CITY OF OMAHA
NPDES PERMIT FOR THE MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4)
NE0133698
2017 ANNUAL REPORT

Submitted by:
Environmental Quality Control Division
5600 S. 10 St.
Omaha, NE 68107

March 30th, 2018

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"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for known violations. See 18 U.S.C. 1001 and 33 U.S.C 1319, and Neb. Rev. Stat. 81-1508 thru 81-1508.02."

James P Kee

Signature of Authorized Representative or Cognizant Official

03/30/2018

Date

James Kee

Printed Name

EQCD Manager

Title

Introduction

The second Omaha Municipal Separate Storm Sewer System (MS4) National Pollutant Discharge Elimination System (NPDES) Permit (NE0133698/PCS 999428) was issued by the Nebraska Department of Environmental Quality (NDEQ) and became effective on October 1, 2008. The MS4 permit authorizes the City of Omaha to discharge storm water from all existing City of Omaha owned or operated MS4 outfalls to the Papillion Creek, the Missouri River, and their tributaries subject to the identified limitations and the Storm Water Management Plan (SWMP) as modified. The City's Environmental Quality Control Division (EQCD) oversees the administration of the permit and ensures that the City is in compliance with the permit requirements.

The MS4 permit was issued for a five-year period and expired on September 30, 2013. The NDEQ issued an administrative extension to this permit in October 2013. The MS4 permit identifies the current City of Omaha SWMP. The SWMP requires the City to submit an annual report and a semi-annual progress report to the NDEQ. In addition, reports will be made available to the public on the Omaha Stormwater Program (www.omahastormwater.org) and Papillion Creek Watershed Partnership web sites (www.papiopartnership.org).

The City of Omaha Departments that participates in meeting the MS4 permit requirements include:

- Public Works Department
  - Environmental Quality Control Division
  - Street Maintenance Division
  - Sewer Maintenance Division
  - Construction Division
  - Design Division
- Parks, Recreation and Public Property Department
  - Park Maintenance
  - Golf Operations
- Fire Department
- Law Department
- Planning Department

The City is committed to partnering with several organizations to meet the MS4 requirements in the most efficient manner possible. The major partners are listed below. The City intends to continue developing additional partnerships throughout the permit cycle to meet the permit requirements.

- Keep Omaha Beautiful (KOB)
- Papillion Creek Watershed Partnership (PCWP)
- Douglas-Sarpy County Extension Office
- Papio-Missouri River Natural Resource District (P-MRNRD)
- Natural Resource Conservation Service (NRCS)

This report satisfies the annual reporting requirement for permit year 9 and covers the calendar year from January 1, 2017 through December 31, 2017. The report is laid out as follows: the program elements are shaded, the permit requirements are underlined, and the City's description of permit compliance is in plain text.

I. Public Education & Outreach

A. Distribute informational brochures on the proper disposal of household hazardous wastes and the availability of the Household Hazardous Waste facility.

The City of Omaha contracted with Keep Omaha Beautiful, Inc. (KOB) to distribute educational information. In the annual report submitted to the City by KOB they reported distributing a total of 2,059 brochures at locations and community events throughout 2017. The 2,059 brochures that were distributed covered topics concerning household hazardous waste. Brochures were primarily provided to adult participants attending KOB's outreach events and delivered to commercial and public locations around the City. In 2017, a bilingual "Only Rain Down the Storm Drain" educational door hanger (which highlights HHW and Under the Sink) was created and distributed. A total of 2,550 educational door hangers were distributed to individuals living near storm drains that were marked. Below is a summarized list of the locations where materials were distributed.

Ashland Park Robbins Elementary (5050 S 51st St)
Boystown (13727 Flanagan Blvd)
Burke High School (12200 Burke St)
Carter Lake (809 Carter Lake Shore Dr)
Castelar Elementary (2316 S 18th St)
Central High School (124 N 20th St)
Chalco Hills (8901 S 154th St)
Champions Run Golf Course (13800 Eagle Run Dr)
Chandler View Elementary (7800 S 25th St, Bellevue - OPS)
Creighton University (602 N 20th St.)
DJ's Dugout (777 N. 114th Street)
Dodge Elementary (3520 Maplewood Ave)
Durham Museum (801 S 10th St,)
Elmwood Park (802 S 60th St)
Garden Cafe Meeting Room (11040 Oak St.)
German American Society (3717 S 120th St.)
Hanscom Park (3201 Woolworth)
Henry Doorly Zoo (3701 S 10th St)
Highland South Park (2512 D St)
Joslyn Elementary (11220 Blondo St)
Kellom Elementary (1311 N 24th St)
Lauritzen Gardens (100 Bancroft St)

Legacy School (6860 N 166th Ave)
Living Faith Methodist Church (5310 S 182nd Ave)
McMillan Junior High School (3802 Redick Ave)
Nathan Hale Middle School (6143 Whitmore St)
Norris Middle School (2235 S 46th St)
Northwest High School (8204 Crown Point Ave)
Oakdale Elementary (3534 S 108th St)
Ralston Arena (7300 Q St)
Ralston High School (8969 Park Dr, Ralston)
Sacred Heart (2207 Wirt St)
Scott Conference Center (6450 Pine St)
Scottish Rite Masonic Center (202 S 20th St)
Sherman Elementary (5618 N 14th Ave)
Spring Ridge Elementary (17830 Shadow Ridge Dr)
St. Margaret Mary's School (123 N 61st St)
St. Philip Neri Church (8200 N 30th St)
Stinson Park (2285 South 67th Street)
University of Nebraska Omaha (6001 Dodge St)
UNMC (S 42nd St & Emile St)
UNO Barbara Weitz Community Engagement Center (6400 South, University Drive Road North)
UNO Campus - Arts and Sciences Building (222 University Dr. North)

UNO Scott Conference Center (6450 Pine St.)
Uta Halee (10625 Calhoun Rd)
Wells Fargo Bank (10010 Regency Cir)
Westgate Elementary (7802 Hascall St)
Wheeler Elementary (6707 S 178th St)
Wilson Focus School (5141 F St)
Zorinsky Lake (3808 S 154th St)
Ashland Park Robbins Elementary (5050 S 51st St)
Boystown (13727 Flanagan Blvd)
Burke High School (12200 Burke St)
Carter Lake (809 Carter Lake Shore Dr)
Castelar Elementary (2316 S 18th St)
Central High School (124 N 20th St)
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In addition to the distribution of brochures, the City maintains the website www.underthesink.org that presents a variety of information about the site, materials accepted and not accepted, hours of operation, and alternative use products.

In the 2017 calendar year UnderTheSink, the household hazardous waste facility, had a total of 18,483 drop offs resulting in a total 1,148,991 lbs of material, an average of 5,745 lbs/day (of days accepting waste). A total weight of 185,081 lbs of HHW was shipped offsite by our disposal contractor. Those drop-offs and that total weight can be further broken down into:

- Recycling Totals in 2017:
  - Steel from paint and aerosol cans: 56,940 lbs
  - Latex paint used with Posi-Shell at Sarpy County Landfill: 28,435 gal
  - Oil-based paint and flammable liquids used as industrial fuel: 13,805 gal
  - Antifreeze recycled: 2,940 gal
  - Automotive batteries: 12,935 lbs
  - Fluorescent bulbs: 14,151 bulbs
- Oil Totals in 2017:
  - Collected approximately 10,820 gal from 6,042 people
  - Sold a total of 4,380 gal during the summer to Tri-State Oil Reclaimers, Inc.
  - The remaining oil, was/is being burned in the waste-oil boiler at the facility
- ReStore Totals in 2017:
  - People who took free usable items for their own use: 11,804 persons
  - Weight of non-paint items taken: 226,976 lbs
  - Gallons of free paint taken: 21,891 gal
- 10 tours were conducted in 2017.

This permit requirement continues to be met.

B. Issue public service announcements related to storm water protection on local TV, radio or print outlets, which will address TMDL pollutants of concern.

In addition to the distribution of educational brochures and public outreach events, Keep Omaha Beautiful, Inc. coordinated a number of public service announcements (PSAs) and other information regarding stormwater pollution through radio, print, and websites in 2017. In total there were 127 PSA's with the following breakdown: radio spots (107), print ads (7), websites (11), and television spots (2). Topics and events addressed by these spots included stormwater pollution prevention, proper firework disposal, World O! Water, and storm drain labeling.

This permit requirement continues to be met.

C. Continue existing drain marking program to improve public awareness concerning illegal dumping utilizing volunteer services, which will address TMDL pollutants of concern.

Keep Omaha Beautiful, Inc. coordinated neighborhood groups and scout troops in 2017 to mark and clean storm sewer inlets. In total, 1,903 inlets were cleaned and had disks placed on them. 734 volunteers participated, totaling 1,955 of community service hours. The table below is a summary of the areas where the disks were placed.

Month	General Description of Target Area	Organization	# of Drains Cleaned/ Marked	# of Volunteers
March	Dundee Neighborhood, 50th St to 48th St., Hamilton to Nicholas St. [5011 Izard Street]	Individual	43	2
March	Peony Park Neighborhood, 90th to 83rd St., Nicholas to Cass St. [8331 Cuming]	Individual	75	3
April	Area surrounding McMillan Jr. High (3802 Redick Ave)	McMillan Jr. High Service Learning Class	33	67
April	Area surrounding McMillan Jr. High (3802 Redick Ave)	McMillan Jr. High Service Learning Class	16	77
April	77th from Bauman to Nebraska and Reddick from 77th to 75th	Northwest High School and UNO International Students	23	17
April	Blackstone [Harney & Dewey Street, 38th to 36th St.]	Pranam Yoga Shala Group	16	4
April	Blackstone [Dodge & Douglas, 44th to 40th Street]	Pranam Yoga Shala Group	2	3
April	Blackstone [Dewey Ave, 40th to 44th Street]	Pranam Yoga Shala Group	10	5
April	Blackstone [Farnam, 43rd to 40th Street]	Pranam Yoga Shala Group	9	3
April	Blackstone [Dodge to Farnam, 35th to 38th Street]	Pranam Yoga Shala Group	4	3
April	30th & Ames (Surrounding neighborhoods)	AmeriCorps NCCC	163	5
June	180th St to 173 Circle & Nina to F St [13931 O St]	Kids CAN [Group 1]	120	45
June	Neighborhoods around Dewey Park	Metro Community College Summer Bridge Program	85	20

Month	General Description of Target Area	Organization	# of Drains Cleaned/ Marked	# of Volunteers
June	Various areas	Wells Fargo	155	26
June	Neighborhoods around Boys Town (from 120th-168th, from Maple to Center)	Boys Town Summer Enrichment Program	26	14
June	Neighborhoods around Boys Town (from 120th-168th, from Maple to Center)	Boys Town Summer Enrichment Program	44	23
June	Neighborhoods around Boys Town (from 120th-168th, from Maple to Center)	Boys Town Summer Enrichment Program	14	30
June	Neighborhoods around Boys Town (from 120th-168th, from Maple to Center)	Boys Town Summer Enrichment Program	37	23
July	Neighborhoods around Boys Town (from 120th-168th, from Maple to Center)	Boys Town Summer Enrichment Program	10	35
July	Neighborhoods around Boys Town (from 120th-168th, from Maple to Center)	Boys Town Summer Enrichment Program	44	36
July	Neighborhoods around Boys Town (from 120th-168th, from Maple to Center)	Boys Town Summer Enrichment Program	60	34
July	Neighborhoods around Boys Town (from 120th-168th, from Maple to Center)	Boys Town Summer Enrichment Program	46	20
August	Neighborhoods around Boys Town (from 120th-168th, from Maple to Center)	Boys Town Summer Enrichment Program	52	36
August	Neighborhoods around Boys Town (from 120th-168th, from Maple to Center)	Boys Town Summer Enrichment Program	32	38
August	Hanscom Park Neighborhood	Metro Community College Summer Bridge Program	35	14
September	South Omaha Neighborhood (Near 33rd&L)	Smithfield's	72	9
September	Neighborhood around Saddle Hills Park (80th and Fort St)	Northwest High School and UNO International Students	27	35
September	Westgate Neighborhood	Individual - Community Service	129	1
September	64th and Newport	Hale Middle School's leadership classes (groups)	6	10
September	65th and Newport	Hale Middle School's leadership classes (groups)	10	10
October	Northwest Omaha	Boy Scouts	175	3
October	64th and Whitmore	Hale Middle School's leadership classes (groups)	9	10
October	Morton Meadows neighborhood starting at Center and 42nd st.	Ollie Web (one form was completed for entire summer of storm drain marking)	43	3
October	Neighborhood around Norris Elementary	Completely Kids, Norris Middle School	33	17

Month	General Description of Target Area	Organization	# of Drains Cleaned/ Marked	# of Volunteers
October	65th and Vane	Hale Middle School's leadership classes (groups)	9	8
October	63rd and Sorenson Pkwy	Hale Middle School's leadership classes (groups)	5	4
October	Neighborhood around Sherman Elementary	Sherman Elementary afterschool club	14	6
October	66th and Vernon	Hale Middle School's leadership classes (groups)	5	10
October	65th and Nebraska	Hale Middle School's leadership classes (groups)	4	12
November	65th and Kansas	Hale Middle School's leadership classes (groups)	8	13
*October/ November	*Added to storm drains that contractor is manufacturing for the City of Omaha	*Contractor (Todd)	200	0
		TOTALS	**1,903**	**734**

KOB, Inc also uses a GIS tracking system to better direct the volunteers to areas that have not been marked. Using this GIS system improves the tracking of those inlets which have been marked or need marking. The City's Sewer Maintenance Division estimates that within City limits, there are approximately 40,000 storm drains.

This permit requirement continues to be met.

D. Hold a Sediment and Erosion Control Seminar for the developers, builders, engineers, vendors, and graders, which will address TMDL pollutants of concern.

The City worked with the P-MRNRD, UNL Douglas-Sarpy County Extension Office, Douglas County Environmental Services, NDEQ, PCWP, and the Natural Resource Conservation Service to present the annual sediment and erosion control seminar on February 2, 2017. There were 271 people that signed in at the seminar. Presentations at the event included:

- Stream Degradation in our Watershed
- NDEQ Update
- The New Construction Stormwater Permit & the Changes for Your Grading Permit
- Omaha CSO Program
- The State of Green Infrastructure
- Panel Discussion: SEC Issues

This permit requirement continues to be met.

E. Schedule outreach events with industry trade organizations to educate the regulated community regarding Omaha's Industrial Permitting Program.

EQCD presented at 12 different outreach events attended by the permitted community with a total attendance of 913. Events were held throughout the State of Nebraska and at national conferences, but most were held in the Omaha area. Topics at these events cover industrial stormwater, construction stormwater, post-construction, and other topics of interest for the regulated community. Audiences varied from business

owners to consultants and government staff. Throughout the year, calls are fielded to answer specific questions regarding these issues as well. The table below is a summary of events and activities conducted.

EVENT	DATE	LOCATION	ATTENDEES	COMMENTS
TD2 Bioretention Presentation	1/25/2017	Omaha, NE	30	Lunch & learn with TD2 to discuss bioretention design, lesson learned, etc...
Annual Sediment and Erosion Control Seminar	2/2/2017	Ralston, NE	271	Annual seminar to construction industry.
2017 Spring Stormwater Symposium	3/8/2017	Omaha, NE	120	Hosted by NeFSMA, UNL Extension, IECA.
2016 National Watershed & Stormwater Conference	4/4/2017	Omaha, NE	50	In conjunction with Douglas County Environmental Services.
NWEA presentation	4/18/2017	La Vista, NE	100	Presentation on green infrastructure monitoring efforts.
WEF Collection Systems Presentation	5/24/2017	Omaha, NE	50	Invited Session Nebraska and Iowa - Tapping into Omaha Parks with Green Infrastructure.
WEF CS 2017 GI Tour	5/24/2017	Omaha, NE	10	10 of each fact sheet: Adams Park, UNO, Fontenelle Park, Elmwood Park, Spring Lake Park
Terracon lunch-n-learn	8/10/2017	Omaha, NE	15	Present to Terracon on construction & post-construction stormwater information. Also touch on basic usage of permix.
Green Infrastructure Tour	9/21/2017	Omaha, NE	95	Tour-two full charter buses-various GI sites from across the metro.
PCWP October Meeting	10/27/2017	Omaha, NE	14	Discussed & handed out materials related to construction & post-construction stormwater.
2017 Iowa Stormwater Summit	12/7/2017	Ankeny, IA	110	Presentation on stormwater and green infrastructure in Omaha.
Presentation to Lyman Richie for Industrial Stormwater	12/13/2017	Omaha, NE	48	Presentation on Industrial Stormwater topics & concrete washout.

This permit requirement continues to be met.

F. Work collaboratively with other community organizations to develop a campaign aimed at picking up pet waste which will address TMDL pollutants of concern.

The City of Omaha hired a marketing firm in 2009, Mint Design Group, currently known as Block 59 Design Group, to assist in the development and implementation of the pet waste campaign. Advertisements were developed and published in several area newspapers, billboard space was used, mass mailings distributed, theater advertising purchased, posters placed on litter cans, radio announcements broadcast, a television commercial produced, and other media printed. We continue to use these materials today. It was a very successful campaign and won the Silver Award in the Total Advertising Campaign category from the Eighth Annual Service Industry Advertising Awards. Additionally, EQCD attended seven events that were focused on pet owners where flyers were handed out along with pet waste bag dispensers, as shown in the table below. These materials are also handed out at other outreach events such as Earth Day and home show booths.

