.97	7.51	432	4	
TE-1	Little River Tributary	02-18-2020	13:05	LO	11.1	13.21	7.98	956	30	Beaver dam upstream
TG-1	Little River Tributary	02-18-2020	13:30	LO	10.3	14.29	7.78	1156	3	
UDB-1	Upper Dave Blue Creek	02-18-2020	8:40	LO	8.9	9.67	7.60	935	3	
URC-2	Upper Rock Creek	02-18-2020	12:30	LO	9.5	9.54	7.57	737	11	
WC-1	Woodcrest Creek	02-18-2020	12:55	LO	10.7	10.29	7.53	1035	10	Beaver activity on upstream

Table 1 Field Data Form

Monitoring Location ID	Monitoring Location Name	Nitrate and Nitrite (mg/l)	Kjeldahl Nitrogen (mg/l)	Phosphorus (mg/l)	Total Suspended Solids (mg/l)
CC-1	Clear Creek	0.07	0.18	0.022	6.0
JB-1	Jim Blue Creek	<0.05	0.24	0.016	6.0
LDB-1	Lower Dave Blue Creek	0.13	0.36	0.026	12.0
LRC-1	Lower Rock Creek	0.07	0.40	0.034	10.0
LT-1	Lake Laterals	<0.05	0.32	0.016	<5.0
TE-1	Little River Tributary	0.10	0.40	0.035	20.0
TG-1	Little River Tributary	0.15	0.44	0.030	12.0
UDB-1	Upper Dave Blue Creek	<0.05	0.26	0.019	10.0
URC-2	Upper Rock Creek	<0.05	0.51	0.038	8.0
WC-1	Woodcrest Creek	0.09	0.51	0.053	14.0

Table 2 Laboratory Analysis Summary

Monitoring Location Name	Nitrate and Nitrite (mg/l)	Kjeldahl Nitrogen (mg/l)	Phosphorus (mg/l)	Total Suspended Solids (mg/l)
Field Blank	<0.05	<0.10	<0.010	<5.0
Duplicate	0.07	0.18	0.020	6.0
Duplicate RPD	0%	0%	9.52%	0%

Table 3 QA/QC Data

Quality assurance/quality control (QA/QC) of the data includes a field blank and duplicate sample from each collection event, and is qualified by the OWRB. Relative Percent Difference (RPD) of the duplicate sample can be categorized into four levels, where Level 1 likely has no QA issues and Level 4 has major QA issues, and should be used with caution.

Monitoring Location ID	Monitoring Location Name	Discharge (cfs)	Stream Stage (ft)
CC-1	Clear Creek	1.31	20.41
JB-1	Jim Blue Creek	1.04	16.63
LDB-1	Lower Dave Blue Creek	4.47	16.72
LRC-1	Lower Rock Creek	12.35	18.32
LT-1	Lake Laterals	0.32	4.44
TE-1	Little River Tributary	0.13	11.41
TG-1	Little River Tributary	1.00	9.16
UDB-1	Upper Dave Blue Creek	0.34	17.46
URC-2	Upper Rock Creek	0.50	11.33
WC-1	Woodcrest Creek	0.10	7.68

Table 4 Station Discharge Summary

Discharge Measurement Summary

Date Generated: Wed Feb 19 2020

File Information	
File Name	CC0218.WAD
Start Date and Time	2020/02/18 09:10:07

Site Details	
Site Name	CC
Operator(s)	SCD

System Information	
Sensor Type	FlowTracker
Serial #	P4713
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units	(English Units)
Distance	ft
Velocity	ft/s
Area	ft^2
Discharge	cfs

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.4%	2.0%
Velocity	1.0%	2.8%
Width	0.1%	0.1%
Method	2.2%	-
# Stations	3.0%	-
Overall	**4.0%**	**3.5%**

Summary

Averaging Int.	40	# Stations	17
Start Edge	LEW	Total Width	8.000
Mean SNR	29.6 dB	Total Area	1.925
Mean Temp	46.60 °F	Mean Depth	0.241
Disch. Equation	Mid-Section	Mean Velocity	0.6810
		Total Discharge	**1.3112**

Supplemental Data

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Tue Feb 18 09:28:46 CST 2020	8.000	20.410		

Measurement Results

St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	09:10	0.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	09:10	0.50	0.6	0.550	0.6	0.220	0.8428	1.00	0.8428	0.275	0.2317	17.7
2	09:11	1.00	0.6	0.400	0.6	0.160	0.7904	1.00	0.7904	0.200	0.1580	12.1
3	*09:13*	*1.50*	*0.6*	*0.300*	*0.6*	*0.120*	*0.7897*	*1.00*	*0.7897*	*0.150*	*0.1184*	*9.0*
4	*09:14*	*2.00*	*0.6*	*0.300*	*0.6*	*0.120*	*0.7359*	*1.00*	*0.7359*	*0.150*	*0.1103*	*8.4*
5	*09:14*	*2.50*	*0.6*	*0.300*	*0.6*	*0.120*	*0.6594*	*1.00*	*0.6594*	*0.150*	*0.0989*	*7.5*
6	09:15	3.00	0.6	0.200	0.6	0.080	0.7139	1.00	0.7139	0.100	0.0714	5.4
7	09:16	3.50	0.6	0.200	0.6	0.080	0.7641	1.00	0.7641	0.100	0.0765	5.8
8	*09:17*	*4.00*	*0.6*	*0.200*	*0.6*	*0.080*	*0.6207*	*1.00*	*0.6207*	*0.100*	*0.0621*	*4.7*
9	09:18	4.50	0.6	0.200	0.6	0.080	0.6227	1.00	0.6227	0.100	0.0623	4.8
10	09:19	5.00	0.6	0.200	0.6	0.080	0.6542	1.00	0.6542	0.100	0.0655	5.0
11	09:20	5.50	0.6	0.200	0.6	0.080	0.7011	1.00	0.7011	0.100	0.0702	5.4
12	09:21	6.00	0.6	0.200	0.6	0.080	0.5151	1.00	0.5151	0.100	0.0515	3.9
13	*09:22*	*6.50*	*0.6*	*0.200*	*0.6*	*0.080*	*0.4318*	*1.00*	*0.4318*	*0.100*	*0.0432*	*3.3*
14	09:23	7.00	0.6	0.200	0.6	0.080	0.5797	1.00	0.5797	0.100	0.0580	4.4
15	09:24	7.50	0.6	0.200	0.6	0.080	0.3314	1.00	0.3314	0.100	0.0332	2.5
16	09:24	8.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Figure 2 Discharge Measurement Summary CC-1

Discharge Measurement Summary

Date Generated: Wed Feb 19 2020

File Information	
File Name	JB0218.WAD
Start Date and Time	2020/02/18 09:48:57

Site Details	
Site Name	JB
Operator(s)	SCD

System Information	
Sensor Type	FlowTracker
Serial #	P4713
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units	(English Units)
Distance	ft
Velocity	ft/s
Area	ft^2
Discharge	cfs

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.6%	1.7%
Velocity	1.1%	4.3%
Width	0.2%	0.2%
Method	2.8%	-
# Stations	4.6%	-
Overall	**5.6%**	**4.7%**

Summary

Averaging Int.	40	# Stations	11
Start Edge	LEW	Total Width	5.000
Mean SNR	37.8 dB	Total Area	1.675
Mean Temp	45.89 °F	Mean Depth	0.335
Disch. Equation	Mid-Section	Mean Velocity	0.6186
		Total Discharge	**1.0360**

Supplemental Data

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Tue Feb 18 09:59:31 CST 2020	5.000	16.630		

Measurement Results

St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	09:48	0.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	09:48	0.50	0.6	0.550	0.6	0.220	0.0666	1.00	0.0666	0.275	0.0183	1.8
2	09:50	1.00	0.6	0.500	0.6	0.200	0.6693	1.00	0.6693	0.250	0.1673	16.2
3	09:51	1.50	0.6	0.450	0.6	0.180	0.8898	1.00	0.8898	0.225	0.2003	19.3
4	09:52	2.00	0.6	0.400	0.6	0.160	0.8550	1.00	0.8550	0.200	0.1710	16.5
5	09:53	2.50	0.6	0.350	0.6	0.140	0.7726	1.00	0.7726	0.175	0.1352	13.1
6	09:54	3.00	0.6	0.300	0.6	0.120	0.7444	1.00	0.7444	0.150	0.1116	10.8
7	09:55	3.50	0.6	0.300	0.6	0.120	0.7083	1.00	0.7083	0.150	0.1062	10.3
8	09:56	4.00	0.6	0.300	0.6	0.120	0.6053	1.00	0.6053	0.150	0.0908	8.8
9	09:57	4.50	0.6	0.200	0.6	0.080	0.3530	1.00	0.3530	0.100	0.0353	3.4
10	09:57	5.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Figure 3 Discharge Measurement Summary JB-1

Discharge Measurement Summary

Date Generated: Wed Feb 19 2020

File Information	
File Name	LT0218.WAD
Start Date and Time	2020/02/18 11:32:31

Site Details	
Site Name	LT
Operator(s)	SCD

System Information	
Sensor Type	FlowTracker
Serial #	P4713
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units	(English Units)
Distance	ft
Velocity	ft/s
Area	ft^2
Discharge	cfs

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.6%	1.9%
Velocity	1.9%	10.8%
Width	0.2%	0.2%
Method	3.2%	-
# Stations	3.3%	-
Overall	**5.1%**	**11.0%**

Summary

Averaging Int.	40	# Stations	15
Start Edge	LEW	Total Width	12.000
Mean SNR	35.2 dB	Total Area	4.975
Mean Temp	49.44 °F	Mean Depth	0.415
Disch. Equation	Mid-Section	Mean Velocity	0.0652
		Total Discharge	**0.3245**

Supplemental Data

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Tue Feb 18 11:43:38 CST 2020	9.000	4.440		

Measurement Results

St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	11:32	0.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	*11:32*	*2.00*	*0.6*	*0.200*	*0.6*	*0.080*	*-0.0007*	*1.00*	*-0.0007*	*0.300*	*-0.0002*	*-0.1*
2	*11:33*	*3.00*	*0.6*	*0.400*	*0.6*	*0.160*	*0.0003*	*1.00*	*0.0003*	*0.400*	*0.0001*	*0.0*
3	*11:34*	*4.00*	*0.6*	*0.550*	*0.6*	*0.220*	*-0.0046*	*1.00*	*-0.0046*	*0.550*	*-0.0025*	*-0.8*
4	*11:36*	*5.00*	*0.6*	*0.550*	*0.6*	*0.220*	*0.0039*	*1.00*	*0.0039*	*0.412*	*0.0016*	*0.5*
5	*11:37*	*5.50*	*0.6*	*0.600*	*0.6*	*0.240*	*0.0768*	*1.00*	*0.0768*	*0.300*	*0.0230*	*7.1*
6	*11:38*	*6.00*	*0.6*	*0.600*	*0.6*	*0.240*	*0.1886*	*1.00*	*0.1886*	*0.300*	*0.0566*	*17.4*
7	*11:39*	*6.50*	*0.6*	*0.600*	*0.6*	*0.240*	*0.2740*	*1.00*	*0.2740*	*0.300*	*0.0822*	*25.3*
8	*11:40*	*7.00*	*0.6*	*0.600*	*0.6*	*0.240*	*0.2526*	*1.00*	*0.2526*	*0.300*	*0.0758*	*23.4*
9	*11:41*	*7.50*	*0.6*	*0.600*	*0.6*	*0.240*	*0.1631*	*1.00*	*0.1631*	*0.300*	*0.0489*	*15.1*
10	*11:42*	*8.00*	*0.6*	*0.550*	*0.6*	*0.220*	*0.0594*	*1.00*	*0.0594*	*0.412*	*0.0245*	*7.5*
11	*11:43*	*9.00*	*0.6*	*0.500*	*0.6*	*0.200*	*0.0246*	*1.00*	*0.0246*	*0.500*	*0.0123*	*3.8*
12	*11:44*	*10.00*	*0.6*	*0.500*	*0.6*	*0.200*	*0.0046*	*1.00*	*0.0046*	*0.500*	*0.0023*	*0.7*
13	*11:45*	*11.00*	*0.6*	*0.400*	*0.6*	*0.160*	*-0.0003*	*1.00*	*-0.0003*	*0.400*	*-0.0001*	*0.0*
14	11:45	12.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Figure 4 Discharge Measurement Summary LT-1

