



Welcome - Please turn off or silence all cell phones during the Study Session.

Meetings are televised everyday on Channel 2 at 7 p.m. and midnight

Study Session:

1. Discuss City Festival (pg. 2)
2. Review KDHE Annual Report for Stormwater (pg. 3)
3. Review Stormwater Management Program (pg. 77)
4. Discuss Leaf Program (pg. 89)
5. Mayor's Award for Public Service (pg. 90)
6. Set Dates for City Commission Budget Work Session & Goal Setting (pg. 91)

POLICY REPORT
Discuss City Festival
February 19, 2019

Prepared By:



Taylour Tedder

Assistant City Manager

Reviewed By:



Paul Kramer

City Manager

BACKGROUND:

The City Commission authorized the temporary formation of the Festival Advisory Board in late 2017. The advisory board met during various dates in 2017 and 2018, looking back at the history of festivals and events held in Leavenworth, feasibility of funding, partnerships, locations, and more.

Staff then entered into a contract with O'Neill Events & Marketing to conduct event research for the 2019 city festival. O'Neill has a proven track record specializing in event management, public relations, and marketing. Staff from O'Neill Marketing held two meetings with various stakeholders to unveil their two preliminary concepts for a citywide festival in September of 2019. Both concepts were well received by those in attendance. They also began conducting event research, including surrounding area events, historical ties, and other significant event theme options. The next step for O'Neill was creating a potential budget for the event, which has been reviewed by the City Manager.

O'Neill is now prepared to present their findings and concepts to the City Commission of efforts thus far, as well as provide a presentation about their background and notable works.

ACTION:

Provide consensus on the direction presented for the festival and to consider a Festival Management contract with O'Neil Events and Marketing at an upcoming City Commission meeting.

POLICY REPORT PWD NO. 19-10

REVIEW DRAFT 2018 KDHE ANNUAL REPORT
FOR STORMWATER

February 19, 2019

Prepared by:



Michael G. McDonald, P.E.,
Director of Public Works

Submitted by:



Paul Kramer,
City Manager

ISSUE:

Review the draft of the annual KDHE report for 2018 stormwater activities.

BACKGROUND:

The City of Leavenworth is regulated by the Kansas Department of Health and Environment (KDHE) and US Environmental Protection Agency (EPA) as a Phase II City for stormwater purposes. The City has been required to submit an annual report on stormwater activities every year since 2003. The report is to summarize the actions the City has taken the previous year to protect and enhance stormwater quality. The guidelines for the activities to be reported on are set by the Stormwater Management Program (SMP) which was adopted by the City Commission in 2016.

The City has submitted reports in accordance with KDHE requirements in previous years. Interaction with KDHE and EPA suggest that the report be reviewed in a public forum rather than simply submitted by staff. KDHE has modified the report format for 2018 from previous years. It is intended that the City take a "look back" over the last five years of stormwater management. The attached documents are a draft of the key portions of the annual report for 2018 and reflect this change in focus. There is considerable additional information in the appendices that will be included when the report is submitted.

Staff is requesting comments and suggestions from the City Commission related to the content of the report. It is appropriate for the City Commission to seek input from the public on this matter as well.

The current KDHE permit began in 2014. The EPA inspected the City in 2013 which resulted in a consent decree in December 2015 that also addressed many of these issues.

Key narratives in the report are:

- Executive Summary
- Section C-E – (6 Minimum Control Measures)
- Section F – Recordkeeping and Reporting
- Section G – Final Report
- Appendix A – Water Quality Sampling Data

RECOMMENDATION:

The report is due at KDHE on February 28th via digital delivery. It is recommended the City Commission adopt a resolution supporting the final report at the February 26th Commission meeting.

ATTACHMENT:

Draft Report (partial)

KDHE Annual Report for 2017; link is:

- https://www.lvks.org/egov/documents/1519914757_341.pdf

EPA MS4 Consent Agreement –

- [https://yosemite.epa.gov/oa/rhc/epaadmin.nsf/Filings/13C0CF4BB965252585257F2A002147CE/\\$File/CWA-07-2015-0023.pdf](https://yosemite.epa.gov/oa/rhc/epaadmin.nsf/Filings/13C0CF4BB965252585257F2A002147CE/$File/CWA-07-2015-0023.pdf)

SECTION 1: EXECUTIVE SUMMARY

To satisfy the requirements of the NPDES permit, this annual report summarizes the City of Leavenworth's plans and actions to reduce the discharge of pollutants from the municipal separate storm sewer system (MS4) to the maximum extent practicable, to protect water quality, and to meet the appropriate water quality requirements of the Clean Water Act. The information contained within this report was obtained through interviews with City staff, review of permits and projects from 2018, and examining communications and publications made available to the citizens of Leavenworth.

City staff communicated the awareness of water quality with efforts in several areas during 2018. These activities continue efforts from previous years including review of the annual report, stormwater guidelines and the "Land Disturbance Permit" (LDP) process.

A critical addition to the work effort in 2018 was the City Commission approval of the implementation of a stormwater fee to fund stormwater construction projects. This legislation created a dedicated funding source from a fee that is billed on the property tax statements. There were 6 Commission meetings (study sessions and regular meetings) open to the public that occurred during this process in 2018, and many more in previous years.

The importance of construction site runoff control was communicated to developers and contractors through issuing of "Land Disturbance Permits" for nearly all construction activities. City staff also contacted developers, contractors and others for enforcement of the regulations.

The City saw overall reductions in Sanitary Sewer Overflow (SSO) events during 2018 and continued with improved the clean up of SSO situations on both public and private property. The aggressive commercial grease trap inspection program by the building inspectors continued with on-site inspections and review of maintenance records.

The City water quality sampling program for Three- and Five-Mile Creeks continued. Six storms were sampled in 2018. Staff has been able to sample effectively during rainfall events; however, the response of local streams to rainfall creates some timing issues to meet KDHE guidelines. In a broad non-scientific overview of five years of testing data, it appears that water quality is usually diminished as it passes through Leavenworth. Three-Mile Creek generally shows a greater decrease in quality than Five-Mile Creek; however, 2018 data indicates substantially greater degradation in Five-Mile creek than in Three-Mile Creek.

Stormwater quality and runoff control from construction projects continues to be addressed during the planning phase of projects. The Development Review Committee (DRC) provides an informal forum as well as advice and guidance to applicants prior to the detailed design process. Stormwater quantity and quality issues are discussed. The creation of the Land Disturbance Permit process includes standard drawings and acknowledgements by owners and/or contractors related to their responsibilities for managing water quality from their site. Requirements related to providing an "Operations and Maintenance Manual" to the owner of any water quality features have been added.

City staff have inspected erosion-control installations and notified contractors and owners regarding necessary follow-up repairs with generally positive results.

The EPA "Special Environmental Project" (SEP) was completed in 2017. This project near Ottawa Street between 7th Street and Broadway contains several water quality features in addition to the basic design to address neighborhood flooding issues. Key project features have been included in other City and development projects at 2nd/Cherokee and 6th/Cherokee.

One of the least effective parts of the stormwater management program lies with managing existing BMPs on private residential developments. Lack of maintenance to detention ponds by Home Owner Associations (HOAs) continues to be a concern by both the HOAs and the City. City staff and City attorney have been working on an approach to improve responses from HOA although no action has been taken. BMPs installed on commercial and industrial properties have generally been maintained in accordance with expectations.

City staff continued outreach to owners/operators of current detention ponds in the City during 2018 with a mailing containing basic information on maintenance of ponds, and held a meeting on March 22nd 2018. This informational meeting reviewed owner responsibilities (especially keeping records of their maintenance activities) and City expectations. City staff also indicated that a fee/fine structure was likely to be installed created for BMP maintenance in 2017 or 2018. The meeting was well received with over 9 attendees and an additional 12 contacts via email/telephone contact.

The inspection and enforcement of the LDP and grease trap regulations continues. As noted previously, while initial compliance is very good, the on-going maintenance and self-inspection of these facilities is lacking. Compliance with City expectations improved in 2018 as the programs became better understood by both staff and citizens.

Efforts to reach out and educate the citizens of Leavenworth through media such as the newspaper, City website, the local cable television station (Channel 2), YouTube, Facebook, and Twitter have increased public awareness of environmental issues in general. The meetings regarding the implementation of a stormwater fee generated additional public interest.

City Staff have not identified any recommended changes to the SMP for consideration by the Commission. KDHE is expected to issue a new five-year MS4 permit in 2018 which will have requirements for a new Stormwater Management Program.

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**Kansas Stormwater Annual Report Form for Municipal Separate Storm Sewer Systems
January 1, 2017 – December 31, 2017**

Section C-E Stormwater Management Program

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Kansas Stormwater Annual Report Form for Municipal Separate Storm Sewer Systems
January 1, 2017 – December 31, 2017

C. Stormwater Management Program

	Place a check mark in the appropriate box.		
	Yes	No	Not Applicable
1. Has the Stormwater Management Program (SMP) been developed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
2. Has the SMP been modified during this reporting period?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
3. If the answer to question 2 above was "yes", has the modified SMP been submitted to KDHE for approval?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

If the answer to item 3 is "No" a copy of the modified SMP must be submitted with this annual report. If it is anticipated a measurable goal cannot be met in the next year the SMP should be modified and submitted to KDHE for approval. The modifications may include different BMPs and/or revised goals to avoid being in a position of non-compliance.

D. Total Maximum Daily Load (TMDL) Best Management Practices

	Place a check mark in the appropriate box.		
	Yes	No	Not Applicable
1. Were any best management practices (BMPs) intended to attenuate the discharge of TMDL regulated pollutants implemented? See your permit to determine if TMDL regulated pollutants are listed for the receiving stream affected by your stormwater system.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2. List all of the BMPs intended to attenuate the discharge of TMDL regulated pollutants as identified in the SMP and provide the requested information on the following table on the following pages.			

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Kansas Stormwater Annual Report Form for Municipal Separate Storm Sewer Systems

January 1, 2017 – December 31, 2017

D. Total Maximum Daily Load (TMDL) Best Management Practices (Table)

BMP ID Number	Brief BMP Description	Regulated TMDL Parameter	Measurable Goal(s)	Progress Achieving Goal(s) (Measured Result)

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Kansas Stormwater Annual Report Form for Municipal Separate Storm Sewer Systems

January 1, 2017 – December 31, 2017

E. Stormwater Management Program Requirements (Six Minimum Control Measures)

1. Public Education and Outreach (Table)

List all of the public education and outreach BMPs as identified in the SMP and provide the requested information in the following table

(List presentations & media)

BMP ID Number	Brief BMP Description	Measurable Goal(s)	Progress Achieving Goal(s) (Measured Result)
1.1	Webpage link to stormwater infrastructure information – Master Plan, Management Plan, Map	# Of visitors – Current software unable to isolate detailed information; however, entire site had 253,612 views in 2017	All items are available on-line. Current web page software does not provide detailed page views counts.
1.2	Place documents in public library stormwater infrastructure information – Master Plan, Management Plan, Map	# Check-out requests – Unknown	All items available at the public library. No check-out requests are known.
1.3	Include articles or stories related to stormwater in City newsletter in at least two issues per year	# Articles/Stories – at least six stories for the three issues in 2017 (Goal was minimum of nine stories) # Issues – three issues of City Connection delivered in 2017	Coordination between Public Information Office and Public Works has stories on leaf collection, wastewater issues, adopt a park, etc.
1.4	City-generated posts on social media related to stormwater issues at least ten occurrences per year	# Posts – unable to determine exact number, well in excess of fifty.	Public Information Office interacts with the public on social media on wide range of stormwater-related issues.
1.5	Provide Information to citizens regarding the City of Leavenworth Solid Waste Division.	Distribute trash bags to citizens with proper disposal handout. A new Recycle Coach app was added which affords residents quick access of proper dates of trash pickup, recycling center availability and brush site availability.	A paper insert with solid waste and other City information is provided to the doorstep on nearly all residences twice per year in roll of trash bags.

CITY OF LEAVENWORTH

Kansas Stormwater Annual Report Form for Municipal Separate Storm Sewer Systems

January 1, 2017 – December 31, 2017

1.6	Show stormwater information on local cable TV station	Broadcast community forums, in which continued water quality discussions take place. There were 9 City Commission meetings (study sessions and regular meetings) and two public information meetings during the course of the year that specifically discussed stormwater.	Public Information Office broadcasts City Commission Meetings, Planning Commission Meetings and others on City channel cable TV – began live broadcast online in 2017.
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2. Public Involvement and Participation (Table)

List all of the public involvement and participation BMPs as identified in the SMP and provide the requested information in the following table
(List all associations & partnerships)

BMP ID Number	Brief BMP Description	Measurable Goal(s)	Progress Achieving Goal(s) (Measured Result)
2.1	Hold public information meetings regarding stormwater issues	Annual review by City Commission of Stormwater Annual Report – YES Review of stormwater projects in annual Capital Improvement Plan - YES	City Commission reviewed KDHE annual stormwater report February 21st, 2017; they were also on TV. City Commission reviewed stormwater projects for CIP in 2017 and approved design and construction of several projects.
2.2	Create an “Adopt a Stream Program”	# Streams adopted - None # Streams cleaned – At least two	City has not created an official “Adopt a Stream” program, but does encourage groups to clean streams. At least two streams were cleaned by groups participating as part of Citywide clean-up or as part of a group activity which included Havens Park, Cody Park and Three-Mile Creek Trail.
2.3	Improve lines of communication with the public through use of website and social media	Integrate contemporary methods of providing and receiving information to the public. - ONGOING	Public Information Office continues a robust social media program for all City issues. Posted Information on other efforts such as detention ponds and such improves as staff skills increase.

CITY OF LEAVENWORTH

Kansas Stormwater Annual Report Form for Municipal Separate Storm Sewer Systems

January 1, 2017 – December 31, 2017

2.4	Annual Citywide clean-up program	# Groups – approximately 40 # Participants – 1,056	Citywide clean up continues to increase in number of participants. The Annual Spring Clean-up Program on May 6th which had an increased number of groups totaling 1,056 volunteers from 42 groups who picked up trash throughout the City, which is an increase of number in 2016 when there were 38 groups. (1,263 participants in 2016)
2.5	Customer surveys – conduct at least one survey each year on stormwater related issues in an on-line environment	# of responses – N/A	No survey was conducted in 2017. This is primarily due to internal conflicts related to the purpose of the survey and lack of similar studies performed by others to learn from.
2.6	Encourage groups to participate in activities such as inlet stencil program and similar	# Groups – None # Programs – None	Group participation is encouraged for environmental issues.

CITY OF LEAVENWORTH

Kansas Stormwater Annual Report Form for Municipal Separate Storm Sewer Systems

January 1, 2017 – December 31, 2017

3. Illicit Discharge Detection and Elimination

		Place a check mark in the appropriate box		
Explain each item below in following table.		Yes	No	Not Applicable
1.	Has a program/plan been developed and is it presently implemented to detect and address illicit/prohibited discharges into the MS4?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
2.	Has a map of the MS4 been developed, showing the location of all outfalls, either pipes or open channel drainage, showing names and location of all streams or lakes receiving discharges from the outfalls?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
3.	The permit requires the permittee enact ordinances, resolutions, or regulations. Has an ordinance, resolution or regulation to prohibit non-stormwater discharges into the storm system been enacted? Effective Date: <u>March 2016</u>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Has the ordinance, resolution or regulation been modified? Effective Date: <u>December 20, 2016</u>			
4.	Has the ordinance, resolution or regulation and/or modification been submitted to KDHE for approval? <i>(Ordinance 8021 INCLUDED in Appendix E to this report, submitted previously in 2016)</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
5.	Have public employees, business, and the general public been informed of the hazards associated with illegal discharges and improper disposal of waste?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
6.	Are stormwater inlets & detention ponds inspected for illicit discharges and debris?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
7.	Are restaurant waste grease areas inspected?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
8.	Are septic systems inspected?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
9.	Are debris, yard waste and dead animals removed from the streets when noticed by employees or reported?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
10.	Is there a yard waste management program?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
11.	Are snow removal activities inspected?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
12.	List all of the illicit discharge detection and elimination BMPs as identified in the SMP and provide the requested information in the table on the following pages.			

CITY OF LEAVENWORTH

Kansas Stormwater Annual Report Form for Municipal Separate Storm Sewer Systems
 January 1, 2017 – December 31, 2017

3. Illicit Discharge Detection and Elimination (Table)

BMP ID Number	Brief BMP Description	Measurable Goal(s)	Progress Achieving Goal(s) (Measured Result)
3.1	Inspect complaints of illicit discharge	Inform public of methods to communicate concerns regarding illicit discharges - YES # Reports investigated – 34 after-hours calls on sewer/storm sewer issues and approximately 20 more from all other sources.	Public Information Officer has created social media space for complaints. 24/7 “real person” phone answering service can dispatch City forces for emergencies.
3.2	Update stormwater outfall maps	Continue efforts to accurately locate and measure existing and new stormwater infrastructure	City maps are updated constantly. The GIS staff and the stormwater crew assist in obtaining accurate measurements and locations. In 2016 the maps were made available online to the public.
3.3	Inspect outfalls	# Outfalls inspected –over 600 inlets and drains were inspected. No specific notation on “outfall”	On-going efforts by the stormwater crew has inspected infrastructure throughout the year as part of their routine work and for the GIS staff.
3.4	Collect yard waste at City composting facility	# Customers: for 2017, Grass – 580, Leaves - 622	City provides free drop off of yard waste for composting. There may be slight overlap with #3.5
3.5	Collect tree and brush debris at brush disposal site	# Customers – 3,974 for 2017. (1,168 on free Saturdays, 2,806 on other days).	City provides a KDHE approved site for drop off of tree and brush debris for disposal through a combination of mulching, composting and burning.
3.6	Collect household hazardous waste (HHW) as part of Citywide clean-up event	# Pounds of household hazardous waste recycled – more than 4,400 lbs.	City residents are directed to Leavenworth County facility during most of the year. Citywide clean up accepts HHW, but it is not weighed separately. In 2017 over 30 customers were serviced.
3.7	Conduct free disposal Saturdays (First Saturday)	# Events - 12 # Tons collected – 229.38	The free Saturdays are well attended; however, volume is not tracked separately for regular refuse and recycling material.
3.8	Staff training	# of staff trained – 10+	At least ten different staff members attended some level of training on stormwater related issues; many on multiple issues.

CITY OF LEAVENWORTH

Kansas Stormwater Annual Report Form for Municipal Separate Storm Sewer Systems

January 1, 2017 – December 31, 2017

3.9	Storm sewer maintenance and inspection	Provide dry weather storm sewer inspection. - YES	Two-person crew inspects stormwater structures and works with GIS staff.
3.10	Inspection of sanitary sewer systems	<p>Inspect residential and commercial sanitary systems for improper discharge into storm drains. - YES</p> <p>Inspect sanitary sewer system to reduce number and volume associated with SSO - YES</p> <p>Coordinate SSO events between wastewater staff, building officials and engineering. -YES</p>	<p>City operates CCTV of sewer and storm sewer systems throughout the year. Approximately 5.7 total miles were inspected in 2017.</p> <p>City completed \$675,000 in work within the sanitary sewer system to reduce Inflow and Infiltration to and from the storm sewer system.</p> <p>Greatly improved coordination between wastewater staff and building inspection staff on review and resolution of SSO events.</p>
3.11	Commercial grease trap inspection program	Review status of commercial grease traps through record review and physical inspection – YES.	An aggressive grease trap inspection program has improved participation and record keeping from the approximately 60 entities required to have a grease trap. At least three new installations were completed in 2017 as a result of this program.

CITY OF LEAVENWORTH

Kansas Stormwater Annual Report Form for Municipal Separate Storm Sewer Systems

January 1, 2017 – December 31, 2017

4. Construction Site Stormwater Runoff Control

		Place a check mark in the appropriate box		
Explain each item below in following table.		Yes	No	Not Applicable
1.	The permit requires the permittee to enact ordinances, resolutions or regulations. Has an ordinance, resolutions or regulation to address construction site runoff from new development and redevelopment projects been enacted? Effective Date: <u>December 2016</u>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.	Has a copy of the ordinance, resolution or regulation been submitted to KDHE as required by the permit? (Ordinance 8021 INCLUDED in Appendix E to this report, submitted previously in 2016)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
3.	Has a procedure or program been developed requiring construction site owners and/or operators to implement appropriate erosion and sediment control best management practices?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
4.	Has a procedure or program been developed requiring construction site owners and/or operators to control wastes such as discarded building materials, concrete truck washout, chemicals, paint, litter and sanitary waste at construction sites likely to cause adverse impacts to water quality?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
5.	Has a procedure been developed and implemented requiring site plan review of erosion control and debris container locations incorporating consideration of potential water quality impacts?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
6.	After review, is a construction site permit issued?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
7.	Has a procedure been developed for the receipt and consideration of information submitted by the public?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
8.	Has a procedure been developed and implemented for construction site inspection and enforcement of the control measures?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
9.	Are construction site inspection and enforcement actions successful?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
10.	Are site owners and/or operators provided instruction on proper construction site erosion and waste control?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
11.	List all the construction site stormwater runoff control BMPs as identified in the SMP and provide the requested information in the table on the following pages.			

CITY OF LEAVENWORTH

**Kansas Stormwater Annual Report Form for Municipal Separate Storm Sewer Systems
January 1, 2017 – December 31, 2017**

4. Construction Site Stormwater Runoff Control (Table)

BMP ID Number	Brief BMP Description	Measurable Goal(s)	Progress Achieving Goal(s) (Measured Result)
4.1	Construction drawing plan review and site runoff control	# Plans reviewed – 24 (construction=17; development=7) # LDPs issued - 67	All development projects were reviewed related to installation of appropriate BMPs. All construction projects were reviewed to ensure adequate BMPs were included in the work to prevent erosion runoff. 2017 initiated less than 100 square feet LDPs not required. Local utility companies were issued a blanket LDP for the year – for small projects.
4.2	Publish updated standard details and design criteria for erosion control	Make available on-line - YES Review annually with staff – No formal meeting; however staff has met informally throughout the year.	Newly-encountered BMPs resulted in staff discussions and sharing of ideas for proper oversight.
4.3	Staff training on runoff inspection	# Inspectors trained – 10+, see section 3.8	City staff has attended a variety of courses in 2017. City staff shares new information as encountered.
4.4	Inform local contractors of LDP	Annual notification of LDP requirements - YES LDP documents available online - YES	Contractor’s LDPs are regularly inspected and contractors are informed of any deficiencies. LDP documents are available online. Contractors notified January 23, 2017 of changes from 2016. Additionally, a contractor informative meeting was held on April 28, 2017
4.5	Pre-construction meetings with owner and contractor - require meetings with owner and contractor prior to commencement of grading operations.	# Meetings – 17	All City-funded projects have a pre-construction conference. Development projects typically meet at the Development Review Committee where BMP requirements are discussed, and then incorporated into the plans. City has no requirement that private development have a pre-con with the City.
4.6	Construction site inspection and enforcement - Increase the frequency of inspections and communications back to owner/contractor	Documentation of inspections - YES	Extensive documentation of site visits (both random and after rainfall) are included in each project file. This includes City and development projects, and individual LDP inspections (such as home construction).

CITY OF LEAVENWORTH

Kansas Stormwater Annual Report Form for Municipal Separate Storm Sewer Systems

January 1, 2017 – December 31, 2017

5. Post-Construction Site Stormwater Management in New Development and Redevelopment

Place a check mark in the appropriate box.

Explain each item below in following table.

Yes No

1. The permit requires the permittee to enact a program to address post-construction site stormwater runoff from new development and redevelopment.

The program developed to manage stormwater in new development and redevelopment projects must include the following elements:

- a. Strategies which include a combination of structural and/or Non-structural BMPs,
- b. Measures to ensure adequate long-term operation and maintenance of BMPs,
- c. Site Owner or operator name and telephone number Responsible to ensure adequate long-term operation Maintenance of BMPs,
- d. BMPs to prevent or minimize adverse water impacts.

2. Has a post-construction stormwater runoff program been Implemented?

3. Has post-construction sites been inspected?

4. Have there been post-construction violations?

(All post construction issues identified were addressed by permit holders)

5. List all the post-construction site stormwater management in new development and redevelopment BMPs as identified in the SMP and provide the requested information in the table on the following pages.

CITY OF LEAVENWORTH

Kansas Stormwater Annual Report Form for Municipal Separate Storm Sewer Systems

January 1, 2017 – December 31, 2017

5. Post-Construction Site Stormwater Management in New Development and Redevelopment Table

BMP ID Number	Brief BMP Description	Measurable Goal(s)	Progress Achieving Goal(s) (Measured Result)
5.1	Construct sediment vane traps on new and reconstructed inlets	# Inlets - 20	Sediment traps were installed on new and replacement inlets on various projects.
5.2	Protect sensitive areas, such as wetlands and riparian areas through plan review and selected land acquisition from developers and at tax sales	# Tracts acquired from developers - 0 # Tracts from tax sale - 1 # Acres acquired/year – 0.26	City participated in the 2016 tax sale by Leavenworth county and purchased one property. Two requests for the City to sell/donate these types of properties occurred in 2016, one resulted in a donation for landscaping at a local restaurant, the other was rejected (in 2017) for lack of detail.
5.3	Enforce post construction runoff control ordinance	#LDP releases – 27 Documentation of inspection and communication – YES	LDPs are closed out when the danger of off-site erosion has been eliminated through either vegetation or other means. This is documented in the various permits. Several LDPs from 2017 are still open into 2018.
5.4	Conduct long-term BMP maintenance inspections	Documentation of inspection and communication - YES	City continues outreach to detention basin owners. Meeting on February 27, 2017 was relatively well attended. This effort will continue and expand. City conducts inspections of selected sites on random, after rainfall, or with depth recording equipment. In 2017 the City requested detention basin owner’s inspection reports and action plans for containing contamination spills.
5.6	Analyze existing structural BMP performances at selected sites (particularly detention basins)	# Sites evaluated – 6+	City installed depth recording devices in at least six locations in 2017. This is to facilitate evaluation of performance. Selected graphs and charts are shared informally with interested parties via email.
5.7	Measure rain gauge and creek depth to evaluate flow quantity and duration from at least March – October.	# Rain gauges - 4 # Stream gauges - 2	City continues to maintain rain and creek monitors. The City also collaborates with other local governments on an extended rain gauge network. Selected graphs and charts are shared informally with interested parties via email. (See Appendix C)

6. Municipal Pollution Prevention/Housekeeping

Place a check mark in the appropriate box.