Date	Location	Activity	Dispensers	Flyers
2/9/2017	Century Link Center	2017 Omaha Home Show & Garden Expo	0	10
4/10/2017	Wheeler Elementary School	Wheeler Elementary School Presentation	9	0
4/22/2017	Elmwood Park	Earth Day Omaha	383	50
5/9/2017	Aksarben/Elmwood Park	Together We Build a Better City - P&R	50	10
5/12/2017	Zorinsky Lake	Spring into Summer - Parks Dept	234	48
9/24/2017	Nebraska Humane Society	Walk for the Animals	562	15
9/30/2017	Youngman Park	Fly into Fall	0	1

The City of Omaha has also partnered with the Omaha Dog Park Advocates by supplying Pet Waste Bag Stations and Pet Waste Bags for the two dog parks in Omaha. The Advocates keep the dispensers supplied with bags and submit a count to EQCD. A total of 70,400 bags were used during 2017.

This permit requirement is on schedule to be met.

G. Develop materials and displays associated with BMP demonstration projects installed with Storm Water Management Program Plan funds from NDEQ

Educational signage has been placed at the City's Under the Sink Facility, Orchard Park, Saddlebrook Joint Use Facility, Metropolitan Community College (MCC) Fort Omaha Campus, and Creighton Prep; all are accessible by the public. In 2017, signage explaining the design and function of the projects were placed at the University of Nebraska Omaha Welcome Center demonstration project and the Dundee Elementary School green infrastructure outdoor classroom. The Dundee Elementary School project was completed in 2017 and includes a bioswale, two permeable paver patios, three rain gardens, and a 500 gallon rain barrel. A project fact sheet has been developed for the site as well.

In collaboration with the US EPA Office of Research and Development, USGS, the Omaha CSO Program, and the University of Nebraska Extension a kiosk was placed at the Douglas County Extension Office that shares real-time data of the Sewer Maintenance bioretention and permeable pavement demonstration project

installed in 2014. In 2016 the kiosk was removed from its location and stored at the EQCD offices until a program update was put onto the machine. During this time the EPA transferred ownership of the kiosk to the University of Nebraska at Omaha. The content on the kiosk was not updated in 2017 but anticipate it will be in 2018 by the University of Nebraska at Omaha with support from the Omaha Stormwater Program.

Project fact sheets continue to be developed for Omaha Stormwater Program's demonstration projects and Omaha CSO Program green infrastructure projects to share basic information on each project with the community. Currently, 26 GI fact sheets have been created. These are shared with participants on tours and other outreach events. These GI fact sheets have also been uploaded to the Omaha Stormwater Program's website, www.omahastormwater.org, for public access and linked to their respective projects.

The Omaha Stormwater Program's website, www.omahastormwater.org, features demonstration and other green infrastructure projects that the program has been involved with. Information provided includes photos, background information, fact sheets, and other specific information on them as they mature from year to year.

This permit requirement continues to be met.

H. Develop a City Stormwater Program Web Site, including but not limited to storm water related information and provide educational information targeted for residents, children, and industries, which will address TMDL pollutants of concern.

The City of Omaha has developed and deployed a website, www.omahastormwater.org dedicated to our Stormwater Management Program. From the website industries can access the necessary documents to apply for a permit as well as access resources to help them maintain compliance. Developers and engineers can access the necessary documents to apply for Construction and Post-Construction Stormwater permits.

Residents can access information as to how they can improve water quality by actions they take at home. Children's activities are also available on the website. There is also public information available on the demonstration projects that have been implemented in areas of the city. The public can access information related to the monitoring program. Additionally there is an online complaint or comment form available to the public.

The website was significantly updated in early 2014 to improve navigation and to increase resources and content to residents, industries, and developers. The website content continues to be updated regularly and improved for better use by the public. In 2017, the industry section of the website was updated to reflect the updated program related to the SWMP amendment that was approved in 2016. Facebook continues to be emphasized as a way to further enhance communication with the public. Regular status updates sharing facts on stormwater, demonstration projects, and other related information were posted and helped to connect them to the Omaha Stormwater website. In 2017 OmahaStormwater.org had 5,677 users with 19,893 total page views. The Omaha Stormwater Program Facebook page had 69 posts with a total reach of 45,936. Tables compiling the monthly breakdown for OmahaStormwater.org and the Omaha Stormwater Program Facebook can be found in Attachment E

This permit requirement continues to be met.

II. Public Participation & Involvement

A. Operate a storm water hotline and web based complaint system for Watershed (general information, complaints, reports of illegal dumping, etc.)

The City of Omaha's Environmental Quality Control Division investigated 110 complaints received in the 2017 calendar year. Complaints ranged from excess sediment in the street to suspicious discharges. A table compiling the complaints, investigations, and resolutions of these reports can be found in Attachment B.

This permit requirement continues to be met.

B. Participate in organizing to hold open houses on Papillion Creek Watershed Plan activities.

The Papillion Creek Watershed Partnership holds monthly meetings, which are open to the public, to discuss watershed and water quality policies. There were four meetings held in the 2017 calendar year. The following table summarizes the times and attendance for the meetings.

Date	Count	Target Market	Comments
1/26/2017	15	Partnership Members	Partnership Meeting
8/24/2017	11	Partnership Members	Partnership Meeting
9/28/2017	12	Partnership Members	Partnership Meeting
10/26/2017	14	Partnership Members	Partnership Meeting

This permit requirement continues to be met.

C. Continue to implement a stream Cleanup Day. Utilize Keep Omaha Beautiful, Inc. to identify stream segments in need of cleanup and recruit volunteers from the local area, public groups, and representatives from local area business and developments.

Keep Omaha Beautiful, Inc. (KOB) organized multiple 2017 cleanup events. An official Stream Cleanup Day was not held in 2017, but numerous cleanup event were coordinated with individuals and groups. In total, there were 414 cleanups with 33 of them occurring at or near a stream, 61at or near a lake, 267 in parks, and 17 at schools. The number of volunteers involved was 4,809, resulting in 11,914.5 total volunteer hours. 3,276 bags of litter were collected.

This permit requirement continues to be met.

D. Provide tours of UnderTheSink, household hazardous waste facility for schools and neighborhood organizations to learn about the proper way to manage household chemicals and about storm water treatment systems installed at the site.

A total of 10 tours were conducted at the UnderTheSink Facility in 2017. Stormwater Best Management Practices (BMPs) have also been installed at the facility along with educational signage. The BMPs were completed in the fall of 2009 and are meant to serve as a demonstration project to the public.

This permit requirement continues to be met.

E. Hold World O! Water Festival focused on elementary school aged children to celebrate Clean Water and engage in water quality related activities.

The World O! Water Festival was held on September 9th, 2017 from 12 PM until 4PM at Wehrspann Lake / Chalco Hills Recreation Area. There were approximately 40 organizations that participated by handing out information, conducting an activity or providing demonstrations. Approximately 2,400 visitors attended the event. Information that was handed out included water stewardship, recycling, water quality, and water conservation. Activities included a watershed pollution demonstrative model, canoe rides, nature hikes, and science experiments. This was the 13th successful year the event was held.

This permit requirement continues to be met.

F. Participate in community organizations, conferences workshops, and web casts related to water quality and storm water management.

City of Omaha Environmental Quality Control Division conducted 46 education and outreach activities with the public, schools, and community organizations. In addition, Keep Omaha Beautiful held 112 outreach events, for a total of 144. Total estimated participation of these events is 23,607. Topics ranged from general stormwater education to rain barrel workshops to information on green infrastructure. A summary table of education and outreach activities conducted by the City of Omaha's Stormwater Program and Keep Omaha Beautiful can be found in Attachment E.

City of Omaha EQCD staff attended or participated in 40 workshops, webcasts, or trainings in the 2017 permit year. These activities continue to further our staff's knowledge and experience on water quality and stormwater management. The following table is an accounting of the events attended.

Date	Title	Associated Program	Attendees
1/3/2017	UNO camera training	Monitoring	3
1/11/2017	January Safety Toolbox Meeting	Good Housekeeping	12
1/12/2017	Grading Permit closure training	Construction	4
1/31/2017	Fall Arrest & Grading Permit enforcement training	Good Housekeeping	20
2/15/2017	February Safety Toolbox Meeting	Good Housekeeping	10
2/16/2017	Permix Training at Parks Dept	Construction	6
3/7/2017	Outfall screening training	IDDE	7
3/8/2017	March Safety Toolbox Meeting	Good Housekeeping	11
4/4/2017	2017 CWP National Watershed & Stormwater Conference	Combination	7
4/12/2017	April Safety Toolbox Meeting	Good Housekeeping	11
4/18/2017	NWEA presentation on green infrastructure	Monitoring	15
4/19/2017	Stream and Stormwater Issues Inspector Training	Monitoring	5
5/1/2017	Collection Systems 2017 Conference & Tour	Post-Construction	20
5/17/2017	May Safety Toolbox Meeting	Good Housekeeping	9
5/17/2017	IDDE Training & Grading Permits	IDDE & Monitoring	17
6/14/2017	June Safety Toolbox Meeting	Good Housekeeping	12
7/12/2017	July Safety Toolbox Meeting	Good Housekeeping	14
8/8/2017	New employee grading permit & Permix training	Construction	1
8/9/2017	August Safety Toolbox Meeting	Good Housekeeping	14
9/13/2017	September Safety Toolbox Meeting	Good Housekeeping	12
9/19/2017	FRCP training at Jaynes St Joint Use Facility	Good Housekeeping	40

9/20/2017	FRCP Training at Sewer Maintenance Facility	Good Housekeeping	25
9/21/2017	Omaha Green Infrastructure Tour	Post-Construction	11
9/27/2017	FRCP Training at Fleet Maintenance Facility	Good Housekeeping	5
9/28/2017	FRCP training at Central Maintenance Facility	Good Housekeeping	24
10/2/2017	FRCP training at 52nd & Dayton Joint Use Facility	Good Housekeeping	25
10/11/2017	October Safety Toolbox Meeting	Good Housekeeping	13
10/13/2017	FRCP training at Elkhorn Joint Use Facility	Good Housekeeping	14
10/17/2017	FRCP training at Vehicle Impound Lot	Good Housekeeping	7
10/18/2017	FRCP training at 87th & Vernon Joint Use Facility	Good Housekeeping	35
11/1/2017	FRCP training at 96th & F Street Maintenance Facility	Good Housekeeping	26
11/3/2017	FRCP training at Parks District 1	Good Housekeeping	6
11/8/2017	November Safety Toolbox Meeting	Good Housekeeping	14
11/14/2017	Stormwater Environmental Inspector training	Construction	6
11/15/2017	Green Infrastructure Jobs & Training webinar	Post-Construction	1
11/16/2017	Nebraska 811 Locator Workshop	Good Housekeeping	1
12/13/2017	December Safety Toolbox Meeting	Good Housekeeping	13
12/13/2017	PCWP Permix Training	Construction	6
12/15/2017	CityWorks - Complaint training	IDDE	4
12/18/2017	Permix training w/Kent & Stacy	Construction	2

This permit requirement continues to be met.

III. Illicit Discharge Detection & Elimination

A. Perform dry-weather inspections including Physical Characteristics Examinations of storm water outfalls 72" or greater and any outfalls with documented complaints.

The City of Omaha – EQCD staff inspected all outfalls identified the previous year as priority outfalls (those 72" or greater and/or documented illicit discharges). They also inspected all outfalls located in areas annexed by the City. EQCD Staff completed all inspections by September 30th, 2017. Any outfall with an obvious or suspicious discharge was to be reported immediately to EQCD. No new outfalls were inspected based on the previous year's inspection. There were 34 outfalls inspected due to annexation. These annexation areas were listed in the 2016 annual report, areas listed in this annual report will be inspected in 2018. No suspicious discharges were found but four outfalls were noted as having a potential, with two physical characteristics with low severity index numbers. Outfall inspections were entered into the City of Omaha's CityWorks asset management system. In 2017, there were 83 existing priority outfalls and 34 new outfalls were inspected, for a total of 117.

Outfall inspections were only conducted after 48 hours of dry weather. A Physical Characteristics Examination was completed for each outfall, if flow was present. If an illicit discharge was encountered EQCD Inspectors call supervisory staff immediately. Photographs were taken of outfalls to be kept as a record of outfall conditions during the inspection.

This permit requirement continues to be met.

B. Investigate and seek resolution concerning any dry weather discharges potentially impacted by sources by notifying the source that they must discontinue discharging, and initiate enforcement action consistent with adopted ordinance which will address TMDL pollutants of concern. Any source that the applicant feels constitutes and immediate health or safety threat will be reported immediately to the NDEQ.

There were no confirmed illicit discharges from an outfall inspection during the permit year 2017.

This permit requirement continues to be met.

C. Dry Weather inspection of storm water outfalls, including smaller outlets and those that discharge to lesser tributaries or other storm conduits in response to suspect conditions and / or complaints.

There were 268 potential outfalls identified by EQCD using GIS information collected by sewer maintenance in 2009. All outfalls were inspected during dry weather.

A total of 81 code enforcement actions associated with complaints were taken in 2017. Eight of those were associated with an illicit discharge. The remainder of those actions were "Requests for Voluntary Compliance" or a "Letter of Warning". There were no fines levied or collected in 2016. A table summarizing the year's activities can be found in Attachment B.

This permit requirement continues to be met.

D. Enforce Existing City Codes prohibiting illicit discharge connections to storm sewers.

There was one instance of an illicit discharge connection in 2017. The connection, a sanitary service line connected to the 15" storm sewer at 52nd and Dodge, was discovered during an emergency sanitary manhole repair. Upon discovery, there was no active flow. The sewer maintenance department implemented

containment to stop flow to the outfall, setup an interim containment system in a nearby manhole, and reconnected the line to a newly constructed sanitary manhole.

This permit requirement continues to be met.

E. Maintain and prevent instances of sanitary sewer leakage into MS4 or waters of the state.

The Sewer Maintenance Division is responsible for preventing sanitary seepage into the storm sewer. They perform preventive and corrective maintenance to the system and are able to identify areas where seepage is occurring. Because of the way the MS4 system is designed, sanitary seepage to the MS4 is an extremely rare event. Storm water pipes are not located immediately below the sanitary line; they are almost always installed on the other side of the street or parallel to the sanitary line. There were 3 instances of sanitary seepage/leakage and /or overflow of the sanitary system that reached the storm sewer system. There were an additional 10 instances of Sanitary Sewer Overflows that reached waters of the state. All 13 of these instances were reported to the state under a separate NPDES Permit as a requirement to report Sanitary Sewer Overflows and Combined Sewer Overflows.

This permit requirement continues to be met.

F. Maintain and update a sewer map of major storm water outfalls and identify the names of respective receiving waters.

The Sewer Maintenance Division is responsible for maintaining and updating storm sewer, in addition to sanitary and combined sewers. EQCD utilizes this information to catalogue and support inspections of outfalls. Handheld portable GPS units are used during outfall inspections to locate them, update information, and track inspections.

In 2010, EQCD staff used the current GIS data collected by sewer maintenance in 2009 to direct our inspections. Two hundred and sixty eight points were inspected resulting in additional priority outfalls being identified. We continue building on the database to better document outfall conditions so that future inspections will be comparative to the past inspections. The data helps to better direct inspections and compare the previous year's condition with the current condition of the outfalls.

The City of Omaha GIS Department maintains a layer of all known waterbodies in Douglas County.

This permit requirement continues to be met.

G. Prevent, contain and respond to spills to the MS4. Review, as necessary, interdepartmental SOP's with respects to spills, dumping and illegal disposal that impacts the MS4.

The City of Omaha's Environmental Quality Control Division worked with the Omaha Fire Department (OFD) to develop a policy dealing with spills that the OFD responds to. Previously the OFD would chemically treat a spill to aid in the breaking down of petroleum products. The revised policy requires OFD to spread fly ash over a spill to absorb any petroleum products. They then collect the material and drop it off at one of several locations throughout the City. Each location has a dedicated 55 gallon drum for storage of the waste material. OFD monitors the use of the barrels and coordinates proper disposal with a hazardous materials processing contractor.

The Omaha Fire Department's Hazardous Materials Unit responded to 428 incidents in the 2017 calendar year.

This permit requirement continues to be met.

IV. Construction Site Program

A. Maintain the construction site inspection and reporting web site and continue to make enhancements.

The City of Omaha deployed its new permit tracking and reporting system, Permix, in April 2014. The new system integrates Grading Permits, Linear Underground Projects, Post-Construction Stormwater Management Plans and Public Improvements, under one website and database system. The individual processes are linked by a common project name and number. This allows for a more comprehensive approach to managing these activities while creating an efficient means for project Applicants to apply for permits and have plans reviewed. The system is being used by all of the communities in the Papillion Creek Watershed Partnership for Grading Permits and Post-Construction Stormwater Management Plans. Improvements to the site in 2017 included enhanced filters for external users in the Grading Permit and Post-Construction modules. These updates provide a better user experience and functionality.

This permit requirement continues to be met.

B. Maintain a construction site inspection program that includes procedures for reporting, resolving deficiencies, and taking appropriate enforcement action consistent with adopted ordinances.

EQCD administers the inspection program for Erosion Control, both within the City of Omaha's jurisdiction as well as the Papillion Creek Watershed Partnership's (PCWP) individual member's jurisdiction. The City's Grading Permit Program requires that the owners of active sites assign a Project Inspector to do inspections weekly and after 0.5 inches of rain. In the 2017 calendar year, reports were submitted to Permix by City Inspectors and Project Inspectors for construction sites as per the NPDES Stormwater Discharges from Construction Sites General Permit. Additionally, enforcement actions were entered by City personnel. The table below accounts for the reports submitted for sites within the City of Omaha's jurisdiction.