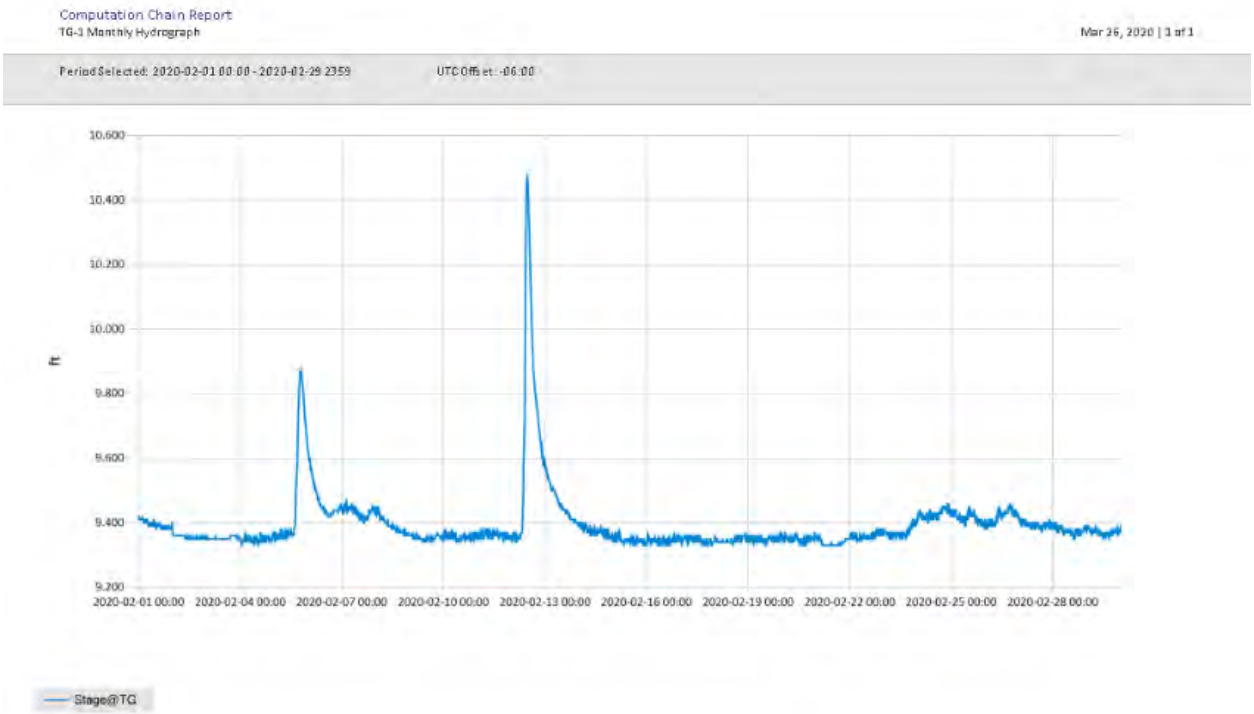

Figure 5 Monthly Hydrograph TG-1

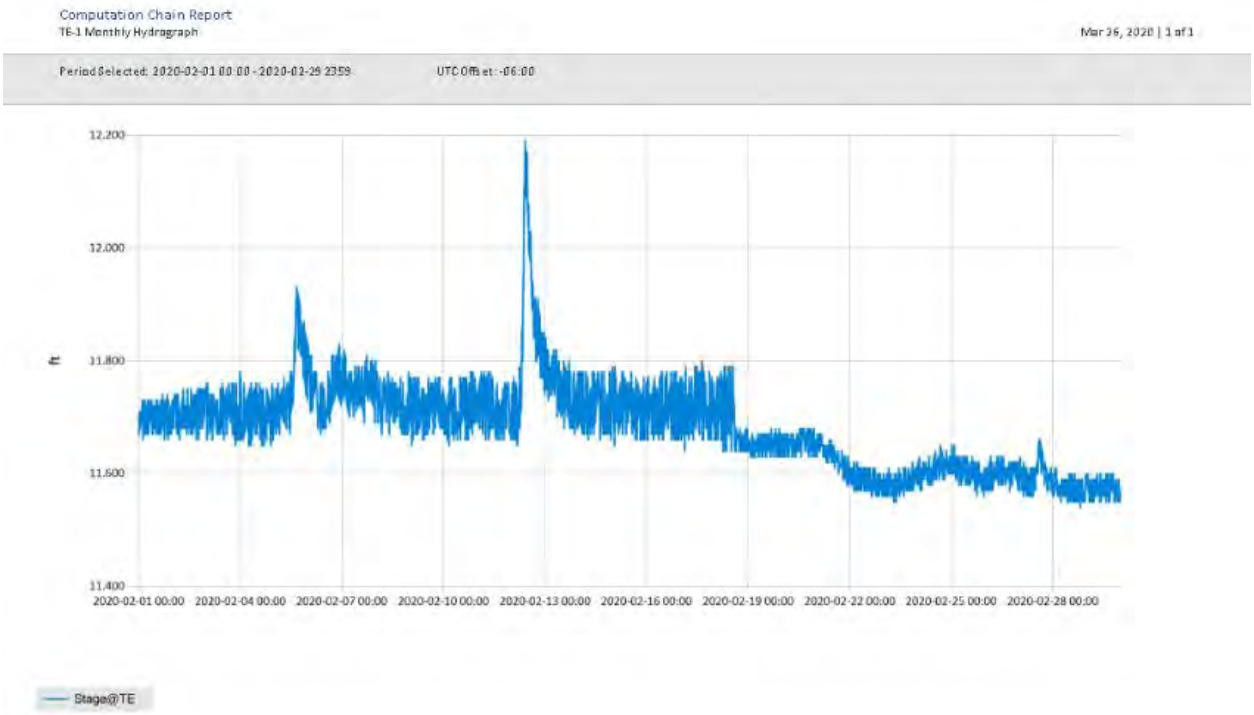

Figure 6 Monthly Hydrograph TE-1

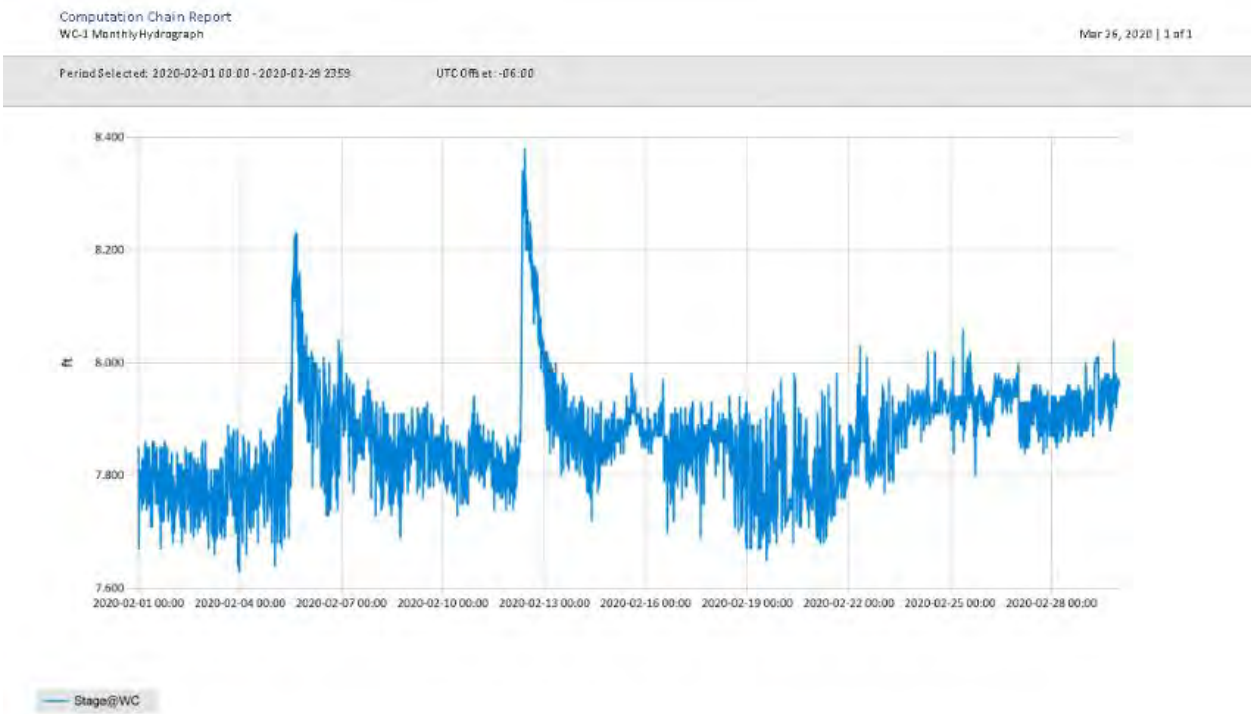

Figure 7 Monthly Hydrograph WC-1

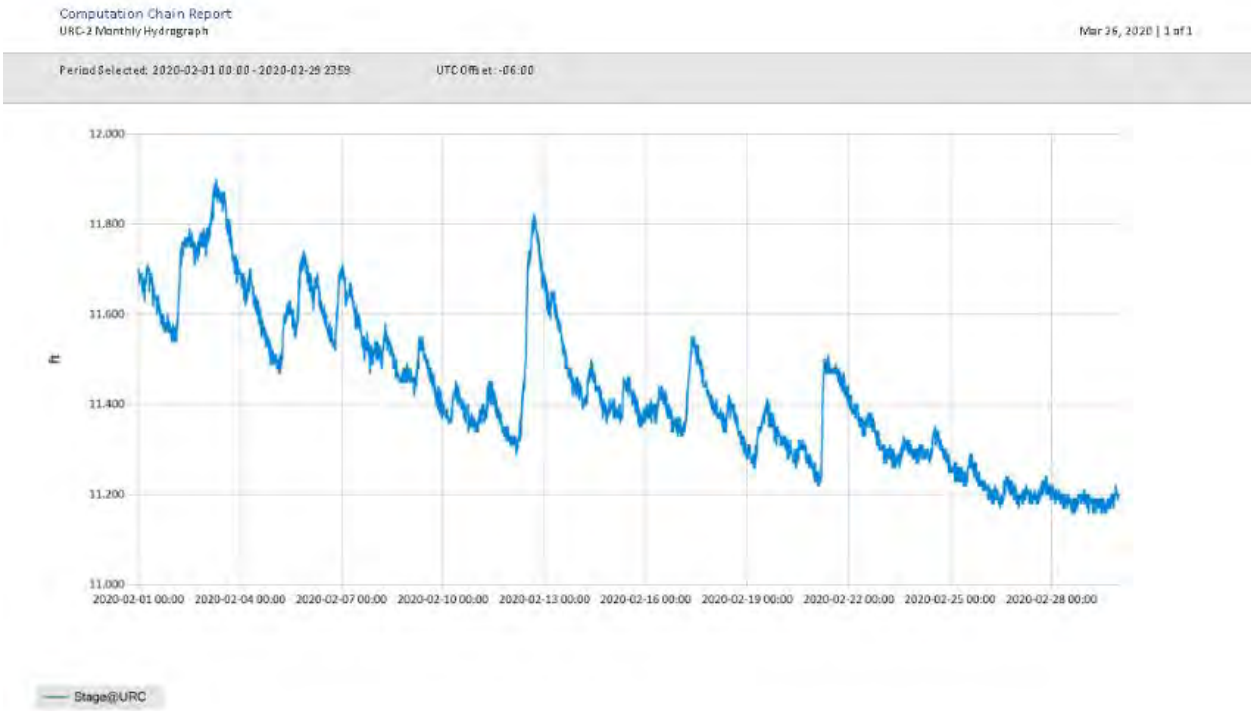

Figure 8 Monthly Hydrograph URC-2

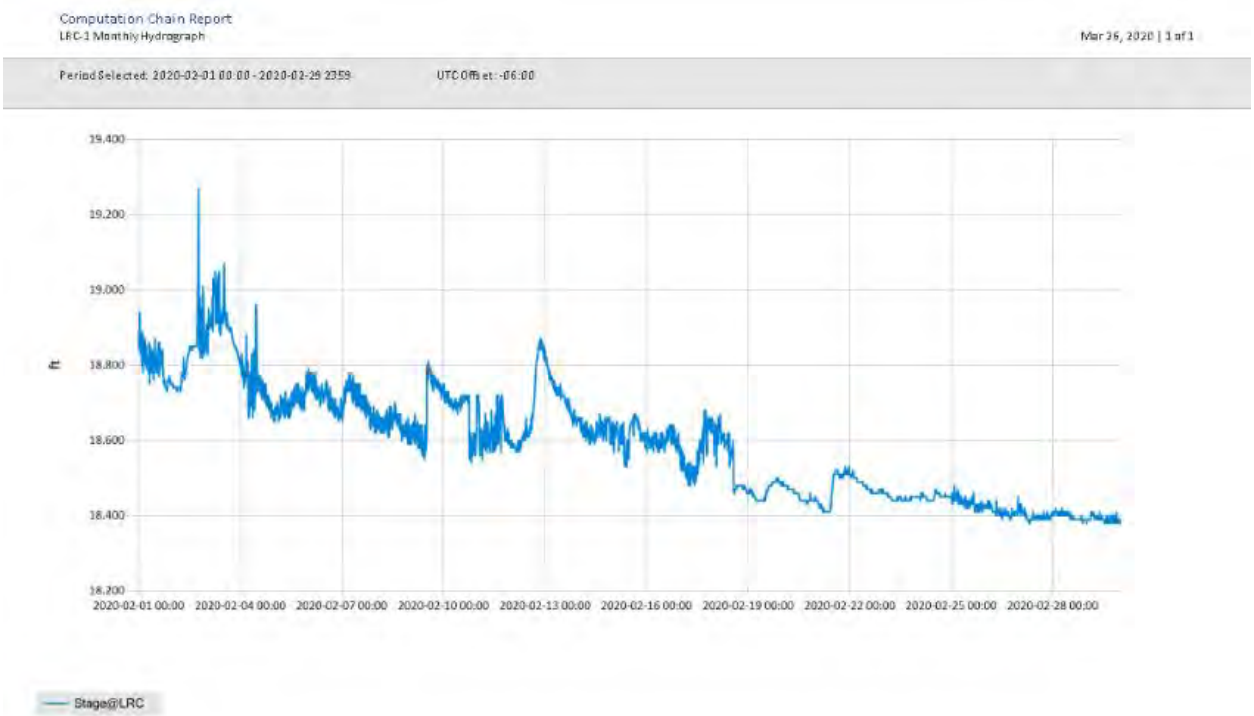

Figure 9 Monthly Hydrograph LRC-1

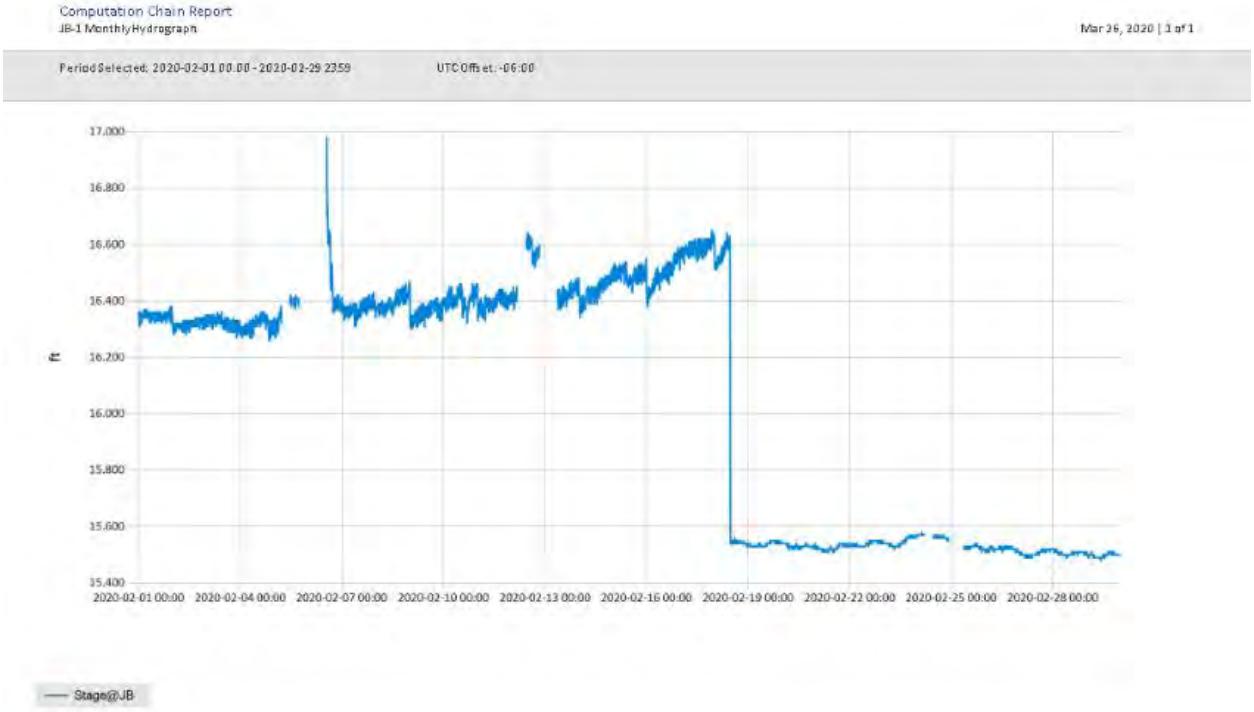

Figure 10 Monthly Hydrograph JB-1

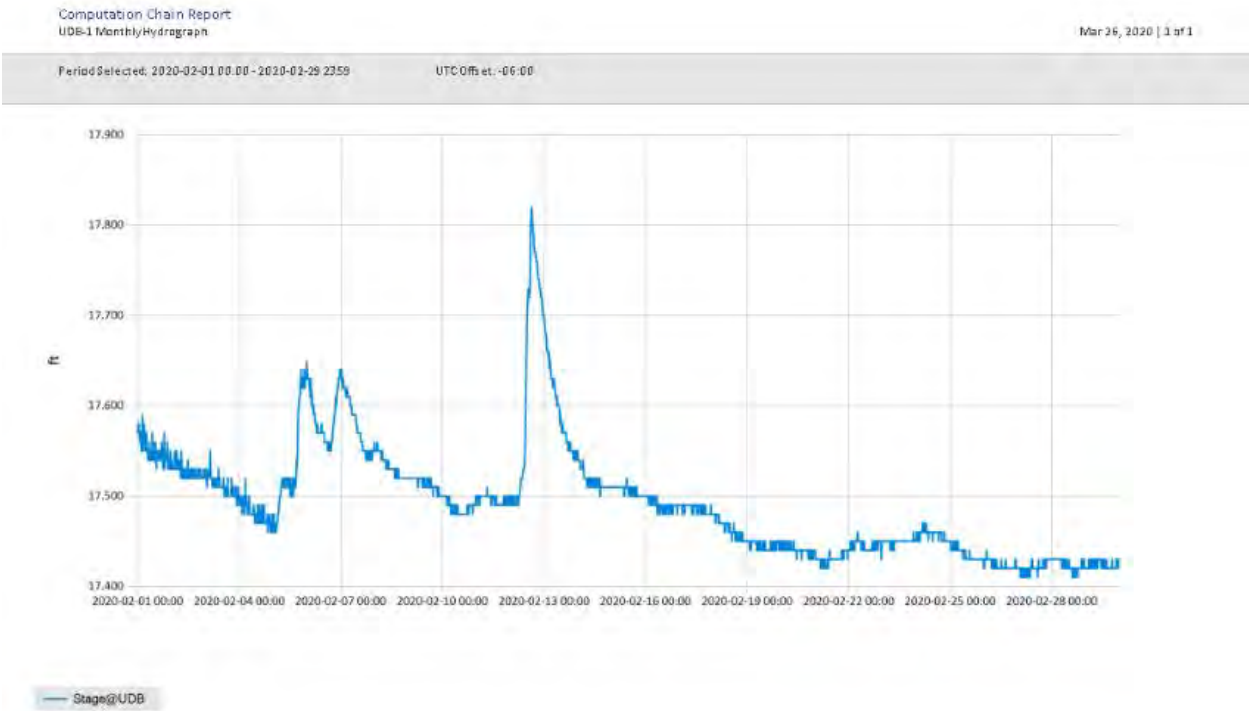

Figure 11 Monthly Hydrograph UDB-1

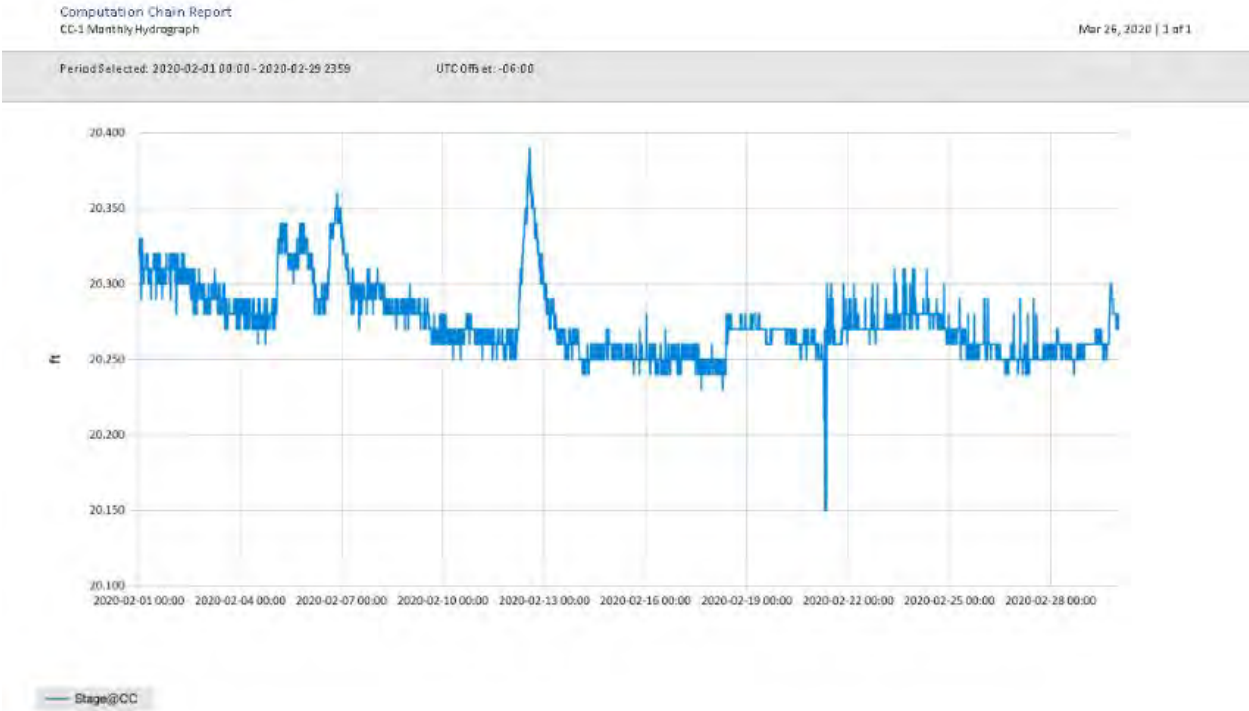

Figure 12 Monthly Hydrograph CC-1

MESONET CLIMATOLOGICAL DATA SUMMARY
(NRMN) Norman
Latitude: 35-14-09

February 2020
Nearest City: 2.1 NW Norman
Longitude: 97-27-53

Time Zone: Midnight-Midnight CST
County: Cleveland
Elevation: 1171 feet

DAY	TEMPERATURE (°F) MAX	MIN	AVG	DEWPT	DEG DAYS HDD	CDD	HUMIDITY (%) MAX	MIN	AVG	RAIN (in)	PRESSURE (in) STN	MSL	WIND SPEED (mph) DIR	AVG	MAX	SOLAR (MJ/m²)	4" SOIL TEMPERATURES SOD	BARE	MAX	MIN
1	65	25	45.9	27.1	20	0	94	21	54	0.00	28.87	30.12	SSW	5.2	17.9	15.22	41.5	44.3	50	39
2	77	41	59.6	30.9	6	0	59	20	35	0.00	28.65	29.89	SSW	7.9	20.5	14.75	44.7	47.3	54	41
3	69	39	55.0	34.1	11	0	79	28	48	0.00	28.46	29.69	S	12.4	27.9	9.76	47.4	48.3	52	46
4	39	30	34.0	30.5	31	0	96	78	87	0.01	28.68	29.93	N	14.4	27.6	2.12	44.7	42.2	46	39
5	31	25	28.7	24.9	37	0	98	73	86	0.00	28.68	29.93	N	12.1	22.6	5.63	41.2	37.0	39	36
6	41	16	28.1	19.1	37	0	94	39	71	0.25	28.50	29.74	WNW	5.8	13.1	16.30	39.8	37.5	42	35
7	51	25	38.3	28.8	27	0	91	43	70	0.14	28.63	29.88	NW	6.6	21.8	13.88	39.9	40.6	47	36
8	60	28	46.3	30.5	21	0	91	32	57	0.00	28.83	30.08	SSE	6.9	22.0	15.73	41.6	43.4	50	38
9	72	38	55.3	44.6	10	0	87	48	68	0.00	28.70	29.94	N	13.6	30.3	5.80	46.2	48.3	53	45
10	40	32	35.8	28.6	29	0	88	60	75	0.06	28.85	30.10	N	11.4	23.2	4.43	44.0	41.9	46	40
11	44	35	39.4	29.5	26	0	90	50	69	0.00	28.94	30.19	NNE	10.1	23.5	4.47	42.9	40.9	43	40
12	42	36	38.8	35.3	26	0	97	67	87	0.33	28.66	29.91	NNW	7.2	25.3	3.19	43.0	41.7	44	40
13	37	20	29.2	14.1	36	0	86	33	55	0.00	29.07	30.32	N	13.1	27.7	17.06	41.2	41.7	46	39
14	47	20	32.6	17.9	32	0	73	35	56	0.00	29.10	30.36	SSE	8.5	23.4	15.94	39.9	40.4	46	37
15	60	36	46.9	35.6	17	0	83	46	66	0.00	28.83	30.08	S	10.8	33.0	14.29	42.3	42.4	48	38
16	62	34	46.8	43.3	17	0	100	60	89	0.00	28.70	29.94	E	4.0	11.4	8.84	44.2	44.9	51	40
17	65	46	54.3	49.2	9	0	98	57	84	0.01	28.55	29.79	N	8.7	23.0	12.60	47.1	49.5	54	45
18	53	34	44.7	29.1	22	0	73	37	55	0.00	28.95	30.20	NNE	13.9	28.7	16.96	46.7	46.6	51	43
19	57	32	44.3	22.8	21	0	78	22	47	0.00	29.07	30.33	ENE	8.1	18.6	16.71	45.1	44.0	51	38
20	44	24	36.7	25.4	31	0	82	45	64	0.00	29.31	30.58	NNE	13.8	28.6	7.86	44.6	42.4	45	39
21	49	16	33.0	15.9	33	0	90	25	54	0.00	29.32	30.58	S	4.6	14.5	18.54	41.7	39.7	46	35
22	62	35	47.4	29.9	17	0	64	35	51	0.00	28.96	30.22	S	10.8	26.5	14.16	43.5	42.6	48	37
23	55	46	50.1	44.6	15	0	97	62	82	0.07	28.66	29.91	SSE	9.5	22.8	3.06	45.9	46.3	48	45
24	55	41	47.9	43.6	17	0	98	70	85	0.05	28.47	29.71	NW	14.1	33.8	3.91	47.2	47.5	49	46
25	53	35	43.0	33.5	21	0	93	42	71	0.03	28.76	30.01	NW	14.1	30.0	14.92	46.3	46.0	50	43
26	42	25	34.0	22.8	32	0	93	38	66	0.04	29.12	30.38	NNW	14.4	34.4	14.93	43.6	42.2	46	39
27	63	21	42.6	20.8	23	0	87	18	48	0.00	28.99	30.24	SSW	8.8	24.3	20.00	42.1	41.9	50	36
28	66	30	48.2	29.0	17	0	94	22	54	0.00	29.03	30.29	WNW	7.4	23.7	19.98	44.4	46.6	55	39
29	75	33	55.1	29.0	11	0	84	14	44	0.00	28.82	30.07	SSE	8.4	28.9	15.67	45.4	48.9	56	41
	54	31	42.8	30.0	<- Monthly Averages ->						28.83	30.08	N	9.9	34.4	11.96	43.7	43.7	49	40