Explain each item below in following table.	Yes	No
1. The permit requires the permittee to enact a program to address Pollution Prevention/Good Housekeeping for Municipal Operations.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2. Has an operation & maintenance program to reduce Pollutant runoff and an audits /inspection program been adopted? <i>(Audits and inspections occur, no formal program has been adopted)</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3. Has a municipal employee training program been established? <i>(All involved employees have been directed to seek appropriate training throughout the year, City also sponsors training)</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
4. Are oil, hazardous wastes, chemicals and municipal debris properly disposed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5. Are snow and ice removal material and chemicals properly managed to prevent runoff?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
6. Are municipal streets swept on a regular basis?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
7. Are municipal stormwater inlets and drains inspected and cleaned?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
8. Are municipal snow piles controlled drainage to prevent runoff pollution?	<input checked="" type="checkbox"/>	<input type="checkbox"/>

List all the Municipal Pollution Prevention/Housekeeping BMPs as identified in the SMP and provide the requested information on the table on the following pages.

7. PHASE I OPERATORS ONLY - Monitoring Industrial and High Risk Run-Off

Place a check mark in the appropriate box.

Explain each item below in following table.	Yes	No
N/A – City is Phase II		
1. Has the permittee developed and maintained a list of the municipal industrial facilities contributing to the pollutant loading to the municipal storm sewer system?	<input type="checkbox"/>	<input type="checkbox"/>
2. Has at least two municipal industrial facilities on the list had inspection and sampling conducted?	<input type="checkbox"/>	<input type="checkbox"/>

If the answer to items 1 and 2 is "No" provide a statement on the Phase I operator form Appendix B as to why monitoring and control has not occurred.

Complete Monitoring form in Appendix B.

CITY OF LEAVENWORTH

Kansas Stormwater Annual Report Form for Municipal Separate Storm Sewer Systems

January 1, 2017 – December 31, 2017

6. Municipal Pollution Prevention/Housekeeping Table

BMP ID Number	Brief BMP Description	Measurable Goal(s)	Progress Achieving Goal(s) (Measured Result)
6.1	Review City facilities for water quality concerns and develop plans to address them, goal is at least three facilities per year	# Reports prepared: No reports prepared in 2017. City focused on water quality in parking lot projects.	City constructed a substation at the 200 block of Cherokee.
6.2	Street sweeping program – goal is residential areas three times per year and collector/arterial streets once per month (8 months)	# Times completed residential area sweeping – average of 8 # Times completed collector/arterial sweeping – 5 # Hours sweeping – 1,561 # Miles of streets swept – 1,200 (estimated) # Pounds of debris removed – 338.99 tons	Aggressive street sweeping program operates all year, weather permitting. There are two sweepers.
6.3	Snow removal operations - use ground speed control and GPS equipment to keep salt use within guidelines	# Tons of salt used per year - 364 # Pounds per lane mile per storm – 370 lbs/lane-mile average for 2017	Use of ground speed control continues to result in relatively stable application rates of 300-350 lbs/lane-mile for several years.
6.4	Stormwater inlet cleaning	# Inlets – 1200+	Stormwater crew inspected and/or maintained in excess of 1200 inlets, areas drains and other stormwater facilities.
6.5	Continue Citywide leaf collection program (currently one-half of City each year)	# Loads – 50 loads (est. 1000cy)	City continues to offer free leaf vacuuming for one-half of the City each year (alternating halves).

Section C-E - 2018 Draft (6 Minimum Control Measures)

6. Pollution Prevention/Good Housekeeping for Municipal Operations

The permittee shall develop and implement an operation and maintenance program that includes employee training to prevent and reduce stormwater pollution from municipal operations activities such as park and open space maintenance, fleet and building maintenance, new construction and land disturbances, and stormwater system maintenance.

B. Stormwater Management Program

Please place an "X" in the left boxes to complete the table below.

YES	NO	N/A	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Has the Stormwater Management Program (SMP) been developed and implemented?
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Has the SMP been modified or updated during this reporting period?
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	If the answer to question 2 above was "yes," has the modified SMP been submitted to KDHE for review?

If the answer to item 3 is a "NO," a copy of the updated SMP must be submitted with this annual report. If it is anticipated a measurable goal cannot be met in the next year the SMP should be modified and submitted to KDHE for review. The modifications may include different BMPs and/or revised goals to avoid being in a position of non-compliance. However; reasonable BMPs with reasonable goals must be implemented or KDHE may require the permittee to modify the SMP to include additional or better BMPs and/or more reasonable goals.

C. Total Maximum Daily Load (TMDL) Best Management Practices (BMPs)

Some permittees are required to implement BMPs to reduce the discharge of listed TMDL regulated pollutants (potentially any or all of the following pollutants – bacteria, nutrients, and sediment)

Please place an "X" in the left boxes to complete the table below.

YES	NO	N/A	
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Were any BMPs intended to attenuate the discharge of TMDL regulated pollutants implemented? See your permit to determine if TMDL regulated pollutants are listed for the receiving stream affected by your stormwater system.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	List all of the BMPs intended to attenuate the discharge of TMDL regulated pollutants as identified in the SMP and provide the requested information in the following table.

List all the TMDL BMPs as identified in the SMP and provide the requested information in the following table.

E. SMP Requirements (Six Minimum Control Measures) (Continued)

3. Illicit Discharge Detection and Elimination

Please place an "X" in the left boxes to complete the table below.

YES	NO	N/A	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Has a program/plan been developed and is it presently implemented to detect and address illicit/prohibited discharges into the MS4?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Has a map of the MS4 been developed, showing the location of all outfalls, either pipes or open channel drainage, showing names and location of all streams or lakes receiving discharges from the outfalls?
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	The permit may require the permittee enact ordinances, or resolutions. Have ordinances, or resolutions, or regulations to prohibit non-stormwater discharges into the storm sewer system been enacted? Effective date:
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Have the ordinances, resolutions, or regulations been modified? Effective date:

List all the Illicit Discharge Detection and Elimination BMPs as identified in the SMP and provide the requested information in the following table

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E. SMP Requirements (Six Minimum Control Measures) (Continued)

4. Construction Site Stormwater Runoff Control

Please place an "X" in the left boxes to complete the table below.

YES	NO	N/A	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The permit requires the permittee, if they have such authority, to enact ordinances or resolutions. Have ordinances or resolutions to address construction site runoff from new development/redevelopment projects been enacted? Effective date: 12/23/16
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Has a copy of the ordinances or resolutions been submitted to KDHE as required by the permit?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Has a procedure or program been developed requiring construction site owners and/or operators to implement appropriate erosion and sediment control best management practices?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Has a procedure or program been developed requiring construction site owners and/or operators to control waste such as discarded building materials, concrete truck washout, chemicals, paint, litter, and sanitary waste at construction sites likely to cause adverse impacts to water quality?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Has a procedure been developed and implemented requiring site plan review which includes consideration of potential water quality impacts?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Has a procedure been developed for the receipt and consideration of information submitted by the public?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Has a procedure been developed and implemented for construction site inspection and enforcement of the control measures?

List all the construction site stormwater runoff control BMPs as identified in the SMP and provide the requested information in the following table.

E. SMP Requirements (Six Minimum Control Measures) (Continued)

5. Post-Construction Site Stormwater Management in New Development and Redevelopment

Please place an "X" in the left boxes to complete the table below.

YES	NO	N/A	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The permit requires the permittee, if they have such authority, to enact ordinances or resolutions. Have ordinances or resolutions to address construction site runoff from new development and redevelopment projects been enacted? Effective date: 12/23/16
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Has a copy of the ordinances or resolutions been submitted to KDHE as required by the permit?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Has a post-construction stormwater runoff program been implemented?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Have post-construction sites been inspected?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Are BMPs specified to minimize adverse water quality impacts?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Have strategies been developed to include a combination of structural and/or non-structural BMP appropriate for the municipality?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Have measures been implemented to ensure adequate long-term operation and maintenance of structural BMPs?

List all the post-construction site stormwater management in new development and redevelopment BMPs as identified in the SMP and provide the requested information in the following table.

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E. SMP Requirements (Six Minimum Control Measures) (Continued)

6. Municipal Pollution Prevention/Housekeeping

Please place an "X" in the left boxes to complete the table below.

YES	NO	N/A	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The permit requires the permittee to enact a program to address pollution prevention/good housekeeping for Municipal Operations. Has such a program been enacted?

List all the municipal pollution prevention/housekeeping BMPs as identified in the SMP and provide the requested information in the following table.

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E. SMP Requirements (Six Minimum Control Measures) (Continued)

7. PHASE ONE OPERATORS ONLY: Monitoring Industrial and High Risk Runoff

The permit requires the permittee to enact a program to address post-construction site stormwater runoff from new development and redevelopment.

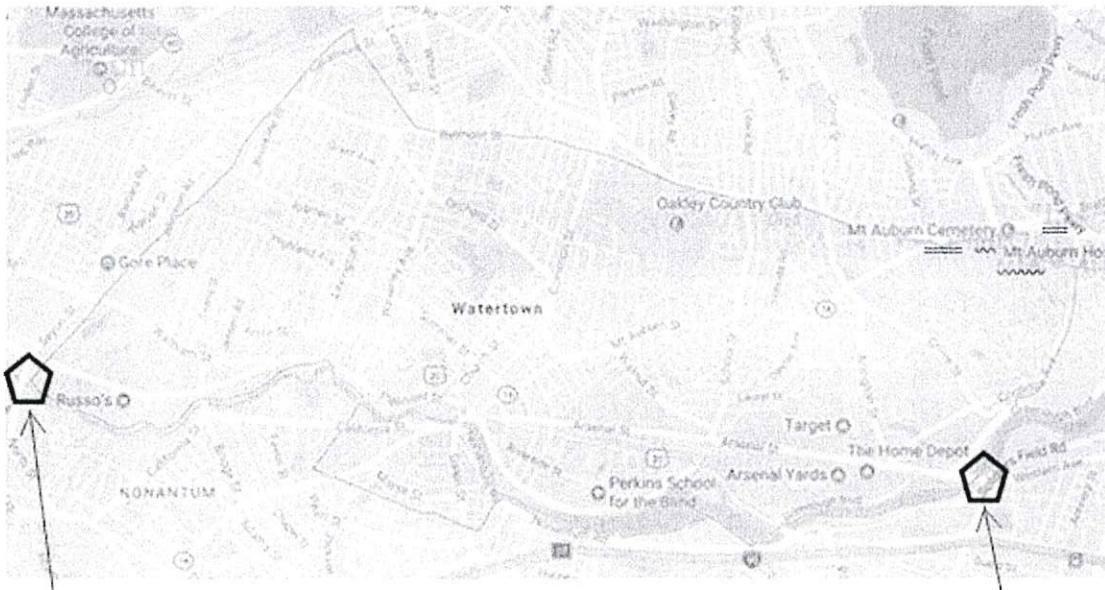
Please place an "X" in the left boxes to complete the table below.

YES	NO	N/A	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Has the permittee developed and maintained a list of the municipal industrial facilities contributing to the pollutant loading to the MS4?
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Have at least two municipal industrial facilities on the list had inspection and sampling conducted?
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	If the answer to items 1 and 2 is "No," provide a statement.

F. Recordkeeping and Reporting

Some permittees are required to monitor surface waters if the permit includes TMDL monitoring requirements for Specific Impaired Streams or Lakes to Target within Part II of the permit. Provide a current map of monitoring locations.

Example map and table below—Please fill out map and table on page 26 and adjust as needed.



Upstream Site: Farwell Street Bridge over Charles River

Downstream Site: Arsenal Street Bridge over Charles River

Section F, Items 1-5

Record Keeping and Reporting

City of Leavenworth, KS Stormwater Management Data Collection

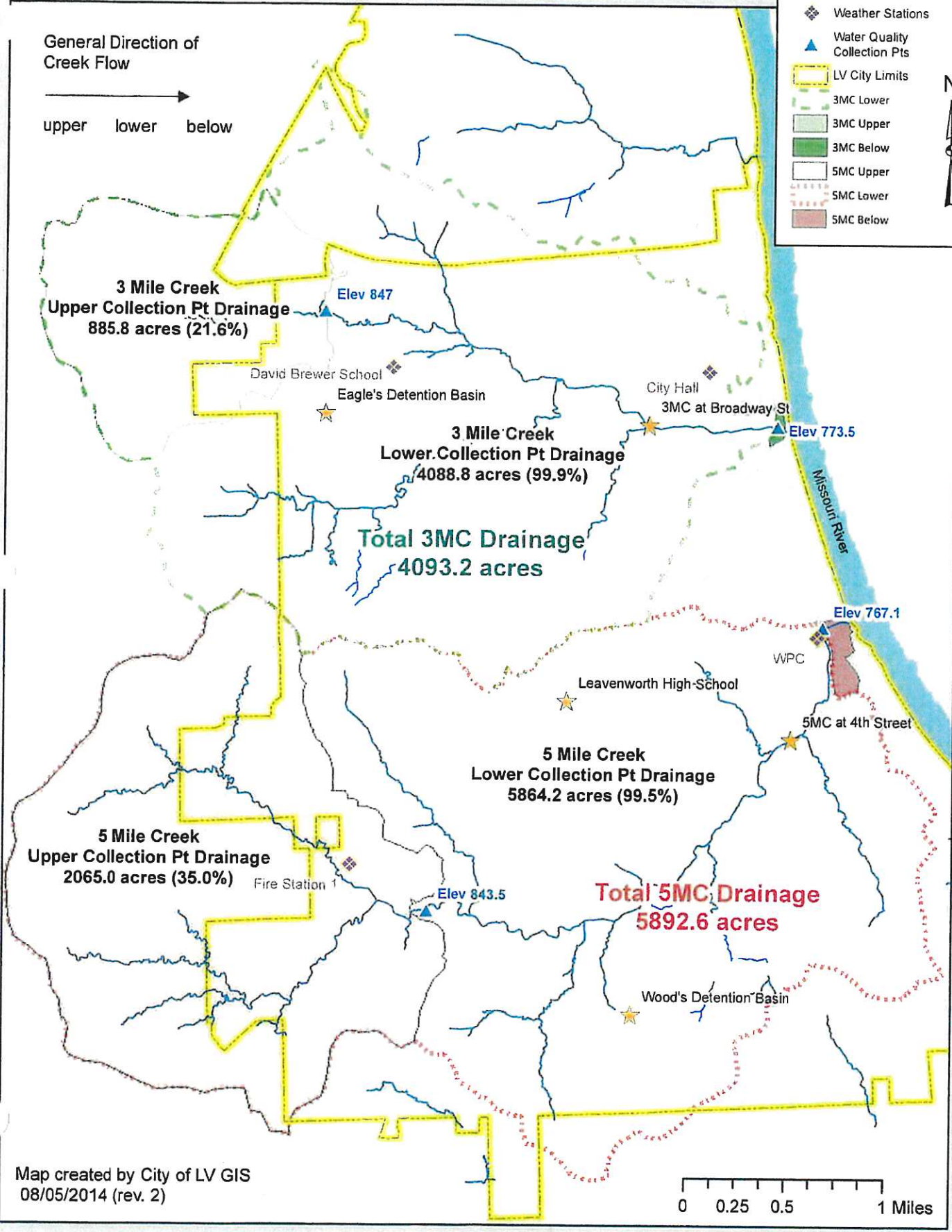
Legend

- ★ Data Loggers
- ⊠ Weather Stations
- ▲ Water Quality Collection Pts
- ⬡ LV City Limits
- ▨ 3MC Lower
- ▨ 3MC Upper
- ▨ 3MC Below
- ▨ 5MC Upper
- ▨ 5MC Lower
- ▨ 5MC Below

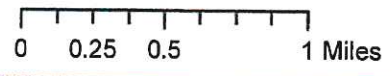
General Direction of
Creek Flow

→

upper lower below












Map created by City of LV GIS
08/05/2014 (rev. 2)

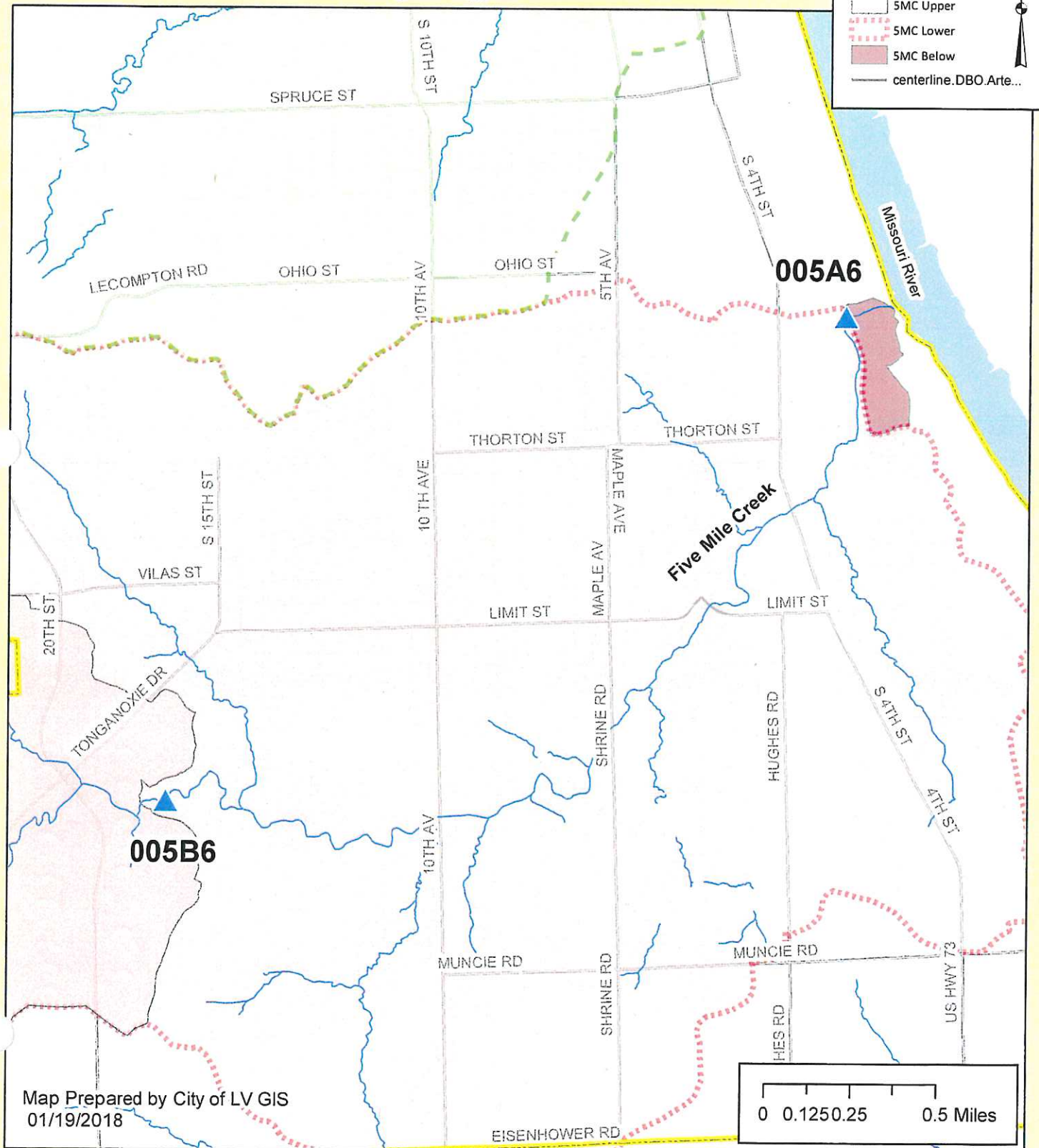


City of Leavenworth, KS

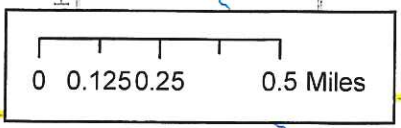
Five Mile Creek Sampling Sites

Legend

-  Water Quality Collection Pts
-  LV City Limits
-  3MC Lower
-  3MC Upper
-  3MC Below
-  5MC Upper
-  5MC Lower
-  5MC Below
-  centerline.DBO.Arte...



Map Prepared by City of LV GIS
01/19/2018



City of Leavenworth

2018 Stormwater Sampling Summary

= Water Quality Improvement
= Reduced or No Change in Water Quality

	Upstream		Downstream		Upstream		Downstream		Upstream		Downstream		Upstream		Downstream	
	(West)	(East)	(West)	(East)	(West)	(East)	(West)	(East)	(West)	(East)	(West)	(East)	(West)	(East)	(West)	(East)
Date	March 19 2018		June 2 2018		June 19 2018		August 7 2018		August 19 2018		October 8 2018					
KDHE ID	003B6	003A6	003B6	003A6	003B6	003A6	003B6	003A6	003B6	003A6	003B6	003A6	003B6	003A6		
Time	11:38 AM	11:16 AM	10:07 AM	9:11 AM	2:21 PM	1:59 AM	8:44 AM	8:27 AM	7:35 PM	7:17 PM	9:40 AM	9:14 AM				
Three-Mile Creek	CFS															
Total Phosphorus	mg/l	0.44	0.33	0.24	0.38	1.1	0.84	0.14	0.17	1.2	1.7	0.56	0.29			
Ortho Phosphate	mg/l	0.12	ND	0.31	0.55	0.42	0.31	0.12	0.12	0.16	0.36	0.39	0.23			
Nitrate+Nitrite	mg/l	0.49	0.38	0.74	0.93	1.2	0.9	0.35	0.63	0.89	0.64	1.1	0.72			
Total Kjeldahl Nitrogen	mg/l	2.3	2.7	1.3	1.9	2	2.5	1.4	1.2	3.3	4.5	1.1	0.74			
Total Suspended Solids	mg/l	374	480	67.5	287	488	400	23	50.3	897	1760	266	86.8			
Turbidity	NTU	121	57	77.5	386	675	318	31.5	53.5	1120	1200	265	77.5			
E.Coli	col/100ml	1340	3590	6970	15650	43520	104620	81600	65700	21420	14500	10710	9080			

	Better	Worse
Total Phosphorus	3	3
Ortho Phosphate	4	2
Nitrate+Nitrite	4	2
Total Kjeldahl Nitrogen	2	4
Total Suspended Solids	2	4
Turbidity	3	3
E.Coli	3	3
Total	21	21

	Upstream		Downstream		Upstream		Downstream		Upstream		Downstream		Upstream		Downstream	
	(West)	(East)	(West)	(East)	(West)	(East)	(West)	(East)	(West)	(East)	(West)	(East)	(West)	(East)	(West)	(East)
Date	March 19 2018		June 2 2018		June 19 2018		August 7 2018		August 19 2018		October 8 2018					
KDHE ID	005B6	005A6	005B6	005A6	005B6	005A6	005B6	005A6	005B6	005A6	005B6	005A6	005B6	005A6		
Time	11:58 AM	12:17 PM	9:49 AM	9:29 AM	2:40 PM	3:00 PM	9:04 AM	9:23 AM	7:52 PM	8:09 PM	9:57 AM	10:18 AM				
Five-Mile Creek	CFS															
Total Phosphorus	mg/l	0.14	0.57	0.19	0.38	0.37	0.71	ND	0.15	1.1	0.87	0.48	0.33			
Ortho Phosphate	mg/l	ND	0.12	ND	0.61	0.18	0.3	ND	1.6	0.28	0.21	0.35	0.25			
Nitrate+Nitrite	mg/l	0.35	0.41	0.45	2	0.36	0.44	0.27	0.37	0.42	0.5	0.83	0.77			
Total Kjeldahl Nitrogen	mg/l	0.66	1.9	1	2.7	1.1	2.3	0.53	1.5	3.6	2.2	1.4	1.4			
Total Suspended Solids	mg/l	156	748	170	578	127	678	37.1	224	1020	1100	138	154			
Turbidity	NTU	52	119	175	576	109	678	30.9	186	910	775	158	121			
E.Coli	col/100ml	310	3320	8840	14210	16160	48840	2481	24196	50120	17850	9580	14830			

	Better	Worse
Total Phosphorus	2	4
Ortho Phosphate	2	4
Nitrate+Nitrite	1	5
Total Kjeldahl Nitrogen	2	4
Total Suspended Solids	0	6
Turbidity	2	4
E.Coli	1	5
Total	10	32

City of Leavenworth - 2018

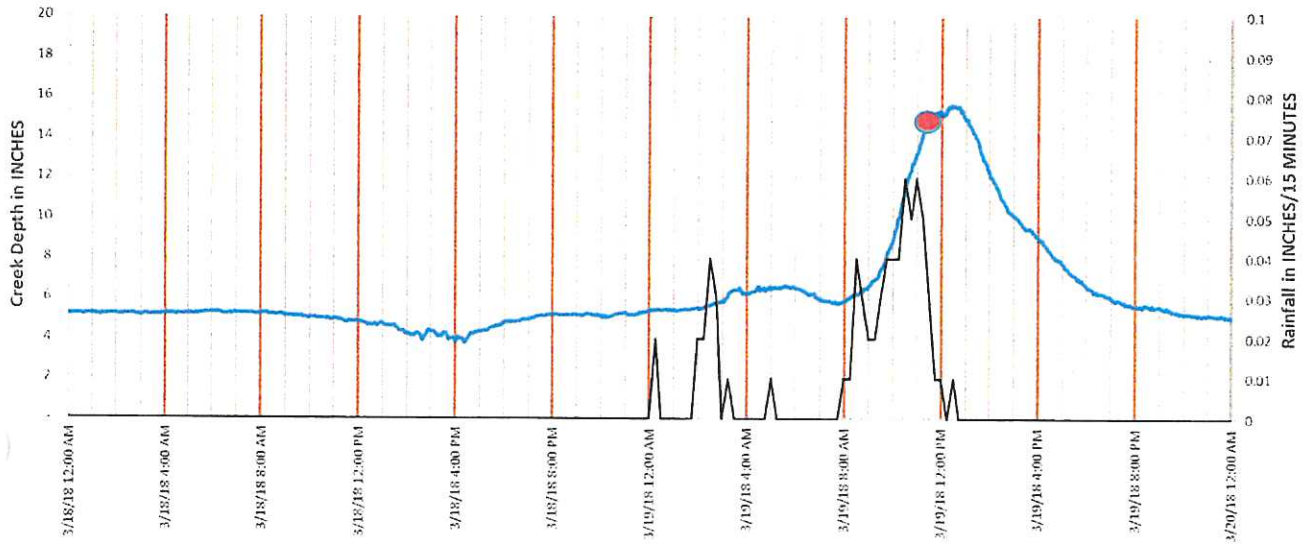
Three Mile Creek - Sampling Time v. Stream Stage and Rainfall

Red Dot ● is approximate Sampling Time

Stream Flow for Three Mile Creek Sample Dates of June 2, 2018 and June 19, 2018 are missing as the data logger was lost or stolen.