	City Inspection Reports	Private Inspection Reports
Phase I Sites (>5 acres)	614	5,017
Phase II Sites (<5 acres)	599	3,824
Total	1,213	8,841

In 2017, there were 253 Requests for Voluntary Compliance (RVC) during City inspections. There were 74 complaint inspections conducted on 43 grading permit sites, with 37 of those inspections including a RVC. A summary table of enforcements above a RVC, Letter of Warning and Notice of Violations that were taken within the City of Omaha's jurisdiction can be found in Attachment C.

Since the Permix system was launched in April 2014, on-going training and support of the system users has been provided. This includes video tutorials on www.omahastormwater.org website, email, and phone conversations with the users. Compliance assistance and project related questions are addressed as they came up for users.

This permit requirement continues to be met.

C. Maintain regulations and design specifications for controlling erosion, sediment loss, and other TMDL pollutants of concern from construction sites that disturb areas of 1 acre or more.

The Omaha Municipal Code Section 32-101 (Grading Permit Required) requires owners/operators to obtain a grading permit on sites sufficiently large enough to require an NPDES construction general permit. On March 10, 2003 when the NPDES Phase II regulation became effective the City began enforcing the soil erosion and sediment control measures on sites that disturbed one acre or greater in the City's jurisdictional area, which extends 3 miles beyond City limits in Douglas County. This allows the City to regulate many of the large developments (SIDs) that remain active for years and have a great potential to adversely impact water quality.

The City has incorporated the Sediment and Erosion Control Manual into the Omaha Regional Storm Water Design Manual as Chapter 9. The Omaha Regional Storm Water Design Manual was adopted by the City of Omaha in April 2006. The Omaha Regional Storm Water Design Manual was updated in 2014. Each chapter was updated with current information. Chapter 9, Erosion and Sediment Control, incorporated the Supplemental BMP Guide into it and updated existing BMPs. Formatting and graphics were also greatly improved with the update. Digital copies, in PDF format with links throughout, are available on our website at www.omahastormwater.org/orsdm.

This permit requirement has been met.

D. Maintain a program for performing review of Grading Permit applications to ensure compliance with applicable regulations and design specifications.

The Public Works Department, Environmental Quality Control Division, reviews the grading permit applications and the associated Storm Water Pollution Prevention Plans (SWPPP). Unless the SWPPP meets the requirements specified in the Omaha Regional Storm Water Design Manual, a grading permit will not be issued. Sites 5 acres or greater are given priority over sites less than 5 acres.

The City of Omaha issued a total of 103 permits in 2017. 36 permits were for sites greater than 5 acres and 67 permits issued for sites less than 5 acres in size. During 2017, there were a total of 455 active permits, with 340 at the start of the year and 373 at the end.

This permit requirement continues to be met.

V. Post Construction Runoff Control

A. Develop a guidance document for Post Construction Storm Water Management Plan.

The City of Omaha finalized the guidance document titled *City of Omaha Post Construction Stormwater Management Planning Guidance* in July 2009. The document is available on the City's website www.omahastormwater.org and www.omahapermix.com. The guidance document incorporated minor updates in August 2015. No updates were made in 2017.

This permit requirement continues to be met.

B. Participate with other City Departments to prepare an Environmental Element of City of Omaha Master Plan and include applicable storm water management provisions.

The Omaha City Council voted 7-0 to adopt the Environmental Element – a comprehensive environmental vision for the city – as a component of Omaha's master plan December 14, 2010.

The document, developed through a two-year process led by the City of Omaha and Omaha by Design, includes more than 600 recommendations in five sections – the natural environment, urban form and transportation, building construction, resource conservation and community health. Each goal is accompanied by a set of objectives and strategies, and a set of measurements has been developed for each of the five sections.

This permit requirement continues has been met.

C. Develop a database of existing structural BMPs (private and public) that reduce the impact of urbanization on storm water run-off and improve water quality and enhance other amenities and activities such as green space, parks and recreation, urban planning, aesthetics, and public safety.

The City of Omaha reviews proposed post construction storm water BMPs for code compliance, functionality, and manageability. Once the proposed post construction BMP passes the review and is approved, that allows construction and implementation to begin. The management plan that is submitted along with the proposed BMP is then attached to the property deed to ensure long term compliance. The City has developed a database, Permix, for tracking purposes and has integrated the Construction program, Public Improvements, and Linear Underground Projects into this database.

A database has been developed to track post construction BMPs within the City of Omaha. Information being entered includes; location, ownership, provided capacity, required capacity, contributing drainage area, type of BMP, date of installation and type of drainage area (combined sewers r separate storm sewers). Each BMP has the latitude and longitude included so that they can be easily mapped using our GIS.

This permit requirement continues to be met.

D. Inspect annually and maintain (as necessary) City owned storm water BMP structures.

All City-owned stormwater BMP structures were inspected at least once with most being inspected twice for any major maintenance issues in early spring and in early winter of 2017. Fontenelle Park Lagoon was not inspected in 2017 due to active construction, part of the Lakes James to Fontenelle Park CSO project. A physical characteristics examination form is completed during the inspection for structures that had flow or

were wet. No basins needed a PCE form completed in 2017. Maintenance is performed by various City Departments based upon the type of activity required. Most of the City Departments are using Cityworks to track their maintenance activities. Additionally EQCD employed three employees, one full-time and two part-time, who were dedicated to maintaining City owned stormwater BMP structures throughout the year. The table below indicates when the inspection occurred as well as any maintenance issues noted at that time.

SITE	INSPECTION DATES	SEDIMENT REMOVAL	TRASH REMOVAL	DEBRIS REMOVAL	MOWING
Storz Expressway (E)	4/24/2017	Yes	Yes	Yes	No
	12/15/2017	No	Yes	No	No
Storz Expressway (W)	4/24/2017	Yes	Yes	Yes	No
	12/15/2017	Yes	Yes	No	No
Adams Park Lagoon	12/20/2017	No	Yes	Yes	No
Lake James Park	12/21/2017	No	No	No	No
Fontenelle Park Lagoon		Park under construction in 2017, part of the Lake James to Fontenelle Park CSO Project			
John J Pershing Drive 1.5	4/24/2017	Yes	No	No	No
	12/20/2017	No	No	No	Yes
Miller Park	4/24/2017	No	No	No	No
	12/19/2017	No	No	No	No
10th & Nicholas	4/24/2017	No	No	No	No
	12/15/2017	No	No	No	No
13th & Carter Blvd	4/24/2017	No	No	Yes	No
	12/19/2017	No	No	No	No
13 & Fowler	4/24/2017	No	Yes	No	No
	12/19/2017	No	Yes	Yes	No
Carter Lake	6/15/2017	No	No	No	No
	12/21/2017	Yes	Yes	No	No
19 & Carter Blvd	4/24/2017	Yes	No	Yes	No
	12/20/2017	Yes	Yes	No	No
18th Street E & Ave H	4/24/2017	Yes	Yes	Yes	No
	12/20/2017	Yes	Yes	No	Yes
14th & Ida St	4/24/2017	No	No	Yes	No
	12/19/2017	No	No	No	Yes
John J. Pershing No. 1	4/24/2017	Yes	Yes	Yes	No
	12/21/2017	No	Yes	Yes	No

John J. Pershing No. 2	4/24/2017	Yes	No	No	No
	12/20/2017	No	No	Yes	No
Gifford Dr. No 1	4/24/2017	No	No	No	No
	12/15/2017	No	No	No	No
9th & Storz	4/24/2017	No	No	No	No
	12/15/2017	Yes	No	No	Yes
Westlawn Cementary	6/27/2017	No	Yes	Yes	No
	12/15/2017	No	No	No	No
64th Street Channel	6/27/2017	No	No	Yes	No
	12/15/2017	No	No	No	No
Elmwood Park	12/15/2017	No	No	No	No
Spring Lake Park	12/20/2017	Yes	Yes	No	No

This permit requirement continues to be met.

E. Revise storm water BMP maintenance and inspection plan as needed.

Adams Park Green Infrastructure project has continued to be maintained in 2017 by the contractor for the JCB/Miami Sewer Separation and Adams Park Landscape Improvements CSO Projects. Maintenance of the screening structure and the basin discharge structure has been maintained by the Sewer Maintenance Division. Maintenance responsibilities for the entire project will be the responsibility of the City in May 2018. Improvements to the Fontenelle Park Lagoon began in February 2017 as part of the Lake James to Fontenelle Park CSO project. The site was not inspected in 2017 due to construction. Completion of the park improvements and the start of the sewer separation phase of the project is expected in early 2018. Spring Lake Park was added to the list of controls in 2017 when the Missouri Avenue/Spring Lake Park Phase I CSO project was completed. Maintenance of the landscape improvements will be conducted by the contractor for approximately two years following the completion of the project.

Each project is inspected annually at a minimum. If maintenance exceeds the capacity of the current staff, coordination with other City divisions or outsourcing of that work is sought.

This permit requirement continues to be met.

F. Implement strategies, which include a combination of structural and or non-structural BMPs appropriate for the watershed, which will address TMDL pollutants of concern. Evaluate these strategies and implement changes as necessary to improve water quality and address TMDL pollutants of concern.

The City of Omaha continues to partner with the Omaha Public Schools to monitor four discharge points at the Saddlebrook Joint Use Facility. Only flow was monitored in 2017. Flow monitoring data remains consistent with previous years in showing reduced peak discharge rates and total volume from the green roof when compared to the traditional roof. Going forward, the City will continue to compare the performance of the traditional versus the green features in terms of volume. With all monitoring efforts, the

goal is to gain a better understanding of how well BMP's can reduce pollutants of concern so as to better promote their use in new and re-development.

In addition to Saddlebrook Joint Use Facility, the City of Omaha continues to actively evaluate the performance of BMPs, including past and current demonstration projects. Additional details on 2017 BMP assessments can be found in Section VIII and Attachment D.

The City of Omaha updated their Omaha Regional Stormwater Design Manual (ORSDM) in 2014. This update included many updates to Chapter 8 Stormwater Best Management Practices to reflect current technologies, research, and field experiences. No updates were made in 2017.

The City of Omaha presents information about BMPs to the general public, community and trade organizations, and businesses on a regular basis. These presentations cover information the City has learned about the performance of their demonstration projects, experiences through implementation of their SWMP, and design approaches for BMPs that improve their overall effectiveness. Sharing this information will help to improve post-construction BMPs in addressing pollutants of concern. A listing of events is included in Attachment E.

In 2016, the City of Omaha's Stormwater Program and Planning Department worked together to build the OmahaPlants.org website. The website is based on the plant list in the back of the Bioretention Manual, which was updated in 2016. The Planning Department is currently adding plants to the website associated with its programs. Bioretention systems are the most common type of BMP used in the Papillion Creek Watershed Partnership (PSMP). Improving its design, construction, and maintenance will have a significant benefit in protecting water quality and addressing pollutants of concern.

This permit requirement continues to be met.

VI. Pollution Prevention/Good Housekeeping

A. Maintain Facility Runoff Control Plans (FRCP) for all City maintenance facilities to indentify BMPs implemented. Review FRCP annually and update as necessary. Inspect all facilities annually.

The City of Omaha conducted compliance inspections at City Maintenance Facilities where FRCP's had been implemented. The audits are given an overall score of Outstanding, Satisfactory, or Needs Improvement. The scores were based upon a records and site review. The inspector not only looked to see that facility inspections were being conducted but that any corrective actions that were noted had been addressed in a timely manner. 22 facilities were inspected in 2017. 15 of the facilities were hot spots and are inspected annually. The other 8 inspections were at sites where no FRCP had been recommended (primarily public parks/golf courses) based on their "Hot Spot" evaluation. In 2017, 8 facilities received a Needs Improvement, 9 facilities received a Satisfactory, and 5 received an Outstanding rating. Copies of EQCD findings were forwarded to the facility and department supervisors.

In 2017, the Jaynes Street Joint Use facility hot spot evaluation was updated, a FRCP plan was developed, and it was rolled out in 2017.

This permit requirement continues to be met.

B. Inspect storm sewer conduits, channels and catch basins and remove and properly dispose of sediment and debris as needed to maintain an efficient system within permitted area.

The Sewer Maintenance Division is responsible for the inspecting, cleaning, repairing and maintaining of the storm sewer system. The Street Maintenance Division is responsible for any creek maintenance cleaning or clearing. They use the same work order tracking system to account for their activities. The table below represents both Divisions' storm sewer system activity for the permit year of 2017.

Work Order Type (Description of Work)	Storm/Storm Combined	Storm	Task Total
Clean FE - (Clean Flared End)	0	4	4
Clean Inlet - (Clean Inlet)	1,161	631	1,792
Clean MH - (Clean Manhole)	6	8	14
Clean Storm Struct - (Clean Stormwater Structure)	0	4	4
Dye Test - (Put Dye in Structure/Cavity to find flow)	78	223	301
I-Abandon (Abandon the Inlet)	2		2
I-Clean - (Clean the Inlet)	3	2	5
I-Flared End - (Reset/Daylight/New Grate)	0	8	8
Inlet Blown Off - (Inlet Grate was blown off but is not missing)	1	1	2
Inlet Broken - (Inlet Grate was broken and replaced)	7	2	9
Insp Inlet (Inspect Inlet)	28	42	70
Insp Structure - (Inspect Sewer Structure (ex.FE, MH, Inlet)	278	385	663
I-Repair - (Seal box, reset hood, reset grate, replace aprons)	65	181	246
I-Replace - (Replace Inlet, Includes all inlet types)	13	8	21
L/S Locate - (Locate where line segment is.)	45	72	117
MH Blown Off - (Manhole was blown off but not missing)	4	5	9
MH Broken - (Manhole broken and replaced)	0	8	8

Work Order Type (Description of Work)	Storm/Storm Combined	Storm	Task Total
MH Locate - (Find the location of manhole)	9	22	31
MH Stolen - (Manhole cannot be found)	1	1	2
MH-Clean - (Clean the Manhole)	1	2	3
MH-R/C - (Reset/Replace Ring & Cover)	6	38	44
MH-Repair - (Ex-seal riser/brick or pipe wall link, floor rehab)	9	16	25
O-Ditchwork (Open ditching, culvert daylighting, etc…)	0	4	4
P-Abandon - (Abandon the Pipe)	0	1	1
Private - (Private Problem, notify owner)	3	29	32
P-Sewer Walk - (Investigate/repair large sewers w/ walk team)	1	0	1
P-Storm Repair - (Repair a Storm line)	19	40	59
P-Storm Replace - (Replace a Storm line)	10	6	16
Street Flooding - (Storm Water is flooding the street)	20	7	27
Test Hole - (Drill Test Hole)	1	3	4
TV Assessment - (Complete PACP Assessment)	2	1	3
TV Inspection - (TV line to find defect)	37	52	89
Unscheduled Jet - (Jetting a line reactively)	23	41	64
Unscheduled Jet Vac - (Jet Vac'ing a line reactively)	67	36	103
Unscheduled Saw - (Jet Sawing a line reactively)	1	0	1
Creek Maintenance	-	-	2
Culvert Cleaning	-	-	35
Culvert Repair	-	-	1
Debris Removal	-	-	878
Ditch Maintenance/Cleaning	-	-	34
Storm Debris Removal - ROW	-	-	1
Task Total:	1,901	1,883	4,735

This permit requirement continues to be met.

C. Training will be provided for employees to prevent pollutant runoff from municipal operations at City maintenance facilities and at field operations.

The City of Omaha employed the services of Felsburg Holt & Ullevig (FHU) in 2009 to develop a training program targeted toward municipal operations at City maintenance facilities. EQCD held 10 training sessions at municipal facilities in 2017, there were a total of 182 employees in attendance combined.

This permit requirement continues to be met.

D. Provide for street cleaning in the following areas: Residential, Business, Major Streets, Other areas in conjunction with special projects.

There are approximately 4,877 lane miles within the City of Omaha. In 2017, the City mechanically swept a total of 10,665 curb miles. The table below gives a more detailed accounting of the City's street sweeping activities. The street sweeping operation no longer allows for debris to be separated by areas of the city.

Area of City	Curb Miles Swept	Tons of Debris Removed
Business District & Major Streets	4,621	1,425
Residential Areas	6,044	4,616
Totals	10,665	6,041

This permit requirement continues to be met.

E. City staff that applies pesticides will be trained in a certification program that complies with FIFRA regulations.

The City's Environmental Quality Control Division and the Parks and Recreation Department have applicators who are required to be FIFRA certified. There are currently 51 certified applicators. All certifications are up to date and are obtained from the Douglas–Sarpy County Extension Office.

This permit requirement continues to be met.

F. The City will continue to minimize pesticide and fertilizer use on publically maintained properties.

EQCD works with the Parks Department to encourage applicators to minimize pesticide and fertilizer use on publicly maintained properties. Additionally Keep Omaha Beautiful Inc. distributed information and presented on the topic to multiple locations and events during 2017. Also, KOB identified 86 active, local lawn care & landscaping companies that the City and/or KOB can reach out to and provide resources in the future.

This permit requirement continues to be met.

VII. Industrial Facilities

On March 3rd 2016, the City of Omaha sent a letter to NDEQ to request a permit amendment to modify its Stormwater Management Plant (SWMP) program element #7 Industrial Facilities. The NDEQ approved the amendment in a letter received April 5th, 2016.

A. Assess the current listing of industries and maintain a systematic process to update the current listing of "known industrial facilities" in the MS4 that are required to obtain and industrial NPDES permit for stormwater discharge.

July 18th, 2016 the NDEQ issued their new Industrial Stormwater Permit General Permit (ISW-GP), NER910000, replacing the previous permit NER900000. In March 2017, Omaha requested and received from the NDEQ an updated list of industries in Omaha covered under the NER910000 ISW-GP. 117 facilities were included on this list with 14 of those facilities having submitted documents but yet to receive their permit.