Temperature - Highest: 77
Lowest: 16

Degree Days - Total HDD: 650
Total CDD: 0

Rainfall: Monthly Total: 0.99 in.
Greatest 24 Hr: 0.33 in.

Humidity - Highest: 100
Lowest: 14

Number of Days With:
Tmax ≥ 90: 0
Tmax ≤ 32: 1
Tmin ≤ 32: 15
Tmin ≤ 0: 0
Rainfall ≥ 0.01 inch: 10
Rainfall ≥ 0.10 inch: 3
Avg Wind Speed ≥ 10 mph: 14
Max Wind Speed ≥ 30 mph: 5

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* Denotes incomplete record

Figure 13 February Mesonet Data

Lake Thunderbird TMDL Monitoring Plan Implementation: Sample Year (SY) 2020- March Report

OWRB

the water agency

SY2020 Monthly Report

Lake Thunderbird TMDL Monitoring Plan Implementation:

March 2020 Monitoring Report

Oklahoma Water Resources Board
Water Quality Programs Division
Monitoring and Assessment Section
3800 N. Classen, Oklahoma City, Oklahoma 73118
405-530-8800

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SUMMARY OF MARCH WATER QUALITY SAMPLING

Sampling for March 2020 occurred over two days and was considered a high flow collection. Water samples were collected from all seven stormwater outfalls, in addition to URC-2 via autosampler, on the fourteenth. Four monitoring stations, TE-1, LRC-1, LDB-1, and JB-1 were collected via autosampler on the seventeenth. Mesonet data shows 0.40 inches of precipitation in the 72 hours prior to sampling, and 0.46 inches of precipitation occurring on the fourteenth. There was 0.13 inches of precipitation in between the two sampling events, 1.31 inches of precipitation on the seventeenth, and 0.65 inches of precipitation in the 72 hours after the sampling event. The total rainfall amount in Norman for the month of March was 4.58 inches. All water level gauges were operational for the month, except for LT-1 and UDB-1 due to equipment malfunction. TG-1, WC-1, and CC-1 were not sampled as a result of autosampler equipment issues. Additionally, due to Covid-19, changes have occurred to sampling and lab procedures.

RESULTS

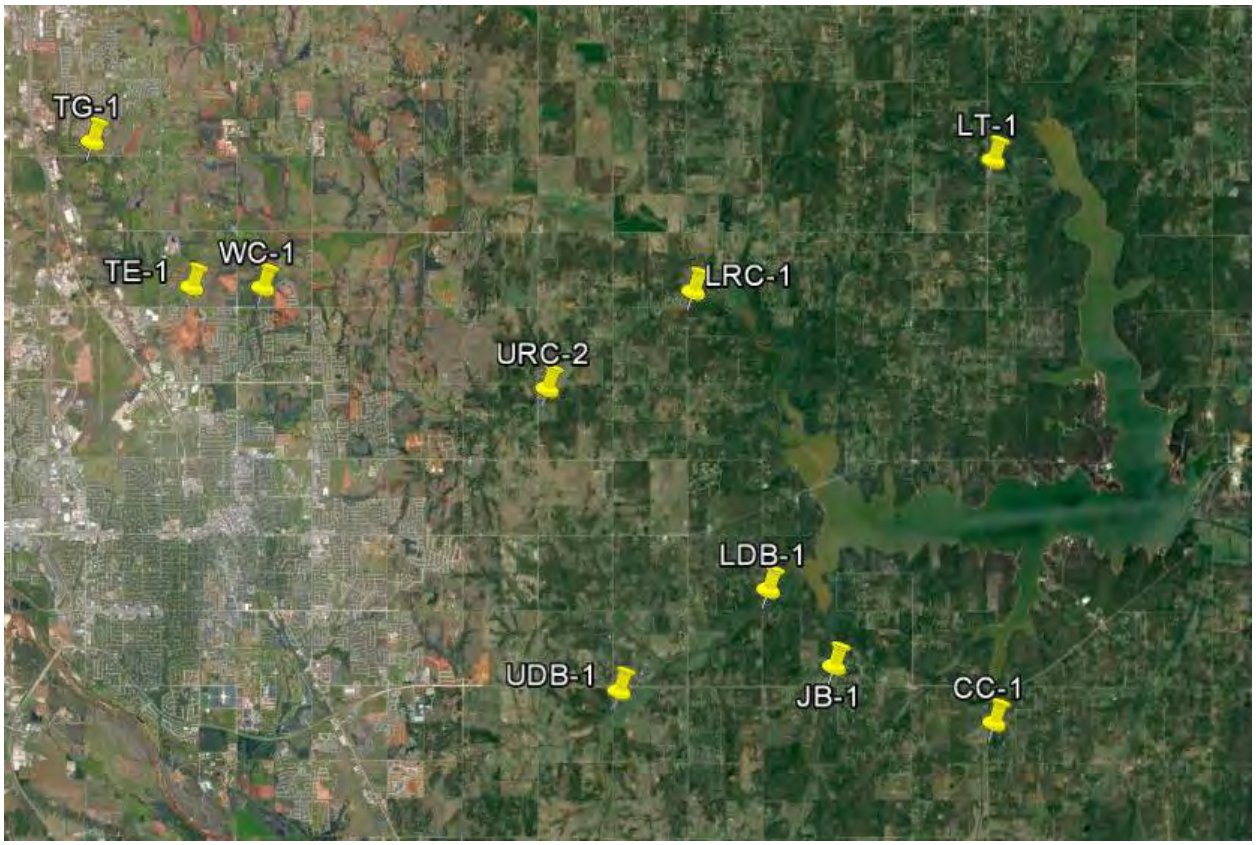

Figure 1 Monitoring Station Map

Monitoring Location ID	Monitoring Location Name	Date	Time	Field Crew	Water Temperature (°C)	Dissolved Oxygen (DO) (mg/l)	pH	Specific Conductance (mS/cm)	Turbidity (NTU)	Notes
JB-1	Jim Blue Creek	03-17-2020	20:00	SD	*	*	7.68	163	1000	Collected at 16.61, peak at 23:00 @ 16.91
LDB-1	Lower Dave Blue Creek	03-17-2020	22:15	SD	*	*	7.82	406	1000	Collected at 18.46, peak at 23:15 (local time) @ 18.88
LRC-1	Lower Rock Creek	03-17-2020	23:15	SD	*	*	7.61	211	1000	Collected at peak (24.20)
TE-1	Little River Tributary	03-17-2020	20:15	SD	*	*	7.73	251	702	Collected at 14.31, peak at 21:15 @14.76
URC-2	Upper Rock Creek	03-14-2020	12:25	SD	10.3	10.29	7.97	424	241	Sampled from curent conditions. Collected at peak (13.10)
SW-01	Stormwater Outfall 01	03-14-2020	10:15	SD	*	*	7.72	845	138	Current channel higher than w hen bottles filled
SW-02	Stormwater Outfall 02	03-14-2020	10:55	SD	12.7	9.76	7.66	234	24	Sampled from current conditions
SW-03	Stormwater Outfall 03	03-14-2020	11:10	SD	*	*	7.92	563	67	Sonde reading from half sample w ater, half current conditions
SW-04	Stormwater Outfall 04	03-14-2020	10:35	SD	8.8	11.07	7.63	256	434	Sampled from current conditions
SW-05	Stormwater Outfall 05	03-14-2020	11:25	SD	9.9	9.40	7.56	489	80	Sampled from current conditions
SW-06	Stormwater Outfall 06	03-14-2020	11:35	SD	12.1	8.63	8.01	631	11	Collected from pool upstream
SW-07	Stormwater Outfall 07	03-14-2020	12:00	SD	*	*	8.05	216	97	