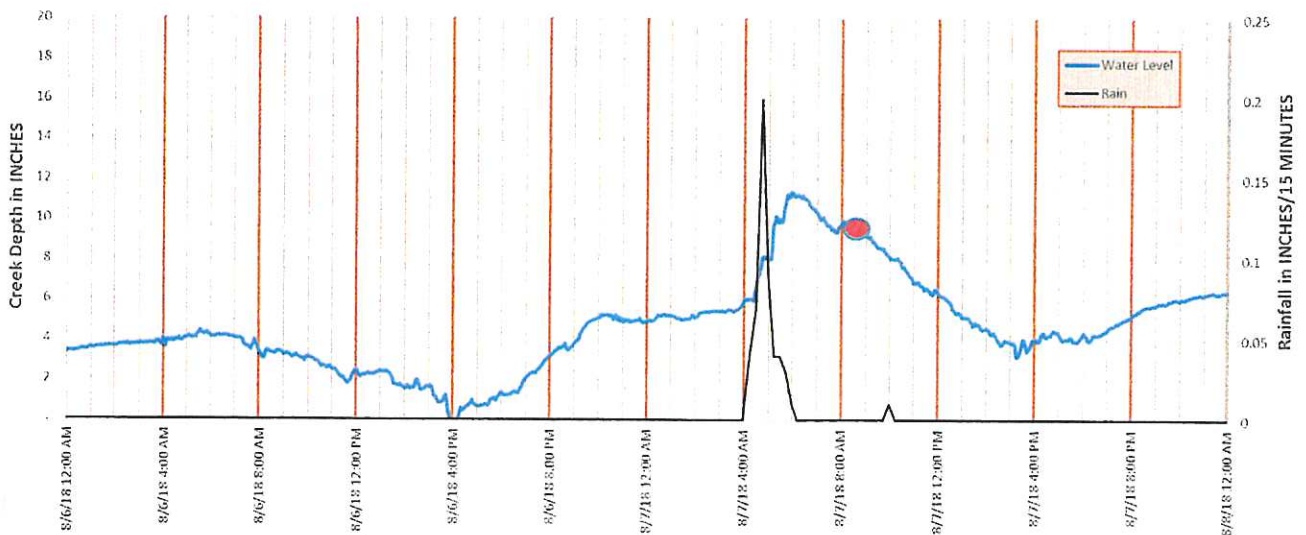
March 19, 2018 (apx 11:30AM)

Three Mile Creek Sampling Time



August 7, 2018 (apx 8:40AM)

Three Mile Creek Sampling Time



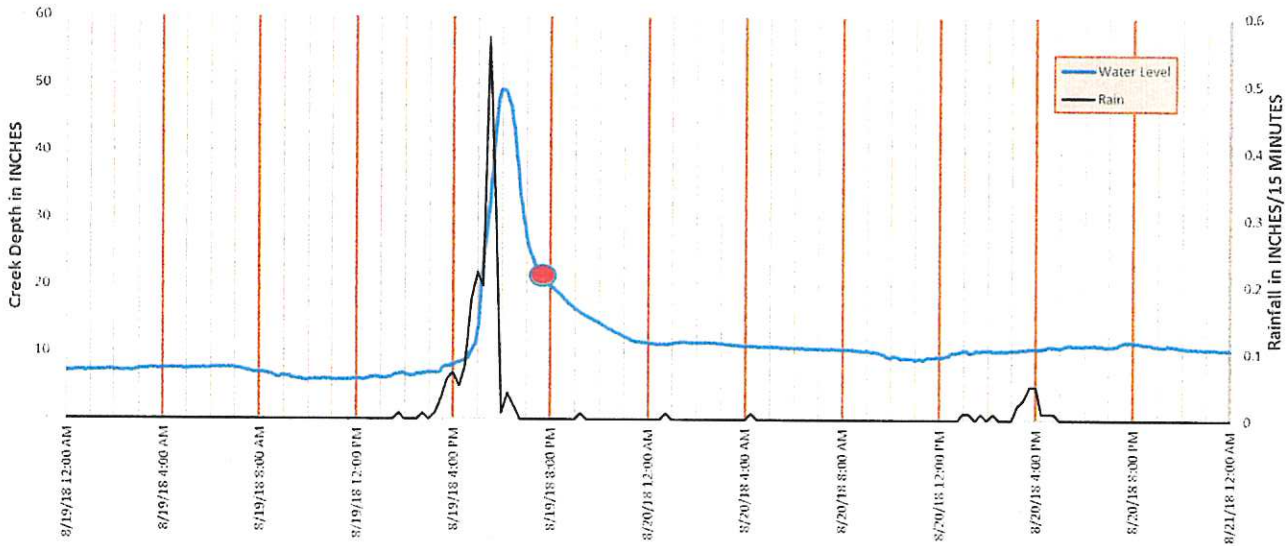
City of Leavenworth - 2018

Three Mile Creek - Sampling Time v. Stream Stage and Rainfall

Red Dot ● is approximate Sampling Time

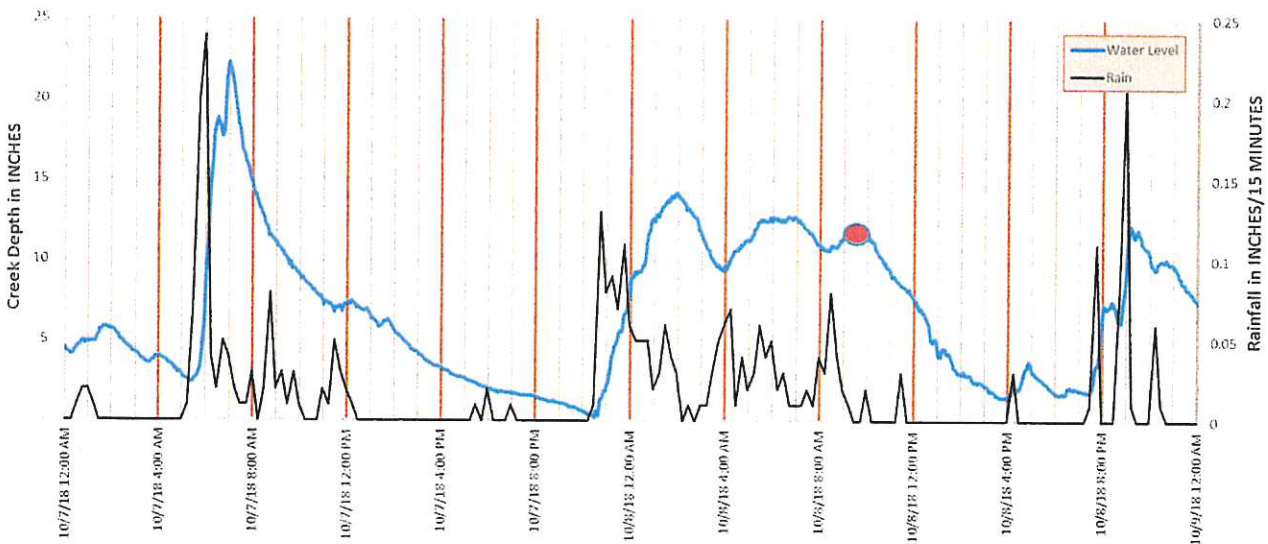
August 19, 2018 (apx 7:30AM)

Three Mile Creek Sampling Time



October 8, 2018 (apx 9:30 AM)

Three Mile Creek Sampling Time



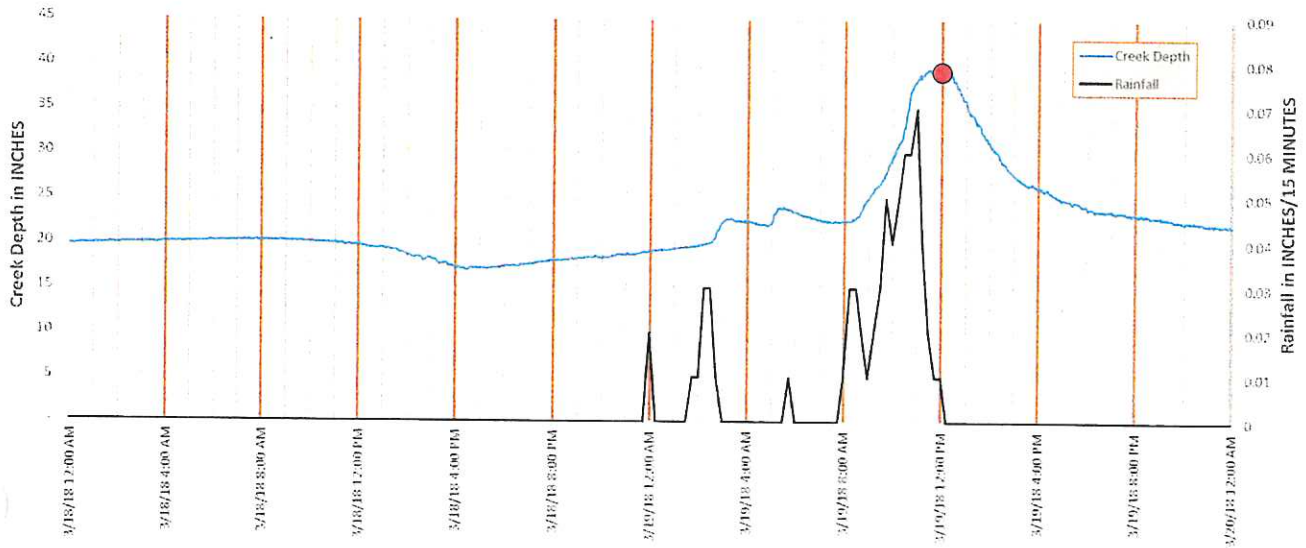
City of Leavenworth – 2018

Five-Mile Creek – Sampling Time v. Stream Stage and Rainfall

Red Dot ● is approximate Sampling Time

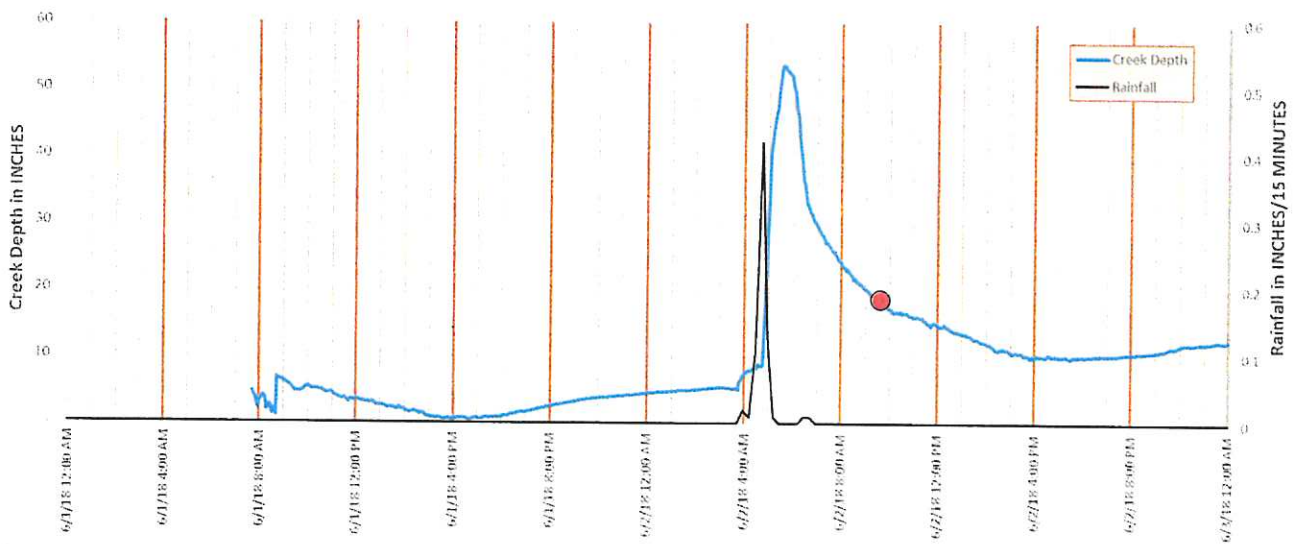
March 19, 2018 (apx 12:00PM)

Five-Mile Creek Sampling Time



June 2, 2018 (apx 9:30AM)

Five-Mile Creek Sampling Time



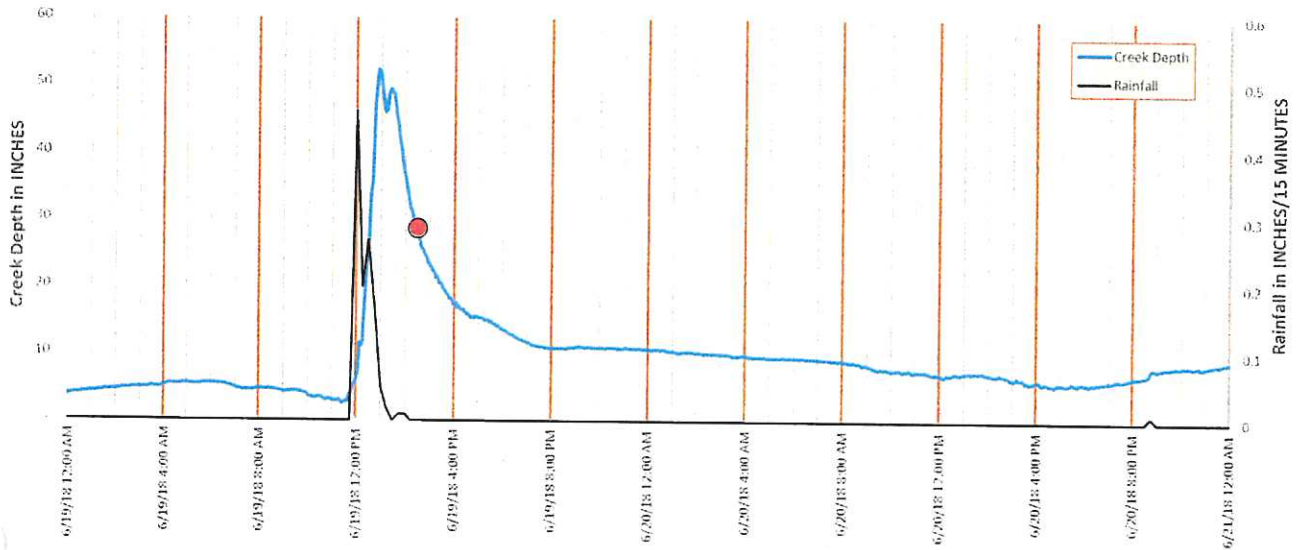
City of Leavenworth – 2018

Five-Mile Creek – Sampling Time v. Stream Stage and Rainfall

Red Dot ● is approximate Sampling Time

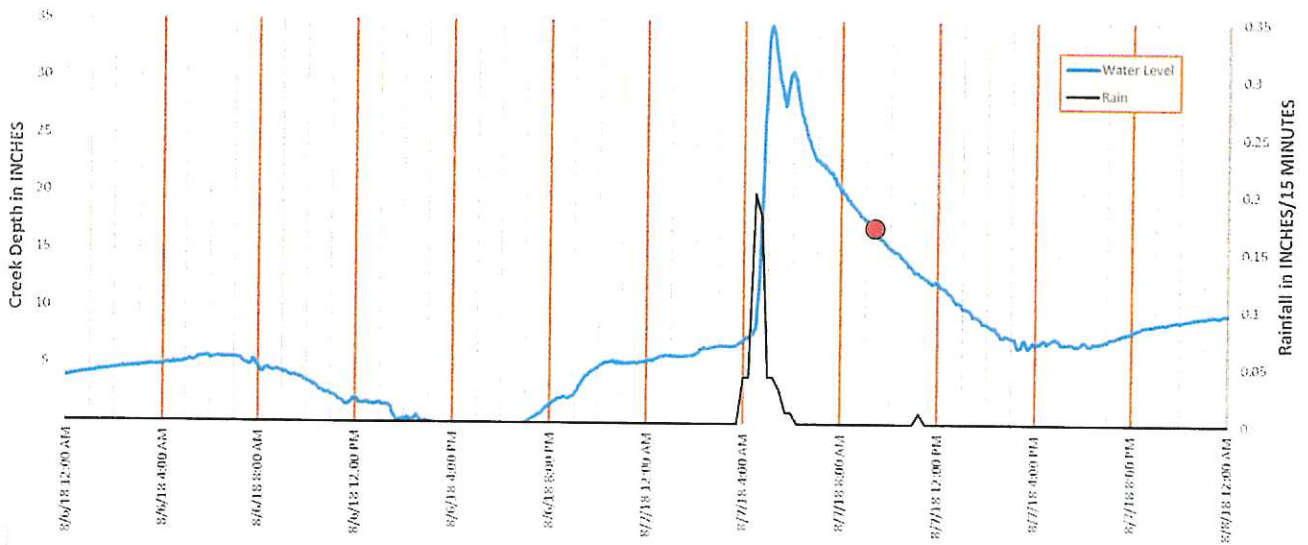
June 19, 2018 (apx 2:45PM)

Five-Mile Creek Sampling Time



August 7, 2018 (apx 9:15AM)

Five-Mile Creek Sampling Time



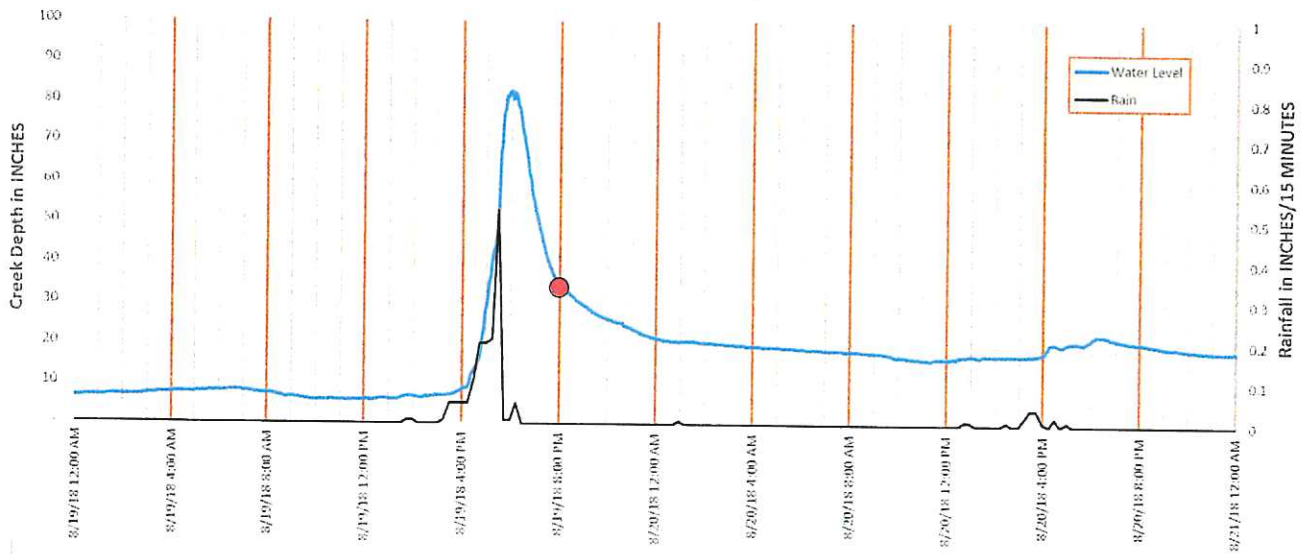
City of Leavenworth – 2018

Five-Mile Creek – Sampling Time v. Stream Stage and Rainfall

Red Dot ● is approximate Sampling Time

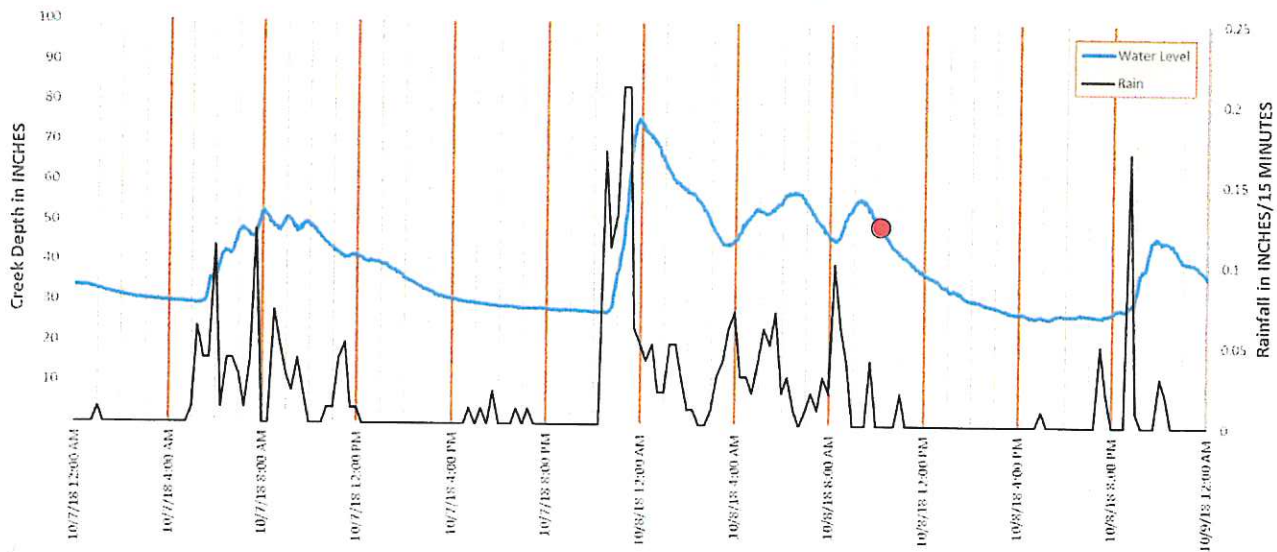
August 19, 2018 (apx 8:00PM)

Five-Mile Creek Sampling Time



October 8, 2018 (apx 10:00AM)

Five-Mile Creek Sampling Time



Section G

Final Report

G: Final Report

1. *Effectiveness of pollutant source controls, e.g. public education, identification and elimination of illicit discharges, and the construction site stormwater runoff control program.*

- a. **Public Education, outreach, participation and Involvement.** City opinion on overall effectiveness in these areas is rated as “Generally Effective”. The following paragraphs highlight activities that contribute to this assessment.
- Stormwater information is disseminated to the public through numerous channels such as the City newsletter, press releases, posting documents on the City website, placing reference material at the public library and several social media platforms. Social media platforms used by the Public Information Officer (PIO) include Facebook, Twitter, and YouTube in the effort to reach a larger population in a timely manner.
 - City at Leavenworth High School on Earth Day with sewer cleaning and TV equipment and information.
 - The City engages the public by calling for volunteers to work on local initiatives through the several lines of communication discussed earlier. The Annual Spring Clean Up has been a long-term ongoing effective program (42 groups, over 1000 participants) that reduces pollution as well increases the public awareness of stormwater BMPs and other City programs.
 - Free drop off of large items on Free Saturdays continues to be a popular program.
 - Calls for civic organizations to clean and make improvements to City parks throughout the year are being made through an established Adopt-a-Park program with 15 parks currently adopted.
 - Arbor Day is observed yearly and the City continues to be part of the Tree City USA program.
 - Brochures and newsletters are published throughout the year that include code enforcement information and more information about any discarded debris and the proper place to discard it.
 - City receives occasional calls from groups such as Boy Scouts related to public service projects. There were no known inquiries in 2018.
- b. **Illicit Discharge Detection and Elimination.** City opinion on overall effectiveness in these areas is rated as “Generally Effective”. The following paragraphs highlight activities that contribute to this assessment.
- Contact from citizens with City staff regarding water quality issues or concerns are referred to Public Works Department for follow up. Typically an engineer or building inspector will coordinate with Water Pollution Control personnel (with the camera if needed) to assess and address the situation.
 - City employees are reminded at staff meetings and safety meetings to report any activity that is questionable to their supervisor and/or the City Engineering Office.

CITY OF LEAVENWORTH

Kansas Stormwater Annual Report Form for Municipal Separate Storm Sewer Systems

January 1, 2018 – December 31, 2018

- In order to control improper disposal of waste to the storm sewer system, the City of Leavenworth makes material available through flyers and online regarding household hazardous waste and its proper disposal. Parks Department promotes a "Pick up Your Dog Doo" plan.
- City operates a leaf collection program as well as provides free disposal of leaves and grass site to reduce impact on stormwater system and stream channels.
- Storm sewers are examined with the City's camera truck that allows for sewer lines to be videotaped and searched for improper connections or line failures. The use of a "Pole Cam" continues to facilitate a much quicker inspection time.
- The City has completed the storm sewer map and it is available to staff and the public on the GIS system, both online and as a paper map (upon request). Technical information on the map continues to be verified through use of physical inspection and hand-held GPS, particularly to correctly note diameters and locations of storm sewer structures. The final GIS database will include size, horizontal location as well as invert and top elevations for all storm structures and outfalls.
- The City has an ongoing cleaning and CCTV program for the sanitary sewer lines. This work has identified several locations that that were repaired as part of the current effort to reduce Inflow and infiltration.
- Staff inspects 33 sewer lines at creek crossings at least three times each year. This includes regularly scheduled inspections as well as after heavy rainfall events. There are an additional 200 crossing locations that are inspected periodically.
- The City has enforced requirements that all exterior clean-out caps on sanitary sewer lines be "screw caps" rather than "press-on caps" this has contributed to the reduced number of Sanitary Sewer Overflow (SSO) events that that release sewer water to the environment.
- The City continues inspection of commercial facilities with grease traps. This program is a combination of inspection and education to ensure that the grease traps are properly maintained which prevents sanitary sewer water from entering the environment. To improve compliance the City is planning to implement a permit/fee/fine structure.

c. **Construction Site Stormwater Runoff Control.** City opinion on overall effectiveness in these areas is rated as "Very Effective". The following paragraphs highlight activities that contribute to this assessment.