Outreach to Omaha industries has continued in 2017 to update industries that the City of Omaha's Industrial Stormwater Permit is no longer being implemented and the City of Omaha is focused on ensuring compliance with the NDEQ's ISW-GP.

In 2016, the City ceased use of the CBI Systems, Inc MS4Web web-based software for tracking of permitted sites. A spreadsheet was developed to track annual inspections of permitted facilities and an Access database is utilized to organize industry information and permitting information. In 2017, ISW-GPs have been integrated into the CityWorks asset management system to help with tracking of ISW-GP permitted facilities.

The City of Omaha website has a section devoted to industries and many educational and reference resources for them area available there, including ISW-GP NER910000 permit and related documents.

This permit requirement on schedule to be met.

B. Maintain and refine a process for review of SWPPPs and stormwater discharges from known industrial facilities subject to state and federal stormwater discharge regulations or those that are determined by the Permittee to have a potential for contributing a substantial pollutant loading to the MS4.

E & A Consulting Group (E&A) was contracted to assist the City in inspecting industrial facilities during 2017. A total of 25 facilities were inspected for compliance with the NDEQ ISW-GP NER910000. One facility did not have a NDEQ ISW permit but did have a City of Omaha ISW permit. They were included in the list of inspected facilities because they were on a list derived from City of Omaha ISW permitted facilities and they were the only one to not have the NDEQ ISW permit. The 25 inspections represent 21% of the 117 total facilities and 24% of permitted facilities provided by the NDEQ

This permit requirement continues to be met.

VIII. Storm Water Monitoring Plan

On March 3rd 2016, the City of Omaha sent a letter to NDEQ to request a permit amendment to modify its Stormwater Management Plant (SWMP) program element #8 Stormwater Monitoring Plan. The NDEQ approved the amendment in a letter received April 5th, 2016.

A. The development and implementation of a BMP monitoring plan. Monitoring will be flow based monitoring to assess the performance of different BMPs.

In 2015, the City of Omaha contracted with Burns and McDonnell to develop a BMP Monitoring Plan to assess the performance of existing green infrastructure demonstration projects to further assess their benefits on water quantity and quality. BMP monitoring continued in 2017 for the Creighton Prep, Orchard Park, and the University of Nebraska at Omaha Welcome Center sites. In 2017, Creighton Prep was monitored for rainfall using a rain gauge, inflow and outflow from the bioretention system using area velocity sensors, water movement at depth under the bioretention with pressure transducers in three wells, and ponding depth using a pressure transducer in perforated riser. Orchard Park was monitored for rain fall with a rain gauge, soil moisture content inside and outside of the bioretention system using soil moisture sensors, and ponding depth using a pressure transducer in a perforated riser. The University of Nebraska at Omaha Welcome Center was monitored for plant and overall performance using two webcams to record plant growth and water ponding levels, ponding depth using a pressure transducer in a perforated riser pipe, and soil moisture and temperature using soil moisture and temperature sensors nested in five locations at the site. Flow is not being directly measured at this site, but the data collected will provide insights into how well water infiltrates and the two bioretention systems are performing as a whole. The 2017 monitoring report for these sites was provided by Burns and McDonnell and is included in Attachment D. Included in the report, there are descriptions of two additional sites that will be monitored in 2018.

Additional monitoring occurred during 2017 to assess the performance of BMPs at additional demonstration project sites. Below is a summary of those assessments in 2017.

Saddlebrook Joint Use Facility

The construction of a green roof and a bioretention garden was completed in 2009 at the Saddlebrook Joint Use Facility. The bioretention garden receives runoff from part of the northwest parking area at the facility. Monitoring stations were installed at the green roof discharge point, traditional roof discharge point, bioretention garden discharge point and a point of discharge from a parking area without a BMP upstream.

Flows from each of these areas were monitored in 2017 and no water quality sampling occurred in 2017. A summary of the green and gray roof monitoring is included in Attachment D, however the full analysis of data for the bioretention system could not be completed prior to this annual report and is not included.

Flow monitoring data remains consistent with previous years in showing reduced peak runoff discharge rates and total volume from the green roof when compared to the traditional roof. There were 35 rain events monitored in 2017 with all 35 events generating runoff from the traditional roof and only 22 events generating runoff from the green roof. The green roof had 7,790.32 cubic feet (58,275.64 gallons) less stormwater runoff than the gray roof, a 64% reduction in volume. Accounting for the variation in contributing area for the monitored gray and green roofs, on average one square foot of gray roof will displace 1.56 cubic feet (11.6 gallons) of stormwater runoff while one square foot of green roof will

displace 0.49 cubic feet (3.66 gallons) of stormwater runoff. The same is true with the bioretention system with reducing total runoff and peak runoff discharge rates in 2017. Monitoring will continue for this site in 2018 with no change in what data is being collected. As data is collected, the City will continue to compare the performance of the traditional versus the green infrastructure features in terms of volume and peak flow reduction.

Sewer Maintenance Demonstration Project

The City of Omaha is collaborating with the US EPA, USGS, University of Nebraska at Omaha, and the Omaha CSO Program on the monitoring of the Sewer Maintenance demonstration project. The monitoring effort is focused on assessing the water quantity benefits associated with permeable pavement and bioretention systems through a water balance study. A weather station, inflow and outflow flumes, soil moisture sensors, and water level pressure transducers are all incorporated to monitor the total flows into and out of the systems. This monitoring project has been a three year effort with 2017 being the final year. A summary of results from the previous three years is included in Attachment D. Data collected in 2017 continue to show that the permeable pavement and bioretention system provide significant volume and peak flow reductions. A valve that is installed on the bioretention system also provides significant benefits in the overall performance and management of the system. The City of Omaha Stormwater Program recently contracted with USGS to continue the monitoring of this site in 2018.

Saturated Hydraulic Conductivity (Infiltration) Assessment

The City of Omaha performed an infiltration study at nine sites throughout the Omaha area in the spring, summer, and fall of 2017. This study examined the hydraulic characteristics of both bioretention systems and rain gardens when compared to traditional turf lawns, allowing for better estimation of their infiltration capacity and overall efficiency. A Modified Philip-Dunne (MPD) infiltrometer was used to estimate infiltration rates via saturated hydraulic conductivity measurements for rain gardens, bioretention systems, and turf lawns. Across all survey sites and all sampling periods, average measurements of saturated hydraulic conductivity in rain gardens (31.20 in/hr) and bioretention systems (19.55 in/hr) were significantly higher than those acquired over adjacent turf grasses (6.30 in/hr).

Data generated from this study provided a current assessment for the surveyed sites and enabled a comparative analysis of infiltration rates from baseline measurements collected in 2016. Measuring infiltration rates of BMPs will provide insights into the efficiency of BMPs in reducing discharges to the storm sewer system. This study highlighted the importance of obtaining quick and quantifiable measurements via MPD infiltrometers in addition to visual inspections. Future work includes continuing infiltration testing efforts at surveyed sites and additional sites to better capture spatial and temporal patterns. The full report is included in Attachment D.

This permit requirement continues to be met.

B. Partner with local organizations, such as Nebraska Watershed Network, to evaluate the results of data that they collected that could provide water quality information on stream or urban aquatic fisheries.

The City of Omaha partnered with the University of Nebraska at Omaha (UNO) on a project titled *Evaluating Regional Rain Garden Environmental Conditions, Functional Attributes, and Plant Health: A Three-Year Study*. The project came about as part of a service-learning grant UNO received to engage science teachers in Omaha Public Schools in the scientific method by doing real-life research projects. Steve Rodie, Professor, Biology and Environmental Studies, was the project lead, Rachael Burns, Horticulture teacher at Northwest High School in Omaha, was the researcher, Andy Szatko, Environmental

Quality Control Technician I and John O'Donnell, Intern, at the City of Omaha, provided support and equipment, and Ted Hartsig, Soil Scientist with Olsson and Associates, consulted on soil analysis. The project assesses the infiltration rates and soil analysis of rain gardens in the Saddle Hills Neighborhood just south of Northwest High School and part of a demonstration project by the City of Omaha Stormwater Program. Rachael Burns and Steve Rodie created a poster with their project information and results; this has been included in Attachment D.

This permit requirement continues to be met.

C. Use GIS to identify land use based on zoning and calculate pollutant loads from discharges of the MS4 based on literature values and precipitation data.

A land use map was created defining land use based on zoning for the City of Omaha; this has been included in Attachment D. Land use patterns were based on current zoning procedures/practices and used to map areas within the City Limits and within the Extra Territorial Jurisdiction (ETJ). Areas that are not defined with a zoning code, i.e. public roads, are not included in the values provided. Five classifications were used to document current land use patterns including Agricultural, Commercial, Industrial, Mixed-Use, and Residential areas. In 2016, some zoning codes were not classified into one of the five classifications due to uncertainty of how to classify them. Those areas were highlighted in gray on the map provided in the 2016 annual report. In 2017, many of these areas have been updated. There is approximately 204 mi^2 covered by the four different classifications, as shown in the table below.

Land Use by Square Mile

Land Use	**Omaha (mi^2)**	**ETJ (mi^2)**	**Total (mi^2)**	**Percent Cover (%)**
Agricultural	4.56	53.05	57.60	28.23%
Commercial	50.21	13.01	63.22	30.99%
Industrial	7.68	0.49	8.17	4.00%
Residential	50.59	24.44	75.03	36.78%
Total	113.05 (55.41%)	90.99 (44.59%)	204.03	

This permit requirement is on schedule to be met.

Zoning by Square Mile

Omaha Only		**Omaha & ETJ**	
Zone	**Sq Mi**	**Zone**	**Sq Mi**
AG	4.56	AG	61.74
AV	4.26	AV	4.32
CBD	0.86	CBD	0.86
CC	4.95	CC	5.34
CH	0.02	CH	0.02
DR	13.13	DR	33.36
DS	0.45	DS	0.50
GC	1.22	GC	1.30
GI	8.97	GI	10.15
GO	1.43	GO	1.46
HI	2.62	HI	2.76
LC	0.20	LC	0.21
LI	0.38	LI	0.44
LO	0.29	LO	0.30
MH	0.23	MH	0.48
MU	3.37	MU	4.73
NBD	0.21	NBD	0.21
R1	2.78	R1	3.90
R2	9.36	R2	10.60
R3	10.27	R3	11.22
R4	10.66	R4	21.48
R4(35)	15.31	R4(35)	15.56
R5	3.35	R5	4.56
R5(35)	1.84	R5(35)	1.87
R6	2.82	R6	3.63
R7	3.57	R7	3.89
R8	0.65	R8	0.66
RR	1.45	RR	1.74
Total	113.05		90.99

A literature review of pollutant loads by land use type was conducted in 2017. There were a wide range of values found for several stormwater pollutants including total nitrogen, total phosphorus, total suspended solids, and E. coli. Pollutant load values were reported as either pollutant export coefficients or event mean concentrations. Pollutant export coefficients represent the average total amount of a pollutant loaded into a system annually from a defined area (kg/ha/yr), whereas event mean concentrations estimate the mass of pollutant per unit of volume (mg/L) based on data generated from local stormwater monitoring. In order to calculate total pollutant loads from event mean concentrations knowledge of surface imperviousness for a given land use type and precipitation data for the area must be used. These literature values, while not specific to Omaha, provide a basic assessment of the range of pollutant loading concentrations within the Omaha area based on current land use patterns.

Pollutant Export Coefficients for total nitrogen and total phosphorus and total nitrogen and phosphorus load based on land use type area. The highest and lowest estimates are shown.

	Area *(ha)*	Total Nitrogen *(kg/ha/yr)*		Total Phosphorus *(kg/ha/yr)*		Total Nitrogen Load *(kg/yr)*		Total Phosphorus *Load (kg/yr)*	
		Low	High	Low	High	Low	High	Low	High
Agricultural	1,180.20	2.10	79.60	0.26	18.60	2,478.43	93,944.27	306.85	21,951.80
Commercial	13,005.24	1.90	13.80	0.10	7.60	24,709.95	179,472.28	24,709.95	98,839.80
Industrial	1,989.16	1.90	14.00	0.40	4.10	3,779.40	27,848.22	3,779.40	8,155.55
Residential	13,104.00	5.00	7.50	0.77	2.20	65,520.00	98,280.00	65,520.00	28,828.80

Event Mean Concentrations for total nitrogen, total phosphorus, and total suspended solids with the highest and lowest estimates shown.

	Total Nitrogen *(mg/L)*		Total Phosphorus (*mg/L)*		Total Suspended Solids (*mg/L)*	
	Low	High	Low	High	Low	High
Agricultural	0.23	41.49	0.08	2.29	19	582
Commercial	0.96	1.8	0.18	0.28	49.6	284
Industrial	0.86	2.9	0.27	0.36	92.2	231
Residential	1.5	5.92	0.38	75	73	299

IX. Additional Permit Reporting Requirements

1. Proposed SWMP Changes and Revisions

Attachment A is the SWMP for the City of Omaha; the City was granted an administrative extension to the existing permit and operates under this SWMP. The City annexed the following unincorporated areas in August 2017, and would now be considered part of the MS4 Permit coverage area.

Area Description		Population	Sq Miles	Acres
NW of Lake Cunningham Rd at 82nd	Lake Cunningham Hills	749	0.102	65.552
NW 168th & Pacific	Pacific Springs Village and Adjacent	114	0.242	155.127
NE 180th & West Dodge Road	West Dodge Place and Adjacent Areas	0	0.123	78.559

2. Expenditures for the Storm Water Program

At the time of preparation of this annual report the City Finance Department had not finalized the accounting for 2017 expenditures, so the following figures are subject to minor revisions. A copy of the complete City of Omaha budget with past expenditures can be found at http://finance.cityofomaha.org. Stormwater management activities are embedded in variety of City programs and work groups. These activities are funded by a variety of sources including the General Fund, Sewer Revenue Funds, Stormwater Administrative Fee Fund, Street and Highway Allocations, and the Street Maintenance Fund.

As such, it is difficult to accurately compile a comprehensive financial summary of every City activity that may have impacts on stormwater. For example, the City maintains litter cans in business districts throughout the City and has a contractor scheduled to empty them on a regular basis. This activity constitutes a stormwater source control or pollution prevention program. These costs are expended from the Solid Waste budget and are not included in the figures below.

1. Administrative

The Quality Control Division of the Omaha Public Works Department has responsibility for coordinating City activities to implement the SWMP and insure that the City meets its MS4 and CSO permit requirements. The estimated MS4 administrative expenditures for 2017 and appropriated 2018 budget amounts are listed below.

Administrative	2017 Expenditures	2018 Planned
Flood Control Administration	$299,283	$334,291
Baseline/BMP Monitoring[1]	$356,983	$477,323
Sediment/Erosion Control Program	$356,983	$477,323
Industrial Program[2]	$71,397	$95,465
Public Education/Outreach	$261,788	$350,037
MS4 Planning	$142,793	$190,929
Annual Administrative Total	$1,489,227	$1,925,366

[1] Includes outfall monitoring, outfall inspections, and illicit discharge investigations

[2] Includes industrial inspections and permitting

2. Operation and Maintenance

The major MS4-related Operation and Maintenance 2017 expenditures and budgeted amounts for 2018 are listed below. These amounts were estimated by evaluating the overall activity costs in the City budget organizations and assigning a percentage for the costs attributable to storm water related activities. There are undoubtedly additional City funded expenditures that impact storm water management, and the following is a conservative estimate of total costs for the City.

Operation and Maintenance	2017 Expenditures	2018 Budgeted
Engineering Design	$516,167	$690,660
Pavement Maintenance	$520,479	$1,470,305
Creek/Open Channel Maintenance	$905,957	$788,919
Street /Right of Way Cleaning	$2,568,870	$3,489,931
OWP (debris removal)	$9,787	$15,254
Residential Street Rehabilitation	$616,425	$588,377
Bridge Maintenance and Rehab	$54,886	$72,500
Sewer Maintenance	$654,784	$699,001
Annual O&M Total	$5,847,354	$7,814,946

ATTACHMENT A

Stormwater Management Plan for the City of Omaha

#1: Public Education & Outreach

BMP #	SWMP Element Description	Measurable Commitments & Implementation Schedule
1.A	Distribute informational brochures on the proper disposal of household hazardous wastes and the availability of the Household Hazardous Waste facility.	Year 1 – 5: Print and distribute brochures. Include the following in Annual Report: the quantity of waste received at the drop-off facility; a summary list of the distribution outlets used for brochures; an estimate of the brochures distributed each year.
1.B	Issue public service announcements related to storm water protection on local TV, radio or print outlets which will address TMDL pollutants of concern.	Year 1 – 5: A summary of the activities will be included in the Annual Report.
1.C	Continue existing drain marking program to improve public awareness concerning illegal dumping utilizing volunteer services (Boy Scouts) which will address TMDL pollutants of concern.	Year 1 – 5: Mark approximately 1,000 inlets annually and include a summary in the Annual Report.
1.D	Hold a Sediment and Erosion Control Seminar for the developers, builders, engineers, vendors, and graders which will address TMDL pollutants of concern.	Year 1 – 5: Annual Sediment and Erosion Control Seminar. Include a summary of the approximate number of participants in Annual Report.
1.E	Schedule outreach events with industry trade organizations to educate the regulated community regarding Omaha's Industrial Permitting Program.	Year 1 – 2: Industrial Permit Outreach. Include a summary of the number of events and approximate number of participants in Annual Report.
1.F	Work collaboratively with other community organizations to develop a campaign aimed at picking up pet waste which will address TMDL pollutants of concern.	Year 1: Develop outreach material and partnerships. Year 2 - 5: Distribute information. Provide an estimate of number of brochures distributed and activities targeted.
1.G	Develop materials and displays associated with BMP demonstration projects installed with Stormwater Management Program Plan funds from NDEQ.	Year 1 -5: Provide a narrative and examples of materials developed in annual report.
1.H	Develop a City Stormwater Program Web Site, including but not limited to storm water related information and provide educational information targeted for residents, children, and industries which will address TMDL pollutants of concern.	Year 1-5: Develop, operate and maintain a City Stormwater Web site. Include a narrative in the Annual Report describing the functions of the website.