Table 1 Field Data Form Where an Asterisk Denotes a Sample from an Autosampler

Monitoring Location ID	Monitoring Location Name	Nitrate and Nitrite (mg/l)	Kjeldahl Nitrogen (mg/l)	Phosphorus (mg/l)	Total Suspended Solids (mg/l)
JB-1	Jim Blue Creek	0.19	8.02	1.755	1200
LDB-1	Lower Dave Blue Creek	0.13	4.31	1.070	1220
LRC-1	Lower Rock Creek	0.17	6.92	2.180	3680
TE-1	Little River Tributary	0.45	1.34	0.407	504
URC-2	Upper Rock Creek	0.34	1.31	0.186	240
SW-01	Stormwater Outfall 01	0.20	1.13	0.203	715
SW-02	Stormwater Outfall 02	0.47	1.78	0.146	36.0
SW-03	Stormwater Outfall 03	0.23	1.39	0.259	214
SW-04	Stormwater Outfall 04	0.73	1.33	0.223	104
SW-05	Stormwater Outfall 05	1.16	1.15	0.191	56.0
SW-06	Stormwater Outfall 06	<0.05	0.38	0.017	20.0
SW-07	Stormwater Outfall 07	0.75	1.24	0.217	170

Table 2 Laboratory Analysis Summary

Monitoring Location ID	Monitoring Location Name	Discharge (cfs)	Stream Stage (ft)
JB-1	Jim Blue Creek	11.60	16.61
LDB-1	Lower Dave Blue Creek	196.80	18.46
LRC-1	Lower Rock Creek	150.00	24.20
TE-1	Little River Tributary	126.80	14.31
URC-2	Upper Rock Creek	6.05	13.10