- City implemented a "Land Disturbance Permit" (LDP) in early 2015 and strengthened it in 2016 with the adoption of a fee and fine structure for LDPs and erosion. No changes were made in 2018. The LDP has been very successful in ensuring owners and contractors know their responsibilities. It has dramatically reduced erosion and sedimentation from construction sites.

CITY OF LEAVENWORTH

Kansas Stormwater Annual Report Form for Municipal Separate Storm Sewer Systems

January 1, 2018 – December 31, 2018

- Construction site runoff is generally inspected as follows:
 - Work within the right-of-way and/or City-bid projects is inspected by Engineering Staff Technicians on a regular basis.
 - Work on private property is inspected by Building Inspections Staff.
- Plan review and construction site inspection are the City's first line of defense in protecting water quality in developing areas. The initial planning process for large and small developments includes a formal focus on stormwater quantity, quality and control measures as part of the Development Review Committee meeting with project sponsors and developers. Staff comments on plans reviewed are submitted in writing.
- Weekly staff meetings are held in the Public Works office. Review of stormwater issues on current City and developer projects both in the design and construction phase is discussed.
- The City guidelines related to stormwater quantity and quality were approved by the City Commission in early 2015. They rely upon the technical work completed in other documents – particularly the MARC BMP Manual, APWA Section 5600 and City of Leavenworth Stormwater Master Plan 1995. These documents are generally accepted by professional engineers and developers as part of the development process. There were no changes in 2018.
- City staff has attended a variety of training and educational events to become more effective in addressing the construction site runoff situation. It includes attendance at regional classes, venter demonstrations, and focused training on installation/inspection of erosion control systems.

CITY OF LEAVENWORTH

Kansas Stormwater Annual Report Form for Municipal Separate Storm Sewer Systems
January 1, 2018 – December 31, 2018

2. **Address all other BMPs implemented (generally the structural BMPs) under the stormwater management program and address their effectiveness.** City opinion on overall effectiveness in these areas is rated as "Generally Effective." The following paragraphs highlight activities that contribute to this assessment.

a. **The City of Leavenworth addresses structural BMPs with the following efforts:**

- Created a program where all BMPs created as part of a city project or a development project must submit an annual report on maintenance, and are subject to city inspection. An annual meeting is also conducted to discuss these issues (and others) with BMP owners.
- Require all project plans with BMPs
 - a. Have the maintenance activities and schedule included in the plan, and a signature by the owner that they have been reviewed.
 - b. Require a two year maintenance period on all vegetation
- Focused BMP selection for public and private projects on more passive than active BMP measures. Typical projects are bio-swales, reduced capacity inlets (allowing pollutants to settle), stream health improvement, and increased use of a textured/rough concrete.
- Created a monitoring plan to determine if detention/retention facilities meet their design goals for water quantity, and seek methods to improve performance if necessary.

b. **Other BMPs implemented by the City as part of Pollution Prevention/Good Housekeeping for Municipal Operations.**

- Operate a leaf collection program each fall (curbside pick-up is one-half of the City each year),
- Efficient application of salt and sand to the roadways through better equipment (ground speed control), street sweeping operations, and extended sweeping season are all effective in decreasing pollutants from entering the storm sewer system. GPS was added to most snow plow equipment in 2018
- Implement an extended street sweeping program, exceeding the goals of at least once per month on Collector and Arterial Streets, and three times per year in residential areas.
- City has two full-time employees dedicated to the inspecting and cleaning of storm inlet structures with a vacuum truck (and occasional augmentation from other workers)
- Water Pollution Control dye tests 33 creek crossing three times a year for an annual total of 132. WPC is working with our GIS department and have identified over 200 creek crossings that are inspected annually.
- City staff reviewed the general state of water quality management at selected City facilities throughout the permit period. Some specific actions that came from this effort.

CITY OF LEAVENWORTH

Kansas Stormwater Annual Report Form for Municipal Separate Storm Sewer Systems
January 1, 2018 – December 31, 2018

- o Grading was improved around portions of the salt/sand storage areas
- o Snow storage area berm was installed
- o Issues with the grease/oil/sand separator and internal processes at the Municipal Service Center were identified and necessary changes and repairs made.
- o Two municipal parking lots were constructed with bio-swales and reduced capacity inlets. A third parking lot is under design with similar elements.
- o Roadway improvements adjacent to the Service Center will include construction of a larger water quality feature related to the entire site.

- c. **Further Discussion of BMPs in general.** City opinion is that the BMP approach to the current level of stormwater activity in Leavenworth is entirely appropriate and generally effective.

They address the main concerns of the city: water quantity, water quality and construction site run-off. The implementation of the LDP has improved erosion and runoff during and after construction on many projects. The aggressive street sweeping program catches much of the salt and sand from winter operations before the spring rains. Grease trap and detention basin inspection are important programs. Staff is aware of the significance of the stormwater issues reviewed by KDHE and seeks to ensure compliance by having an empowered staff and opportunities for the public to comment or become involved.

- d. **An assessment of the effectiveness of the BMPs towards achieving the statutory goal of reducing the discharge of pollutants to the Maximum Extent Practicable (MEP).** Current BMP installations are seen as generally effective for water quality. Pond performance is seen as less than expected when reviewing water quantity issues.

The City of Leavenworth has evaluated the functionality of various types of BMPs in Leavenworth while preparing this document and consideration of an updated stormwater design manual. BMP overall effectiveness, economy, and general upkeep needs will drive BMP selection on future developments in Leavenworth. For instance, most in-situ soils in Leavenworth have low permeability which has led the Public Works staff to favor BMPs focused more on pollutant removal rather than stormwater infiltration. Recently constructed detention basins and bank stabilization projects have proven stable in normal rains.

The increased numbers of programs and greater inspection efforts have surely improved water quality in at least the local area of implementation. It is clear that without additional enforcement options there is minimal effort or

CITY OF LEAVENWORTH

Kansas Stormwater Annual Report Form for Municipal Separate Storm Sewer Systems
January 1, 2018 – December 31, 2018

interest on the part of owners and contractors on complying with record keeping and maintenance for all BMPs.

3. **Summarize water quality test results, if such testing has been conducted, and address any trends or outliers, i.e., unusually high or low pollutant concentrations. As the data is somewhat limited (perhaps only data over the last five years), definitive conclusions may not be possible; however, if trends are observed, some adjustment in the Stormwater Management Program (SMP) may be justified.** A summary of the results for the five years of sampling is included in this narrative along with several graphs and charts in Appendix A. The City's opinion is it met all the program requirements. In general the City observed the following during this water quality sampling process:
- a. **The stream stage is extremely sensitive to rainfall intensity and duration.** It was difficult to have all of the samples taken during a "rising stream" stage. Details on this have been reported in previous annual reports.
 - b. **Measuring stream volume is difficult.** City has used manual methods and "stage-discharge" charts to estimate volume while sampling. Ultimately, it was found most effective to use the manual methods to calculate volume.
 - c. **Differences in water quality data are difficult to interpret.** A very simplistic analysis shows that in 2014 water quality was improved by flowing through the City of Leavenworth. This was NOT TRUE in 2015, 2016, 2017 or 2018. Data does show that water generally degraded as it passed through Leavenworth although 3-Mile Creek was not degraded in 2018, and 5-Mile Creek was not degraded in 2015.

Staff opinion is that the tables show generally better water quality in 5-Mile Creek from 2014 to 2017. In 2018 water quality was much better in 3-Mile Creek than 5-Mile Creek. Speculation is that 3-Mile Creek generally suffers from receiving urban runoff and residential housing on smaller lots, and 5-Mile Creek is larger sized properties with more vegetation. The 2018 degradation in 5-Mile Creek is suspected as being a by-product of an increasing residential and commercial construction activity although no single set of test results can identify specific issues.

CITY OF LEAVENWORTH

Kansas Stormwater Annual Report Form for Municipal Separate Storm Sewer Systems
January 1, 2018 – December 31, 2018

4. ***Address any SMP modifications which will be considered and possibly implemented in the next few years (up to five years).*** The City expects that the following issues will be evaluated in the next five years as part of the SMP.

- a. Improve citizen contact and reduce ineffective methods such as tracking use of information at the library.
- b. Consider adopting revised APWA 5600 specifications.
- c. Require monitoring to ensure ponds meet design criteria.
- d. Consider revisions to the current “Stormwater Guidelines” especially related to effective implementation, and consider revisions to the fee and fine schedules.
- e. Expand awareness of BMP maintenance expectations and requirements with a fee and fine structure, especially for ponds and grease traps.
- f. Increase staff training related to construction site inspection and post construction inspection activities throughout the year.
- g. Increase exposure of staff members from building inspection and code enforcement to stormwater issues, especially with illicit discharge issues.
- h. Seek opportunities with community groups to improve awareness of stormwater issues.
- i. Construct stormwater quality and quantity improvements on City facilities.

Appendix A

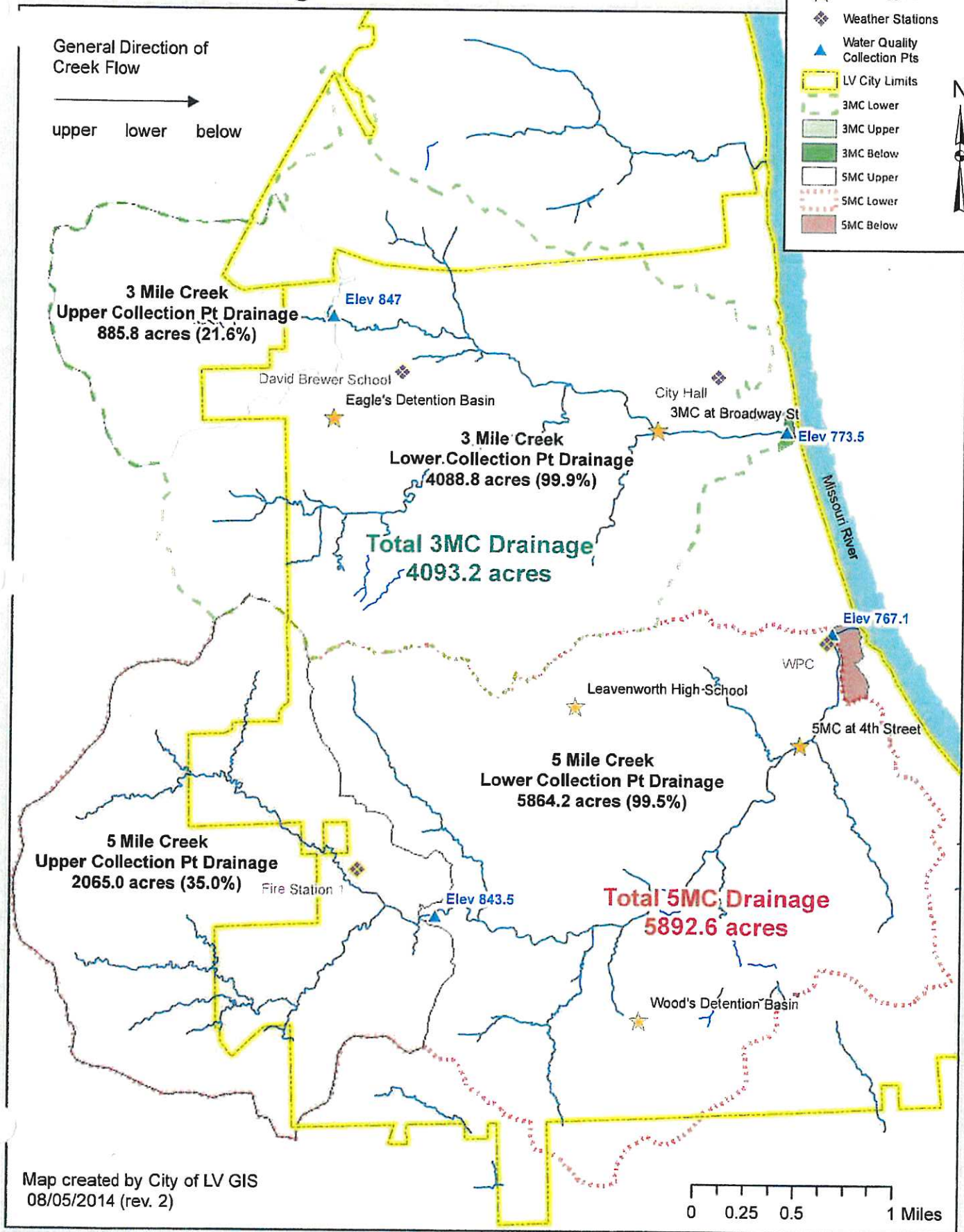
Summary of Sampling Data

- Overall
- Basin Maps
 - 3-Mile Creek
 - 5-Mile Creek
- Location Detail Coordinates
- Weather Monthly Summary Sheets (City Hall)
- Data Collection Time Summary (Shown on Water Quality Sheet)
- Data Collection Visual Summary
- Summary of Water Quality Data (six storms) in 2018
- Summary of 2014-2018 Water Quality Data

City of Leavenworth, KS Stormwater Management Data Collection

- Legend**
- ★ Data Loggers
 - ◆ Weather Stations
 - ▲ Water Quality Collection Pts
 - ▭ LV City Limits
 - ▭ 3MC Lower
 - ▭ 3MC Upper
 - ▭ 3MC Below
 - ▭ 5MC Upper
 - ▭ 5MC Lower
 - ▭ 5MC Below

General Direction of
Creek Flow
→
upper lower below












Map created by City of LV GIS
08/05/2014 (rev. 2)

0 0.25 0.5 1 Miles

City of Leavenworth, KS

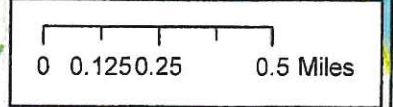
Three Mile Creek Sampling Sites

Legend

-  Water Quality Collection Pts
-  LV City Limits
-  3MC Lower
-  3MC Upper
-  3MC Below
-  5MC Upper
-  5MC Lower
-  5MC Below
-  centerline.DBO.Arte...












Map Prepared by City of LV GIS
01/19/2018

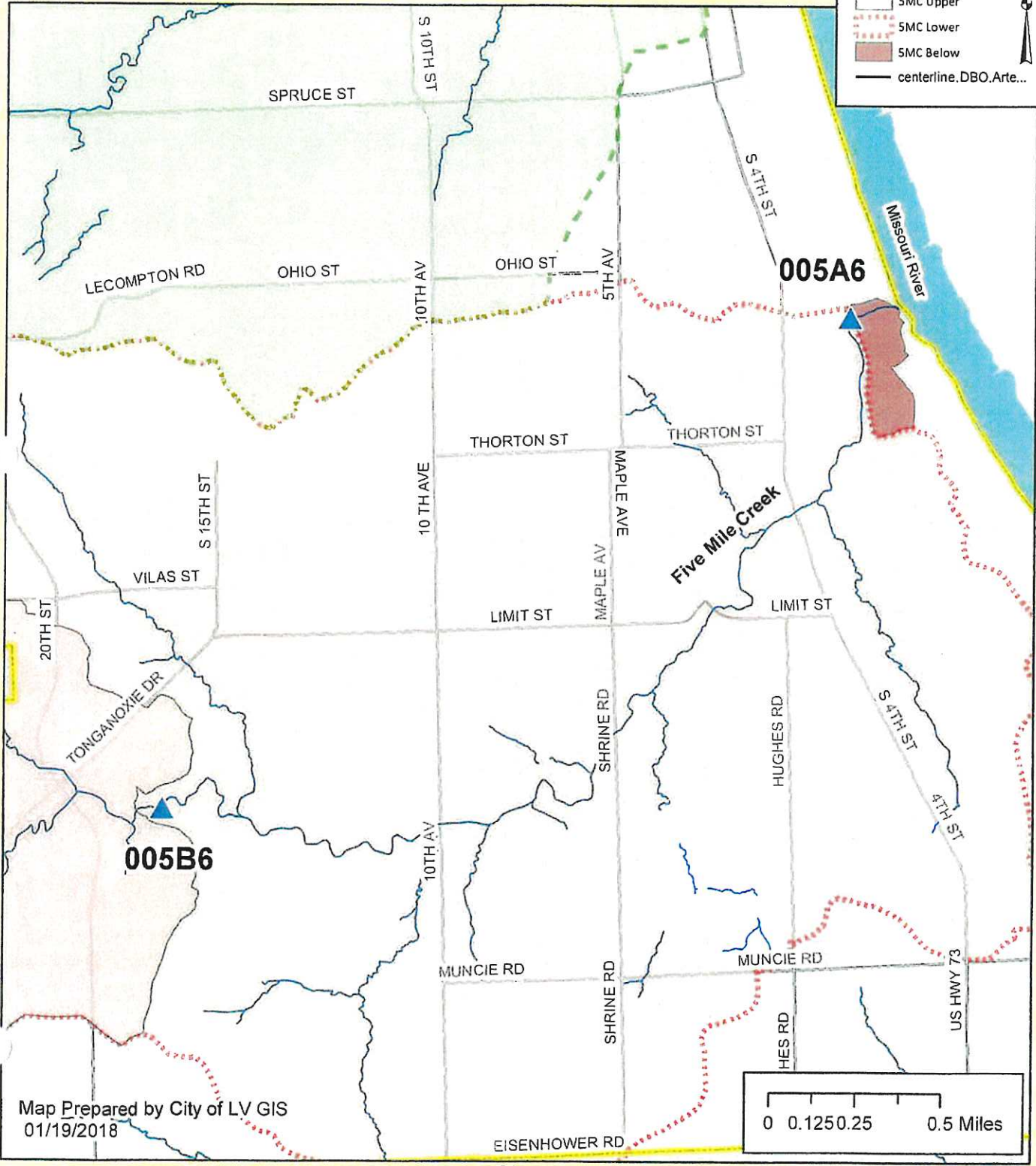


City of Leavenworth, KS

Five Mile Creek Sampling Sites

Legend

-  Water Quality Collection Pts
-  LV City Limits
-  3MC Lower
-  3MC Upper
-  3MC Below
-  5MC Upper
-  5MC Lower
-  5MC Below
-  centerline.DBO.Arte...



Map Prepared by City of LV GIS
01/19/2018

City of Leavenworth, Kansas

Water Quality Collection Points

Location	KS ID	Type	Measurement Location	Elevation	Additional Height	Baseline	LATITUDE	LONGITUDE
5MC West	005B6	Deck	@7th vert f/ east upstr edge	843.5	Handrail Elev = 848.3	848.3	39.28160093	-94.94268289
3MC West	003B6	Deck	@4th vert f/ north upstr edg	847.0	Handrail Elev = 848.1	848.1	39.32462470	-94.95067177
5MC East	005A6	Deck	@5th vert f/ north upstr edg	767.1	Deck Elev = 767.1	767.1	39.30099774	-94.90515459
3MC East	003A6	Deck	@4th vert f/ north upstr edg	773.5	Handrail Elev = 777.0	777.0	39.31544044	-94.90893167

Update by City of Leavenworth GIS, February 16, 2018

Kansas FIPS 1501 North (Decimal Degrees)

MONTHLY CLIMATOLOGICAL SUMMARY for JAN. 2018

NAME: Leavenworth City Hall CITY: Leavenworth STATE: Kansas
 ELEV: 851 ft LAT: 39° 18' 00" N LONG: 94° 54' 00" W

TEMPERATURE (°F), RAIN (in), WIND SPEED (mph)

DAY	MEAN TEMP	HIGH	TIME	LOW	TIME	HEAT DEG DAYS	COOL DEG DAYS	RAIN	AVG WIND SPEED	HIGH	TIME	DOM DIR
1	-1.0	8.5	3:45p	-9.4	7:30a	66.0	0.0	0.00	2.6	15.0	1:45p	N
2	10.5	21.8	4:00p	-2.5	7:45a	54.5	0.0	0.00	3.0	18.0	4:15p	SW
3	19.9	24.7	5:30a	11.3	12:00m	45.1	0.0	0.00	5.3	27.0	5:00a	NNW
4	14.2	23.5	4:30p	5.8	7:45a	50.8	0.0	0.00	1.6	8.0	4:00a	SE
5	18.4	26.8	2:15p	12.6	4:15a	46.6	0.0	0.00	3.6	13.0	10:15a	NE
6	21.1	30.6	12:00m	11.4	8:00a	43.9	0.0	0.00	3.5	14.0	2:45p	SE
7	35.2	38.0	8:15a	30.6	12:15a	29.8	0.0	0.05	1.9	14.0	4:00a	SSE
8	37.6	52.8	3:00p	27.4	7:45a	27.4	0.0	0.00	0.5	6.0	9:00a	NW
9	37.4	43.7	3:00p	31.5	4:15a	27.6	0.0	0.00	1.3	12.0	5:00p	SE
10	47.4	56.3	7:30p	38.7	4:00a	17.6	0.0	0.00	5.9	28.0	12:45p	S
11	24.6	51.5	12:15a	11.6	12:00m	40.4	0.0	0.08	6.5	31.0	8:00a	NNW
12	10.9	15.7	1:45p	4.9	7:45a	54.1	0.0	0.00	5.3	20.0	12:15a	NNW
13	15.7	19.6	8:30p	11.1	5:45a	49.3	0.0	0.00	2.7	14.0	2:00a	N
14	24.1	34.4	11:30p	16.5	4:00a	40.9	0.0	0.13	3.6	18.0	3:30p	SE
15	11.9	34.0	12:15a	0.1	12:00m	53.1	0.0	0.00	7.0	34.0	2:45a	NNW
16	2.8	9.2	4:15p	-3.2	5:15a	62.2	0.0	0.00	3.3	16.0	10:15a	WNW
17	13.3	25.1	4:00p	1.4	2:30a	51.7	0.0	0.00	3.2	17.0	4:15p	W
18	28.0	38.4	3:45p	16.8	12:15a	37.0	0.0	0.00	4.7	23.0	11:15a	S
19	39.1	46.7	4:30p	30.4	7:45a	25.9	0.0	0.00	6.0	24.0	3:00p	S
20	45.6	51.8	3:45p	36.8	12:00m	19.4	0.0	0.00	2.0	18.0	12:45p	S
21	50.6	62.1	5:00p	34.4	1:15a	14.4	0.0	0.51	1.6	28.0	1:00p	SE
22	36.9	53.2	12:15a	30.4	10:15p	28.1	0.0	0.07	5.4	30.0	8:30p	W
23	30.7	35.5	4:45p	27.2	10:45a	34.3	0.0	0.00	4.0	29.0	1:15a	WNW
24	38.2	51.2	3:45p	28.7	1:30a	26.8	0.0	0.00	1.2	13.0	11:15p	S
25	49.3	65.0	4:30p	36.8	7:45a	15.7	0.0	0.00	5.7	30.0	11:00p	S
26	51.9	58.0	3:30p	39.5	12:00m	13.1	0.0	0.00	10.6	42.0	10:45a	S
27	43.3	55.6	5:15p	31.2	7:45a	21.7	0.0	0.00	2.3	17.0	2:30p	WNW
28	31.3	38.0	12:15a	22.2	12:00m	33.7	0.0	0.00	3.6	22.0	10:15p	N
29	21.5	31.7	4:00p	12.7	7:45a	43.5	0.0	0.00	3.1	18.0	2:00a	NNW
30	36.1	49.7	3:45p	20.8	2:00a	28.9	0.0	0.00	7.1	35.0	11:00p	S
31	43.8	49.9	3:00p	39.5	8:00a	21.2	0.0	0.00	4.3	25.0	12:30a	N
	28.7	65.0	25	-9.4	1	1124.7	0.0	0.84	3.9	42.0	26	S

Max >= 90.0: 0

Max <= 32.0: 11

Min <= 32.0: 25

Min <= 0.0: 3

Max Rain: 0.51 ON 01/21/18

Days of Rain: 5 (>.01 in) 2 (>.1 in) 0 (>1 in)

Heat Base: 65.0 Cool Base: 65.0 Method: Integration

MONTHLY CLIMATOLOGICAL SUMMARY for FEB. 2018

NAME: Leavenworth City Hall CITY: Leavenworth STATE: Kansas
 ELEV: 851 ft LAT: 39° 18' 00" N LONG: 94° 54' 00" W

TEMPERATURE (°F), RAIN (in), WIND SPEED (mph)