 # 2: Public Participation and Involvement

BMP #	SWMP Element Description	Measurable Commitments & Implementation Schedule
2.A	Operate a stormwater hotline and web based complaint system for Watershed (general information, complaints, reports of illegal dumping, etc.).	Years 1 - 5: Maintain system operation and include summary of received calls/emails in the Annual Report.
2.B	Participate in organizing and hold open houses on Papillion Creek Watershed Plan activities.	Years 1 - 5: A summary of activities will be included in the Annual Report.
2.C	Continue to implement a stream Cleanup Day. Utilize Keep Omaha Beautiful to identify stream segments in need of cleanup and recruit volunteers from the local area, public groups, and representatives from local area business and developments.	Years 1 – 5: Conduct one clean-up day each year. A summary of the clean-up day activities will be included in the Annual Report.
2.D	Provide tours of UndertheSink, household hazardous waste facility, for schools and neighborhood organizations to learn about the proper way to manage household chemicals and about stormwater treatment systems installed at the site.	Year 1 – 5: Provide a summary of the tours conducted on an annual basis for the annual report. Document when BMPs are installed and included in the tour.
2.E	Hold World O! Water Festival focused on elementary school aged children to celebrate Clean Water and engage in water quality related activities.	Year 1-5: Hold event annually. Report estimated number of participants in Annual Report.
2.F	Participate in community organizations, conferences, workshops, and web casts related to water quality and stormwater management.	Year 1- 5: Report number of staff attending, dates, location, and description of events.

 # 3: Illicit Discharge Detection and Elimination

BMP #	SWMP Element Description	Measurable Commitments & Implementation Schedule
3.A	Perform dry-weather inspections including Physical Characteristics Examinations of storm water outfalls 72" or greater and any outfalls with documented complaints.	Year 1 – 5: Inspect and record observations. Included a count of outfalls inspected in the Annual Report.
3.B	Investigate and seek resolution concerning any dry weather discharges of potentially impacted by sources by notifying the source that they must discontinue discharging, and initiate enforcement action consistent with adopted ordinance which will address TMDL pollutants of concern. Any source that the applicant feels constitutes an immediate health or safety threat will be reported immediately to the NDEQ.	Year 1 – 5: The following information will be included in the Annual Report: the number of potential process or wastewater sources found; the number of above resolved at local level; and the identity of any referred and/or unresolved discharge sources.
3.C	Dry weather inspection of storm water outfalls, including smaller outlets and those that discharge to lesser tributaries or other storm conduits, in response to suspect conditions and/or complaints.	Year 1 – 5: Inspect and record observations. Included a count for outfalls inspected in the Annual Report.
3.D	Enforce existing City codes prohibiting illicit discharge connections to storm sewers.	Year 1 -5: Summarize code violations and enforcement actions taken in annual report.
3.E	Maintain and prevent instances of sanitary sewer leakage into MS4 or waters of the state.	Year 1 -5: Summarize investigations of leakage and actions taken in Annual Report.
3.E	Maintain and update a sewer map of major storm water outfalls and identify the names of respective receiving waters.	Years 1 - 5: Map will be maintained electronically on City GIS.
3.G	Prevent, contain and respond to spills to the MS4. Review, as necessary, interdepartmental SOPs with respects to spills, dumping and illegal disposal that impacts the MS4.	Year 1-5: Summarize number of reports of spills and actions taken in Annual Report. Identify City Department SOP and review date in Annual Report.

 # 4: Construction Site Runoff Control

BMP #	SWMP Element Description	Measurable Commitments & Implementation Schedule
4.A	Maintain the construction site inspection and reporting web site and continue to make enhancements.	Year 1-5: Include a narrative in the annual report about major web site upgrades and the date implemented.
4.B	Maintain a construction site inspection program that includes procedures for reporting, resolving deficiencies, and taking appropriate enforcement action consistent with adopted ordinances.	Years 1-5: The Annual Report will contain the following information relative to this commitment: 1) the number of inspections conducted in each of the following size categories: < 5 acres and > 5 acres 2) the number of sites receiving enforcement actions.
4.C	Maintain regulations and design specifications for controlling erosion, sediment loss, and other TMDL pollutants of concern from construction sites that disturb areas of 1 acre or more.	Year 1 -5: Provide a narrative description of any changes implemented in the City's sediment and erosion control regulations or design specifications in the annual report.
4.D	Maintain a program for performing review of Grading Permit applications to ensure compliance with applicable regulations and design specifications.	Year 1 -5: Summarize the number of grading permit issued on an annual basis.

 # 5: Post-construction Runoff Control

BMP #	SWMP Element Description	Measurable Commitments & Implementation Schedule
5.A	Develop guidance document for Post-Construction Stormwater Management Plan.	Year 2: Develop guidance document for Post Construction Storm Water Management Plan Year 2-5: Revise as necessary.
5.B	Participate with other City Departments to prepare an Environmental Element of City of Omaha Master Plan and include applicable storm water management provisions.	Year 1-5: Summarize progress in annual report. Year 5: Present the Environmental Element to City Planning Board and Omaha City Council for their consideration to adopt into the Omaha Master Plan.
5.C	Develop a database of existing structural BMPs (private and public) that reduce the impact of urbanization on storm water run-off and improve water quality and enhance other amenities and activities such as green space, parks and recreation, urban planning, aesthetics, and public safety.	Year 2: Coordinate with engineering firms and the NRD to identify existing BMPs and their location. Year 3: Develop a database and GIS map of BMPs.
5.D	Inspect annually and maintain (as necessary) City owned storm water BMP structures.	Year 1 -5: List BMPs inspected and summarize maintenance activity in Annual Report.
5.E	Revise stormwater BMP maintenance and inspection plan as needed.	Year 1-5: Review maintenance plan annually and include new structures. Make revisions as necessary. Report revisions and new structures in Annual Report.
5.F	Implement strategies, which include a combination of structural and or non-structural BMPs appropriate for the watershed, which will address TMDL pollutants of concern. Evaluate these strategies and implement changes as necessary to improve water quality and address TMDL pollutants of concern.	Year 1 -5: Summarize strategies, findings, and any changes in the Annual Report.

 # 6: Pollution Prevention/Good Housekeeping for Municipal Operations

BMP #	SWMP Element Description	Measurable Commitments & Implementation Schedule
6.A	Maintain Facility Runoff Control Plans (FRCP) for all City maintenance facilities to indentify BMPs implemented. Review FRCP annually and update as necessary. Inspect all facilities annually.	Year 1 -5: Review logs of FRCP updates and inspections. Report dates in annual report.
6.B	Inspect storm sewer conduits, channels and catch basins and remove and properly dispose of sediment and debris as needed to maintain an efficient system within permitted area.	Year 1 - 5: Report maintenance activities in the Annual Report.
6.C	Training will be provided for employees to prevent pollutant runoff from municipal operations at City maintenance facilities and at field operations.	Years 1 – 5: Provide training annually for employees and include summary in Annual Report of when training was held and number of attendees.
6.D	Provide for street cleaning in the following areas: Residential Business Major Streets Other areas in conjunction with special projects	Year 1 – 5: Summarize street cleaning activities in annual report.
6.E	City staff that applies pesticides will be trained in a certification program that complies with FIFRA regulations.	Year 1 -5: Report total number of City Staff certified each year in the Annual Report.
6.F	The City will continue to minimize pesticide and fertilizer use on publically maintained properties.	Year 1 -5: Summarize efforts in Annual Reports.

 # 7: Industrial Facilities (Amended 2016)

BMP#	SWMP Element Description	Measureable Commitments & Implementation Schedule
7.A	Assess the current listing of industries and maintain a systematic process to update the current listing of "known industrial facilities" in the MS4 that are required to obtain an industrial NPDES permit for stormwater discharge.	**On-Going All years –** Maintain the process for updating industrial facilities and any additional new facilities on the list of NDEQ permitted industrial facilities.
7.B	Maintain and refine a process for review of SWPPPs and stormwater discharges from known industrial facilities subject to state and federal stormwater discharge regulations or those that are determined by the Permittee to have a potential for contributing a substantial pollutant loading to the MS4.	**On-Going All Years** – Annually inspect 20%of NDEQ permitted industrial facilities subject to state and federal stormwater discharge regulations or develop a prioritization scheme to address facilities of greatest pollution potential for targeted inspections if inspection of all known facilities is not possible based on increases to the number of known facilities.
The Permittee may conduct other activities not specifically identified in this section which contribute to the industrial and related facility program.		

#8: Storm Water Monitoring Plan (Amended 2016)

BMP#	SWMP Element Description	Measurable Commitments & Implementation Schedule
8.A	The development and implementation of a BMP monitoring plan Monitoring will be flow based monitoring to assess the performance of different BMPs Monitoring Plan: Monitoring of the BMPs is to provide more useful data than has been gathered in the past. This will provide for a more complete picture of the efficiency of various BMPs in the watershed. a. Consideration will be given to the following objectives: i. Quantify the BMPs ability to reduce discharges to the storm sewer system. ii. Evaluate if any improvements could be made to the BMP to increase the volume of water detained from the storm sewer system. b. A record of the following information: i. Narrative and quantitative data, as appropriate, for each event. ii. A narrative description of the data and duration of the events sampled (either simulated event or real event)	**On-Going All Years** – Implement annual monitoring plan
8.B	Partner with local organizations, such as Nebraska Watershed Network, to evaluate the results of data that they collected that could provide water quality information on stream or urban aquatic fisheries	**On-Going All Years** –Report the results in the annual report.
8.C	Use GIS to identify land use based on zoning and calculate pollutant loads from discharges of the MS4 based on literature values and precipitation data.	**On-Going All Years** –Report the estimate in the annual report based on literature values.
The Permittee may conduct other activities not specifically identified in this section which contribute to Monitoring Program.		

ATTACHMENT B

ATTACHMENT B
COMPLAINT INVESTIGATIONS

Date Received	Issue Address	Illicit Discharge	Complaint Type	Enforcement Action Taken
1/12/2017	W Center Rd & Westgate Rd	No	Debris in the Street	Other
1/20/2017	65th & Military	No	Debris in the Street	Other
2/7/2017	4406 Curtis Ave	No	Debris in the Street	Other
2/9/2017	6424 Newport Ave	No	Stormwater Runoff	No Action Taken
2/15/2017	12th & J St	No	Debris in the Street	Other
3/2/2017	7220 Pratt ST	No	Construction	Request for Voluntary Compliance - Verbal
3/6/2017	Cuming Street/ The north lane of westbound Cuming between the interstate ramp and 30th	No	Concrete Washout/Slurry	Request for Voluntary Compliance - Verbal
3/7/2017	17th & Capitol Ave	No	Debris in the Street/Sewer	No Action Taken
3/7/2017	S 99th St & Mockingbird Dr	No	Debris in the Street	Other
3/7/2017	3026 Redick Ave	No	Debris in the Street/Sewer	Other
3/13/2017	E Locust & Abbott Dr	No	Debris in the Street/Sewer	Other
3/15/2017	9527 Westchester (originally listed as 9521 Douglas St)	No	Construction	Request for Voluntary Compliance - Written
3/24/2017	I-480 W & Martha St	No	Stormwater Runoff	Request for Voluntary Compliance - Written
3/24/2017	33rd & Emmet	No	Construction	Request for Voluntary Compliance - Written
3/29/2017	16th & Vinton St	No	Debris in the Street/Sewer	Other
3/30/2017	S 185th & Drexel St in front of 18575 Drexel St	No	Debris in the Street/Sewer	Other
3/31/2017	1338 N 143rd Ave Cir	No	Sediment & Erosion	No Action Taken
4/3/2017	3103 N 204th St	Yes	Spill	None
4/3/2017	16TH & Read ST 1440 Read St	No	Industrial	Request for Voluntary Compliance - Written

ATTACHMENT B

Date Received	Issue Address	Illicit Discharge	Complaint Type	Enforcement Action Taken
4/6/2017	1110 N Skyline Dr	No	Stormwater Runoff	Request for Voluntary Compliance - Verbal
4/10/2017	1302 N 143rd Ave Cir	No	Sediment & Erosion	No Action Taken
4/11/2017	4945 S 72nd St	Yes	Leak	Request for Voluntary Compliance - Verbal
4/13/2017	Duplicate of 340	No	Concrete Washout/Slurry	Letter of Warning
4/27/2017	7602 Pinkney St, Omaha, NE 68134	No	Dumping	No Action Taken
5/2/2017	1014 N 63 St	Yes	Construction	Request for Voluntary Compliance - Verbal
5/3/2017	Near 87th & Cass 501 N 87th Street / NO PCB's	Yes	Spill	No Action Taken
5/5/2017	8924 North 36th Street	No	Construction	Other
5/11/2017	501 N 87th St	Yes	Spill	No Action Taken
5/17/2017	3723 S 49th St	No	Construction	Request for Voluntary Compliance - Verbal
5/17/2017	915 S 184th Ave Cir	No	Construction	Request for Voluntary Compliance - Verbal
5/18/2017	8610 N 171st St	No	Construction	No Action Taken
5/20/2017	1424 N 187th St	No	Construction	Request for Voluntary Compliance - Verbal
5/22/2017	12572 Ohern ST	No	Debris in the Street	No Action Taken
5/23/2017	2222 N 204 Ter (directly south) No address on Dogis / County Assessor Parcel ID 0805790020	No	Construction	Request for Voluntary Compliance - Verbal
5/23/2017	84th & Tangier Way, just south of there	No	Concrete Washout/Slurry	Request for Voluntary Compliance - Verbal
5/26/2017	3546 S HWS Cleveland Blvd	No	Debris in the Street/Sewer	Other
6/1/2017	35th & Franklin	No	Construction	Request for Voluntary Compliance - Verbal
6/2/2017	5419 Leavenworth St	No	Construction	Request for Voluntary Compliance - Verbal
6/4/2017	1515 S 5th St	No	Stormwater Runoff	Request for Voluntary Compliance - Verbal

ATTACHMENT B

Date Received	Issue Address	Illicit Discharge	Complaint Type	Enforcement Action Taken
6/6/2017	6306 N 160th Ave	No	Construction	Request for Voluntary Compliance - Verbal
6/6/2017	6306 N 160th Ave	No	Construction	Request for Voluntary Compliance - Verbal
6/7/2017	6501 S 185th Ave, 18454 Monroe St; 6412 & 6418 S 184th Ave	No	Construction	Request for Voluntary Compliance - Verbal
6/9/2017	13336 B St	No	Industrial	Request for Voluntary Compliance - Verbal
6/12/2017	1207 S 107th St	No	Construction	Request for Voluntary Compliance - Verbal
6/14/2017	12572 Ohern St	No	Debris in the Street/Sewer	No Action Taken
6/19/2017	3034 Redick Ave	No	Stormwater Runoff	Request for Voluntary Compliance - Verbal
6/19/2017	7010 N 143 St	No	Construction	Other
6/19/2017	4070 Ames Ave	No	Debris in the Street/Sewer	Other
6/20/2017	180th & F St 18115 Atlas St	No	Debris in the Street/Sewer	No Action Taken
6/20/2017	91st Ave & Pacific (south on 91st Ave)	No	Sediment & Erosion	Request for Voluntary Compliance - Verbal
6/20/2017	18115 Atlas St 180th & F St	No	Construction	Request for Voluntary Compliance - Verbal
6/23/2017	3606 McKinley St	No	Leak	Request for Voluntary Compliance - Verbal
6/23/2017	1314 S 27th St	No	Sediment & Erosion	Request for Voluntary Compliance - Verbal
6/24/2017	16th & Ogden St	No	Sediment & Erosion	Request for Voluntary Compliance - Verbal
6/26/2017	N 73rd St & Miami St 2812 N 72 St	No	Construction	Request for Voluntary Compliance - Written
6/29/2017	42nd & Redman 4202 Redman Ave	No	Leak	Notice of Violation
6/30/2017	1045 N 115th St, in the parking lot by the golf course	Yes	Spill	No Action Taken
7/7/2017	3700 Dewey 3708 Dewey Ave	No	Construction	Request for Voluntary Compliance - Verbal
7/10/2017	1404 S 190 Plz	No	Stormwater Runoff	No Action Taken