Table 3 Station Discharge Summary

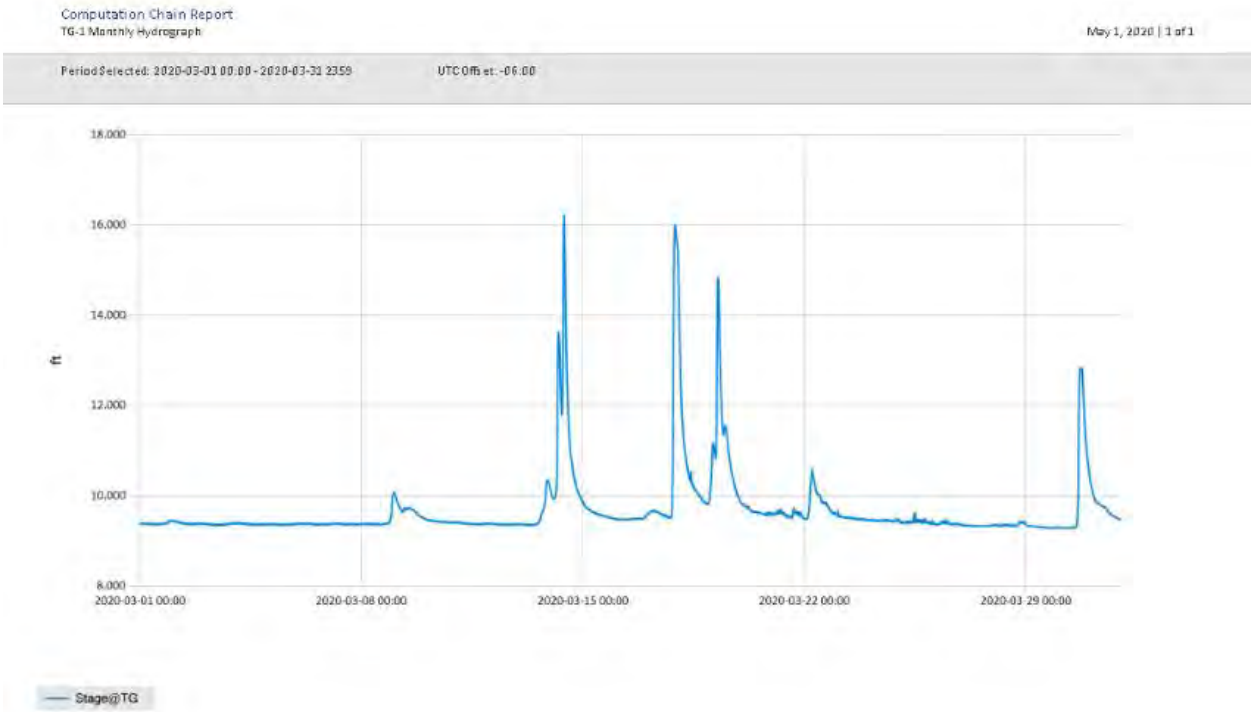

Figure 2 Monthly Hydrograph TG-1

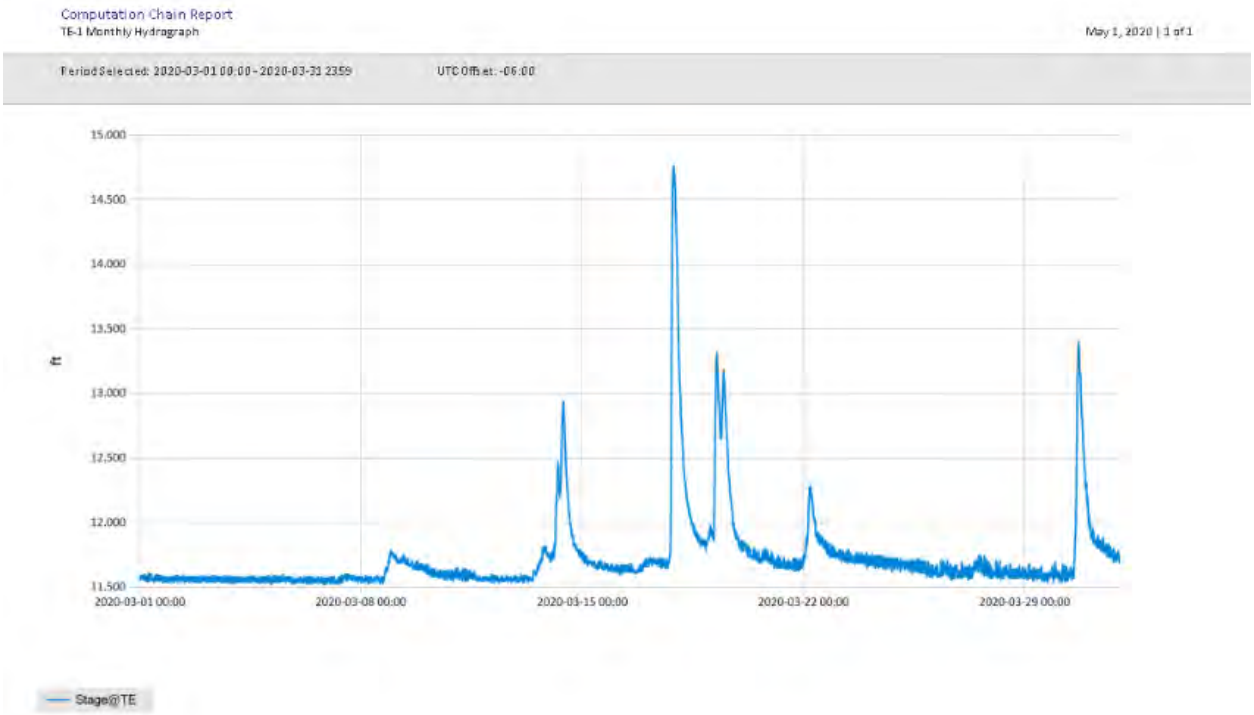

Figure 3 Monthly Hydrograph TE-1

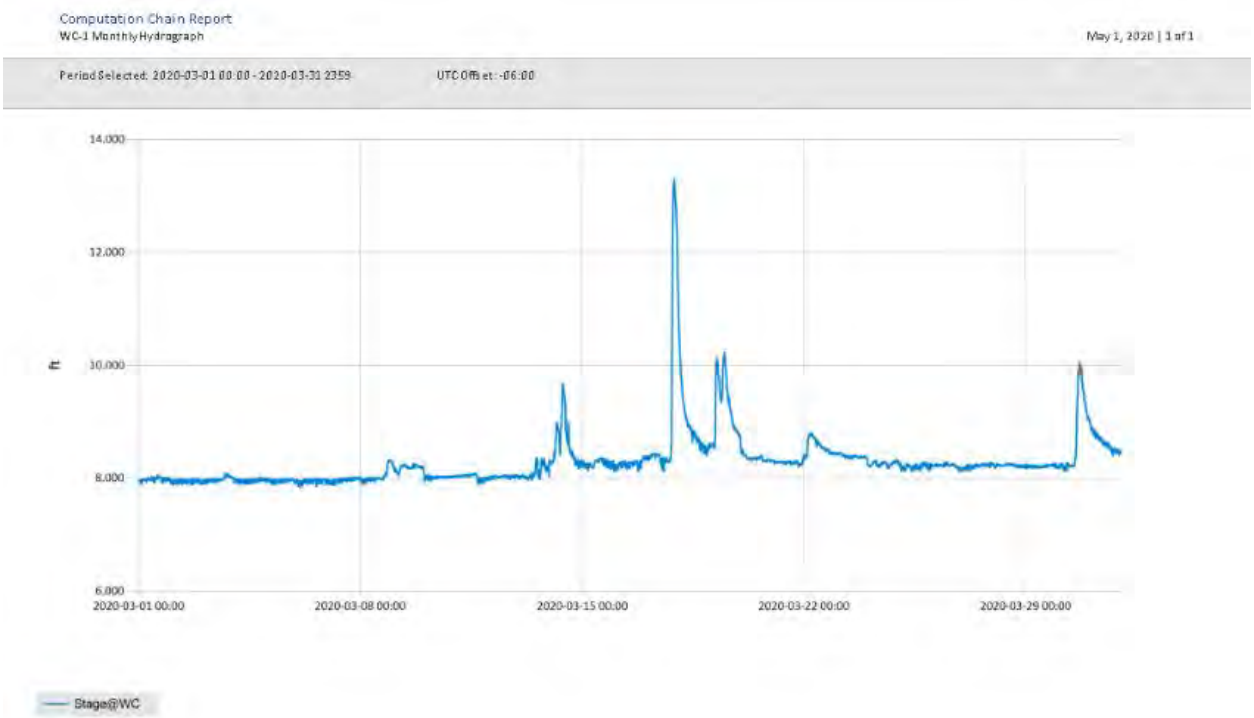

Figure 4 Monthly Hydrograph WC-1

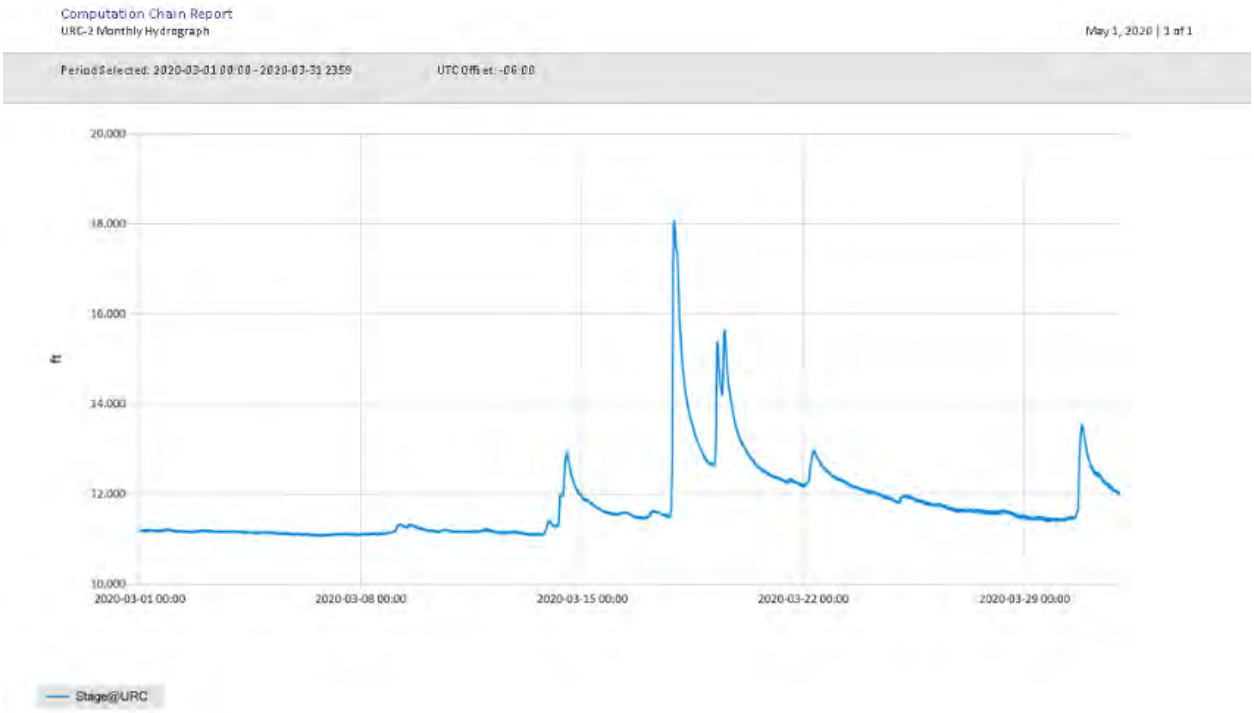

Figure 5 Monthly Hydrograph URC-2

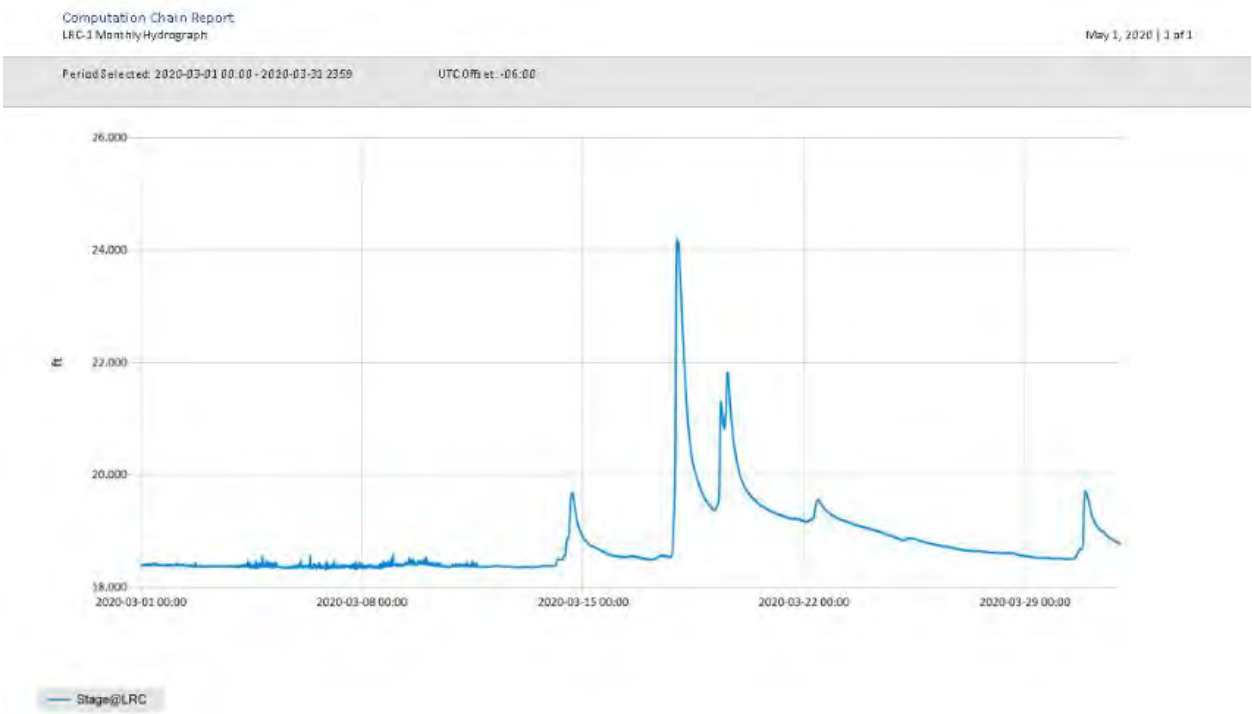

Figure 6 Monthly Hydrograph LRC-1

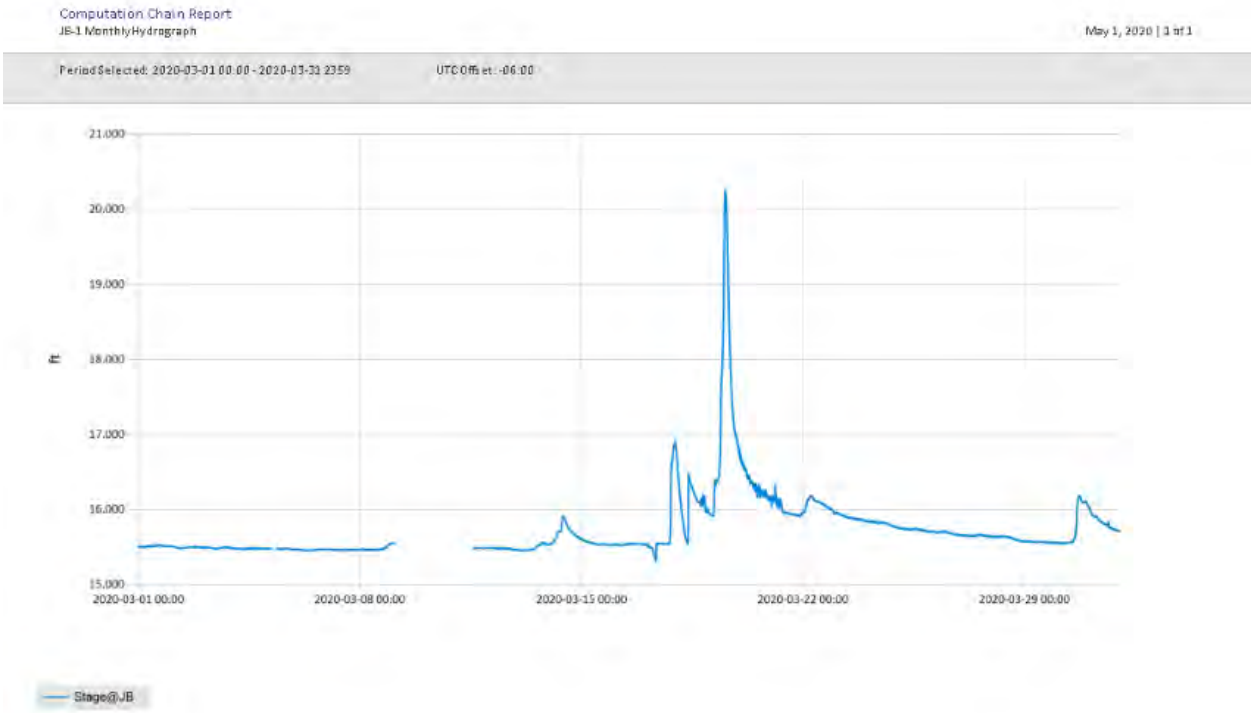

Figure 7 Monthly Hydrograph JB-1

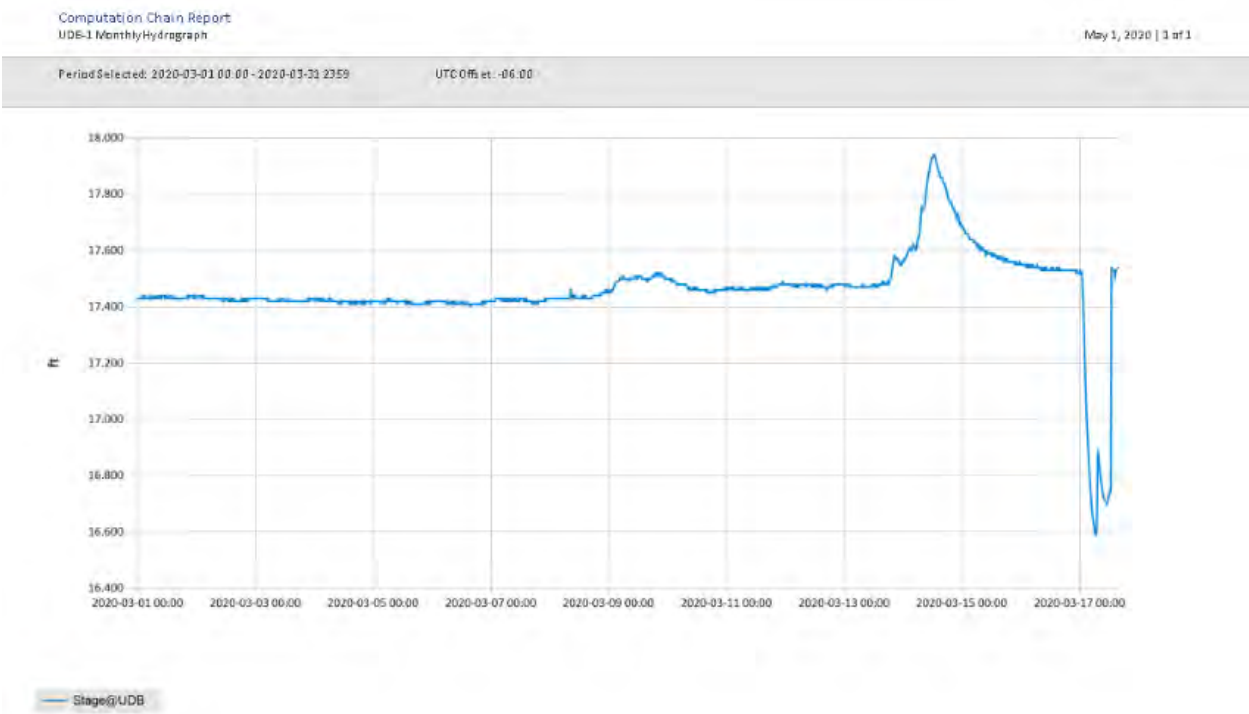

Figure 8 Monthly Hydrograph UDB-1

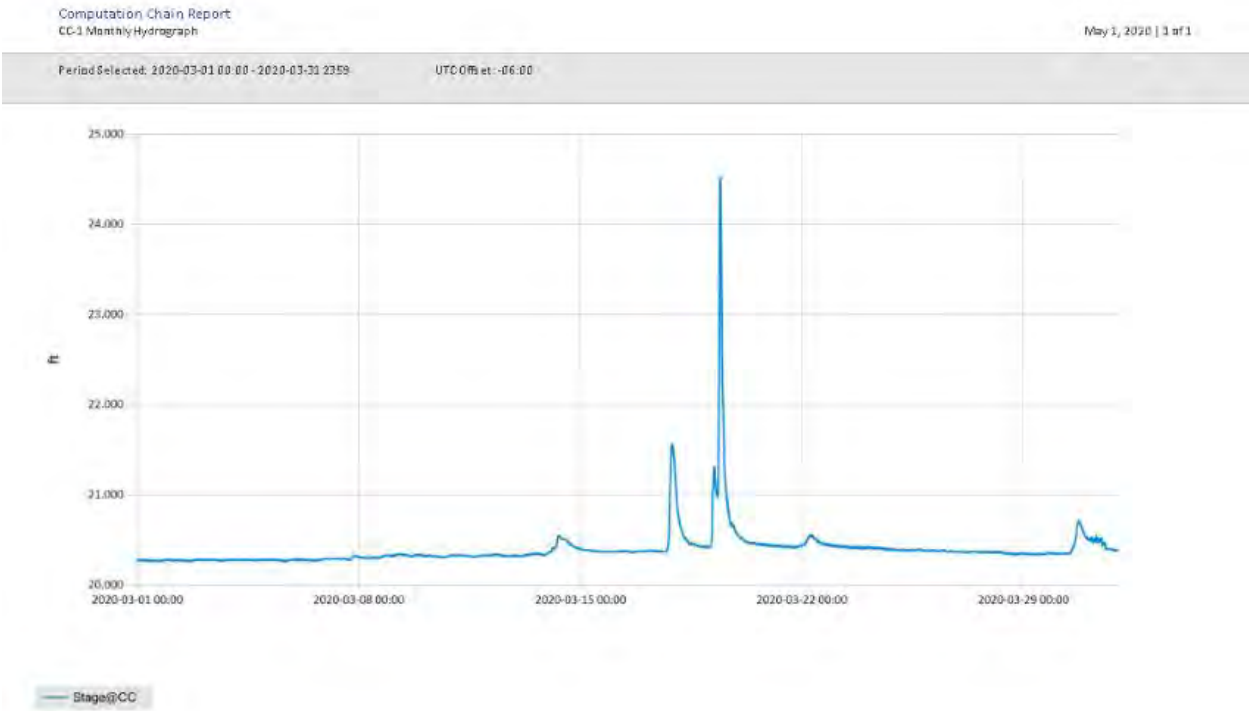

Figure 9 Monthly Hydrograph CC-1

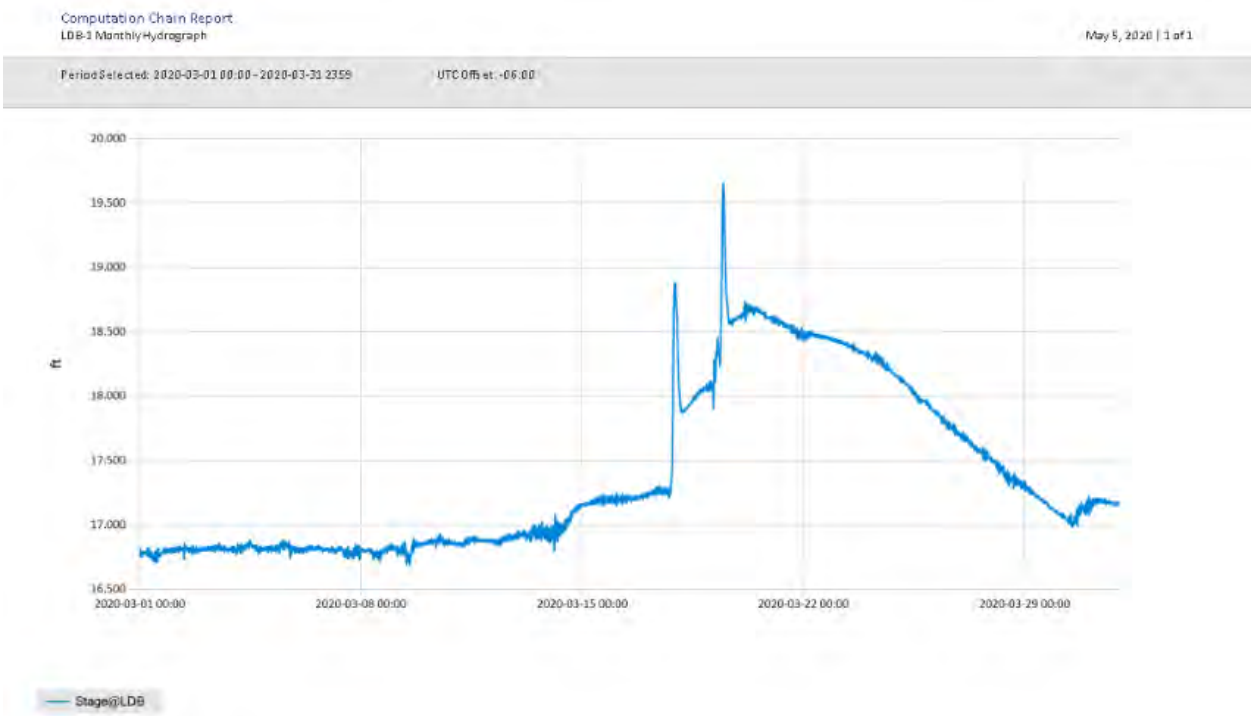

Figure 10 Monthly Hydrograph LDB-1

MESONET CLIMATOLOGICAL DATA SUMMARY — March 2020 — Time Zone: Midnight-Midnight CST
(NRMN) Norman — Nearest City: 2.1 NW Norman — County: Cleveland
Latitude: 35-14-09 — Longitude: 97-27-53 — Elevation: 1171 feet