DAY	MEAN TEMP	HIGH	TIME	LOW	TIME	HEAT DEG DAYS	COOL DEG DAYS	RAIN	AVG WIND SPEED	HIGH	TIME	DOM DIR
1	26.7	40.4	2:45a	16.2	11:30p	38.3	0.0	0.00	6.6	28.0	7:15a	NNW
2	23.4	34.7	5:30p	11.6	6:45a	41.6	0.0	0.00	4.1	17.0	5:00p	S
3	40.5	50.7	2:15p	31.1	12:30a	24.5	0.0	0.00	7.2	27.0	11:45a	S
4	17.7	39.5	12:15a	5.8	12:00m	47.3	0.0	0.00	6.8	28.0	5:45a	NNW
5	12.8	20.6	4:15p	3.0	4:45a	52.2	0.0	0.00	3.1	13.0	11:30a	W
6	13.9	17.8	4:15p	10.2	7:45a	51.1	0.0	0.00	3.9	14.0	6:30p	NNE
7	20.2	29.8	4:30p	11.2	7:30a	44.8	0.0	0.00	2.4	13.0	10:00a	NNW
8	36.8	52.1	4:30p	20.6	2:30a	28.2	0.0	0.00	4.2	20.0	1:15p	S
9	29.0	45.7	12:15a	15.7	12:00m	36.0	0.0	0.00	7.0	23.0	9:30p	N
10	16.2	21.8	3:45p	11.4	8:00a	48.8	0.0	0.00	6.9	27.0	1:15a	N
11	21.0	34.0	4:00p	12.0	8:15a	44.0	0.0	0.00	3.4	17.0	12:15a	NNW
12	24.1	35.0	4:15p	13.8	7:00a	40.9	0.0	0.00	3.4	17.0	4:30p	E
13	36.2	49.4	3:30p	25.8	6:00a	28.8	0.0	0.00	4.3	22.0	3:00p	S
14	45.5	57.1	4:45p	36.6	12:15a	19.5	0.0	0.00	2.5	18.0	8:00a	S
15	53.4	63.3	11:15a	34.7	12:00m	11.6	0.0	0.00	6.2	33.0	11:00p	NNW
16	29.1	36.0	3:30p	20.6	9:00a	35.9	0.0	0.00	4.3	27.0	1:15a	NNW
17	39.6	53.6	4:00p	28.3	12:15a	25.4	0.0	0.00	3.8	23.0	11:45a	NNW
18	46.8	56.7	4:30p	30.1	2:00a	18.2	0.0	0.00	8.4	42.0	10:15a	S
19	42.1	64.8	8:45a	28.4	11:45p	22.9	0.0	0.02	6.2	33.0	5:00a	NNW
20	24.8	29.5	1:15a	18.6	12:00m	40.2	0.0	0.57	2.4	13.0	9:30a	NNW
21	21.1	26.6	4:45p	14.0	7:00a	43.9	0.0	0.00	2.9	11.0	12:00p	N
22	29.3	32.9	8:00p	25.3	1:45a	35.7	0.0	0.08	1.1	9.0	12:30a	E
23	33.4	35.3	3:45p	32.4	1:30a	31.6	0.0	0.00	1.0	8.0	9:30a	NNW
24	34.4	38.8	2:30p	32.1	11:00p	30.6	0.0	0.16	2.4	16.0	7:45p	W
25	38.3	50.8	4:45p	26.5	7:15a	26.7	0.0	0.00	1.7	15.0	12:15p	W
26	45.1	61.3	3:30p	28.7	7:00a	19.9	0.0	0.00	2.2	20.0	12:45p	SSE
27	55.0	67.7	3:45p	39.7	12:30a	10.2	0.2	0.00	7.7	32.0	4:30p	S
28	51.2	59.0	4:30p	42.7	12:00m	13.8	0.0	0.00	1.7	22.0	11:15p	NNW
	32.4	67.7	27	3.0	5	912.6	0.2	0.83	4.2	42.0	18	NNW

Max >= 90.0: 0
 Max <= 32.0: 6
 Min <= 32.0: 22
 Min <= 0.0: 0

Max Rain: 0.57 ON 02/20/18

Days of Rain: 4 (>.01 in) 2 (>.1 in) 0 (>1 in)

Heat Base: 65.0 Cool Base: 65.0 Method: Integration

MONTHLY CLIMATOLOGICAL SUMMARY for MAR. 2018

NAME: Leavenworth City Hall CITY: Leavenworth STATE: Kansas
 ELEV: 851 ft LAT: 39° 18' 00" N LONG: 94° 54' 00" W

TEMPERATURE (°F), RAIN (in), WIND SPEED (mph)

DAY	MEAN TEMP	HIGH	TIME	LOW	TIME	HEAT DEG DAYS	COOL DEG DAYS	RAIN	AVG WIND SPEED	HIGH	TIME	DOM DIR
1	41.4	53.0	4:30p	32.4	7:00a	23.6	0.0	0.00	4.3	21.0	12:45a	NNW
2	43.1	57.9	4:15p	27.2	5:45a	21.9	0.0	0.00	3.0	22.0	3:45p	SE
3	54.0	66.4	4:30p	41.4	7:30a	11.1	0.1	0.00	6.0	25.0	11:00a	SE
4	53.2	61.9	2:30p	45.2	7:15a	11.8	0.0	0.00	7.6	24.0	4:15p	SE
5	48.3	54.2	4:30a	41.8	10:00a	16.7	0.0	0.01	8.7	38.0	12:30p	W
6	35.8	44.7	12:15a	31.4	9:30a	29.2	0.0	0.00	12.6	47.0	8:00a	W
7	31.1	40.8	4:30p	24.4	6:30a	33.9	0.0	0.00	5.8	24.0	2:30a	NNW
8	32.4	45.1	4:30p	20.3	7:30a	32.6	0.0	0.00	2.0	13.0	9:15a	W
9	42.6	58.0	3:45p	28.8	2:00a	22.4	0.0	0.00	3.1	16.0	9:45a	ENE
10	44.2	56.4	2:15p	31.5	5:45a	20.8	0.0	0.00	2.8	14.0	7:15p	ENE
11	38.9	46.6	12:15a	33.4	12:00m	25.0	0.0	0.00	6.6	25.0	11:30a	NNW
12	39.8	52.3	5:30p	31.2	4:45a	25.2	0.0	0.00	4.6	18.0	5:45a	NNW
13	39.3	50.7	5:45p	28.1	7:45a	25.7	0.0	0.00	4.2	22.0	3:30p	NNW
14	45.6	65.0	5:30p	24.7	6:30a	19.4	0.0	0.00	4.2	23.0	2:30p	SW
15	57.9	74.8	5:30p	42.0	7:15a	9.3	2.2	0.00	2.6	16.0	4:00p	SE
16	47.7	56.9	12:15a	40.7	11:15a	17.3	0.0	0.18	7.2	30.0	11:45p	E
17	39.8	47.1	12:15a	37.0	7:15a	25.2	0.0	0.00	5.6	25.0	12:30a	NNW
18	41.9	47.4	5:15p	38.7	9:00a	23.1	0.0	0.00	3.2	16.0	9:15p	ENE
19	43.7	50.2	7:30p	38.9	8:30a	21.3	0.0	0.71	5.3	25.0	2:00p	NNE
20	42.3	46.9	12:15p	39.6	7:15a	22.7	0.0	0.00	4.0	21.0	2:15p	NNW
21	42.6	56.0	6:30p	30.6	8:00a	22.4	0.0	0.00	2.4	16.0	1:00a	NNW
22	52.1	67.1	5:00p	40.0	2:30a	13.1	0.2	0.00	3.6	20.0	2:45p	SE
23	49.8	58.1	4:30p	43.8	6:15a	15.2	0.0	0.00	6.7	22.0	6:00p	E
24	44.1	49.1	12:15a	35.5	11:45p	20.9	0.0	0.04	4.3	27.0	1:15p	NNW
25	38.0	42.8	4:00p	33.0	6:15a	27.0	0.0	0.00	4.1	15.0	3:30p	E
26	45.1	49.4	8:15p	41.4	6:45a	19.9	0.0	0.33	2.7	16.0	7:45a	E
27	42.9	46.6	12:15a	39.1	8:15a	22.1	0.0	0.00	2.5	18.0	3:30a	N
28	46.1	51.8	5:15p	40.2	7:45a	18.9	0.0	0.00	0.6	6.0	3:45p	SE
29	41.3	46.6	12:15a	38.9	3:45a	23.7	0.0	0.00	2.3	14.0	8:00a	N
30	44.5	57.8	5:30p	28.7	7:00a	20.5	0.0	0.00	2.1	18.0	6:45p	NNW
31	49.1	59.5	11:00a	36.1	12:00m	15.9	0.0	0.00	9.3	31.0	6:15a	N

	43.8	74.8	15	20.3	8	657.8	2.5	1.27	4.6	47.0	6	NNW

Max >= 90.0: 0
 Max <= 32.0: 0
 Min <= 32.0: 11
 Min <= 0.0: 0

Max Rain: 0.71 ON 03/19/18

Days of Rain: 4 (>.01 in) 3 (>.1 in) 0 (>1 in)

Heat Base: 65.0 Cool Base: 65.0 Method: Integration

MONTHLY CLIMATOLOGICAL SUMMARY for APR. 2018

NAME: Leavenworth City Hall CITY: Leavenworth STATE: Kansas
 ELEV: 851 ft LAT: 39° 18' 00" N LONG: 94° 54' 00" W

TEMPERATURE (°F), RAIN (in), WIND SPEED (mph)

DAY	MEAN TEMP	HIGH	TIME	LOW	TIME	HEAT DEG DAYS	COOL DEG DAYS	RAIN	AVG WIND SPEED	HIGH	TIME	DOM DIR
1	27.2	36.1	12:15a	23.2	11:30p	37.8	0.0	0.14	5.6	30.0	4:45a	NNE
2	27.6	33.6	6:45p	21.5	7:15a	37.4	0.0	0.00	3.7	15.0	1:15p	ESE
3	34.7	39.9	3:00p	26.8	12:00m	30.3	0.0	0.07	7.1	33.0	4:15p	NNW
4	30.9	44.9	6:30p	18.2	7:15a	34.1	0.0	0.00	4.8	28.0	12:30a	NNW
5	50.7	68.4	6:30p	36.4	2:30a	14.5	0.3	0.00	3.5	20.0	12:00p	SE
6	36.0	50.9	12:15a	22.9	9:00p	29.0	0.0	0.00	8.3	39.0	1:15p	N
7	30.9	42.9	6:00p	20.0	7:15a	34.1	0.0	0.00	4.0	19.0	1:30a	N
8	33.6	37.5	10:15a	31.7	2:00a	31.4	0.0	0.08	2.8	24.0	10:30a	SE
9	36.5	41.5	4:00p	31.0	4:00a	28.5	0.0	0.00	1.8	13.0	4:45p	N
10	45.4	61.7	6:00p	28.6	7:15a	19.6	0.0	0.00	2.6	19.0	5:15p	S
11	62.7	80.0	5:30p	46.7	6:30a	6.4	4.1	0.00	6.3	29.0	4:30p	S
12	70.3	81.9	4:00p	54.6	7:15a	1.3	6.6	0.00	6.8	28.0	1:00a	S
13	71.1	82.0	2:30p	55.0	12:00m	1.0	7.1	0.41	11.1	41.0	1:45p	S
14	39.5	55.0	12:15a	30.2	12:00m	25.5	0.0	0.02	4.0	23.0	9:30p	SW
15	29.4	31.6	6:00p	27.0	7:15a	35.6	0.0	0.00	7.3	32.0	5:00a	NNW
16	38.1	51.4	5:30p	27.3	6:30a	26.9	0.0	0.00	4.3	22.0	9:15a	NNW
17	48.7	65.0	6:15p	33.5	7:00a	16.3	0.0	0.00	4.8	19.0	2:00p	E
18	44.1	55.0	12:15a	38.2	10:45p	20.9	0.0	0.00	7.8	31.0	1:45p	NW
19	45.8	58.0	4:15p	32.8	6:45a	19.2	0.0	0.00	3.9	16.0	12:00p	E
20	50.2	62.2	4:00p	34.7	7:00a	14.8	0.0	0.00	3.6	19.0	11:00a	ESE
21	55.0	64.1	6:00p	48.5	8:15a	10.0	0.0	0.00	3.8	17.0	5:15p	ENE
22	57.1	67.1	5:45p	47.8	10:00a	8.0	0.1	0.00	5.0	22.0	6:15p	NE
23	63.7	75.2	5:00p	54.5	4:45a	4.2	2.9	0.00	3.8	19.0	2:30p	N
24	61.8	77.3	3:30p	46.4	6:45a	6.2	3.1	0.00	3.7	30.0	9:15p	NNW
25	51.0	59.4	12:15a	46.3	12:00m	14.0	0.0	0.41	3.8	16.0	1:00a	NNE
26	55.3	69.3	6:45p	40.5	7:15a	10.3	0.6	0.00	2.8	27.0	11:15p	N
27	62.0	76.8	6:45p	44.5	6:30a	6.3	3.4	0.00	5.4	24.0	1:45p	W
28	58.1	67.3	6:15p	47.3	6:45a	7.1	0.3	0.00	3.7	15.0	12:45a	E
29	60.7	71.1	6:00p	48.5	6:00a	5.6	1.2	0.00	5.6	22.0	8:45a	SE
30	70.4	82.3	5:30p	59.1	7:00a	1.4	6.7	0.00	9.9	41.0	5:45p	S
	48.3	82.3	30	18.2	4	537.7	36.4	1.13	5.1	41.0	13	NNW

Max >= 90.0: 0

Max <= 32.0: 1

Min <= 32.0: 12

Min <= 0.0: 0

Max Rain: 0.41 ON 04/13/18

Days of Rain: 6 (>.01 in) 3 (>.1 in) 0 (>1 in)

Heat Base: 65.0 Cool Base: 65.0 Method: Integration

MONTHLY CLIMATOLOGICAL SUMMARY for MAY. 2018

NAME: Leavenworth City Hall CITY: Leavenworth STATE: Kansas
 ELEV: 851 ft LAT: 39° 18' 00" N LONG: 94° 54' 00" W

TEMPERATURE (°F), RAIN (in), WIND SPEED (mph)

DAY	MEAN TEMP	HIGH	TIME	LOW	TIME	HEAT DEG DAYS	COOL DEG DAYS	RAIN	AVG WIND SPEED	HIGH	TIME	DOM DIR
1	72.1	77.9	4:45p	63.0	7:45a	0.1	7.2	0.13	7.9	29.0	1:45a	S
2	72.3	82.5	3:30p	62.7	11:45p	0.3	7.6	1.53	6.0	25.0	1:45a	S
3	68.5	81.0	3:15p	60.0	7:00a	1.5	5.0	0.40	4.7	28.0	5:00p	S
4	66.9	78.9	5:15p	56.0	6:45a	2.5	4.3	0.00	1.9	17.0	5:15a	NNW
5	70.8	85.6	6:00p	53.8	6:45a	2.6	8.3	0.00	1.3	27.0	10:15p	W
6	74.5	87.0	5:45p	59.6	6:45a	0.5	10.0	0.00	1.9	18.0	5:15p	N
7	73.8	86.0	5:15p	61.6	6:45a	0.3	9.1	0.00	1.8	12.0	11:30a	NNE
8	75.9	86.2	1:30p	65.1	6:15a	0.0	10.9	0.00	4.1	25.0	12:30p	SE
9	76.4	86.6	4:45p	65.5	6:45a	0.0	11.4	0.00	3.6	22.0	2:00p	WNW
10	76.5	89.0	5:30p	62.7	6:15a	0.2	11.7	0.00	1.9	13.0	6:45p	WNW
11	75.9	158.0	7:00a	65.2	8:00a	0.0	10.9	0.09	5.0	25.0	11:30a	S
12	77.4	84.6	4:00p	70.0	7:45a	0.0	12.4	0.02	4.7	22.0	6:00p	S
13	80.7	90.9	5:30p	71.7	6:45a	0.0	15.7	0.00	4.8	21.0	5:30p	S
14	77.7	86.9	3:30p	70.8	11:15p	0.0	12.7	0.00	2.7	22.0	1:00a	SW
15	71.5	78.1	4:00p	66.8	5:15a	0.0	6.5	0.00	2.9	17.0	3:00a	NNE
16	69.7	82.3	6:15p	60.7	6:30a	0.6	5.4	0.07	1.6	23.0	7:15p	NNE
17	72.4	84.5	3:30p	60.7	6:45a	0.9	8.3	0.00	2.1	18.0	6:00p	SE
18	73.1	86.1	3:00p	57.9	6:30a	1.3	9.4	0.00	2.4	15.0	4:30p	E
19	72.2	83.1	4:45p	65.6	7:00a	0.0	7.2	0.07	1.5	16.0	5:00a	NNW
20	66.7	69.4	2:00p	63.8	11:45p	0.1	1.8	1.32	1.2	15.0	8:30a	N
21	64.2	73.8	6:00p	59.1	7:15a	2.5	1.7	0.00	1.5	9.0	2:30a	W
22	73.4	86.2	6:00p	57.4	5:30a	1.7	10.1	0.00	1.8	15.0	5:00p	SE
23	78.5	90.0	4:15p	64.5	6:15a	0.0	13.5	0.00	2.3	19.0	9:45p	SE
24	74.1	86.2	3:45p	67.2	6:30a	0.0	9.1	0.09	2.7	23.0	4:30p	SSE
25	75.7	86.6	5:15p	67.2	7:15a	0.0	10.7	0.04	2.6	13.0	10:30a	S
26	83.4	95.7	4:30p	70.7	6:30a	0.0	18.4	0.00	3.1	17.0	3:00p	SW
27	84.5	95.1	4:45p	71.3	6:30a	0.0	19.5	0.00	2.4	13.0	3:00p	SW
28	84.4	94.7	5:00p	72.2	6:00a	0.0	19.4	0.00	1.6	11.0	5:30p	SW
29	81.6	93.8	3:15p	69.2	12:00m	0.0	16.6	0.43	2.7	27.0	12:00m	SE
30	75.5	88.1	6:45p	62.7	6:30a	0.4	10.9	0.65	3.0	24.0	4:15p	W
31	80.3	93.6	5:00p	71.3	8:45a	0.0	15.3	0.00	2.0	19.0	6:00a	W
	74.9	158.0	11	53.8	5	15.5	321.0	4.84	2.9	29.0	1	S

Max >= 90.0: 8
 Max <= 32.0: 0
 Min <= 32.0: 0
 Min <= 0.0: 0

Max Rain: 1.53 ON 05/02/18

Days of Rain: 12 (>.01 in) 6 (>.1 in) 2 (>1 in)

Heat Base: 65.0 Cool Base: 65.0 Method: Integration

MONTHLY CLIMATOLOGICAL SUMMARY for JUN. 2018

NAME: Leavenworth City Hall CITY: Leavenworth STATE: Kansas
 ELEV: 851 ft LAT: 39° 18' 00" N LONG: 94° 54' 00" W

TEMPERATURE (°F), RAIN (in), WIND SPEED (mph)

DAY	MEAN TEMP	HIGH	TIME	LOW	TIME	HEAT DEG DAYS	COOL DEG DAYS	RAIN	AVG WIND SPEED	HIGH	TIME	DOM DIR
1	83.3	94.0	3:45p	70.7	6:00a	0.0	18.3	0.00	2.5	15.0	5:45p	SE
2	74.0	82.5	12:15a	64.3	5:00a	0.0	9.0	0.81	4.6	32.0	4:00a	NNW
3	72.5	83.5	5:00p	59.7	6:15a	0.8	8.3	0.00	2.2	19.0	3:00p	WNW
4	68.8	78.1	6:15p	59.5	5:00a	1.2	5.0	0.00	1.0	10.0	4:15p	SE
5	76.1	89.5	5:30p	59.8	6:00a	0.9	12.1	0.00	1.6	13.0	11:15a	S
6	81.8	93.7	4:45p	68.3	6:30a	0.0	16.8	0.00	2.1	36.0	11:45p	S
7	78.1	84.7	7:15p	70.2	12:30a	0.0	13.1	0.00	2.5	23.0	2:30a	ENE
8	81.6	94.2	5:00p	69.2	6:00a	0.0	16.6	0.00	2.0	16.0	6:15p	SE
9	82.9	94.2	5:15p	74.2	6:00a	0.0	17.9	0.00	4.2	28.0	9:15p	S
10	86.6	97.0	4:30p	76.4	6:30a	0.0	21.6	0.00	6.1	22.0	2:15a	S
11	85.3	96.9	4:30p	68.7	12:00m	0.0	20.3	0.12	4.4	27.0	10:15p	SE
12	77.5	87.1	4:30p	68.7	12:45a	0.0	12.5	0.02	2.1	19.0	8:30a	SW
13	77.3	82.7	4:45p	72.3	7:45a	0.0	12.3	0.00	2.8	14.0	10:00a	ENE
14	85.2	98.1	3:15p	72.5	5:30a	0.0	20.2	0.00	4.6	22.0	3:30p	S
15	87.0	95.8	3:30p	78.3	5:45a	0.0	22.0	0.00	6.9	25.0	3:15p	S
16	86.7	95.3	4:00p	78.4	5:45a	0.0	21.7	0.00	6.4	25.0	4:00p	S
17	87.2	95.8	5:15p	78.8	6:45a	0.0	22.2	0.00	6.0	25.0	12:15p	S
18	85.8	94.0	4:00p	77.1	6:00a	0.0	20.8	0.00	5.4	24.0	3:45p	S
19	78.3	85.0	7:15p	69.0	2:15p	0.0	13.3	0.74	2.6	22.0	11:45a	S
20	77.5	82.6	4:15p	68.9	12:00m	0.0	12.5	0.16	3.9	21.0	12:00p	W
21	67.0	73.2	5:15p	63.3	12:30p	0.3	2.4	0.15	3.0	24.0	3:30p	W
22	67.3	70.6	7:00p	64.7	9:00a	0.0	2.3	0.01	1.4	13.0	5:00a	NNW
23	73.7	84.9	6:30p	63.5	4:30a	0.2	8.9	0.00	1.1	9.0	1:15p	W
24	75.8	85.1	1:15p	69.9	3:45a	0.0	10.8	0.06	1.1	22.0	3:00p	SE
25	75.6	84.3	6:30p	68.6	8:00a	0.0	10.6	0.14	3.4	17.0	2:45p	S
26	77.7	88.2	5:00p	65.8	7:30a	0.0	12.7	0.24	2.2	18.0	12:30a	W
27	82.3	92.3	5:15p	70.9	6:45a	0.0	17.3	0.00	1.6	11.0	5:00p	SE
28	89.4	102.1	5:45p	78.2	6:30a	0.0	24.4	0.00	3.1	15.0	2:30p	S
29	89.2	98.5	5:00p	80.2	6:15a	0.0	24.2	0.00	6.9	26.0	11:15a	S
30	82.8	96.3	4:00p	72.0	10:15p	0.0	17.8	1.13	4.9	40.0	10:45p	S
	79.8	102.1	28	59.5	4	3.4	447.9	3.58	3.4	40.0	30	S

Max >= 90.0: 15

Max <= 32.0: 0

Min <= 32.0: 0

Min <= 0.0: 0

Max Rain: 1.13 ON 06/30/18

Days of Rain: 10 (>.01 in) 8 (>.1 in) 1 (>1 in)

Heat Base: 65.0 Cool Base: 65.0 Method: Integration

MONTHLY CLIMATOLOGICAL SUMMARY for JUL. 2018

NAME: Leavenworth City Hall CITY: Leavenworth STATE: Kansas
 ELEV: 851 ft LAT: 39° 18' 00" N LONG: 94° 54' 00" W

TEMPERATURE (°F), RAIN (in), WIND SPEED (mph)

DAY	MEAN TEMP	HIGH	TIME	LOW	TIME	HEAT DEG DAYS	COOL DEG DAYS	RAIN	AVG WIND SPEED	HIGH	TIME	DOM DIR
1	76.4	85.5	5:00p	70.4	6:15a	0.0	11.4	0.09	2.4	16.0	6:30p	W
2	77.9	88.8	5:15p	65.1	6:15a	0.0	12.9	0.00	1.4	12.0	2:15p	ESE
3	84.7	96.8	4:30p	71.4	3:45a	0.0	19.7	0.00	2.4	17.0	12:15p	SE
4	86.1	94.0	5:30p	77.3	6:30a	0.0	21.1	0.00	2.3	14.0	1:30p	SE
5	82.7	90.1	4:45p	74.8	6:00a	0.0	17.7	0.00	2.1	15.0	5:00p	N
6	81.3	89.5	6:30p	74.6	6:45a	0.0	16.3	0.00	2.4	11.0	3:00p	N
7	78.0	87.0	4:00p	69.8	6:15a	0.0	13.0	0.00	2.3	11.0	2:45p	E
8	78.0	90.8	4:00p	63.0	6:00a	0.2	13.2	0.00	1.8	13.0	2:45p	SE
9	81.3	92.4	4:45p	65.1	6:45a	0.0	16.3	0.00	1.4	14.0	12:45p	S
10	84.5	94.8	3:45p	71.9	6:30a	0.0	19.5	0.00	1.4	11.0	5:15p	NNE
11	87.2	98.2	4:15p	73.9	6:45a	0.0	22.2	0.00	1.6	12.0	2:15p	SE
12	87.9	99.2	2:00p	76.9	6:15a	0.0	22.9	0.00	1.4	21.0	3:00p	ENE
13	86.9	98.7	4:45p	76.5	12:00m	0.0	21.9	0.00	3.1	20.0	8:15p	SW
14	80.0	86.6	2:15p	74.3	5:30a	0.0	15.0	0.00	1.4	10.0	5:15a	ENE
15	82.7	91.3	4:45p	71.7	6:30a	0.0	17.7	0.00	1.6	13.0	3:30p	W
16	84.1	92.3	4:15p	75.4	6:45a	0.0	19.1	0.00	1.9	12.0	2:45p	N
17	75.7	80.3	12:15a	72.8	11:15p	0.0	10.7	0.49	1.7	13.0	5:00p	ENE
18	76.2	84.8	6:00p	70.3	9:30a	0.0	11.2	0.00	1.7	12.0	3:45p	E
19	83.2	97.0	3:00p	74.5	7:15a	0.0	18.2	0.00	2.6	27.0	4:45p	W
20	78.1	87.3	12:45p	70.1	6:00a	0.0	13.1	0.00	1.1	13.0	1:00p	NNW
21	78.4	88.3	5:00p	67.7	6:30a	0.0	13.4	0.00	2.3	15.0	11:00a	NNW
22	78.3	88.5	4:45p	68.1	5:45a	0.0	13.3	0.00	1.8	14.0	2:30p	N
23	76.3	85.2	7:00p	66.8	6:15a	0.0	11.3	0.00	1.5	12.0	4:15p	N
24	78.4	87.5	5:00p	69.4	6:45a	0.0	13.4	0.00	2.1	18.0	2:30p	N
25	77.4	90.4	1:45p	63.9	6:15a	0.1	12.4	0.00	1.3	9.0	11:00a	N
26	75.1	85.4	5:30p	66.8	10:00a	0.0	10.1	0.04	1.2	14.0	6:00p	NNW
27	74.8	85.0	5:30p	64.7	6:30a	0.0	9.8	0.00	1.3	12.0	3:15p	ENE
28	74.9	83.4	1:45p	68.2	6:00a	0.0	9.9	0.00	2.6	17.0	1:45p	ENE
29	70.5	76.0	6:45p	65.2	7:15a	0.0	5.5	0.77	2.2	13.0	4:15p	ENE
30	70.3	79.8	5:30p	62.6	12:00m	0.2	5.5	0.39	1.5	14.0	9:00p	ESE
31	72.0	83.7	4:00p	60.4	6:45a	1.1	8.0	0.01	1.2	17.0	4:30p	NW
	79.3	99.2	12	60.4	31	1.6	445.7	1.79	1.8	27.0	19	N

Max >= 90.0: 13
 Max <= 32.0: 0
 Min <= 32.0: 0
 Min <= 0.0: 0

Max Rain: 0.77 ON 07/29/18

Days of Rain: 5 (>.01 in) 3 (>.1 in) 0 (>1 in)