ATTACHMENT B

Date Received	Issue Address	Illicit Discharge	Complaint Type	Enforcement Action Taken
7/17/2017	39th and Farnam	No	Construction	Request for Voluntary Compliance - Verbal
7/18/2017	194th & Seward Cir	No	Concrete Washout/Slurry	Other
7/21/2017	5120 Mayberry St	No	Construction	Other
7/26/2017	16420 Jaynes - approx. 16420 Jaynes St 16423 Jaynes St	No	Construction	Request for Voluntary Compliance - Verbal
7/26/2017	915 184th Ave Cir, Elkhorn, NE 68022	No	Stormwater Runoff	Request for Voluntary Compliance - Verbal
7/27/2017	6418 S 184 Ave 6412 S 184 Ave	No	Construction	Request for Voluntary Compliance - Verbal
7/27/2017	885 N HWS Cleveland Blvd	No	Stormwater Runoff	No Action Taken
7/28/2017	N 182nd Cir & Thayer St	No	Construction	Request for Voluntary Compliance - Verbal
7/31/2017	5744 N 167 Cir	No	Non-stormwater discharge	Other
8/1/2017	99th & Redick	No	Sediment & Erosion	Request for Voluntary Compliance - Verbal
8/3/2017	181st St & Jefferson St (6215 S 182 AVE)	No	Construction	No Action Taken
8/8/2017	N 182nd Cir	No	Construction	Request for Voluntary Compliance - Verbal
8/9/2017	7701 W Center Rd	No	Stormwater Runoff	Other
8/11/2017	NA	No	Construction	No Action Taken
8/15/2017	38th & Webster	No	Stormwater Runoff	No Action Taken
8/16/2017	4323 N 81 Ave Cir	No	Debris in the Street/Sewer	No Action Taken
8/23/2017	8521 California St	No	Stormwater Runoff	No Action Taken
8/25/2017	2308 S 16th St	No	Industrial	No Action Taken
8/28/2017	39th & Farnam	No	Construction	Request for Voluntary Compliance - Verbal
8/28/2017	1625 N 74th St	No	Construction	No Action Taken

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Date Received	Issue Address	Illicit Discharge	Complaint Type	Enforcement Action Taken
8/28/2017	158th & Woolworth	No	Dumping	No Action Taken
8/29/2017	15513 King Cir	No	Non-stormwater discharge	No Action Taken
8/30/2017	49th and Dodge	No	Construction	Request for Voluntary Compliance - Verbal
8/31/2017	21st & Burt, south side	Yes	Construction	No Action Taken
9/1/2017	9521 / 9501 Douglas St	No	Construction	Request for Voluntary Compliance - Verbal
9/11/2017	10305 N Street	No	Construction	Request for Voluntary Compliance - Verbal
9/14/2017	6202 Q ST	No	Construction	Request for Voluntary Compliance - Verbal
9/20/2017	2905 S 168th St	No	Dumping	Request for Voluntary Compliance - Written
9/20/2017	3747 N 38th St	No	Spill	Other
9/22/2017	720 Pacific St	No	Sediment & Erosion	No Action Taken
9/25/2017	72nd & Pawnee Rd; 13560 N 72nd S	No	Sediment & Erosion	Other
9/26/2017	3821 N 167th Court	No	Sediment & Erosion	Request for Voluntary Compliance - Verbal
10/2/2017	Nearest address: 4202 D St, Omaha, NE, 68107	No	Other (please specify)	Other
10/3/2017	60th St between Arbor to Grover	No	Sediment & Erosion	Request for Voluntary Compliance - Verbal
10/4/2017	4930 Battlefield Dr	No	Industrial	No Action Taken
10/6/2017	1444 S 20th St	No	Industrial	Request for Voluntary Compliance - Verbal
10/6/2017	9803 Pasadena Ave	No	Sediment & Erosion	Request for Voluntary Compliance - Verbal
10/10/2017	10323 N 182nd Cir	No	Construction	Request for Voluntary Compliance - Verbal
10/11/2017	9313 Davenport St	No	Sediment & Erosion	Request for Voluntary Compliance - Verbal
10/12/2017	13th St between William & Pine	No	Construction	Request for Voluntary Compliance - Verbal

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Date Received	Issue Address	Illicit Discharge	Complaint Type	Enforcement Action Taken
10/23/2017	1026 S 32nd St, Omaha, NE 68105	No	Construction	No Action Taken
10/23/2017	Nearest Address (Est.): 3625 Dewey Ave, Omaha, NE, 68105	No	Construction	Request for Voluntary Compliance - Verbal
10/24/2017	13th St & RR crossing north of Pacific	No	Stormwater Runoff	Other
11/3/2017	3009 S 74th St, Omaha, NE	No	Debris in the Street/Sewer	Request for Voluntary Compliance - Verbal
11/6/2017	6628 Charles Street, Omaha, NE	Yes	Spill	No Action Taken
11/6/2017	3717 Harney St, Omaha, NE	No	Concrete Washout/Slurry	Request for Voluntary Compliance - Verbal
11/17/2017	4905 So. 160th Street	No	Dumping	Request for Voluntary Compliance - Verbal
11/17/2017	721 S. 72nd St., Ste.111	No	Dumping	Request for Voluntary Compliance - Written
11/21/2017	9521 Douglas	No	Construction	Request for Voluntary Compliance - Verbal
11/29/2017	1516 N 108th St	No	Construction	Request for Voluntary Compliance - Verbal
11/29/2017	1516 N 108th St	No	Construction	Request for Voluntary Compliance - Verbal

ATTACHMENT C

Omaha Grading Permit Enforcements

Permit Number	Address	Status	Date Submitted	Action Taken
OMA20170208-3962-GP1	180th and Emmet St, Omaha, NE 68022	Active	11/16/2017	LOW
OMA20131027-1558-1	56th and Sorensen Parkway, Omaha, NE 68152	Active	11/1/2017	LOW
OMA20160907-3786-GP2	20810 Cumberland Dr, Omaha, NE 68022	Resolved	9/11/2018	NOV with fines

ATTACHMENT D

Saddlebrook Green Infrastructure Assessment

2017 Monitoring Summary

The Saddlebrook Joint Use Facility is located at 149th Street and Laurel Avenue in northwest Omaha, Nebraska (Figure 1). This city-owned, multi-use facility sits on roughly 20 acres of land, slightly upstream of Standing Bear Lake. The Saddlebrook Joint Use Facility acts as a stormwater demonstration project with several stormwater best management practices (BMPs), including a green roof, a bioretention system, and a dry retention pond. In 2009, a sedum-type green roof was installed on the library portion of the building, which can be viewed from the community center's second floor walking/running track. On the North side of the multi-use building, a bioretention system was installed to collect stormwater runoff from the west parking lot. A traditional dry retention pond was installed on the northeast portion of the building to collect stormwater runoff from the east parking lot. The Saddlebrook demonstration project was designed to compare traditional "gray" infrastructure practices against green infrastructure practices.

Flow monitoring equipment has been installed on site to measure discharge (outflow) rates from the gray roof, the green roof, the bioretention system, and the dry retention pond. This data is collected with 2150 Area Velocity Flow Module and Sensors which provide quantity and velocity measurements of stormwater runoff. This data will be used to compare volume, peak flow rate, and overall efficiency between traditional and green infrastructure practices. A rain gauge has been installed on site to measure precipitation at the site. For this annual report, the 2017 assessment of the green and gray roofs is provided. The bioretention system and parking lot systems were monitored in 2017; however the full analysis of data could not be completed prior to this annual report. Outflow (discharge) data was collected from the gray and green roofs. Inflow and outflow data was collected from the bioretention system and outflow (runoff) data was collected from the East parking lot.

Monitoring equipment collected data from June through early November 2017. During the 2017 sampling period, 35 precipitation events were recorded at the Saddlebrook site, totaling 15.71 in of precipitation (Table 1). The total accumulation recorded at Saddlebrook is slightly lower than recorded values (during the same sampling period) at the National Weather Service Valley weather station (Valley, NE; station ID USC00258795) and Waterford weather station (Bennington, NE; station ID KNEBENNI11) with 20.26 in and 18.83 in, respectively. The lowest recorded precipitation event at Saddlebrook was 0.02 in with the highest recorded precipitation event at 1.90 in. The average precipitation across all events was 0.45 in with the average duration for a precipitation event of 2 hours and 20 minutes.

All 35 precipitation events recorded discharge values from the gray roof with an observed total volume of 12,241.9 cubic feet (91,575.77 gallons) for the 2017 sampling period. Only 22 out of the 35 precipitation events recorded discharge values from the green roof with an observed total volume of 4,451.58 cubic feet (33,000.13 gallons). In 2017, the green roof had 7,790.32 cubic feet (58,275.64 gallons) less stormwater runoff than the gray roof, a 64% reduction in volume. Accounting for the variation in footprint or area of both the monitored gray and green roof, we can calculate that on average one square foot of gray roof will displace 1.56 cubic feet (11.6 gallons) of stormwater runoff while the one square foot of green roof will displace 0.49 cubic feet (3.66 gallons) of stormwater runoff.

Green infrastructure practices are known for their reduction of stormwater runoff volumes but have also been documented to delay and reduce peak flows when compared to traditional gray infrastructure practices. During the 2017 sampling period, the delay in peak flows from the gray roof to the green roof ranged from a 14-minute delay to 2 hours and 45-minutes, with an average delay time of 38 minutes. Precipitation intensity and duration heavily influenced this range. On average, a 75% reduction in peak flow occurred across all events (Table 1).

Flow monitoring data remains consistent with previous years in showing reduced peak discharge rates and total volume from the green roof when compared to the traditional gray roof. The same is true for the bioretention system in 2017. Monitoring will continue for this site in 2018 with no change in what data is being collected. As data is collected, the City will continue to compare the performance of the traditional versus the green infrastructure features in terms of volume and peak flow reduction.

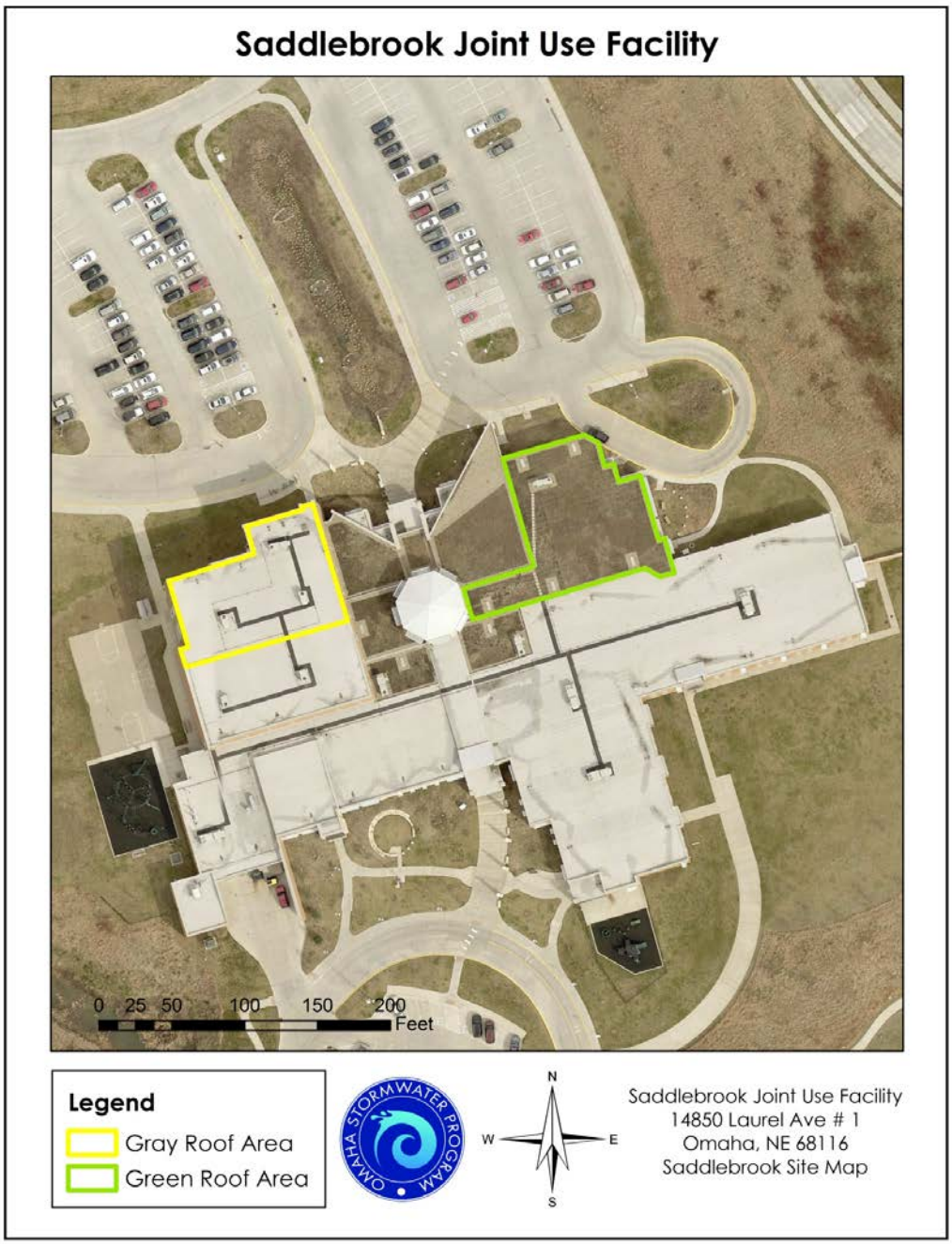


Figure 1. Site map of the Saddlebrook Joint Use Facility highlighting the drainage area for both the Gray and Green Roofs.

ATTACHMENT D

Table 1. Summary of 2017 rain/discharge events for the Gray and Green Roofs at Saddlebrook.

Year	Month	Date	Total Precip	Observed Volume Gray Roof	Observed Volume Green Roof	Peak Rate Gray Roof	Peak Rate Green Roof	% Reduction Peak Flow
yyyy	*mmm*	*dd-mmm*	*in*	*cf*	*cf*	*cfs*	*cfs*	*%*
2017	JUN	12-Jun	0.13	114.84	0.00	0.024	0.0	100%
2017	JUN	13&14-Jun	0.48	37.68	5.10	0.043	0.004	91%
2017	JUN	15&16-Jun	0.11	141.36	1.08	0.099	0.001	99%
2017	JUN	16&17-Jun	1.5	392.58	499.56	1.791	0.462	74%
2017	JUN	26-Jun	0.24	253.02	0.84	0.105	0.001	99%
2017	JUN	28-Jun	0.18	244.5	0.72	0.085	0.001	99%
2017	JUN	29&30-Jun	0.20	167.52	0.00	0.085	0.0	100%
2017	JUN	30-Jun	0.08	136.86	0.00	0.050	0.0	100%
2017	JUL	2-Jul	0.13	193.32	0.00	0.051	0.0	100%
2017	JUL	3-Jul	0.55	142.62	73.20	0.106	0.056	47%
2017	JUL	11&12-Jul	0.13	77.04	0.00	0.033	0.0	100%
2017	JUL	13-Jul	0.14	145.2	0.00	0.043	0.0	100%
2017	JUL	18-Jul	0.05	34.92	0.00	0.037	0.0	100%
2017	JUL	26&27-Jul	1.44	472.68	332.76	0.107	0.17	-59%
2017	AUG	5-Aug	0.06	183.24	0.00	0.028	0.0	100%
2017	AUG	10-Aug	0.35	79.14	4.14	0.075	0.002	97%
2017	AUG	13-Aug	0.02	60.12	0.00	0.013	0.0	100%
2017	AUG	15&16-Aug	1.56	275.58	584.04	0.074	0.164	-122%
2017	AUG	20-Aug	0.35	213.54	17.70	0.054	0.003	94%
2017	AUG	21&22-Aug	0.45	75.18	68.58	0.052	0.029	44%
2017	AUG	25-Aug	0.33	351.9	19.44	0.082	0.002	98%
2017	SEP	10-Sep	0.03	147.24	0.00	0.037	0.0	100%
2017	SEP	16&17-Sep	0.65	381.54	76.02	0.090	0.017	81%
2017	SEP	18&19-Sep	0.5	489.66	306.18	0.131	0.041	69%
2017	SEP	24-26-Sep	1.71	1478.8	649.62	0.119	0.072	39%
2017	OCT	1-Oct	0.20	410.52	72.78	0.094	0.009	90%
2017	OCT	2-Oct	0.48	686.52	230.58	0.132	0.032	76%
2017	OCT	3-Oct	0.25	202.38	169.86	0.087	0.017	80%
2017	OCT	5&6-Oct	0.65	1102.32	315.24	0.111	0.086	23%
2017	OCT	6&7-Oct	1.9	2010.54	908.64	0.076	0.054	29%
2017	OCT	9-Oct	0.02	21.06	0.00	0.016	0.0	100%
2017	OCT	10-Oct	0.59	787.8	115.14	0.129	0.012	91%
2017	OCT	14-Oct	0.10	245.76	0.36	0.056	0.001	98%
2017	OCT	21-Oct	0.08	234.3	0.00	0.157	0.0	100%
2017	NOV	12-Nov	0.07	250.62	0.00	0.172	0.0	100%
		Total	15.71	12,241.90	4,451,58		**Average**	75%

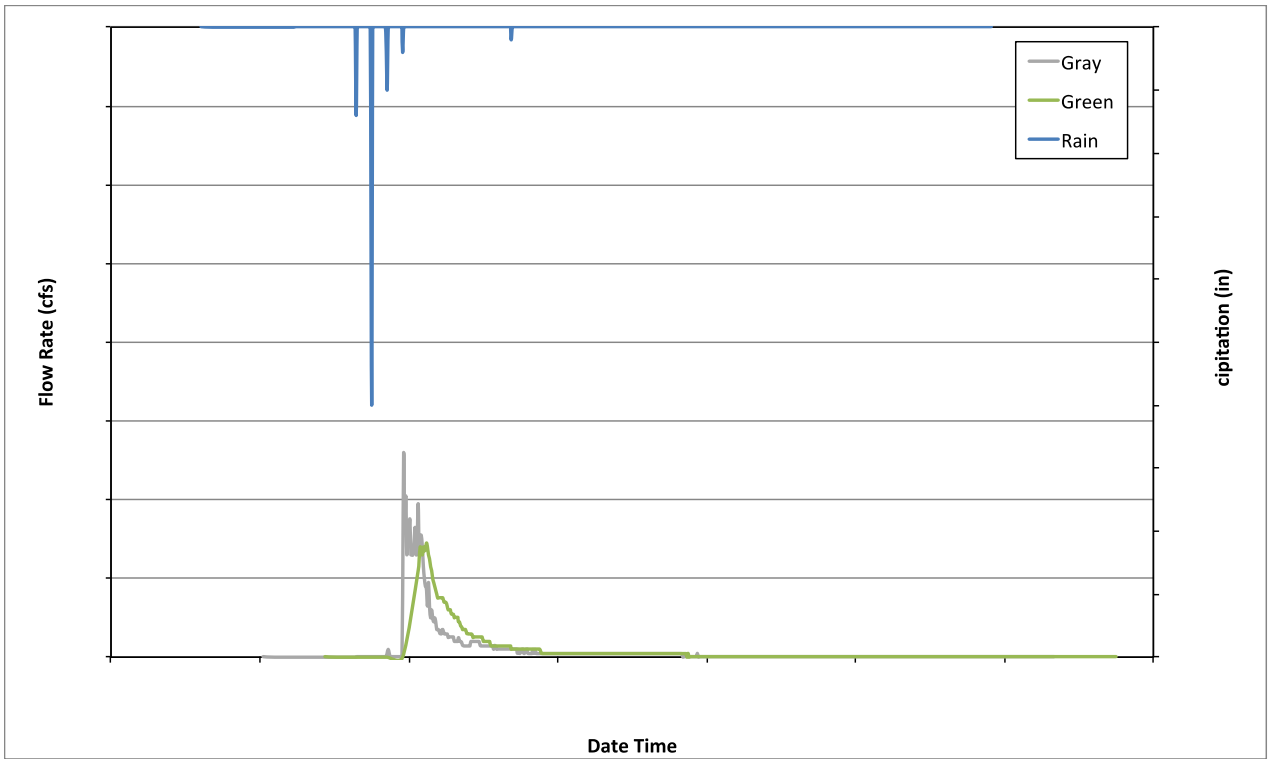


Figure 2. Discharge event for 08/22/2017 through 08/22/2017. Total precipitation for the event was recorded at 0.45 inches.