DAY	TEMPERATURE (°F) MAX	MIN	AVG	DEWPT	DEG DAYS HDD	CDD	HUMIDITY (%) MAX	MIN	AVG	RAIN (in)	PRESSURE (in) STN	MSL	WIND SPEED (mph) DIR	AVG	MAX	SOLAR (MJ/m²)	4" SOIL TEMPERATURES SOD	BARE	MAX	MIN
1	79	45	61.7	40.5	3	0	84	16	51	0.00	28.49	29.73	S	12.2	30.0	19.75	49.5	55.3	63	50
2	58	42	48.6	38.6	15	0	90	50	69	0.00	28.54	29.78	N	7.0	22.7	16.67	49.0	53.5	59	48
3	68	41	53.3	36.9	10	0	89	27	58	0.00	28.61	29.86	NE	5.1	17.7	13.60	48.9	52.9	59	48
4	58	41	50.7	32.1	16	0	73	28	50	0.00	28.78	30.02	NE	6.8	23.3	5.13	49.0	52.0	54	49
5	68	30	49.0	28.4	16	0	94	19	51	0.00	29.01	30.27	N	8.8	30.5	20.92	47.5	50.7	58	43
6	65	28	48.4	21.1	18	0	75	16	38	0.00	29.22	30.48	SE	4.7	14.9	21.50	47.0	51.4	60	43
7	69	38	53.7	24.3	11	0	49	19	33	0.00	29.04	30.30	SSE	11.1	29.4	20.31	47.9	52.8	60	46
8	58	45	52.2	44.1	14	0	95	43	75	0.26	28.88	30.14	S	12.9	32.3	5.02	48.6	51.9	54	49
9	74	41	58.5	50.5	8	0	93	50	76	0.08	28.79	30.04	S	14.1	35.1	17.26	52.4	55.3	61	52
10	75	38	55.2	43.9	9	0	97	37	70	0.00	28.93	30.19	SSE	6.4	18.9	20.31	51.5	53.5	62	46
11	77	60	67.6	55.5	0	4	89	45	67	0.00	28.68	29.93	SSE	7.5	23.1	16.07	55.6	60.7	67	56
12	84	57	68.8	47.3	0	6	82	20	51	0.00	28.56	29.80	N	12.0	30.9	19.72	57.2	63.5	72	57
13	57	44	47.4	42.4	14	0	98	57	84	0.40	28.85	30.10	ENE	12.6	28.1	2.64	53.9	56.2	63	51
14	51	42	46.1	44.2	18	0	98	82	93	0.46	28.94	30.19	NNE	9.2	20.8	6.06	51.3	51.5	54	49
15	46	41	43.4	42.0	22	0	99	86	95	0.01	29.10	30.36	NNE	9.4	21.0	5.65	50.2	50.7	52	49
16	56	45	51.2	50.5	15	0	100	89	98	0.12	28.90	30.15	ESE	4.5	14.1	4.12	50.8	51.7	54	49
17	56	49	52.3	51.2	13	0	100	86	96	1.31	28.87	30.12	E	8.8	25.5	3.87	52.2	53.7	55	52
18	76	55	64.8	61.2	0	0	99	66	89	0.12	28.66	29.90	SSW	9.5	26.0	12.97	55.5	57.7	64	53
19	78	59	67.2	51.4	0	3	97	23	63	0.53	28.59	29.83	SW	12.6	42.5	17.02	58.9	62.0	66	59
20	62	36	43.3	32.7	16	0	81	42	67	0.00	29.09	30.35	N	15.5	38.6	12.68	53.0	54.5	60	51
21	57	30	43.4	30.1	21	0	91	34	62	0.11	29.10	30.36	NE	7.4	24.6	16.43	49.7	50.7	57	45
22	56	45	51.1	49.6	14	0	98	86	95	0.24	28.84	30.09	SSW	5.6	15.3	4.43	51.4	52.5	54	51
23	66	52	58.3	55.6	6	0	100	71	91	0.00	28.75	30.00	SSE	8.2	22.6	7.59	53.8	55.7	59	53
24	70	50	61.8	55.1	5	0	99	58	80	0.00	28.61	29.85	N	7.7	24.3	22.83	57.4	61.3	67	57
25	85	48	67.6	48.5	0	2	97	20	57	0.00	28.57	29.81	SSE	9.9	27.0	23.48	57.1	60.7	67	55
26	93	63	77.2	59.1	0	13	84	28	57	0.00	28.44	29.68	SSW	11.4	27.3	23.16	60.5	63.4	69	58
27	79	67	71.4	65.5	0	8	93	65	82	0.00	28.42	29.66	S	8.7	21.9	12.95	63.6	66.4	70	63
28	71	51	64.8	40.6	4	0	90	19	46	0.01	28.54	29.78	WSW	15.1	35.8	23.01	62.0	62.6	65	57
29	70	38	56.7	34.6	11	0	93	19	49	0.00	28.88	30.13	SSE	4.4	15.9	22.09	58.0	57.3	64	50
30	62	50	53.4	46.5	9	0	97	45	79	0.89	28.81	30.06	ESE	7.6	25.7	2.87	56.6	55.6	58	55
31	66	49	55.9	46.0	7	0	98	43	72	0.04	28.80	30.05	NNE	6.6	17.2	22.79	56.8	58.6	66	53
	67	46	56.3	44.2	<- Monthly Averages ->						28.78	30.03	SSE	9.1	42.5	14.29	53.4	56.0	61	52

Temperature - Highest: 93
Lowest: 28

Degree Days - Total HDD: 296
Total CDD: 35

Rainfall: Monthly Total: 4.58 in.
Greatest 24 Hr: 1.31 in.

Humidity - Highest: 100
Lowest: 16

Number of Days With:
Tmax ≥ 90: 1 — Rainfall ≥ 0.01 inch: 14
Tmax ≤ 32: 0 — Rainfall ≥ 0.10 inch: 10
Tmin ≤ 32: 3 — Avg Wind Speed ≥ 10 mph: 10
Tmin ≤ 0: 0 — Max Wind Speed ≥ 30 mph: 8

© 1993-2020 Oklahoma Climatological Survey and the Oklahoma Mesonet
* Denotes incomplete record
Monthly data generated at 2020-05-01 18:48:37 UTC

Figure 11 March Mesonet Data

Lake Thunderbird TMDL Monitoring Plan Implementation: Sample Year (SY) 2020- April Report

SY2020 Monthly Report

Lake Thunderbird TMDL Monitoring Plan Implementation:

April 2020 Monitoring Report

Oklahoma Water Resources Board
Water Quality Programs Division
Monitoring and Assessment Section
3800 N. Classen, Oklahoma City, Oklahoma 73118
405-530-8800

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SUMMARY OF APRIL WATER QUALITY SAMPLING

Sampling for April 2020 occurred on two separate days and was considered a high flow collection. On the thirteenth, water samples were collected from four stormwater outfalls, in addition to TE-1, TG-1, and URC-2 via autosampler. Mesonet data shows 0.01 inches of precipitation occurring on the thirteenth, 1.26 inches of precipitation in the 72 hours prior to sampling, and 0.06 inches of precipitation in the 72 hours after the sampling event. Water samples were collected from JB-1, LDB-1, LRC-1, and UDB-1 via autosampler on the twenty-second. Mesonet data shows 0.20 inches of precipitation on the twenty-second, 1.09 inches of precipitation in the 72 hours prior to sampling, and no precipitation in the 72 hours after sampling. The total rainfall amount in Norman for the month of April was 2.91 inches. All water level gauges were operational for the month, except for LT-1 due to equipment malfunction. CC-1 and WC-1 were not sampled as a result of autosampler equipment issues. Additionally, due to Covid-19, changes have occurred to sampling and lab procedures.

RESULTS

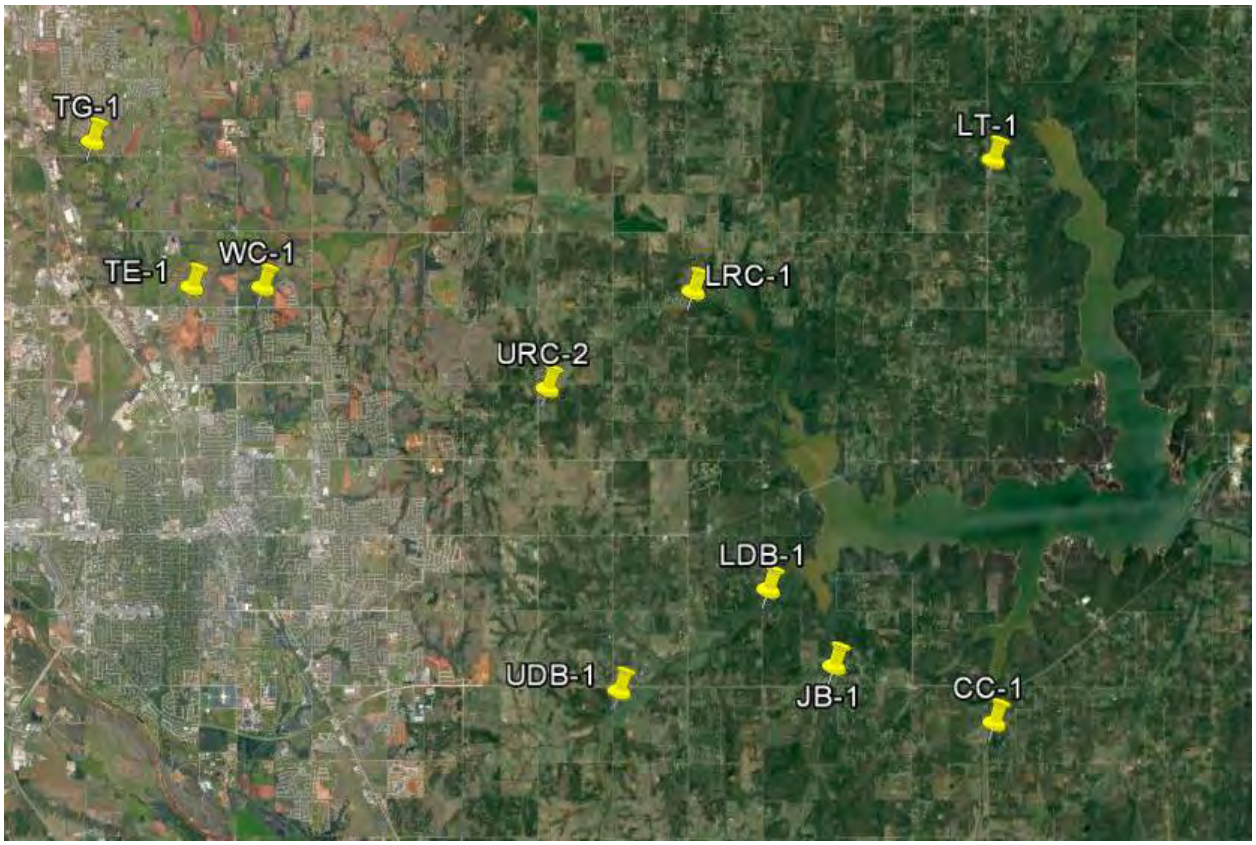

Figure 1 Monitoring Station Map

Monitoring Location ID	Monitoring Location Name	Date	Time	Field Crew	Water Temperature (°C)	Dissolved Oxygen (DO) (mg/l)	pH	Specific Conductance (mS/cm)	Turbidity (NTU)	Notes
JB-1	Jim Blue Creek	04-22-2020	4:15	SD	*	*	7.92	575	189	T2, T1 bottle more turbid. Peak at 05:15 @ 16.75
LDB-1	Lower Dave Blue Creek	04-22-2020	1:30	SD	*	*	7.43	269	1000	T2, peak at 02:00 @ 18.63 (local time one hour ahead of data)
LRC-1	Lower Rock Creek	04-22-2020	3:15	SD	*	*	7.50	347	1000	T2, peak at 03:00 @ 23.11, datalogger time of collection 02:15 (one hour behind local time)
TE-1	Little River Tributary	04-11-2020	23:15	SD	*	*	7.68	907	532	T1, peak at 23:45 @ 13.49
TG-1	Little River Tributary	04-11-2020	23:45	SD	*	*	7.03	592	980	T1, peak at 4/12 @ 00:15 at 15.43
UDB-1	Upper Dave Blue Creek	04-22-2020	2:00	SD	*	*	7.53	265	1000	T4, peak at 02:30 @ 22.73
URC-2[1]	Upper Rock Creek	04-12-2020	1:30	SD	*	*	7.55	847	198	T1, first peak at 02:00 @ 12.54
URC-2[2]	Upper Rock Creek	04-12-2020	10:00	SD	*	*	7.43	525	251	T2, second peak at 10:45 @ 13.47
SW-01	Stormwater Outfall 01	04-13-2020	10:40	SD	*	*	7.30	828	706	Current conditions less turbid than sample
SW-04	Stormwater Outfall 04	04-13-2020	11:30	SD	*	*	7.96	202	1000	
SW-06	Stormwater Outfall 06	04-13-2020	12:25	SD	11.77	9.72	8.03	562	14	Bottles didn't fill completely, so mixed with current conditions
SW-07	Stormwater Outfall 07	04-13-2020	12:45	SD	*	*	7.73	128	305	Lots of small particles floating in sample

Table 1 Field Data Form Where an Asterisk Denotes a Sample from an Autosampler

Monitoring Location ID	Monitoring Location Name	Nitrate and Nitrite (mg/l)	Kjeldahl Nitrogen (mg/l)	Phosphorus (mg/l)	Total Suspended Solids (mg/l)
JB-1	Jim Blue Creek	0.09	1.45	0.254	216
LDB-1	Lower Dave Blue Creek	0.28	6.23	1.370	3000
LRC-1	Lower Rock Creek	0.31	6.31	1.210	4080
TE-1	Little River Tributary	0.30	1.70	0.406	250
TG-1	Little River Tributary	0.20	3.26	0.990	1270
UDB-1	Upper Dave Blue Creek	0.33	5.40	2.290	3600
URC-2[1]	Upper Rock Creek	0.05	1.08	0.178	200
URC-2[2]	Upper Rock Creek	0.12	1.54	0.248	210
SW-01	Stormwater Outfall 01	0.32	2.32	0.745	760
SW-04	Stormwater Outfall 04	0.41	3.49	1.510	1390
SW-06	Stormwater Outfall 06	<0.05	0.61	0.052	12.0
SW-07	Stormwater Outfall 07	0.33	5.57	0.870	628

Table 2 Laboratory Analysis Summary

Monitoring Location ID	Monitoring Location Name	Discharge (cfs)	Stream Stage (ft)
JB-1	Jim Blue Creek	10.33	16.54
LDB-1	Lower Dave Blue Creek	170.60	18.25
LRC-1	Lower Rock Creek	111.30	22.68
TE-1	Little River Tributary	28.06	13.01
TG-1	Little River Tributary	211.80	14.70
UDB-1	Upper Dave Blue Creek	888.10	22.32
URC-2[1]	Upper Rock Creek	1.24	12.51
URC-2[2]	Upper Rock Creek	6.18	13.11

Table 3 Station Discharge Summary

URC-2 experienced two separate peaks during this rain event, and the autosampler collected near both peaks. The initial flush is noted by [1] in the tables above, while the second peak, which was higher than the initial peak, is represented by [2] in the tables above. Since the second peak occurred about nine hours after the first peak, both samples were collected and analyzed. These two collections will be compared to analyze the variation in different stages during a runoff event, as well as changes between an initial and secondary flush during a runoff event.