Heat Base: 65.0 Cool Base: 65.0 Method: Integration

MONTHLY CLIMATOLOGICAL SUMMARY for AUG. 2018

NAME: Leavenworth City Hall CITY: Leavenworth STATE: Kansas
 ELEV: 851 ft LAT: 39° 18' 00" N LONG: 94° 54' 00" W

TEMPERATURE (°F), RAIN (in), WIND SPEED (mph)

DAY	MEAN TEMP	HIGH	TIME	LOW	TIME	HEAT DEG DAYS	COOL DEG DAYS	RAIN	AVG WIND SPEED	HIGH	TIME	DOM DIR
1	76.1	87.8	2:00p	62.1	6:45a	0.2	11.3	0.00	0.9	9.0	3:00p	NE
2	80.7	93.7	5:00p	66.3	7:00a	0.0	15.7	0.00	2.0	16.0	10:45p	N
3	82.8	95.4	4:15p	68.5	6:45a	0.0	17.8	0.00	3.7	20.0	5:45p	S
4	81.7	91.7	2:00p	72.8	7:30a	0.0	16.7	0.08	4.1	24.0	1:45p	S
5	86.2	97.7	4:15p	74.9	5:45a	0.0	21.2	0.00	5.9	23.0	2:15p	S
6	84.8	96.5	6:30p	73.0	10:45p	0.0	19.8	0.00	3.5	17.0	9:15p	SW
7	76.5	86.8	6:00p	67.7	6:00a	0.0	11.5	0.53	1.6	17.0	2:00a	N
8	79.8	90.1	4:00p	68.1	7:00a	0.0	14.8	0.00	0.9	10.0	4:00p	NE
9	80.6	93.0	5:45p	70.0	6:00a	0.0	15.6	0.00	1.5	27.0	6:15p	SW
10	78.8	88.6	4:30p	68.8	5:30a	0.0	13.8	0.00	1.8	15.0	3:15p	N
11	78.7	89.0	2:15p	67.4	6:45a	0.0	13.7	0.00	1.2	9.0	4:00p	NW
12	79.8	91.3	4:00p	67.3	7:15a	0.0	14.8	0.00	1.8	13.0	3:15p	NNE
13	80.8	91.1	4:15p	71.6	6:45a	0.0	15.8	0.00	2.4	16.0	9:30p	ESE
14	74.0	80.9	2:15p	71.1	6:00p	0.0	9.0	0.54	1.1	22.0	4:15p	SE
15	76.9	84.5	1:45p	71.7	2:30a	0.0	11.9	0.00	0.8	11.0	4:00p	SSW
16	79.2	89.4	3:45p	70.4	6:45a	0.0	14.2	0.00	1.2	19.0	10:00p	N
17	77.8	86.2	6:45p	69.9	7:00a	0.0	12.8	0.00	1.7	15.0	11:30a	WNW
18	79.4	88.2	2:00p	68.5	7:00a	0.0	14.4	0.00	1.3	9.0	3:00p	N
19	73.7	78.3	12:00p	70.7	5:30p	0.0	8.7	1.87	1.0	17.0	4:15p	SE
20	68.4	73.5	11:15a	66.7	2:45a	0.0	3.4	0.24	5.0	27.0	1:15p	W
21	71.7	80.3	4:30p	63.1	7:00a	0.1	6.8	0.00	2.3	16.0	3:30p	NNW
22	69.0	76.9	3:30p	63.2	7:15a	0.3	4.3	0.00	0.9	7.0	1:45p	NE
23	67.4	77.4	6:00p	62.2	10:15a	0.8	3.1	0.71	2.0	23.0	4:30p	SSE
24	80.4	90.8	6:00p	68.5	1:15a	0.0	15.4	0.00	4.1	19.0	3:45p	S
25	85.0	96.1	3:30p	77.5	5:45a	0.0	20.0	0.00	4.9	19.0	6:00a	SW
26	84.4	93.3	4:15p	77.8	8:30a	0.0	19.4	0.00	5.7	27.0	8:15p	S
27	85.1	94.3	4:15p	75.9	6:30a	0.0	20.1	0.13	9.1	32.0	2:45p	S
28	82.8	93.1	2:30p	68.5	12:00m	0.0	17.8	0.00	6.7	29.0	10:00a	S
29	68.0	77.3	5:45p	59.9	7:30a	1.3	4.3	0.23	2.2	19.0	12:15a	ENE
30	71.6	78.9	5:30p	68.0	12:15a	0.0	6.6	0.17	2.1	19.0	5:15p	SE
31	77.9	90.6	6:00p	68.8	7:45a	0.0	12.9	0.00	4.2	21.0	5:45p	SE
	78.1	97.7	5	59.9	29	2.7	407.6	4.50	2.8	32.0	27	S

Max >= 90.0: 15
 Max <= 32.0: 0
 Min <= 32.0: 0
 Min <= 0.0: 0

Max Rain: 1.87 ON 08/19/18

Days of Rain: 9 (>.01 in) 8 (>.1 in) 1 (>1 in)

Heat Base: 65.0 Cool Base: 65.0 Method: Integration

MONTHLY CLIMATOLOGICAL SUMMARY for SEP. 2018

NAME: Leavenworth City Hall CITY: Leavenworth STATE: Kansas
 ELEV: 851 ft LAT: 39° 18' 00" N LONG: 94° 54' 00" W

TEMPERATURE (°F), RAIN (in), WIND SPEED (mph)

DAY	MEAN TEMP	HIGH	TIME	LOW	TIME	HEAT DEG DAYS	COOL DEG DAYS	RAIN	AVG WIND SPEED	HIGH	TIME	DOM DIR
1	84.0	92.3	4:15p	76.6	8:00a	0.0	19.0	0.00	5.7	22.0	2:30a	S
2	78.8	88.9	3:15p	73.7	7:15p	0.0	13.8	0.03	2.6	16.0	10:15a	S
3	80.3	88.7	3:45p	74.1	1:30a	0.0	15.3	0.01	2.7	23.0	4:30p	S
4	78.4	85.3	11:45a	75.0	6:45a	0.0	13.4	0.16	3.4	27.0	12:15p	S
5	73.2	75.9	12:15a	70.8	12:00m	0.0	8.2	0.48	0.9	11.0	6:15a	S
6	70.3	73.2	2:15p	68.3	4:45a	0.0	5.3	0.02	1.8	10.0	2:15p	NNE
7	66.7	68.9	12:15a	63.8	9:00p	0.1	1.8	0.16	2.1	14.0	8:30p	NNE
8	64.8	69.5	3:45p	61.6	7:45a	1.2	1.0	0.01	2.4	15.0	5:15a	NNE
9	64.9	75.3	5:45p	56.1	7:15a	2.9	2.9	0.00	1.2	8.0	2:15p	N
10	67.7	80.0	4:45p	55.1	6:45a	2.7	5.4	0.01	0.7	9.0	4:45p	SW
11	70.7	82.4	3:30p	58.0	7:00a	1.4	7.1	0.00	1.8	17.0	4:30p	S
12	71.2	81.1	5:00p	61.6	6:00a	0.6	6.8	0.00	1.5	15.0	2:30p	SE
13	73.9	82.6	4:00p	66.4	6:15a	0.0	8.9	0.00	2.4	20.0	1:00p	S
14	78.4	90.0	5:45p	66.7	7:30a	0.0	13.4	0.00	1.6	16.0	1:00p	S
15	79.9	91.7	4:15p	68.0	7:15a	0.0	14.9	0.00	0.8	11.0	4:00p	SE
16	78.6	91.4	4:15p	67.0	7:00a	0.0	13.6	0.00	0.8	11.0	2:00p	ESE
17	79.5	91.7	4:15p	67.8	5:45a	0.0	14.5	0.00	1.5	14.0	5:15p	S
18	82.4	93.7	4:45p	71.9	6:15a	0.0	17.4	0.00	2.1	18.0	2:30p	S
19	82.6	94.2	4:15p	72.1	7:00a	0.0	17.6	0.00	2.3	21.0	3:45p	S
20	84.1	92.8	3:30p	73.2	12:00m	0.0	19.1	0.01	6.2	34.0	3:15p	S
21	65.9	73.2	12:15a	58.9	12:00m	0.9	1.8	0.17	2.8	19.0	12:00p	N
22	60.2	73.0	5:30p	48.8	7:15a	6.5	1.7	0.00	1.4	10.0	1:45a	NE
23	64.1	79.4	5:00p	49.8	7:45a	5.2	4.3	0.00	1.0	14.0	3:30p	SE
24	68.2	78.5	6:00p	58.9	2:15a	1.4	4.6	0.00	1.3	15.0	2:15p	S
25	65.1	76.9	1:00p	55.1	12:00m	1.8	2.0	0.00	2.5	21.0	2:00p	N
26	56.5	69.3	6:00p	47.8	7:00a	8.9	0.5	0.00	0.9	11.0	1:30p	NNW
27	58.9	73.2	4:30p	45.1	7:00a	7.9	1.8	0.00	1.8	18.0	1:00p	S
28	55.1	62.1	2:30p	49.5	6:15a	9.9	0.0	0.00	3.2	21.0	2:45p	NNE
29	56.7	68.3	9:30p	45.4	6:00a	9.1	0.8	0.10	2.0	15.0	12:15p	SE
30	68.4	74.7	3:30p	64.9	11:45a	0.0	3.4	0.00	1.7	14.0	2:45a	SW
	71.0	94.2	19	45.1	27	60.5	240.3	1.16	2.1	34.0	20	S

Max >= 90.0: 8
 Max <= 32.0: 0
 Min <= 32.0: 0
 Min <= 0.0: 0

Max Rain: 0.48 ON 09/05/18

Days of Rain: 7 (>.01 in) 4 (>.1 in) 0 (>1 in)

Heat Base: 65.0 Cool Base: 65.0 Method: Integration

MONTHLY CLIMATOLOGICAL SUMMARY for OCT. 2018

NAME: Leavenworth City Hall CITY: Leavenworth STATE: Kansas
 ELEV: 851 ft LAT: 39° 18' 00" N LONG: 94° 54' 00" W

TEMPERATURE (°F), RAIN (in), WIND SPEED (mph)

DAY	MEAN TEMP	HIGH	TIME	LOW	TIME	HEAT DEG DAYS	COOL DEG DAYS	RAIN	AVG WIND SPEED	HIGH	TIME	DOM DIR
1	68.3	80.3	4:15p	60.2	11:45p	0.7	4.0	0.00	3.6	23.0	9:45a	S
2	71.7	86.9	4:00p	58.5	8:00a	2.5	9.2	0.00	3.1	23.0	3:45p	S
3	79.9	90.3	4:30p	66.3	11:45p	0.0	14.9	0.24	8.8	40.0	3:00p	S
4	56.3	66.9	1:00a	48.5	10:00a	8.8	0.1	0.00	2.9	19.0	9:00a	N
5	63.4	78.0	8:15p	53.1	2:30a	5.0	3.3	0.00	0.7	12.0	3:45p	SE
6	53.8	68.0	12:15a	49.9	10:15p	11.2	0.1	1.40	2.2	17.0	2:15a	N
7	57.3	65.3	4:00p	50.3	12:15a	7.7	0.0	1.73	0.3	6.0	7:15a	NNE
8	67.9	79.0	4:00p	61.9	1:45a	0.3	3.2	1.73	1.4	19.0	5:00p	SE
9	66.5	71.7	2:45p	63.6	4:45a	0.2	1.7	1.74	2.0	18.0	4:30p	E
10	51.4	65.0	12:15a	45.9	12:00m	13.6	0.0	0.11	3.0	23.0	12:45p	W
11	45.7	54.6	5:30p	38.6	7:30a	19.3	0.0	0.00	1.7	15.0	1:45a	NNW
12	45.4	47.7	12:15a	43.9	8:15a	19.6	0.0	0.33	0.5	6.0	1:15p	ENE
13	49.0	56.6	4:00p	43.6	12:00m	16.0	0.0	0.00	0.9	9.0	10:00a	SSE
14	42.1	51.2	1:00p	32.6	11:30p	22.9	0.0	0.18	1.9	21.0	2:00p	N
15	37.3	46.8	5:30p	31.0	7:45a	27.7	0.0	0.04	1.7	13.0	10:30a	W
16	46.9	65.1	5:30p	31.3	5:45a	18.1	0.0	0.00	1.7	16.0	1:45p	W
17	53.1	67.4	3:15p	40.1	7:30a	12.1	0.2	0.00	0.9	13.0	4:00p	N
18	53.0	66.9	5:00p	38.8	7:45a	12.1	0.2	0.00	1.1	13.0	1:15p	SSE
19	58.2	68.0	5:45p	53.0	8:00a	7.1	0.2	0.00	3.2	21.0	1:30p	SW
20	53.2	63.2	3:00p	42.1	11:30p	11.8	0.0	0.00	2.8	28.0	12:30p	NNW
21	49.1	64.7	5:00p	34.5	6:30a	15.9	0.0	0.00	3.4	21.0	3:45p	S
22	56.7	72.4	4:15p	46.7	7:30a	9.3	1.0	0.00	1.0	13.0	12:15a	S
23	52.8	64.9	4:00p	44.3	11:30p	12.2	0.0	0.00	0.9	9.0	4:45p	NNE
24	50.1	62.7	3:00p	36.4	7:45a	14.9	0.0	0.00	1.0	12.0	2:30p	E
25	49.2	52.4	12:15a	46.7	11:00p	15.8	0.0	0.08	1.0	8.0	4:45p	N
26	49.4	58.2	4:30p	41.6	8:30a	15.6	0.0	0.01	0.9	9.0	11:45a	W
27	57.4	72.2	5:00p	44.4	8:15a	9.0	1.4	0.00	0.7	11.0	3:30p	WNW
28	56.9	66.1	3:45p	44.4	11:45p	8.2	0.1	0.00	2.3	21.0	11:45a	NNW
29	57.3	72.1	3:45p	42.7	6:15a	9.1	1.4	0.00	2.2	20.0	12:15p	SSE
30	58.3	64.3	1:00a	53.3	12:00m	6.7	0.0	0.00	2.2	16.0	7:30p	N
31	51.9	56.8	2:00p	46.6	7:45a	13.1	0.0	0.00	1.7	13.0	12:30a	N

	55.1	90.3	3	31.0	15	346.5	41.0	7.59	2.0	40.0	3	N

Max >= 90.0: 1
 Max <= 32.0: 0
 Min <= 32.0: 2
 Min <= 0.0: 0

Max Rain: 1.74 ON 10/09/18

Days of Rain: 10 (>.01 in) 8 (>.1 in) 4 (>1 in)

Heat Base: 65.0 Cool Base: 65.0 Method: Integration

MONTHLY CLIMATOLOGICAL SUMMARY for NOV. 2018

NAME: Leavenworth City Hall CITY: Leavenworth STATE: Kansas
 ELEV: 851 ft LAT: 39° 18' 00" N LONG: 94° 54' 00" W

TEMPERATURE (°F), RAIN (in), WIND SPEED (mph)

DAY	MEAN TEMP	HIGH	TIME	LOW	TIME	HEAT DEG DAYS	COOL DEG DAYS	RAIN	AVG WIND SPEED	HIGH	TIME	DOM DIR
1	50.5	51.6	9:15p	49.5	12:00m	1.8	0.0	0.00	3.4	13.0	11:45p	SW
2	48.6	51.1	5:15p	42.0	11:15p	16.4	0.0	0.00	1.7	18.0	10:30a	W
3	50.4	59.4	2:00p	42.1	12:15a	14.6	0.0	0.17	1.7	20.0	11:15a	SE
4	44.6	50.9	12:15a	39.2	12:00m	20.4	0.0	0.01	2.3	17.0	8:00a	W
5	46.4	52.9	5:00p	39.0	12:15a	18.6	0.0	0.26	1.8	13.0	10:15p	W
6	43.4	50.0	1:30p	35.7	12:00m	21.6	0.0	0.00	2.4	18.0	1:00a	W
7	38.0	45.0	3:00p	32.8	12:00m	27.1	0.0	0.00	1.5	12.0	9:15a	NNW
8	31.2	34.9	1:30p	28.1	5:45a	33.8	0.0	0.09	0.9	7.0	8:45a	NNE
9	26.8	33.1	10:15a	16.3	12:00m	38.2	0.0	0.00	2.9	25.0	12:15p	W
10	25.3	37.3	4:00p	13.2	6:15a	39.7	0.0	0.00	2.6	24.0	2:15p	SSE
11	35.5	46.8	2:45p	25.2	12:30a	29.5	0.0	0.00	1.9	22.0	8:45a	N
12	26.5	30.9	12:15a	19.7	12:00m	38.5	0.0	0.00	5.3	23.0	11:45a	N
13	23.1	34.6	4:00p	14.0	6:45a	41.9	0.0	0.00	1.7	12.0	1:15p	NW
14	29.3	40.1	3:45p	19.5	3:45a	35.7	0.0	0.00	0.5	7.0	3:30p	SE
15	36.2	50.2	3:15p	23.4	7:00a	28.8	0.0	0.00	1.6	15.0	11:30a	S
16	45.3	56.5	4:00p	32.3	7:30a	19.7	0.0	0.00	0.9	10.0	2:30p	SSE
17	35.8	41.7	9:00a	27.0	12:00m	29.2	0.0	0.00	4.8	25.0	12:30p	N
18	28.0	37.1	3:30p	22.9	9:00a	37.0	0.0	0.00	1.8	17.0	12:45a	NNW
19	33.3	42.8	4:00p	25.7	5:15a	31.7	0.0	0.00	1.8	13.0	1:45p	NNW
20	34.3	45.2	4:15p	21.7	7:15a	30.7	0.0	0.00	1.8	16.0	2:45p	S
21	47.9	61.1	3:30p	35.1	7:30a	17.1	0.0	0.00	2.4	17.0	3:30p	S
22	49.9	62.5	3:00p	37.8	7:15a	15.1	0.0	0.00	4.7	22.0	11:15p	S
23	49.8	52.8	2:30p	45.4	11:45p	15.2	0.0	0.00	3.9	28.0	12:15p	S
24	49.1	60.4	3:30p	36.8	7:30a	15.9	0.0	0.00	0.9	11.0	11:15p	E
25	33.3	52.0	12:15a	21.3	12:00m	31.7	0.0	0.30	6.0	35.0	11:45a	N
26	23.1	27.5	7:45p	16.8	7:30a	41.9	0.0	0.00	2.7	14.0	1:15p	N
27	20.8	26.0	12:15a	15.3	7:45a	44.2	0.0	0.00	2.3	13.0	2:15a	NNW
28	28.4	36.9	2:45p	18.1	12:45a	36.6	0.0	0.00	2.0	12.0	12:00p	ESE
29	34.0	44.5	3:15p	25.7	3:30a	31.0	0.0	0.00	0.7	8.0	3:45p	NNE
30	34.3	40.3	12:00m	27.5	7:15a	30.7	0.0	0.14	2.4	13.0	11:00p	ENE
	36.8	62.5	22	13.2	10	834.3	0.0	0.97	2.4	35.0	25	N

Max >= 90.0: 0

Max <= 32.0: 3

Min <= 32.0: 18

Min <= 0.0: 0

Max Rain: 0.30 ON 11/25/18

Days of Rain: 5 (>.01 in) 4 (>.1 in) 0 (>1 in)

Heat Base: 65.0 Cool Base: 65.0 Method: Integration

MONTHLY CLIMATOLOGICAL SUMMARY for DEC. 2018

NAME: City Hall CITY: STATE:
 ELEV: 0 ft LAT: LONG:

TEMPERATURE (°F), RAIN (in), WIND SPEED (mph)

DAY	MEAN TEMP	HIGH	TIME	LOW	TIME	HEAT DEG DAYS	COOL DEG DAYS	RAIN	AVG WIND SPEED	HIGH	TIME	DOM DIR
1	43.5	51.4	11:00a	35.8	11:00p	21.5	0.0	0.83	4.0	26.0	1:00p	SW
2	34.1	36.5	1:00a	30.0	12:00m	30.9	0.0	0.00	4.8	18.0	6:30a	W
3	28.0	30.0	12:15a	26.6	12:00m	37.0	0.0	0.01	3.3	14.0	5:45a	NNW
4	27.2	29.8	8:30p	24.7	9:00a	37.8	0.0	0.00	2.3	12.0	1:45p	W
5	36.0	46.2	2:45p	26.0	7:15a	29.0	0.0	0.00	2.9	15.0	1:45p	W
6	30.0	40.0	12:15a	20.7	12:00m	35.0	0.0	0.00	3.4	15.0	11:00a	N
7	24.3	30.9	3:00p	18.3	7:45a	40.7	0.0	0.00	1.5	8.0	2:15a	ENE
8	26.2	35.3	3:00p	18.6	7:45a	38.8	0.0	0.00	1.9	12.0	2:15p	ENE
9	25.4	36.7	3:30p	14.9	7:30a	39.6	0.0	0.00	0.2	4.0	12:00p	NE
10	30.3	43.5	3:45p	17.9	6:15a	34.7	0.0	0.00	0.8	13.0	2:00p	SW
11	40.1	52.8	2:45p	28.1	4:30a	24.9	0.0	0.00	3.1	23.0	3:45p	S
12	39.9	52.8	2:30p	30.2	6:00a	25.1	0.0	0.00	1.2	9.0	12:15a	W
13	38.6	43.2	3:45a	34.5	11:15p	26.4	0.0	0.00	2.7	15.0	1:30p	NNW
14	37.2	46.2	3:15p	30.1	11:45p	27.8	0.0	0.00	3.0	19.0	3:30a	N
15	38.1	54.3	2:00p	26.7	7:00a	26.9	0.0	0.00	0.3	6.0	7:30a	NW
16	39.2	55.0	3:00p	27.4	7:45a	25.8	0.0	0.00	0.6	12.0	3:15p	NW
17	38.5	55.7	3:15p	26.5	8:00a	26.5	0.0	0.00	0.3	5.0	12:00p	SSE
18	43.5	57.6	2:00p	28.7	6:15a	21.5	0.0	0.00	1.7	19.0	12:45p	S
19	45.2	48.3	12:15a	42.7	8:15a	19.8	0.0	0.00	3.0	19.0	11:45a	S
20	38.7	43.8	12:15a	33.2	9:45p	26.3	0.0	0.00	4.2	29.0	1:45p	NNW
21	35.6	46.1	3:00p	28.7	7:15a	29.4	0.0	0.00	1.1	11.0	10:15a	NNW
22	38.8	46.4	3:45p	31.1	12:15a	26.2	0.0	0.00	1.4	13.0	3:45p	NNW
23	39.1	47.9	4:00p	29.6	7:00a	25.9	0.0	0.00	1.3	13.0	3:15p	W
24	39.3	46.1	2:30p	31.0	7:45a	25.7	0.0	0.00	1.6	17.0	8:15p	S
25	42.1	50.9	2:45p	33.3	8:00a	22.9	0.0	0.00	0.9	8.0	2:45p	ENE
26	42.9	49.5	12:00m	38.9	2:15a	22.1	0.0	1.08	2.1	18.0	8:00p	ESE
27	45.0	56.0	12:15p	25.6	12:00m	20.0	0.0	0.18	6.2	36.0	5:15a	W
28	22.5	25.8	12:15a	16.4	11:15p	42.5	0.0	0.00	4.2	15.0	12:30a	NNW
29	21.2	26.8	4:00p	16.8	12:15a	43.8	0.0	0.00	1.3	10.0	12:45p	SW
30	31.3	42.5	2:45p	20.7	2:30a	33.7	0.0	0.00	3.8	21.0	12:15p	S
31	33.8	38.7	12:15a	20.8	12:00m	31.2	0.0	0.56	3.8	24.0	5:45p	WNW

	35.3	57.6	18	14.9	9	919.4	0.0	2.66	2.4	36.0	27	NNW

Max >= 90.0: 0
 Max <= 32.0: 5
 Min <= 32.0: 25
 Min <= 0.0: 0

Max Rain: 1.08 ON 12/26/18

Days of Rain: 4 (>.01 in) 4 (>.1 in) 1 (>1 in)

Heat Base: 65.0 Cool Base: 65.0 Method: Integration

2018 STORM EVENTS: THREE- AND FIVE-MILE CREEKS, LEAVENWORTH, KS

THREE-MILE CREEK EAST LOOKING EAST (DOWNSTREAM)

MARCH 19



JUNE 2



JUNE 19



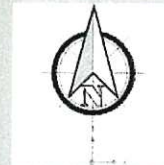
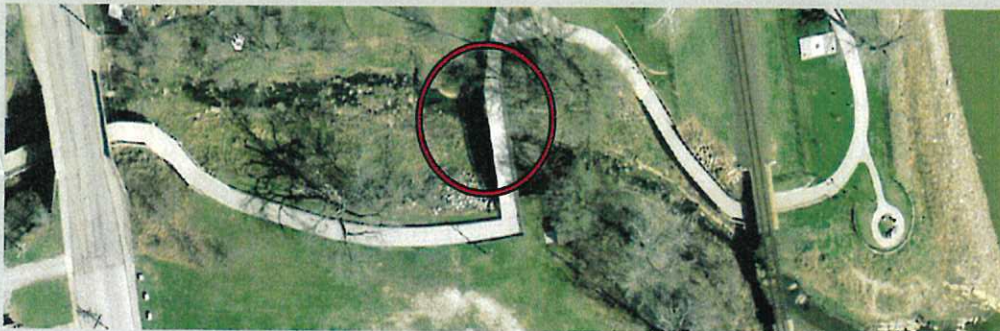
AUGUST 7



AUGUST 19



OCTOBER 8



2018 STORM EVENTS: THREE- AND FIVE-MILE CREEKS, LEAVENWORTH, KS

THREE-MILE CREEK EAST LOOKING WEST (UPSTREAM)