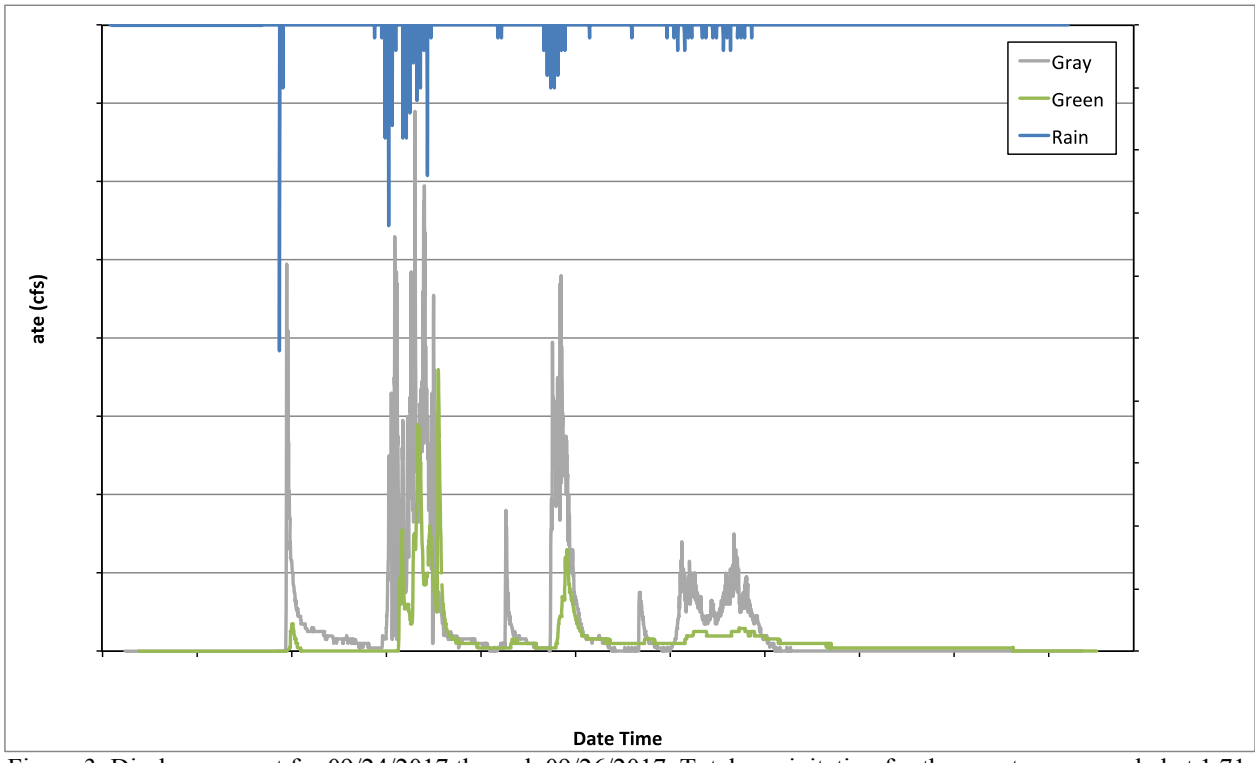


Figure 3. Discharge event for 09/24/2017 through 09/26/2017. Total precipitation for the event was recorded at 1.71 inches.

Green Infrastructure Monitoring – Investigation of Soils for Green Infrastructure Implementation in at the Sewer Maintenance Facility in Omaha – NE

David Rus & Kellan Strauch, USGS Nebraska Water Science Center

Research Objectives:

- To characterize the impacts of a green infrastructure project on the local water balance during storm events.
- To relate those impacts to the role of local, urban soils.
- To demonstrate green infrastructure performance in the soils and climate of Omaha, Nebraska for comparison to other sites nationwide.

Monitoring Approach: The project site was selected through consultation with the City of Omaha in anticipation of the design and construction of a green infrastructure project at their Sewer Maintenance Facility near 69th and Q Streets. The project included permeable pavers in sequence with a bioretention cell, and monitoring equipment was incorporated into the design. The project was designed in 2013, constructed in 2014, and non-winter monitoring occurred from 2015-17.

The water balance was measured in the bioretention cell in the following manner: inflow into the bioretention cell was measured by a cutthroat flume at one entrance to the cell and by a Palmer Bowlus flume to capture the flow entering the cell through the permeable pavers. Flow out of the cell through an underdrain was measured by a Palmer Bowlus flume installed on the underdrain pipe. Due to construction of the underdrain pipe at a slope greater than that specified in the design, the data from this underdrain flume was often compromised by critical velocities. Overflow leaving the cell through a standpipe during high-volume events was estimated by treating the standpipe opening as a weir and measuring the depth of water above the standpipe. Potential evapotranspiration was measured by a Campbell Scientific ET107 system, and rainfall was measured using a tipping bucket mechanism. Infiltration was estimated as the residual of that water balance.

Soil moisture was monitored using Time Domain Reflectometry probes distributed within and adjacent to the bioretention cell in an attempt to identify wetting fronts moving vertically as well as laterally. However, these data were problematic in their collection and interpretation, likely as a result of preferential flow-paths being introduced by the sensor cables in the clay-loam soils, escpecially when standing water was occurring. The utility of these data is still being assessed, and only a subset of the probe data will likely be incorporated into the final report.

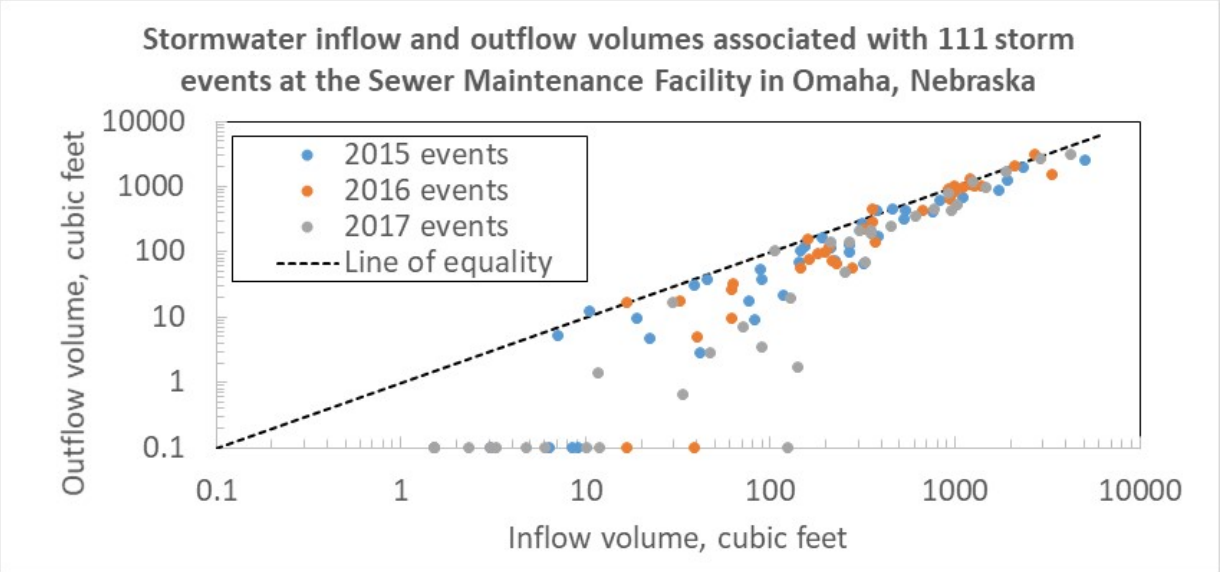
Preliminary Results:

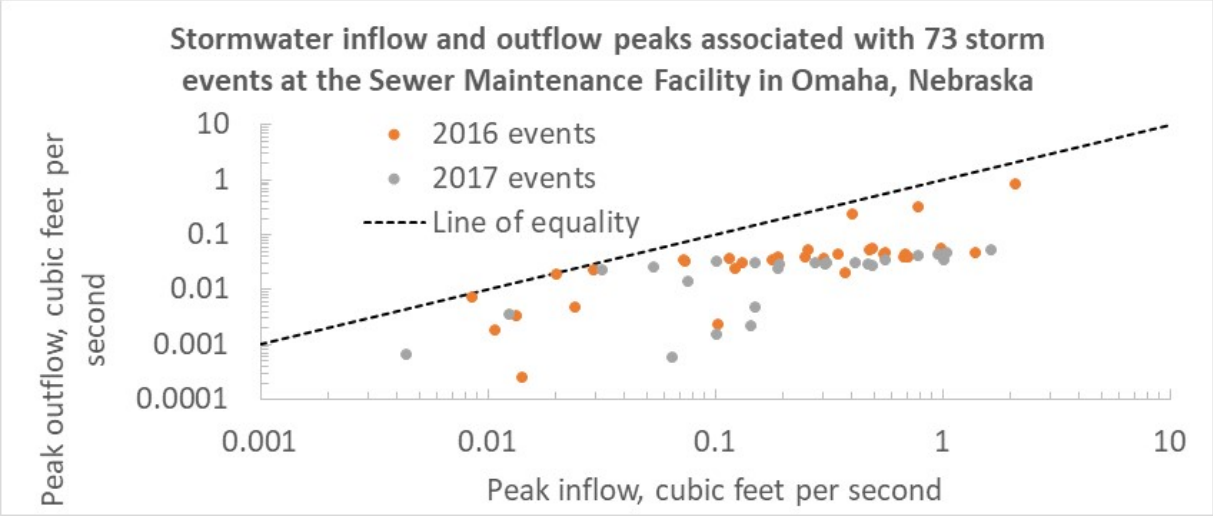
Monitoring at the site characterized the water balance components of 111 stormwater events from 2015-17. On average, the bioretention cell redirected approximately 31-percent of the stormwater volume away from the storm sewer through infiltration and evaporative processes. This and other metrics will be considered locally when trying to identify ways to improve

performance in other green infrastructure projects. Regionally, those metrics will be put in the context of other cities to evaluate how different soils and climatic conditions may influence the design and performance of otherwise similar green infrastructure projects.

Measured stormwater removed from the storm sewer system by the bioretention cell at the Omaha Sewer Maintenance Facility.

	Number of events	Inflow volume, cubic ft	Outflow volume, cubic ft.	Removal, cubic feet	Removal, percentage
Total	111	61,137	42,228	18,910	31%
2015	38	19,063	11,360	7,703	40%
2016	34	22,512	17,532	4,980	22%
2017	39	19,562	13,335	6,227	32%





Saturated Hydraulic Conductivity (Infiltration) Assessment

2017 Monitoring Summary

The purpose of this study was to estimate infiltration rates via saturated hydraulic conductivity (K_{sat}) measurements within bioretention systems, rain gardens, and adjacent traditional turf areas. K_{sat} is a quantitative measure of the maximum water transmission rate of a saturated soil. Data generated from this study will be added to annual assessments for each project, provide comparison estimates to baseline measurements collected in 2016, and examine seasonal variation of K_{sat} within individual bioretention systems and rain gardens. An additional objective of this study was to examine the spatial distribution of K_{sat} values. Understanding how these living systems function over time will help improve overall stormwater management.

Similar to 2016, we sampled nine sites throughout Omaha, Nebraska: Saddle Hills Park (SHP), University of Nebraska at Omaha (UNO) Welcome Center, Orchard Park (OP), Florence Streetscape (FL), The Benson East Gateway (BEN), Under the Sink Facility (UTS), Creighton Prep (CRP), South Omaha Industrial Area (SOIA) Lift Station, and Omaha Sewer Maintenance Facility (SMF) (Figure 1). A summary of site details can be found in Table 1.

Measurements were collected at all sites using Modified Philip-Dunne (MPD) Infiltrometers. The MPD infiltrometer is a falling head device used to measure the saturated hydraulic conductivity (K_{sat}) at the soil surface. K_{sat} is important for modeling infiltration rates within BMPs. Sampling at each site was conducted using a grid method technique. Grid sampling allows for a better approximation of the spatial variability for a given parameter within site, is easier to set up for routine monitoring, and provides better estimates for site characteristics as a whole. Grid sampling for each site was set up to account for 2016 sampling locations, while still trying to capture the spatial variability of K_{sat} within each site accurately.

Samples were collected during three periods throughout 2017; spring (mid-April to Mid-May), summer (late-June to early August), and fall (late October to early December). Sampling in fall occurred prior to the ground freezing. All nine sites were sampled in both the spring and fall of 2017. Only four sites (UNO, SMF, CRP, & Saddle Hills Park) were sampled during the summer of 2017 as a result of logistical constraints. A total of 560 MPD Infiltrometer samples were acquired in 2017, with a combined total of 672 samples across both the 2016 and 2017 sampling seasons.

Data generated were compared within site and against non-BMPs (nearby turf and landscape areas) adjacent to each site. Data were compared across sites for evaluation of pretreatment effect on K_{sat} within the bioretention systems, distribution of K_{sat} across the entire system, and plant influence.

Increased sampling periods throughout 2017 identified seasonal trends within and across our nine study sites. Across all sites, mean site values of K_{sat} were one and a half to five times larger in the fall than the spring (Table 2). Mean site values of K_{sat} recorded in the spring ranged from 4.56 to 17.19 in/hr and 15.57 in/hr to 37.62 in/hr in the fall. The Benson and Sewer Maintenance Facility bioretention gardens saw the largest increase in site average K_{sat} values from spring to fall. Two of the four sites that were sampled over spring, summer, and fall saw a steady increase in site average K_{sat} values during each sampling period. The University of Nebraska bioretention systems exhibited a low mean site K_{sat} value in the spring, a seven fold increase in the summer, and then decrease in the fall. Lower site average K_{sat} values in the spring could be indicative of

higher ground water tables and/or dormant plant root systems, while higher site average K_{sat} values in the summer and fall could result from active root systems and greater evapotranspiration rates.

Comparative analysis between fall 2016 and fall 2017 sampling data saw slight increases in site average K_{sat} values (Table 2). Site average K_{sat} values ranged from 4.01 to 55.35 in/hr and 15.57 to 37.62 in/hr for fall 2016 and fall 2017, respectively. Saddle Hills Park and the University of Nebraska sites saw a significant decrease in site average K_{sat} from fall 2016 to fall 2017, which could correspond to variation in sample size. Increases in site average K_{sat} from year to year could be associated with vegetative growth, which has been shown to increase infiltration rates by increasing pore spaces within soil via root growth

.

Spatial analysis of K_{sat} values within each study site identified “troubled spots” or areas of low permeability. These low permeability areas most often corresponded to locations within proximity or adjacent to inflow points. Despite various pretreatment options at each site, sedimentation, silt deposits, and erosion reduce permeability resulting in lower K_{sat} values.

The mean K_{sat} values across all sampling periods and for both rain gardens and bioretention systems sampled ranged from 14.37 to 31.20 in/hr (Table 2). Across all survey sites and all sampling periods, average measurements of saturated hydraulic conductivity in rain gardens (31.20 in/hr) and bioretention systems (19.55 in/hr) were significantly higher than those acquired over adjacent turf grasses (6.30 in/hr) (Table 4).