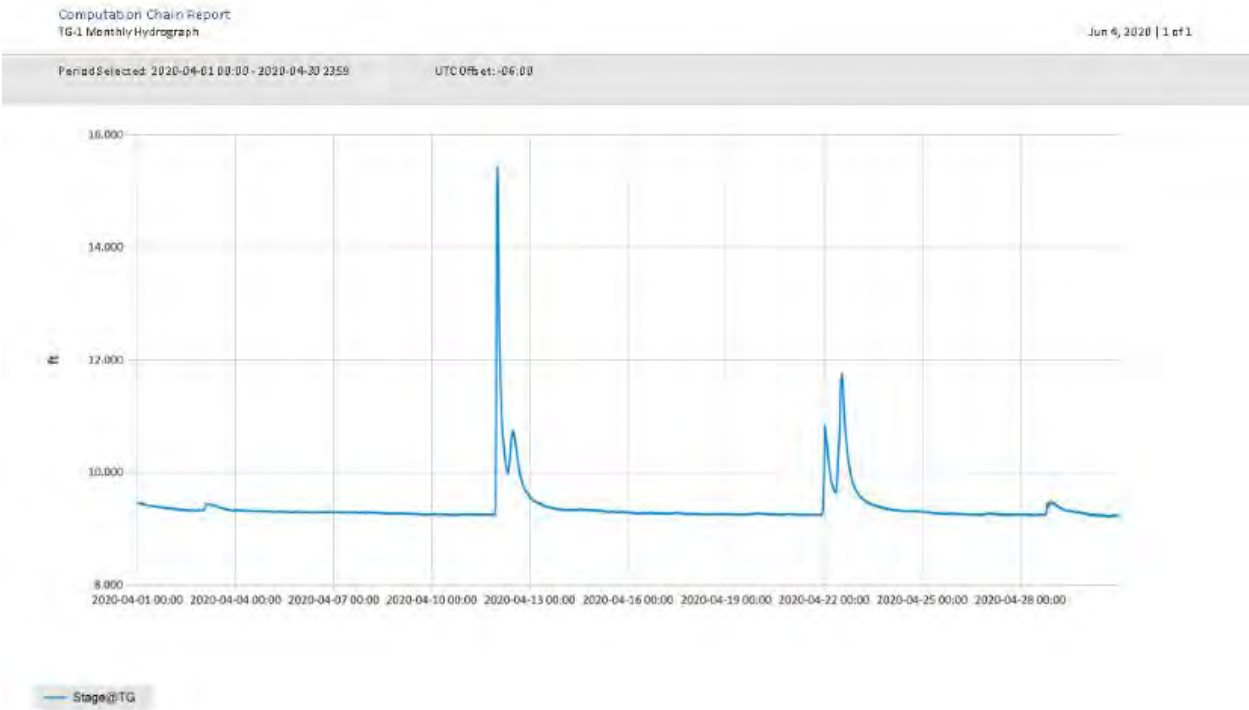

Figure 2 Monthly Hydrograph TG-1

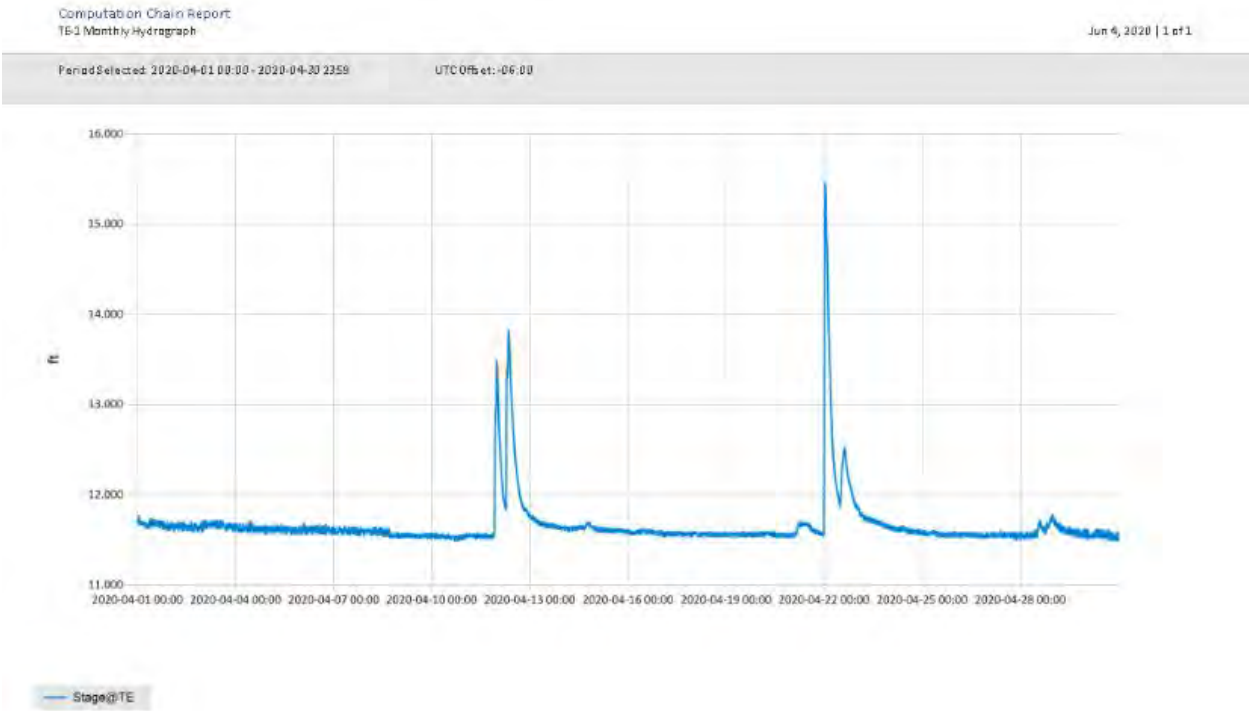

Figure 3 Monthly Hydrograph TE-1

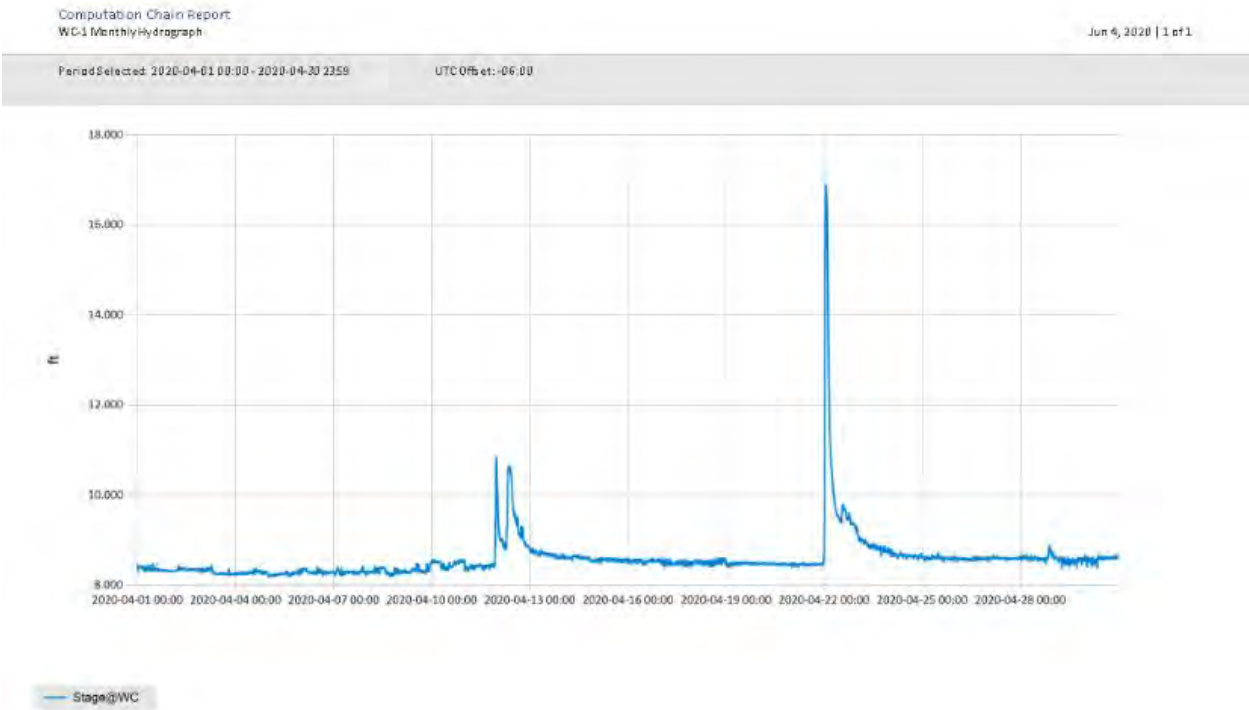

Figure 4 Monthly Hydrograph WC-1

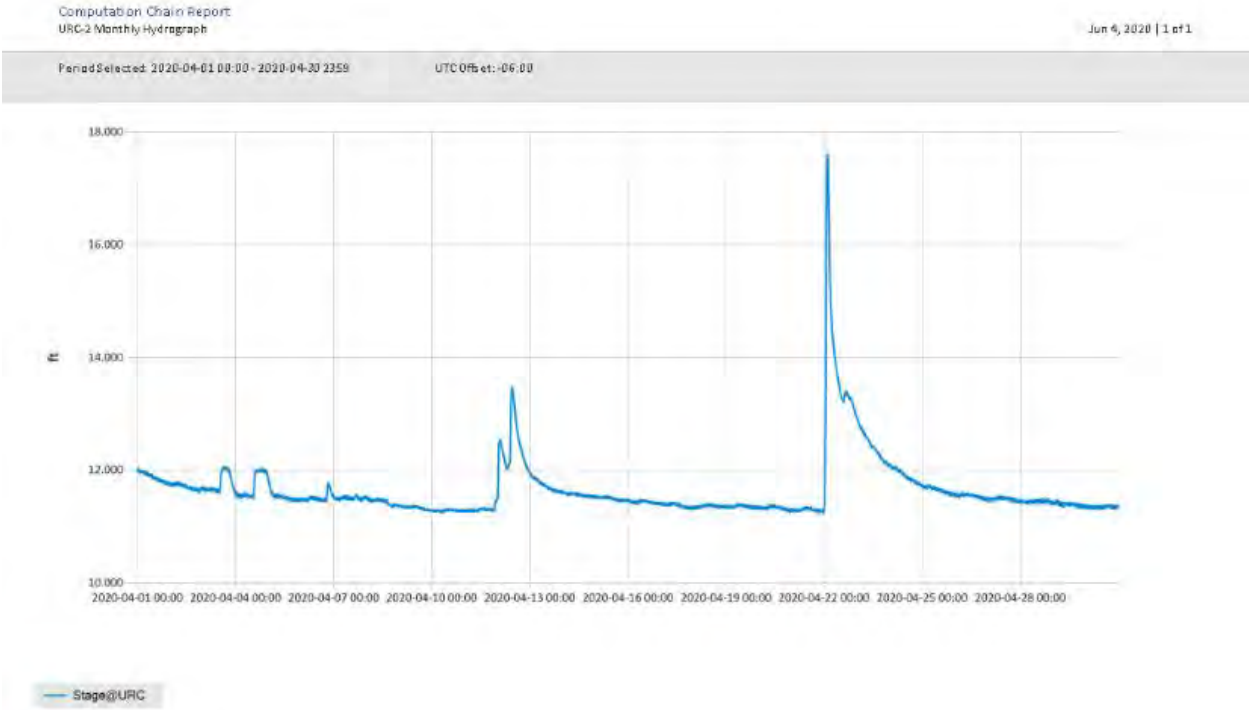

Figure 5 Monthly Hydrograph URC-2

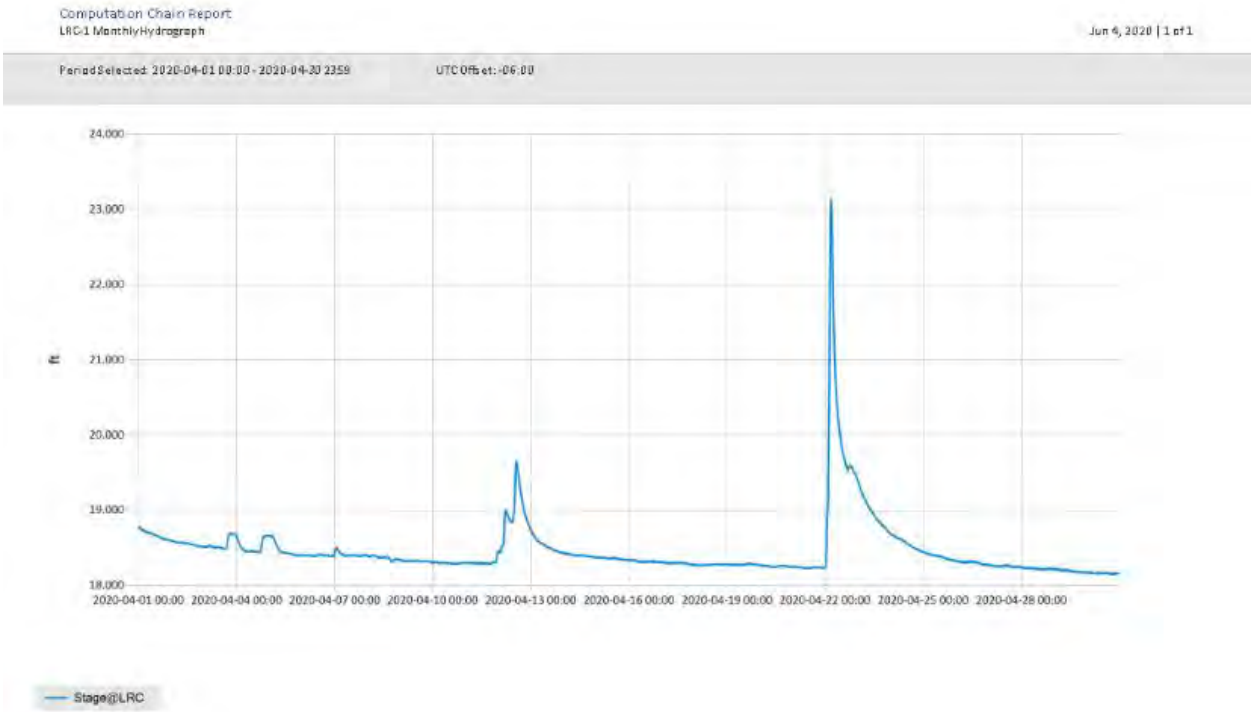

Figure 6 Monthly Hydrograph LRC-1

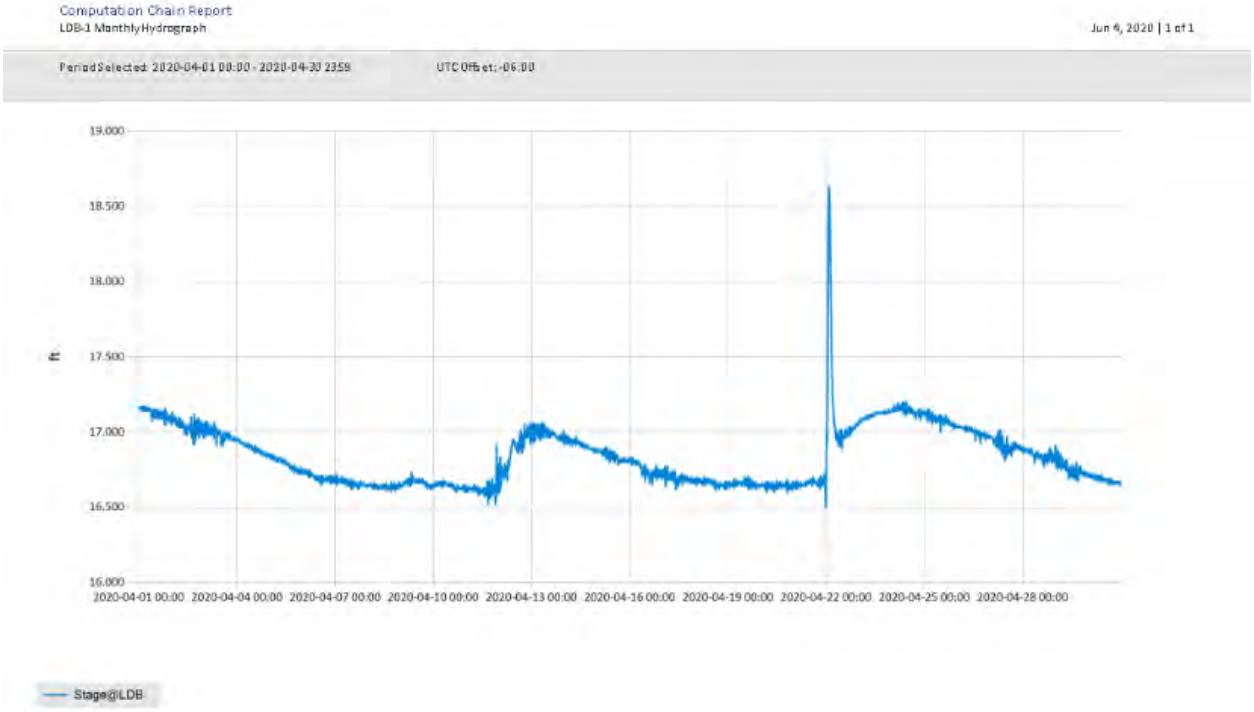

Figure 7 Monthly Hydrograph LDB-1

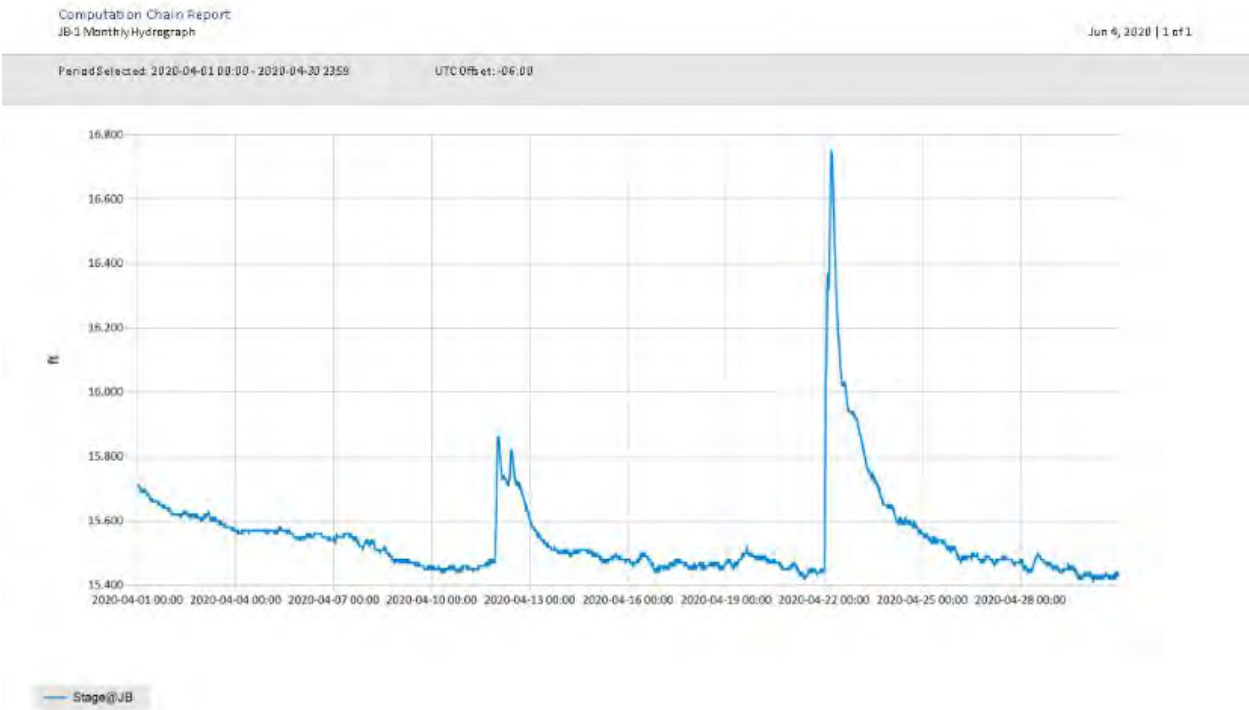

Figure 8 Monthly Hydrograph JB-1

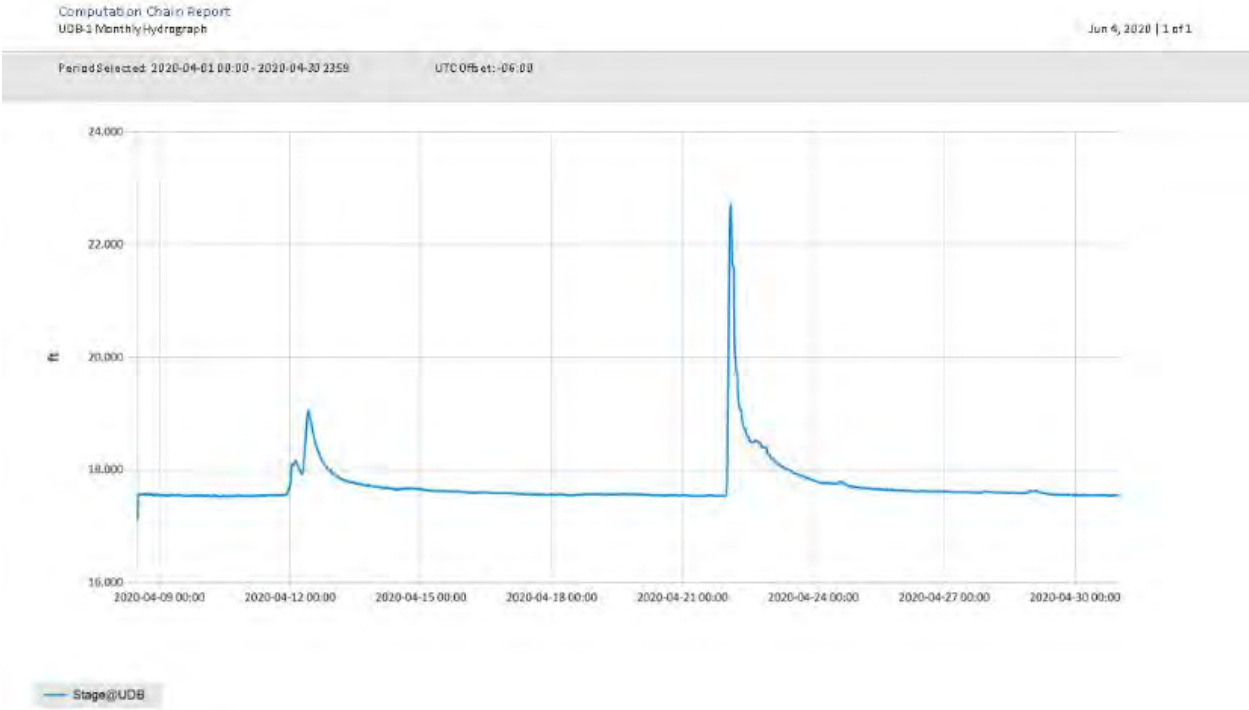

Figure 9 Monthly Hydrograph UDB-1

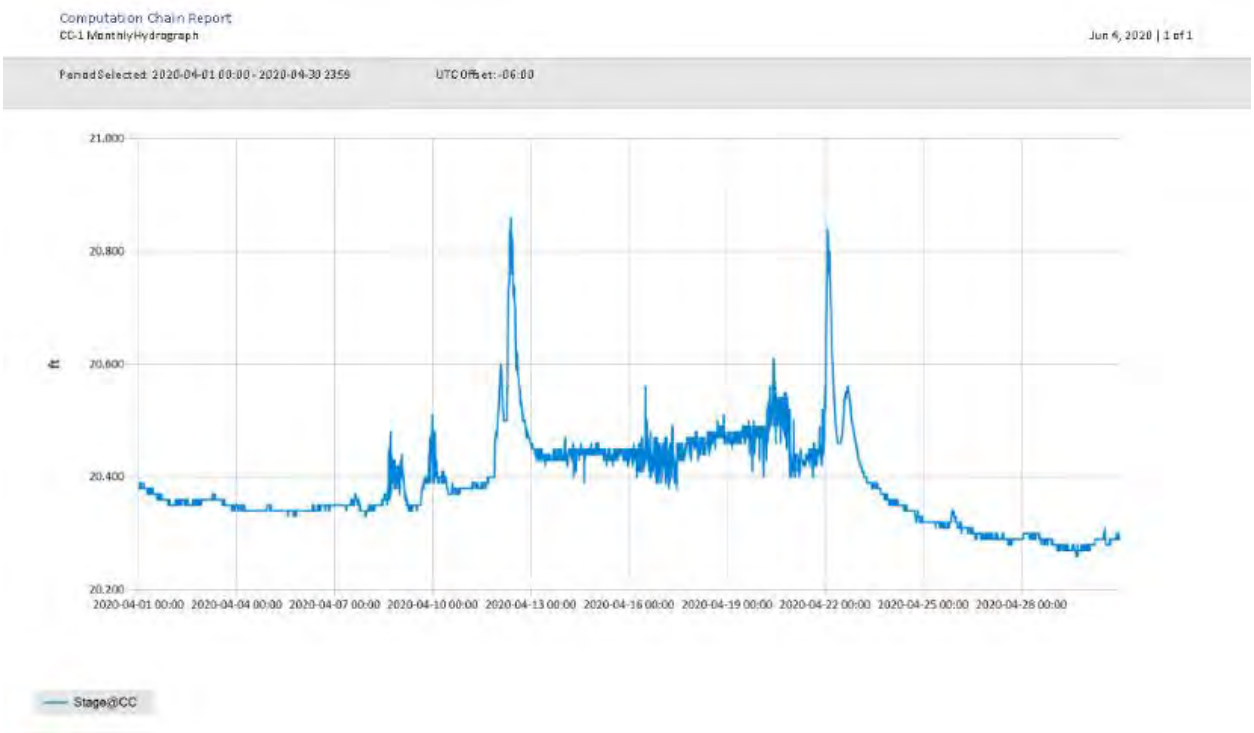

Figure 10 Monthly Hydrograph CC-1

MESONET CLIMATOLOGICAL DATA SUMMARY April 2020 Time Zone: Midnight-Midnight CST
(NRMN) Norman Nearest City: 2.1 NW Norman County: Cleveland
Latitude: 35-14-09 Longitude: 97-27-53 Elevation: 1171 feet

DAY	TEMPERATURE (°F) MAX	MIN	AVG	DEWPT	DEG DAYS HDD	CDD	HUMIDITY (%) MAX	MIN	AVG	RAIN (in)	PRESSURE (in) STN	MSL	WIND SPEED (mph) DIR	AVG	MAX	SOLAR (MJ/m²)	4" SOIL TEMPERATURES SOD	BARE	MAX	MIN
1	70	47	59.0	46.9	6	0	88	48	66	0.00	28.66	29.90	SSE	11.1	31.1	18.57	56.8	58.9	64	54
2	68	46	60.9	54.5	8	0	98	63	80	0.05	28.58	29.82	SSE	13.0	38.2	8.55	57.3	58.6	61	56
3	46	32	35.0	31.8	26	0	96	79	88	0.03	28.86	30.11	N	15.2	31.1	4.64	52.7	50.4	60	46
4	43	35	39.2	35.0	26	0	91	78	85	0.00	28.85	30.10	NNE	8.6	20.7	7.05	49.4	46.6	49	44
5	68	40	52.7	46.2	11	0	93	60	80	0.00	28.79	30.04	S	6.1	24.9	18.17	52.2	52.1	60	47
6	71	59	64.0	58.8	0	0	92	70	84	0.00	28.70	29.94	S	11.0	27.5	8.53	56.6	58.3	62	56
7	86	63	72.0	58.2	0	10	97	26	67	0.00	28.59	29.83	S	9.7	24.4	20.05	60.1	63.0	68	59
8	91	54	73.8	50.7	0	7	94	18	50	0.00	28.55	29.79	S	8.9	29.7	26.11	61.6	63.7	70	57
9	70*	49*	61.4*	38.9*	5*	0*	69*	29*	45*	0.00*	28.76*	30.01*	NE *	10.0*	24.0*	NA	60.2*	62.2*	68*	58*
10	68	42	56.3	32.2	10	0	59	26	41	0.00	28.82	30.07	NE	7.2	16.8	25.74	57.8	61.3	70	53
11	69	53	59.8	52.3	4	0	99	51	77	0.64	28.52	29.76	S	12.4	40.6	11.07	58.2	61.7	66	58
12	70	36	52.1	44.8	12	0	99	60	77	0.62	28.43	29.67	NNW	15.6	45.1	8.84	57.6	58.6	62	53