MARCH 19



JUNE 2



JUNE 19



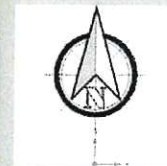
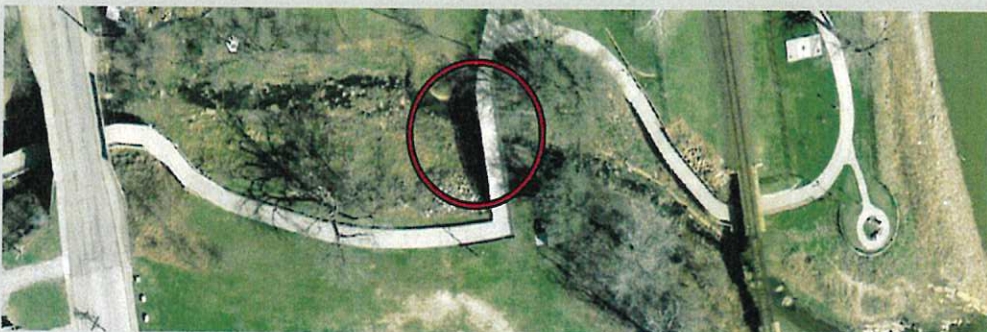
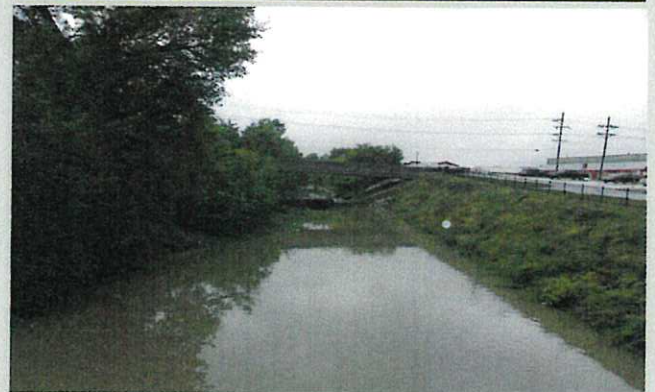
AUGUST 7



AUGUST 19



OCTOBER 8



2018 STORM EVENTS: THREE- AND FIVE-MILE CREEKS, LEAVENWORTH, KS

THREE-MILE CREEK WEST LOOKING EAST (DOWNSTREAM)

MARCH 19



JUNE 2



JUNE 19



AUGUST 7



AUGUST 19



OCTOBER 8



2018 STORM EVENTS: THREE- AND FIVE-MILE CREEKS, LEAVENWORTH, KS

THREE-MILE CREEK WEST LOOKING WEST (UPSTREAM)

MARCH 19



JUNE 2



JUNE 19



AUGUST 7



AUGUST 19



OCTOBER 8



2018 STORM EVENTS: THREE- AND FIVE-MILE CREEKS, LEAVENWORTH, KS

FIVE-MILE CREEK EAST LOOKING EAST (DOWNSTREAM)

MARCH 19



JUNE 2



JUNE 19



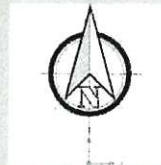
AUGUST 7



AUGUST 19



OCTOBER 8



2018 STORM EVENTS: THREE- AND FIVE-MILE CREEKS, LEAVENWORTH, KS

FIVE-MILE CREEK EAST LOOKING WEST (UPSTREAM)

MARCH 19



JUNE 2



JUNE 19



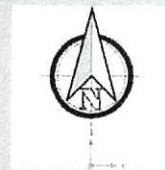
AUGUST 7



AUGUST 19



OCTOBER 8



2018 STORM EVENTS: THREE- AND FIVE-MILE CREEKS, LEAVENWORTH, KS

FIVE-MILE CREEK WEST LOOKING EAST (DOWNSTREAM)

MARCH 19



JUNE 2



JUNE 19



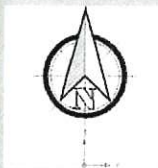
AUGUST 7



AUGUST 19



OCTOBER 8



2018 STORM EVENTS: THREE- AND FIVE-MILE CREEKS, LEAVENWORTH, KS

FIVE-MILE CREEK WEST LOOKING WEST (UPSTREAM)

MARCH 19



JUNE 2



JUNE 19



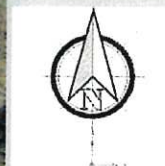
AUGUST 7



AUGUST 19



OCTOBER 8



Three- & Five-Mile Creeks Storm Events Data

Three-Mile Creek										
	2014-4 Events		2015-6 Events		2016-6 Events		2017-5 Events		2018-6 Events	
	NC/Better	Worse	NC/Better	Worse	NC/Better	Worse	NC/Better	Worse	NC/Better	Worse
Total Phosphorus	1	3	1	5	0	6	0	5	3	3
Ortho Phosphate	0	2	3	3	2	4	1	4	4	2
Nitrate+Nitrite	2	2	2	4	3	3	1	4	4	2
Total Kjeldahl Nitrogen	2	2	3	3	0	6	1	4	2	4
Total Suspended Solids	3	1	3	3	0	6	1	4	2	4
Turbidity	4	0	2	4	2	4	1	4	3	3
E.Coli			0	6	0	6	1	4	3	3
Total	12	10	14	28	7	35	6	29	21	21

Five-Mile Creek										
	2014- 4 Events		2015-6 Events		2016-6 Events		2017-5 Events		2018-6 Events	
	NC/Better	Worse	NC/Better	Worse	NC/Better	Worse	NC/Better	Worse	NC/Better	Worse
Total Phosphorus	3	1	2	4	2	4	0	5	2	4
Ortho Phosphate	2	0	5	1	3	3	1	4	2	4
Nitrate+Nitrite	0	4	0	6	3	3	1	4	1	5
Total Kjeldahl Nitrogen	4	0	4	2	1	5	2	3	2	4
Total Suspended Solids	2	2	2	4	2	4	2	3	0	6
Turbidity	2	2	3	3	3	3	2	3	2	4
E.Coli			5	1	3	3	1	4	1	5
Total	13	9	21	21	17	25	9	26	10	32

City of Leavenworth

2018 Stormwater Sampling Summary

	= Water Quality Improvement
	= Reduced or No Change in Water Quality

	Upstream		Downstream		Upstream		Downstream		Upstream		Downstream		Upstream		Downstream									
	(West)	(East)	(West)	(East)	(West)	(East)	(West)	(East)	(West)	(East)	(West)	(East)	(West)	(East)	(West)	(East)								
Date	March 19 2018				June 2 2018				June 19 2018				August 7 2018				August 19 2018				October 8 2018			
KDHE ID	003B6	003A6	003B6	003A6	003B6	003A6	003B6	003A6	003B6	003A6	003B6	003A6	003B6	003A6	003B6	003A6								
Time	11:38 AM	11:16 AM	10:07 AM	9:11 AM	2:21 PM	1:59 AM	8:44 AM	8:27 AM	7:35 PM	7:17 PM	9:40 AM	9:14 AM												
Three-Mile Creek	CFS																							
Total Phosphorus	mg/l	0.44	0.33	0.24	0.38	1.1	0.84	0.14	0.17	1.2	1.7	0.56	0.29											
Ortho Phosphate	mg/l	0.12	ND	0.31	0.55	0.42	0.31	0.12	0.12	0.16	0.36	0.39	0.23											
Nitrate+Nitrite	mg/l	0.49	0.38	0.74	0.93	1.2	0.9	0.35	0.63	0.89	0.64	1.1	0.72											
Total Kjeldahl Nitrogen	mg/l	2.3	2.7	1.3	1.9	2	2.5	1.4	1.2	3.3	4.5	1.1	0.74											
Total Suspended Solids	mg/l	374	480	67.5	287	488	400	23	50.3	897	1760	266	86.8											
Turbidity	NTU	121	57	77.5	386	675	318	31.5	53.5	1120	1200	265	77.5											
E.Coli	col/100ml	1340	3590	6970	15650	43520	104620	81600	65700	21420	14500	10710	9080											

	Better	Worse
Total Phosphorus	3	3
Ortho Phosphate	4	2
Nitrate+Nitrite	4	2
Total Kjeldahl Nitrogen	2	4
Total Suspended Solids	2	4
Turbidity	3	3
E.Coli	3	3
Total	21	21

	Upstream		Downstream		Upstream		Downstream		Upstream		Downstream		Upstream		Downstream									
	(West)	(East)	(West)	(East)	(West)	(East)	(West)	(East)	(West)	(East)	(West)	(East)	(West)	(East)	(West)	(East)								
Date	March 19 2018				June 2 2018				June 19 2018				August 7 2018				August 19 2018				October 8 2018			
KDHE ID	005B6	005A6	005B6	005A6	005B6	005A6	005B6	005A6	005B6	005A6	005B6	005A6	005B6	005A6	005B6	005A6								
Time	11:58 AM	12:17 PM	9:49 AM	9:29 AM	2:40 PM	3:00 PM	9:04 AM	9:23 AM	7:52 PM	8:09 PM	9:57 AM	10:18 AM												
Five-Mile Creek	CFS																							
Total Phosphorus	mg/l	0.14	0.57	0.19	0.38	0.37	0.71	ND	0.15	1.1	0.87	0.48	0.33											
Ortho Phosphate	mg/l	ND	0.12	ND	0.61	0.18	0.3	ND	1.6	0.28	0.21	0.35	0.25											
Nitrate+Nitrite	mg/l	0.35	0.41	0.45	2	0.36	0.44	0.27	0.37	0.42	0.5	0.83	0.77											
Total Kjeldahl Nitrogen	mg/l	0.66	1.9	1	2.7	1.1	2.3	0.53	1.5	3.6	2.2	1.4	1.4											
Total Suspended Solids	mg/l	156	748	170	578	127	678	37.1	224	1020	1100	138	154											
Turbidity	NTU	52	119	175	576	109	678	30.9	186	910	775	158	121											
E.Coli	col/100ml	310	3320	8840	14210	16160	48840	2481	24196	50120	17850	9580	14830											

	Better	Worse
Total Phosphorus	2	4
Ortho Phosphate	2	4
Nitrate+Nitrite	1	5
Total Kjeldahl Nitrogen	2	4
Total Suspended Solids	0	6
Turbidity	2	4
E.Coli	1	5
Total	10	32

City of Leavenworth 2017 Stormwater Sampling Summary

= decrease in Water Quality
= increase or No Change in Water Quality

	KDHE ID	March 29 2017		April 5 2017		July 27 2017		August 5 2017		October 22 2017	
		Upstream (West)	Downstream (East)	Upstream (West)	Downstream (East)	Upstream (West)	Downstream (East)	Upstream (West)	Downstream (East)	Upstream (West)	Downstream (East)
Three Mile Creek	CFS	51	24	52	98	5	<1	<1	0	12	24
Total Phosphorus	mg/l	0.26	0.86	0.21	0.43	0.29	0.41	0.23	0.21	ND	0.27
Ortho Phosphate	mg/l	0.1	0.21	0.2	0.33	0.17	0.27	0.16	0.14	ND	0.3
Nitrate+Nitrite	mg/l	0.62	0.9	0.99	0.67	0.5	1.2	0.53	0.55	0.3	1
Total Kjeldahl Nitrogen	mg/l	0.76	2.5	0.84	1.4	1.2	2.2	0.56	ND	1	1.2
Total Suspended Solids	mg/l	185	488	116	132	56	159	62	33	41.3	47
Turbidity	NTU	155	434	107	134	50.9	67.2	58.6	30.5	38.3	56.6
E.Coli	col/100ml	4106	4352	1450	6130	8164	6867	4730	9870	2410	5810
<i>potable TSS meter</i>	<i>at time of sampling</i>	420	960	290	1870	170	380	180	110	110	170
	<i>later few hours</i>	240	210	140	150	50	110				

	KDHE ID	March 29 2017		April 5 2017		July 27 2017		August 5 2017		October 22 2017	
		Upstream (West)	Downstream (East)	Upstream (West)	Downstream (East)	Upstream (West)	Downstream (East)	Upstream (West)	Downstream (East)	Upstream (West)	Downstream (East)
Five Mile Creek	CFS	129	112	274	360	17	33	3	36	12	32
Total Phosphorus	mg/l	0.36	0.66	0.18	0.29	0.23	0.28	0.13	0.16	0.15	0.2
Ortho Phosphate	mg/l	0.19	0.14	0.24	0.3	0.1	0.15	ND	ND	0.17	0.22
Nitrate+Nitrite	mg/l	1	1	0.25	0.35	0.44	0.57	0.37	0.19	0.42	0.66
Total Kjeldahl Nitrogen	mg/l	1.9	2.6	0.98	0.89	1.1	1.1	ND	4.5	0.96	1.2
Total Suspended Solids	mg/l	270	994	162	336	92	81	68	35.5	30	83.2
Turbidity	NTU	252	855	296	222	63.2	77.3	47	33	4.4	7.5
E.Coli	col/100ml	31800	55600	6630	8200	4352	5475	6090	24810	8360	7980
<i>potable TSS meter</i>	<i>at time of sampling</i>	630	2610	410	520	260	250	190	120	170	280
	<i>later few hours</i>	300	300	230	270	130	120				

City of Leavenworth

2017 Stormwater Sampling Summary (2014-2017)

(Note - in calculating CFS - the rating curve was used rather than the observed velocities)

Page 1 of 2

2017	KDHE ID	Upstream (West)		Downstream (East)		Upstream (West)		Downstream (East)		Upstream (West)		Downstream (East)		Upstream (West)		Downstream (East)	
		March 29 2017		April 5 2017		July 27 2017		August 3 2017		October 22 2017							
		00386	003A6	00386	003A6	00386	003A6	00386	003A6	00386	003A6	00386	003A6	00386	003A6	00386	003A6
Time		8:57 AM	8:17 AM	9:19 AM	8:57 AM	8:45 AM	8:18 AM	4:16 PM	3:53 PM	11:02 AM	10:37 AM						
Three Mile Creek	CFS	51	24	52	98	5	41	41	0	12	24						
Total Phosphorus	mg/l	0.20	0.50	0.21	0.43	0.29	0.41	0.23	0.21	ND	0.27						
Ortho Phosphate	mg/l	0.1	0.21	0.2	0.33	0.17	0.27	0.16	0.14	ND	0.3						
Nitrate+Nitrite	mg/l	0.62	0.9	0.99	0.67	0.5	1.2	0.53	0.55	0.3	1						
Total Kjeldahl Nitrogen	mg/l	0.76	1.5	0.84	1.4	1.2	2.2	0.56	ND	1	1.2						
Total Suspended Solids	mg/l	165	498	116	132	56	159	92	85	41.3	47						
Turbidity	NTU	155	434	107	134	50.9	67.2	58.6	30.5	38.3	56.6						
E.Coli	col/100ml	4106	4352	1460	6190	8164	6467	4730	9670	2410	5510						

Three Mile Creek - 5 event 2017		
	NC/Better	Worse
Total Phosphorus	1	4
Ortho Phosphate	1	4
Nitrate+Nitrite	1	4
Total Kjeldahl Nitrogen	1	4
Total Suspended Solids	1	4
Turbidity	1	4
E.Coli	1	4

2017	KDHE ID	Upstream (West)		Downstream (East)		Upstream (West)		Downstream (East)		Upstream (West)		Downstream (East)		Upstream (West)		Downstream (East)	
		March 29 2017		April 5 2017		July 27 2017		August 3 2017		October 22 2017							
		00586	005A6	00586	005A6	00586	005A6	00586	005A6	00586	005A6	00586	005A6	00586	005A6	00586	005A6
Time		9:15 AM	9:28 AM	9:36 AM	9:55 AM	9:11 AM	9:34 AM	2:40 PM	5:04 PM	11:26 AM	11:49 AM						
Five Mile Creek	CFS	129	112	274	360	17	33	1	36	12	32						
Total Phosphorus	mg/l	0.36	0.60	0.18	0.29	0.23	0.28	3.13	0.16	0.15	0.2						
Ortho Phosphate	mg/l	0.19	0.14	0.24	0.3	0.1	0.35	ND	ND	0.17	0.22						
Nitrate+Nitrite	mg/l	1	1	0.25	0.35	0.44	0.57	0.37	0.15	0.42	0.66						
Total Kjeldahl Nitrogen	mg/l	1.9	2.6	0.99	0.89	1.1	1.1	ND	4.5	0.96	1.2						
Total Suspended Solids	mg/l	370	994	162	336	92	81	69	35.5	30	83.2						
Turbidity	NTU	252	855	296	222	63.2	77.3	47	33	4.4	7.5						
E.Coli	col/100ml	31500	55600	6640	8700	4352	5475	6000	24510	8360	7950						

Five-Mile Creek - 5 event 2017		
	NC/Better	Worse
Total Phosphorus	0	5
Ortho Phosphate	1	4
Nitrate+Nitrite	1	4
Total Kjeldahl Nitrogen	2	3
Total Suspended Solids	2	3
Turbidity	2	3
E.Coli	1	4

2016	April 25, 2016		April 26, 2016		May 11, 2016		July 31, 2016		August 25, 2016		September 14, 2016		
	West	East	West	East	West	East	West	East	West	East	West	East	
	Upstream	Downstream	Upstream	Downstream	Upstream	Downstream	Upstream	Downstream	Upstream	Downstream	Upstream	Downstream	
Three Mile Creek	CFS												
Total Phosphorus	mg/l	<0.1	0.28	1.10	1.80	0.32	0.73	0.55	0.30	0.66	0.67	0.39	0.55
Ortho Phosphate	mg/l	<0.1	0.12	0.11	<0.1	<0.1	C.15	0.13	0.18	0.30	0.28	0.19	0.30
Nitrate+Nitrite	mg/l	0.50	0.60	0.84	0.40	0.18	0.39	0.39	0.37	0.55	0.37	0.17	0.55
Total Kjeldahl Nitrogen	mg/l	1.3	1.6	3.4	10.8	1.2	2.5	2.0	3.2	1.8	2.4	1.3	1.8
Total Suspended Solids	mg/l	17	85	1,040	1,750	196	495	362	500	648	1,340	349	442
Turbidity	NTU	21	103	876	849	176	429	318	264	570	765	303	244
E.Coli	col/100ml	1,723	6,131	10,452	27,500	3,840	28,510	43,500	99,700	24,600	78,600	4,500	36,540

Three Mile Creek - 6 event 2016		
	NC/Better	Worse
Total Phosphorus	0	6
Ortho Phosphate	2	4
Nitrate+Nitrite	3	3
Total Kjeldahl Nitrogen	0	6
Total Suspended Solids	0	6
Turbidity	2	4
E.Coli	0	6

2016	April 25, 2016		April 26, 2016		May 11, 2016		July 31, 2016		August 25, 2016		September 14, 2016		
	West	East	West	East	West	East	West	East	West	East	West	East	
	Upstream	Downstream	Upstream	Downstream	Upstream	Downstream	Upstream	Downstream	Upstream	Downstream	Upstream	Downstream	
Three Mile Creek	CFS												
Total Phosphorus	mg/l	0.14	0.14	1.60	1.80	0.56	1.63	0.14	0.37	1.50	0.43	0.38	0.56
Ortho Phosphate	mg/l	<0.1	<0.1	<0.1	<0.1	<0.1	0.24	<0.1	0.10	0.41	0.22	0.16	0.20
Nitrate+Nitrite	mg/l	0.17	0.30	2.70	0.72	1.10	0.20	0.26	0.49	0.54	0.42	0.13	0.20
Total Kjeldahl Nitrogen	mg/l	1.0	1.2	7.9	7.9	2.0	5.0	1.2	2.4	6.9	1.4	1.6	2.2
Total Suspended Solids	mg/l	60	53	2,120	2,840	449	1,710	194	314	2,720	348	604	620
Turbidity	NTU	116	61	1,653	1,590	333	1,120	157	240	1,960	385	167	504
E.Coli	col/100ml	4,854	5,475	26,500	24,195	48,840	198,600	32,300	36,400	44,100	16,100	19,890	15,650

Five-Mile Creek - 6 event 2016		
	NC/Better	Worse
Total Phosphorus	2	4
Ortho Phosphate	3	3
Nitrate+Nitrite	3	3
Total Kjeldahl Nitrogen	1	5
Total Suspended Solids	2	4
Turbidity	3	3
E.Coli	3	3

City of Leavenworth
2017 Stormwater Sampling Summary (2014-2017)

(Note - in calculating CFS - the rating curve was used rather than the observed velocities)

Page 2 of 2

2015	May 5 2015		May 14 2015		June 3 2015		July 20 2015		October 31 2015		November 5 2015								
	West East		West East		West East		West East		West East		West East								
	Upstream	Downstream	Upstream	Downstream	Upstream	Downstream	Upstream	Downstream	Upstream	Downstream	Upstream	Downstream							
Three Mile Creek	CFS	300	350	40	45	1300	7700	45	n/a (1)	30	0	550	140						
Total Phosphorus	mg/l	0.14	0.24	w	0.15	0.23	w	1.1	2.4	w	0.34	0.18	b	0.19	0.42	w	2.4	0.76	w
Ortho Phosphate	mg/l	ND	ND	w	ND	ND	w	0.11	0.15	w	0.12	0.11	b	0.18	0.24	w	0.13	0.18	w
Nitrate+Nitrite	mg/l	0.33	0.54	w	0.27	0.37	w	0.37	0.33	w	0.39	0.61	w	0.4	0.38	b	0.47	0.31	b
Total Kjeldahl Nitrogen	mg/l	0.88	1.5	w	0.81	0.88	w	3	6.3	w	1.3	0.7	b	0.77	0.7	b	31.1	ND	b
Total Suspended Solids	mg/l	90	88	w	60	51	w	1340	1570	b	322	157	b	38	41	w	1370	402	b
Turbidity	NTU	87.3	117	w	47.4	57	w	801	1380	w	173	100	b	3.6	10.3	w	1310	69.3	b
E.Coli	col/100ml	2247	1573	w	866	9090	w	12997	89700	w	20960	13540	w	3448	5172	w	34400	42800	w

Three Mile Creek - 6 event 2015		
	NC/Better	Worse
Total Phosphorus	1	5
Ortho Phosphate	3	3
Nitrate+Nitrite	2	4
Total Kjeldahl Nitrogen	1	3
Total Suspended Solids	3	3
Turbidity	2	4
E.Coli	0	6
	14	28

2015	May 5 2015		May 14 2015		June 3 2015		July 20 2015		October 31 2015		November 5 2015								
	West East		West East		West East		West East		West East		West East								
	Upstream	Downstream	Upstream	Downstream	Upstream	Downstream	Upstream	Downstream	Upstream	Downstream	Upstream	Downstream							
Five Mile Creek	CFS	30	150	35	150	330	1900	30	n/a (1)	70	185	35	600						
Total Phosphorus	mg/l	0.18	0.34	w	0.29	0.13	b	2.4	1.8	b	0.47	0.19	b	0.14	0.13	b	0.19	0.68	w
Ortho Phosphate	mg/l	ND	ND	w	ND	ND	w	0.11	0.15	w	0.15	ND	b	0.14	0.14	w	0.12	0.15	w
Nitrate+Nitrite	mg/l	0.22	0.46	w	0.12	0.23	w	0.21	0.28	w	0.42	0.47	w	ND	0.19	w	0.13	0.24	w
Total Kjeldahl Nitrogen	mg/l	1.3	2.1	w	1.3	0.84	b	7.3	2.8	b	1.8	0.25	b	0.54	ND	b	0.5	12.2	w
Total Suspended Solids	mg/l	113	165	w	136	65	b	1540	2710	w	450	201	b	11	25	w	49	392	w
Turbidity	NTU	146	231	w	100	28.5	b	1650	1230	b	404	134	b	5.3	13.1	w	27.2	188	w
E.Coli	col/100ml	12997	17329	w	17600	7540	b	20800	52100	b	77012	81310	b	1421	2613	w	16000	2951	w

Five-Mile Creek - 6 event 2015		
	NC/Better	Worse
Total Phosphorus	2	4
Ortho Phosphate	5	1
Nitrate+Nitrite	0	6
Total Kjeldahl Nitrogen	4	2
Total Suspended Solids	2	4
Turbidity	3	3
E.Coli	6	1
	22	21

(1) Mission River Backed up

2014	April 24 2014		May 22 2014		October 1 2014		October 2 2014						
	Upstream Downstream		Upstream Downstream		Upstream Downstream		Upstream Downstream						
	Upstream	Downstream	Upstream	Downstream	Upstream	Downstream	Upstream	Downstream					
Three Mile Creek	CFS	230	190	200	190	200	190	45	750				
Total Phosphorus	mg/l	0.17	0.55	w	0.42	0.61	w	1.5	0.79	b	0.6	0.67	w
Ortho Phosphate	mg/l	ND	ND	w	ND	ND	w	0.19	0.3	w	0.16	0.19	w
Nitrate+Nitrite	mg/l	0.5	0.42	b	0.69	0.69	w	0.56	0.52	w	0.3	0.73	w
Total Kjeldahl Nitrogen	mg/l	1	1.1	w	0.7	2.4	b	2.8	2.4	b	2.1	2.5	w
Total Suspended Solids	mg/l	303	742	b	165	440	w	1370	508	b	480	465	b
Turbidity	NTU	294	817	b	276	274	b	520	260	b	313	239	b
E.Coli	col/100ml	12997	2448	b	10500	14100	w	10663	72700	w	9208	17420	w
Dissolved Oxygen	mg/l	6.2	3.3	b	6.3	4.6	b						

Three Mile Creek - 4 event 2014		
	NC/Better	Worse
Total Phosphorus	1	3
Ortho Phosphate	0	2
Nitrate+Nitrite	2	1
Total Kjeldahl Nitrogen	2	2
Total Suspended Solids	3	1
Turbidity	4	0
E.Coli	6	1
	12	10

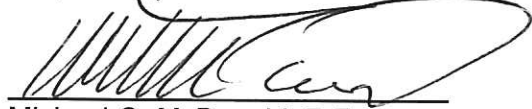
2014	April 24 2014		May 22 2014		October 1 2014		October 2 2014						
	Upstream Downstream		Upstream Downstream		Upstream Downstream		Upstream Downstream						
	Upstream	Downstream	Upstream	Downstream	Upstream	Downstream	Upstream	Downstream					
Five Mile Creek	CFS	2020	800	280	660	1100	800	3100	165				
Total Phosphorus	mg/l	0.13	0.54	w	0.34	0.28	b	0.65	0.63	b	1.5	1.1	b
Ortho Phosphate	mg/l	ND	ND	w	ND	ND	w	0.2	0.18	b	2.24	0.22	b
Nitrate+Nitrite	mg/l	2.21	0.94	w	3.29	0.37	w	0.3	0.5	w	0.32	0.41	w
Total Kjeldahl Nitrogen	mg/l	0.69	0.56	b	1.1	1.6	b	1.3	1.3	w	2.2	3	b
Total Suspended Solids	mg/l	54	485	w	300	226	b	364	472	w	1510	1460	b
Turbidity	NTU	22.5	261	w	199	193	b	241	263	w	413	431	b
E.Coli	col/100ml	1872	3255	w	8560	1460	w	8690	20900	b	63100	59100	b
Dissolved Oxygen	mg/l	6.2	4.9	b	5.5	5.1	b						

Five-Mile Creek - 4 event 2014		
	NC/Better	Worse
Total Phosphorus	1	1
Ortho Phosphate	0	0
Nitrate+Nitrite	0	4
Total Kjeldahl Nitrogen	4	0
Total Suspended Solids	2	2
Turbidity	1	2
E.Coli	6	1
	13	9

**POLICY REPORT PWD NO. 19-11
REVIEW STORMWATER MANAGEMENT PROGRAM**

February 19, 2019

Prepared by:



Michael G. McDonald, P.E.,
Director of Public Works

Submitted by:



Paul Kramer,
City Manager

ISSUE:

Review Stormwater Management Program

BACKGROUND:

The City of Leavenworth is a Phase II City for stormwater matters and is regulated by KDHE. A permit was issued to the City in 2014 for a five-year period. A requirement of the permit is completion of a Stormwater Management Program and an annual review of the program. The current Stormwater Management Program (SMP) was adopted by the City Commission on February 23, 2016 and is attached to this report. The report outlines how the City intends to implement programs to protect water quality in the creeks and streams within the City; ultimately contributing to improved water quality of the Missouri and Mississippi Rivers.