13	45	33	38.6	23.0	26	0	96	38	54	0.01	28.96	30.22	N	13.2	33.7	13.75	51.1	51.3	54	48
14	47	33	38.5	31.5	25	0	96	52	77	0.05	29.04	30.29	NNE	5.8	17.0	12.09	50.1	50.0	54	46
15	61	31	47.5	31.3	19	0	90	30	58	0.01	28.89	30.14	SSE	7.5	20.9	27.22	50.5	50.4	58	43
16	71	46	59.0	42.7	7	0	74	43	56	0.00	28.75	29.99	SSE	12.8	32.1	26.57	53.5	53.6	60	47
17	59	36	44.2	36.8	18	0	94	59	76	0.00	28.87	30.13	NNW	11.8	30.2	11.53	53.3	51.4	55	48
18	66	32	51.6	37.9	16	0	98	29	65	0.00	28.74	29.99	S	6.8	21.1	23.72	52.2	51.1	58	43
19	68	48	58.7	54.2	7	0	99	63	86	0.01	28.52	29.76	NNE	6.2	20.0	9.18	55.8	56.8	61	55
20	77	46	61.7	51.1	4	0	99	35	72	0.00	28.65	29.90	SSW	4.0	17.2	20.74	57.1	59.6	69	52
21	82	48	67.5	52.0	0	0	99	30	63	1.08	28.70	29.95	SE	7.1	29.0	26.44	59.8	65.2	75	56
22	66	57	61.1	58.7	3	0	98	80	92	0.20	28.45	29.69	NW	9.9	27.9	5.48	60.4	63.1	66	62
23	81	51	66.5	52.2	0	1	97	26	64	0.00	28.50	29.74	NW	6.6	20.8	26.24	61.5	64.7	72	58
24	77	56	66.0	52.0	0	1	77	43	62	0.00	28.53	29.77	NNW	12.9	35.9	21.13	62.9	65.0	70	61
25	73	48	61.0	44.9	4	0	91	30	59	0.00	28.83	30.08	NNW	9.6	30.2	26.92	61.8	60.9	66	55
26	78	45	64.2	45.3	4	0	96	30	55	0.00	28.87	30.12	SSE	6.6	22.2	24.58	60.9	60.6	67	53
27	80	62	70.0	52.3	0	6	72	43	54	0.00	28.70	29.95	SSE	11.4	32.1	22.44	62.2	63.9	71	58
28	86	62	72.5	61.7	0	9	91	48	70	0.21	28.57	29.81	S	10.4	32.7	21.97	65.0	69.0	77	62
29	72	49	62.4	42.3	4	0	81	31	50	0.00	28.81	30.06	NNW	13.1	40.6	28.75	63.8	65.0	71	59
30	79	45	64.6	47.4	3	0	97	32	58	0.00	28.79	30.04	SSE	5.4	19.2	28.32	62.5	66.6	77	57
	70*	46*	58.1*	45.6*	<- Monthly Averages ->						28.71*	29.96*	S *	9.7*	45.1*	18.43*	57.5*	58.8*	65*	53*

Temperature - Highest: 91*
Lowest: 31*

Degree Days - Total HDD: 247*
Total CDD: 34*

Rainfall: Monthly Total: 2.91* in.
Greatest 24 Hr: 1.08* in.

Humidity - Highest: 99*
Lowest: 18*

Number of Days With:
Tmax ≥ 90: 1* Rainfall ≥ 0.01 inch: 11*
Tmax ≤ 32: 0* Rainfall ≥ 0.10 inch: 5*
Tmin ≤ 32: 3* Avg Wind Speed ≥ 10 mph: 14*
Tmin ≤ 0: 0* Max Wind Speed ≥ 30 mph: 13*

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* Denotes incomplete record
Monthly data generated at 2020-05-04 16:49:28 UTC

Figure 11 April Mesonet Data