The goals of the program are to:

- Protect people and property from water quantity issues (flooding).
- Protect and improve water quality in the creeks and streams of Leavenworth.

The EPA and KDHE dictate the form of the SMP, particularly how the "Six Minimum Control Measures" should be addressed by the City (attached). These six measures are:

1. Public Education and Outreach
2. Public Involvement and Participation
3. Illicit Discharge Detection and Elimination
4. Construction Site Stormwater Runoff and Control
5. Post-Construction Stormwater Management in New Development and Redevelopment Projects
6. Pollution Prevention/Good Housekeeping for Municipal Operations

These control measures are addressed by "Best Management Practices" (BMP). This is a broad term that generally relates to an expectation by regulatory agencies that the City will be following good practices for a municipality of our size such as design standards, permit requirements, record keeping, inspection staff and more.

A series of goals formulated as BMPs has been incorporated into the SMP. City staff has sought to meet the goals through a variety of programs over the last year. It is important to note that these activities need to be tracked and are expected to be reported each year in the annual report submitted to KDHE.

This annual review of the Stormwater Management Program is an opportunity for the City Commission and the public to comment on the activities and direction the City is taking to meet the various goals of the program.

KDHE has informed the City that a new permit will be issued later in 2019. A new SMP will be required as part of that permit, probably in 2020. Until then the City is required to use the 2016 SMP.

Part of the annual SMP review is to identify parts of the program that need improvement and possibly modify the program. Staff does not have any critical issues that need to be addressed by the Commission at this time. Some changes that can be incorporated into a new program are expected to be along the following lines:

- Revise and clarify public notification and public involvement procedures and the use of social media.
- Establishment of more a formal approach to Land Disturbance Permits, Grease Traps, construction site runoff and other programs.
- Improved tracking of concerns about water quality generated by staff or the public.
- Increased training of staff related to operation and maintenance of stormwater BMPs.
- Additional monitoring requirements by owner of BMP installations to ensure functionality (particularly ponds and water quality).

RECOMMENDATION: It is recommended that a resolution supporting the program be adopted at the Commission meeting February 26, 2019.

ATTACHMENTS:

2016 City Stormwater Management Program adopted February 23, 2016; link is:

- https://www.lvks.org/egov/documents/1549641366_60574.pdf

Kansas Stormwater Phase II Final Rule Fact Sheet Series

KDHE Guidance for Completion of a Stormwater Management Program Document



Stormwater Phase II Final Rule

Small MS4 Stormwater Program Overview

Stormwater Phase II Final Rule Fact Sheet Series

Overview

1.0 – Stormwater Phase II Final Rule: An Overview

Small MS4 Program

2.0 – Small MS4 Stormwater Program Overview

2.1 – Who's Covered? Designation and Waivers of Regulated Small MS4s

2.2 – Urbanized Areas: Definition and Description

Minimum Control Measures

2.3 – Public Education and Outreach

2.4 – Public Participation/Involvement

2.5 – Illicit Discharge Detection and Elimination

2.6 – Construction Site Runoff Control

2.7 – Post-Construction Runoff Control

2.8 – Pollution Prevention/Good Housekeeping

2.9 – Permitting and Reporting: The Process and Requirements

2.10 – Federal and State-Operated MS4s: Program Implementation

Construction Program

3.0 – Construction Program Overview

3.1 – Construction Rainfall Erosivity Waiver

Industrial "No Exposure"

4.0 – Conditional No Exposure Exclusion for Industrial Activity

Polluted storm water runoff is often transported to municipal separate storm sewer systems (MS4s) and ultimately discharged into local rivers and streams without treatment. EPA's Stormwater Phase II Rule establishes an MS4 stormwater management program that is intended to improve the Nation's waterways by reducing the quantity of pollutants that stormwater picks up and carries into storm sewer systems during storm events. Common pollutants include oil and grease from roadways, pesticides from lawns, sediment from construction sites, and carelessly discarded trash, such as cigarette butts, paper wrappers, and plastic bottles. When deposited into nearby waterways through MS4 discharges, these pollutants can impair the waterways, thereby discouraging recreational use of the resource, contaminating drinking water supplies, and interfering with the habitat for fish, other aquatic organisms, and wildlife.

In 1990, EPA promulgated rules establishing Phase I of the National Pollutant Discharge Elimination System (NPDES) stormwater program. The Phase I program for MS4s requires operators of "medium" and "large" MS4s, that is, those that generally serve populations of 100,000 or greater, to implement a stormwater management program as a means to control polluted discharges from these MS4s. The Stormwater Phase II Rule extends coverage of the NPDES stormwater program to certain "small" MS4s but takes a slightly different approach to how the stormwater management program is developed and implemented.

What Is a Phase II Small MS4?

A small MS4 is any MS4 not already covered by the Phase I program as a medium or large MS4. The Phase II Rule automatically covers on a nationwide basis all small MS4s located in "urbanized areas" (UAs) as defined by the Bureau of the Census (unless waived by the NPDES permitting authority), and on a case-by-case basis those small MS4s located outside of UAs that the NPDES permitting authority designates. For more information on Phase II small MS4 coverage, see Fact Sheets 2.1 and 2.2.

What Are the Phase II Small MS4 Program Requirements?

Operators of regulated small MS4s are required to design their programs to:

- Reduce the discharge of pollutants to the "maximum extent practicable" (MEP);
- Protect water quality; and
- Satisfy the appropriate water quality requirements of the Clean Water Act.

Implementation of the MEP standard will typically require the development and implementation of BMPs and the achievement of measurable goals to satisfy each of the six minimum control measures.

The Phase II Rule defines a small MS4 stormwater management program as a program comprising six elements that, when implemented in concert, are expected to result in significant reductions of pollutants discharged into receiving waterbodies.

The six MS4 program elements, termed “minimum control measures,” are outlined below. For more information on each of these required control measures, see Fact Sheets 2.3 – 2.8.

- ① ***Public Education and Outreach***
Distributing educational materials and performing outreach to inform citizens about the impacts polluted stormwater runoff discharges can have on water quality.
- ② ***Public Participation/Involvement***
Providing opportunities for citizens to participate in program development and implementation, including effectively publicizing public hearings and/or encouraging citizen representatives on a stormwater management panel.
- ③ ***Illicit Discharge Detection and Elimination***
Developing and implementing a plan to detect and eliminate illicit discharges to the storm sewer system (includes developing a system map and informing the community about hazards associated with illegal discharges and improper disposal of waste).
- ④ ***Construction Site Runoff Control***
Developing, implementing, and enforcing an erosion and sediment control program for construction activities that disturb 1 or more acres of land (controls could include silt fences and temporary stormwater detention ponds).
- ⑤ ***Post-Construction Runoff Control***
Developing, implementing, and enforcing a program to address discharges of post-construction stormwater runoff from new development and redevelopment areas. Applicable controls could include preventative actions such as protecting sensitive areas (e.g., wetlands) or the use of structural BMPs such as grassed swales or porous pavement.
- ⑥ ***Pollution Prevention/Good Housekeeping***
Developing and implementing a program with the goal of preventing or reducing pollutant runoff from municipal operations. The program must include municipal staff training on pollution prevention measures and techniques (e.g., regular street sweeping, reduction in the use of pesticides or street salt, or frequent catch-basin cleaning).

What Information Must the NPDES Permit Application Include?

The Phase II program for MS4s is designed to accommodate a general permit approach using a Notice of Intent (NOI) as the permit application. The operator of a regulated small MS4 must include in its permit application, or NOI, its chosen BMPs and measurable goals for each minimum control measure. To help permittees identify the most appropriate BMPs for their programs, EPA issued a Menu of BMPs to serve as guidance. NPDES permitting authorities can modify the EPA menu or develop their own list. For more information on application requirements, see Fact Sheet 2.9.

What Are the Implementation Options?

The rule identifies a number of implementation options for regulated small MS4 operators. These include sharing responsibility for program development with a nearby regulated small MS4, taking advantage of existing local or State programs, or participating in the implementation of an existing Phase I MS4's stormwater program as a co-permittee. These options are intended to promote a regional approach to stormwater management coordinated on a watershed basis.

What Kind of Program Evaluation/Assessment Is Required?

Permittees need to evaluate the effectiveness of their chosen BMPs to determine whether the BMPs are reducing the discharge of pollutants from their systems to the “maximum extent practicable” and to determine if the BMP mix is satisfying the water quality requirements of the Clean Water Act. Permittees also are required to assess their progress in achieving their program’s measurable goals. While monitoring is not required under the rule, the NPDES permitting authority has the discretion to require monitoring if deemed necessary. If there is an indication of a need for improved controls, permittees can revise their mix of BMPs to create a more effective program. For more information on program evaluation/assessment, see Fact Sheet 2.9.

For Additional Information

Contacts

- ☞ U.S. EPA Office of Wastewater Management
<http://www.epa.gov/npdes/stormwater>
Phone: 202-564-9545

- ☞ Your NPDES Permitting Authority. Most States and Territories are authorized to administer the NPDES Program, except the following, for which EPA is the permitting authority:

Alaska	Guam
District of Columbia	Johnston Atoll
Idaho	Midway and Wake Islands
Massachusetts	Northern Mariana Islands
New Hampshire	Puerto Rico
New Mexico	Trust Territories
American Samoa	

- ☞ A list of names and telephone numbers for each EPA Region and State is located at <http://www.epa.gov/npdes/stormwater> (click on "Contacts").

Reference Documents

- ☞ EPA's Stormwater Web Site
<http://www.epa.gov/npdes/stormwater>
 - Stormwater Phase II Final Rule Fact Sheet Series
 - Stormwater Phase II Final Rule (64 *FR* 68722)
 - National Menu of Best Management Practices for Stormwater Phase II
 - Measurable Goals Guidance for Phase II Small MS4s
 - Stormwater Case Studies
 - And many others

KDHE GUIDANCE FOR COMPLETION OF A STORMWATER MANAGEMENT PROGRAM DOCUMENT IN COMPLIANCE WITH THE REQUIREMENTS OF AN MS4 NPDES STORMWATER PERMIT

A. General Guidance and Background

The Municipal Separate Storm Sewer System (MS4) NPDES stormwater permits issued by KDHE require preparation of a Stormwater Management Program (SMP) document, also referred to as a stormwater management plan. The acronym SMP is used to help differentiate this plan from other plans required by NPDES stormwater permits in Kansas. Both industrial stormwater permits as well as construction stormwater general permits call for development of a Stormwater Pollution Prevention (SWP2) Plan.

The SMP documents which have been prepared by various NPDES permitted MS4 municipalities in Kansas range from documents of a few pages to documents contained in multiple three ring binders with several hundred pages. The purpose of this guidance document is to identify the requirements for an SMP document and help to avoid development of a document excessively long and detailed or too brief and unacceptable.

The SMP document should comply with the requirements of the permit and may also satisfy other needs of the permittee. As an example some SMP documents include multiyear capital improvement plans, this is not required by the MS4 permit but may be useful to the permittee. Additionally, some municipalities may have established a stormwater utility and imposed a stormwater fee for property owners. The present fee schedule and ordinance may be included in the SMP document, however, there is no requirement within the MS4 permit for the permittee to impose a stormwater utility fee nor include such documents in the SMP.

The MS4 permit should be fully read and understood prior to writing or updating the SMP document. Typically, the MS4 permits require the SMP document be drafted or updated with the intent of implementing a program designed to:

- 1) Reduce the discharge of pollutants from the MS4 to the Maximum Extent Practicable.
- 2) Fully implement the six minimum control measures as presented in the permit.
- 3) Satisfy the requirements of the permit, the Clean Water Act and Kansas surface water quality statutes and regulations.

The permit defines Maximum Extent Practicable as implementation of the Best Management Practices (BMPs) as specified in the SMP. However, failure to implement the BMP in a manner to achieve the measurable goal or failure to implement reasonable goals can constitute a failure to comply with the permit and may place the permittee in jeopardy of enforcement by KDHE. Please note, these MS4 NPDES permits are joint State of Kansas and Federal permits and the Federal Government, normally the Environmental Protection Agency, can also bring enforcement action for failure to comply with the permit. Federal regulations and the permit require implementation of BMPs to achieve improvements in stormwater quality and are expected to result in significant reductions of pollutants discharged into surface waterbodies.

There are six minimum control measures for which BMPs are to be implemented to attenuate the discharge of pollutants in stormwater. This document does not define specific BMPs and associated measurable goals which must be implemented for each permittee. Permittees have great discretion in the selection of BMPs and associated measurable goals. However, implemented BMPs should be reasonable, and effective.

The six minimum control measures (and their associated EPA Fact Sheet numbers) are listed as follows:

- 1) Public Education and Outreach (Fact Sheet 2.3)
- 2) Public Participation and Involvement (Fact Sheet 2.4)
- 3) Illicit Discharge Detection and Elimination (Fact Sheet 2.5)
- 4) Construction Site Stormwater Runoff Control (Fact Sheet 2.6)
- 5) Post-Construction Stormwater Management in New Development and Redevelopment Projects (Fact Sheet 2.7)
- 6) Pollution Prevention/Good Housekeeping for Municipal Operations (Fact Sheet 2.8)

The SMP document should at a minimum identify the associated BMPs, their goals, and the responsible party or entity tasked with implementation or maintenance of the BMP. Additional guidance and information regarding implementation of BMPs for the six minimum control measures can be obtained from EPA Fact Sheets addressing each of the measures. The Fact Sheets are available from EPA on-line, a search engine should be able to locate them by the fact sheet number, for example "Fact Sheet 2.5".

Additionally, many MS4 NPDES permits require implementation of BMPs to reduce the discharge of TMDL pollutants identified in the permit and also conduct surface water monitoring for various parameters associated with the specified TMDL pollutants. If there are no TMDL pollutants and associated impaired stream or lake identified in the TMDL table within the permit then the permit does not require either implementation of BMPs to reduce TMDL pollutants or surface water monitoring for associated parameters. In the event such BMPs and monitoring are required the SMP document should at a minimum identify the associated BMPs, their goals, the individuals or entity responsible for surface water monitoring, and a map should be included which identifies the surface water monitoring locations.

B. KDHE Recommended Format and Items Which Should be Included in the SMP Document.

The SMP document should address the program tasks and items necessary to comply with the requirements of the permit. It may address other issues and include additional information so as to provide for the needs of the municipality. KDHE has attempted to provide as much flexibility for the permittee to develop a stormwater program which best serves the needs of the municipality and achieves compliance with the NPDES MS4 permit.

The SMP document should outline stormwater program activities, monitoring requirements, BMPs, BMP goals, reporting requirements, and responsible parties for implementing this work. The document should be sufficiently comprehensive such that if the stormwater manager discontinues employment, some other municipal staff member could review the document and understand the commitments and obligations which must be met to ensure satisfactory operation of the program and continued compliance with the MS4 NPDES permit.

Suggested elements in the document include the following:

- Table of Contents, this may be included if the document is at least moderately long, perhaps 20 pages or more. A table of contents is not required by the MS4 permit.
- An Introductory Section may be helpful to provide an overview of the MS4 permit program and the specific aspects of the local program as it presently exists. A history of how the program developed may be useful. Any such introduction is not required by the MS4 permit.
- A general section which address municipal staff responsibilities should be included. Perhaps a chain of command listing or organizational chart may be helpful. The individual or entity responsible for ensuring the program is enacted in compliance with the MS4 permit should be identified. This need not name specific staff members but simply identify the staff positions who are responsible for various aspects of implementation. This section is required by the MS4 permit.

KDHE recommends within this section a list of general permit requirements be included which may not be addressed subsequently in the document. This list may include such items, if included in the permit, as a requirement to update the SMP document (including any specific items or subjects specified by the permit), the duty to reapply for continued permit coverage prior to expiration of the present permit, update of maps, and an explanation of the management staff responsible for compliance with the stormwater management program. If a schedule of compliance is included in the permit, the schedule should be repeated here and an explanation of how compliance with the schedule will be accomplished should be provided. This entire section is not necessarily required by the permit, but some items addressed above may be required by the permit. This section is required by the MS4 permit.

- A section which addresses the six minimum control measures and specifies the BMPs which the municipality has committed to implement must be included. This section is required by the MS4 permit. Normally the BMPs are included in a table format, and the table should specify:
 1. the individual BMP,
 2. a general description of the BMP,
 3. the measurable goal the municipality commits to achieve,
 4. and the responsible staff positions and/or entities who are principally responsible for implementing and/ or maintaining the BMP.

Guidance for implementing BMPs for the six minimum control measures can be found within Fact Sheets prepared by the EPA. Six separate fact sheets, one for each control measure, are available on-line and are numbered as indicated in the list of control measures on page two. Additionally, a search for "[Stormwater Phase II Final Rule Fact Sheet Series](#)" will normally provide links to the Fact Sheets. The EPA Fact Sheets provide only guidance, they are not a portion of the enforceable NPDES MS4 permit. Review of the Fact Sheets is recommended when drafting or updating the SMP document.

This section should be organized in subsections, one for each of the six minimum control measures. Each subsection should address the BMPs which are to be implemented. In some cases individual BMPs may be repeated under multiple control measures. As an example, distribution of leaflets for public education by inserting them in the utility bills may serve to meet the obligation of implementing one of the BMPs for the Public Education minimum control measure. This same BMP may be repeated under the subsection listing BMPs for control of TMDL pollutants if a commitment to distribute a leaflet addressing proper fertilizer application to lawns is scheduled in late winter with one of the monthly utility bills. This section is required in the SMP document.

An example of a portion of a table listing a few of the BMPs for Illicit Discharge Detection and Elimination is provided on the next page as follows:

Illicit Discharge Detection and Elimination		
BMP Description	Measurable Goal	Responsible Staff
Update the Stormwater GIS map as required.	Updated Stormwater system map will be included with annual report.	Public Works GIS staff of City of Watertown.
Inspect a portion of the MS4 outfalls and their associated collection system for illicit discharges annually.	The number of MS4 stormwater outfalls at the start of the calendar year shall be documented and the number of outfalls with their associated collection system which are inspected shall be documented at the end of the calendar year. Number of MS4 stormwater outfalls inspected by the end of the year shall equal or exceed 5% of the number of outfalls documented at the start of the year.	Public Works staff of City of Watertown.
Any spill reports received by the Public Works Department shall be conveyed to the on-call Public Works staff member for his response or consultation with municipal staff on site.	All spill reports received by the on call Public Works staff member shall be logged in and each of the logged spills (100%) shall be physically attended by the on call staff member (or his designee) or verbal guidance by the staff member/designee shall be provided to municipal staff on site. All spill reports which are logged in shall include documentation of the response.	On call Public Works staff Member City of Watertown.
Review and update the Stormwater Pollution Ordinance No XXXX every other year (even years) with an update of enforcement procedures as needed.	Ordinance reviewed and updated (if required).	Stormwater Director City of Watertown

- If a TMDL table is included in the MS4 permit with TMDL regulated pollutants listed and a listing of targeted streams and/or lakes, the BMPs for which the municipality commits to implement for reduction of the discharge of TMDL pollutants must be identified. In addition to the BMPs the associated measurable goals must also be specified. Normally this is accomplished in a table format similar to the tables addressed above with the six minimum control measures. Any specific requirements specified in the permit for reduction of TMDL regulated pollutants should be repeated in this section and an explanation of how the permittee will achieve compliance with these requirements is to be included. This section must be included if a TMDL table with TMDL pollutants listed in the table is included in the permit.
- A section should be included which addresses required permit compliance activities and scheduled milestones. These requirements are often addressed in the permit in a section titled "Permit Compliance Activities and Schedules".

- A current map of the municipality which illustrates the permit area must be included in the SMP document. These maps may need to be updated each year in conjunction with the annual report. This item is required by the MS4 permit.

C. SUMMARY

The NPDES MS4 permits require SMP documents be drafted or updated periodically. The current version of the SMP document must be submitted with each annual report provided to KDHE. KDHE reviews the SMP documents, normally an approval letter is not provided as there is no requirement for approval. For documents which are found to be inadequate, notification to the permittee will be provided with a specific request for revision. When SMP documents are reviewed by KDHE, the items which will be checked include the following:

- 1) Review Table of Contents. A table is not required by the permit, it is only recommended at times.
- 2) Review the introductory section. This section is not required by the permit but may be included at the discretion of the permittee.
- 3) Review the general section which address managerial and operational responsibilities. Additionally, this section should address any permit requirements which are not addressed elsewhere in the SMP document. Inclusion of this section is required.
- 4) Review the section which addresses implementation of BMPs for the six minimum control measures. This section is required.
- 5) Review the section, if present, which includes a table for implementation of BMPs for reduction of TMDL pollutants. This section is to be included only if a TMDL table is included in the permit and TMDL pollutants are listed in the table along with the targeted stream(s) and/or lake(s). This section is required if the permit imposes the requirement for TMDL BMPs and surface water monitoring.
- 6) Review the section which addresses permit compliance activities and scheduled milestones. This section is required if a "Permit Compliance Activities and Schedules" section is included in the permit.
- 7) Review the current map of the permit area and confirm updates as needed. The permit area is the area for which the permittee is implementing the stormwater management program. The MS4 permit typically indicates this permit area is either the area within the municipality (normally area within corporate limits of a city) or for municipalities in an urbanized area, as defined by the U. S. Census Bureau, the

area within the permittee's jurisdiction which is also located in the urbanized area. This map is required by the permit and must be included in the SMP document. Urbanized area maps are associated with six municipalities, they are as follows:

- 1) Kansas City,
- 2) Lawrence,
- 3) Topeka,
- 4) St. Joseph, Missouri (small area in Kansas)
- 5) Wichita,
- 6) Manhattan.

Maps of urbanized areas in Kansas can be found on the KDHE Municipal Stormwater Program webpage at the following link - url:

"List of 2010 Urbanized Area Maps" <http://www.kdheks.gov/muni/ms4.htm>

Policy Report
Leaf program discussion
February 19, 2019

Prepared by:



Paul Kramer
City Manager

Issue:

Mayor Jermaine Wilson has requested a Study Session to discuss the City's Leaf Pick Up Program.

Background

The City collects leaves from one-half of the City each year, alternating between north of Spruce Street and south of Spruce Street.

Operations of the leaf program follow these general guidelines:

- The program starts in the second week of November, with crews working through grids of the area of the City receiving service.
- Generally, leaf pick up operations continue until weather dictates a shift to snow removal operations. The number of sweeps through each grid varies based primarily on weather.
- There are a number of variables that affect the program.
 - Rain/ice: The timing of moisture and freezing temperatures can stop leaf collection for periods of time, or hinder the speed crews are able to complete grids.
 - Equipment: The existing leaf machines are past their useful life and very often breakdown for significant periods of time. The City Commission has approved approximately \$65,000 in each of the next two years in the Capital Improvements Program budgets to replace the machines. The new machines are much larger and more robust and therefore should improve performance.
 - Labor: The City can no longer rely on inmate labor for the program, and must rely solely on Streets Division crews to perform the work. The inmate program became increasingly unreliable to the point of creating more hardship than help.

Next steps

Currently staff has direction to continue the program and purchase a new machine in 2019. Any changes would need to be made by the Commission.

Policy Report
Mayor's Award for Public Service
February 19, 2019

Prepared by:



Paul Kramer
City Manager

Issue:

Mayor Jermaine Wilson has inquired to the City Manager's Office about establishing a form of recognition to be given out to individuals, business, organizations, etc., for their service to the City.

In the past, the Commission has done a limited number of resolutions or proclamations for this type of recognition, but those methods don't always fit the idea of individual gestures of recognition.

Therefore, somewhat modeled on the "Commander's Award for Public Service" that is given in such instances by Fort Leavenworth, staff has drafted a "Mayor's Award for City Service" for Commission consideration. (See attached)

The specifics of awarding the recognitions could be determined by the Commission or left to the discretion of whoever happens to be serving as the Mayor at the time.

Next steps

Commission discussion.

Policy Report
City Commission Budget Work Sessions and Goal Setting
February 19, 2019

Prepared by:



Paul Kramer
City Manager

Subject:

The City Commission meets annually over two or three days to review, modify and provide staff with direction on the final draft of the budget. Prior to the budget process, the City Commission has traditionally set aside a half-day to consider the Commission Goals, which while not an exhaustive list of items to be pursued does help guide resource allocation and staff direction for the following year. Setting dates for budget hearings and goal setting is a necessary action in the budget formation process.

Action Requested:

Based on the budget schedule, it is recommended that the City Commission select time during the week of July 8-12 to convene budget work sessions; specifically, Wednesday, July 10, Thursday, July 11 and/or Friday, July 12.

The annual goal-setting session is a more flexible part of the process, as it is generally scheduled for one afternoon. I would offer Wednesday, March 27 or Wednesday April 10 from 1-5 p.m. as a first options.

The items are put forward for general discussion.