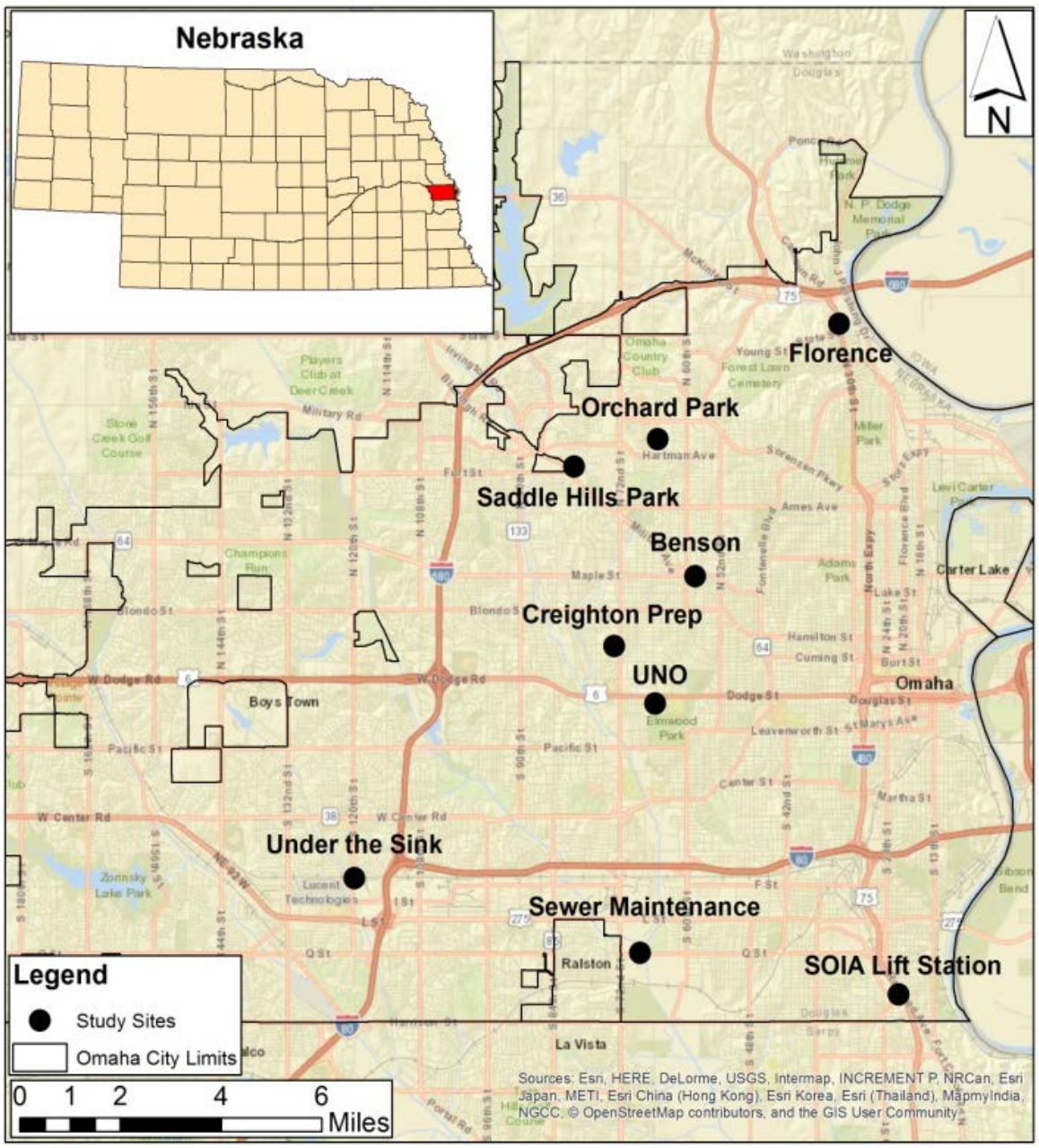


Figure 1. Map of the City of Omaha, Douglas County, highlighting the nine study sites in our study.

ATTACHEMENT D

Table 1. Summary of project details for each of the nine study sites examined in this study.

Site	Install	Type *	Footprint (ft^2)	Contributing Area (acres)	% Footprint to Contributing Area	Design Volume (gal)	Pretreatment	Under-drain Outlet Control	Under-drain	Overflow	Bioretention Soil Mix
Saddle Hills Park	2014	RG	2,310	2.5	2.2	N/A	Utility box curb-wells	None	None	Soft weir in berm	Compost amended in-situ soils
University of Nebraska-Omaha	2012	B	1,345	0.6	5.5	2,469	None	4" Polyball valve	4" perforated HDPE	Soft weir in berm	50/50 sand/compost
Orchard Park	2009	B	3,180	0.8	9.2	14,270	Vegetated Forebay	2" Brass Curb-Stop Valve	4" perforated PVC	Offline system	50/50 sand/compost
Florence	2012	B	440	0.7	1.5	2,825	Stainless steel sediment trap w/ Permeable Base	2" Brass Curb-Stop Valve	4"perforated HDPE	Offline system	50/50 sand/compost
Benson	2013	B	1,225	1.0	2.8	5,535	2 Forebays & Dry Creek Bed	2" Brass Curb-Stop Valve	4" perforated PVC	High flow structure & soft weir	50/50 sand/compost
Under the Sink Facility	2008	B	1,540	2.5	1.4	9,620	Bioswale	4" Polyball valve	4" perforated HDPE	Soft weir in berm	50/50 sand/compost
Creighton Prep	2014	B	5,720	2.7	4.9	40,395	Permeable patio (East) & manhole sump w/Envirohood (West)	4" Slide Gate Valve	4" perforated PVC	Soft weir in berm	80/20 sand/compost
South Omaha Industrial Area	2014	B	3,400	0.7	11.5	25,430	Turf swale	4" Polyball valve	4" perforated PVC	High flow structure & soft weir	100% 1" washed limestone
Sewer Maintenance Facility	2014	B	2,200	0.95	5.3	39,085	Permeable paver parking lot (East) & Forebay (West)	4" Slide Gate Valve	4" perforated PVC	High flow structure	100% pea gravel

*RG = Rain Garden; B= Bioretention System

Table 2. Summary of mean K_{sat} values (in/hr) and number of samples acquired (N) for each of the nine study sites during each sampling period.

Site	Fall 2016	*N*	Spring 2017	*N*	Summer 2017	*N*	Fall 2017	*N*	Cumulative	*N*
SHP	55.31	*16*	13.92	*25*	25.59	*7*	34.15	*29*	31.20	*77*
OP	11.77	*4*	13.68	*13*	-	*-*	15.99	*12*	14.37	*29*
BEN	27.55	*6*	4.56	*18*	-	*-*	25.66	*18*	16.89	*42*
UNO	55.35	*6*	5.37	*20*	40.69	*17*	15.63	*18*	23.16	*61*
FL	18.28	*6*	8.84	*17*	-	*-*	24.61	*17*	16.96	*40*
CRP	4.01	*8*	10.12	*25*	16.47	*25*	15.57	*26*	14.95	*84*
UTS	12.57	*7*	-	*-*	-	*-*	16.48	*9*	20.90	*16*
SOIA	29.14	*15*	17.19	*34*	-	*-*	33.31	*33*	25.86	*82*
SMF	20.83	*7*	7.73	*11*	21.36	*13*	37.62	*13*	22.59	*44*

Table 3. Summary of mean K_{sat} values (in/hr) and number of samples acquired (N) for individual bioretention systems and/or rain gardens at each of the nine study sites during each sampling period.

Site	Fall 2016	*N*	Spring 2017	*N*	Summer 2017	*N*	Fall 2017	*N*	Cumulative	*N*
SHP	55.31	*16*	13.92	*25*	25.59	*7*	34.15	*29*	31.20	*77*
SHP-E	65.41	*10*	17.28	*11*	29.36	*3*	35.66	*12*	37.78	*36*
SHP-W	38.48	*6*	11.27	*14*	22.76	*4*	33.08	*17*	25.96	*41*
UNO	55.35	*6*	5.37	*20*	40.69	*17*	15.63	*18*	23.16	*61*
UNO-N	76.46	*3*	2.43	*9*	50.36	*8*	4.89	*8*	24.76	*28*
UNO-S	34.25	*3*	7.78	*11*	32.09	*9*	24.23	*10*	21.80	*33*
FL	18.28	*6*	8.84	*17*	-	*-*	24.61	*17*	16.96	*40*
FL-E	30.56	*3*	8.20	*12*	-	*-*	18.72	*12*	15.36	*27*
FL-W	6.00	*3*	10.39	*5*	-	*-*	38.73	*5*	20.28	*13*
CRP	4.01	*8*	10.12	*25*	16.47	*25*	15.57	*26*	14.95	*84*
CRP-W	3.09	*4*	9.37	*13*	12.25	*14*	13.84	*14*	11.10	*45*
CRP-E	4.93	*4*	10.94	*12*	21.85	*11*	17.59	*12*	19.69	*39*
UTS BG	12.57	*7*	-	*-*	-	*-*	16.48	*9*	20.90	*16*
UTS BG3	10.88	*3*	-	*-*	-	*-*	7.05	*4*	8.69	*7*
UTS BG4	18.12	*3*	34.93	*7*	-	*-*	24.02	*5*	27.93	*15*

Table 4. Summary of mean K_{sat} values (in/hr) and number of samples acquired (N) from all nine study sites throughout each sampling period.

Averages (in/hr)	**2016 Fall**	**N**	**2017 Spring**	**N**	**2017 Summer**	**N**	**2017 Fall**	**N**	**Collectively**	**N**
Turf with BG	5.57	*16*	3.23	*15*	-	*-*	8.39	*16*	5.78	*47*
Turf	6.30	*14*	3.23	*13*	-	*-*	7.45	*14*	5.72	*41*
BG	0.431	*2*	3.22	*2*	-	*-*	14.93	*2*	6.19	*6*
Tree Planters	33.30	*6*	14.20	*8*	-	*-*	46.89	*8*	31.30	*22*
Bioretention	23.00	*59*	11.62	*145*	25.11	*55*	23.94	*146*	19.55	*405*
Bioretention Infiltration Cell	19.42	*13*	14.38	*37*	22.66	*15*	20.99	*39*	18.68	*104*
Bioretention Basin	24.01	*46*	10.68	*108*	26.03	*40*	25.01	*107*	19.85	*301*
Rain Garden	55.31	*16*	13.92	*25*	25.59	*7*	34.15	*29*	31.20	*77*

BURNS McDONNELL

Final Report

City of Omaha, Nebraska

2017 Stormwater BMP Monitoring
Project No. 84726

Revision A
3/15/2018

Final Report

prepared for

City of Omaha, Nebraska
2017 Stormwater BMP Monitoring
Omaha, Nebraska

Project No. 84726

Revision A
3/15/2018

prepared by

Burns & McDonnell Engineering Company, Inc.
Kansas City, Missouri

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LIST OF ABBREVIATIONS

Abbreviation	Term/Phrase/Name
Burns & McDonnell	Burns & McDonnell Engineering Company, Inc.
BMP	Stormwater Best Management Practice
Creighton Prep	Creighton Preparatory School
EC	Electrical Conductivity
MCC	Metropolitan Community College
NVR	Network Video Recording
PVC	Polyvinyl Chloride
SMS	Soil Moisture Sensor
STB	Stilling Basin
STW	Stilling Well
UNO	University of Nebraska Omaha
USGS	United States Geological Survey
VMC	Volumetric Moisture Content

1.0 INTRODUCTION

The City of Omaha, Nebraska (City) has implemented a Stormwater Best Management Practice (BMP) monitoring program to evaluate the performance at several BMP sites across the City. This report summarizes the sites evaluated during the 2017 monitoring period and the data collected, organized by site.

1.1 Background

In 2015 Burns & McDonnell partnered with the City of Omaha to develop a detailed implementation plan for the Draft BMP Monitoring Plan, dated November 5, 2014. The sites chosen for the monitoring plan include: Creighton Preparatory School (Creighton Prep) Bioretention; Florence Bioretention; Fort Omaha Metropolitan Community College (MCC) Bioretention Garden; Orchard Park Bioretention and Rain Gardens; and University of Nebraska Omaha (UNO) Welcome Center Bioretention Garden.

In 2016, the first round of monitoring equipment was selected and installed at the Creighton Prep Bioretention and Orchard Park Bioretention sties. Additionally, in 2016, the University of Nebraska was supported in installing equipment at the Orchard Park site. The 2017 monitoring activities continued to build on the findings from 2016 with additional BMP monitoring at the UNO Welcome Center site, and monitoring plans were developed for Dundee Elementary and Adams Park sites.

1.2 Data Collection

Data was collected at each site based on the monitoring plans developed in conjunction with the City. Specific data collected for each site is described in Section 4.0 of this report and generally as follows:

- Video Data
- Equipment Data
  - Water Level Data from Pressure Transducer Data
  - Soil Moisture Sensor Data
  - Flow Meter Data
  - Rain Gauge Data

Additionally, a ‘Water Quality Sampling Protocol’ was developed in during the 2017 monitoring period, based on the water quality work completed in 2016. The ‘Water Quality Sampling Protocol’ is included in Appendix B for reference.

2.0 MONITORING SITES

2.1 Orchard Park

2.1.1 Site Description

The Orchard Park site is located on the western edge of Orchard Park near the intersection of N 66th Street and Kansas Avenue. The bioretention garden was constructed in 2009 and receives runoff from two street side curb-cuts which serve an approximate 1.0-acre drainage area. t For rain events that produce runoff greater than the designed bioretention garden capacity, the bioretention garden is bypassed and flow enters the adjacent storm inlets.

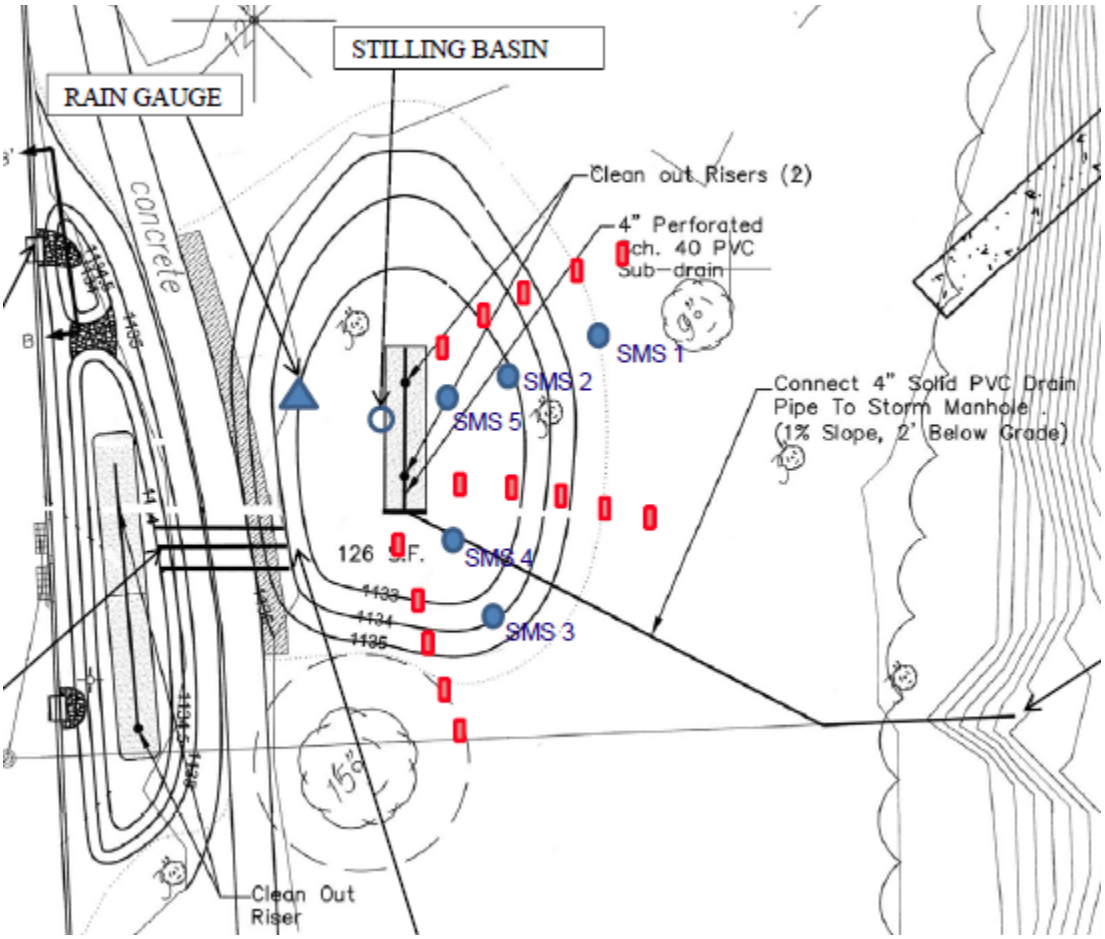

Figure 2-1: Orchard Park Site Plan

2.1.2 Monitoring

The following equipment was used to collect data at the Orchard Park site:

- ECH20 GS3 Soil Moisture Sensors by Decagon Devices, Inc.
- Em50 Data Loggers by Decagon Devices, Inc.
- ECRN-100 High Res Rain Gauge by Decagon Devices, Inc.
- WL16 Pressure Transducer and Data Logger Combination by Global Water

The three data loggers controlled the collection of data from the rain gauge and the soil moisture sensors (SMS). Soil moisture sensors were installed at depths of 6 inches and 36 inches below grade at five locations. The ponding depth within the bioretention basin was monitored using a stilling basin with a pressure transducer. The stilling basin was made of 4-inch polyvinyl chloride (PVC) pipe with 3/8-inch perforation holes on 1.5-inch centers. The pressure transducer was mounted on the inside of the stilling basin pipe at ground level and recorded the ponding depth every 5 minutes.

2.1.3 Period of Record

During the 2017 monitoring period, the rain gauge and pressure transducer were installed from April to November. Soil moisture sensors remained in place year-round. Soil Moisture Sensor Data

ECH20 GS3 Soil Moisture Sensor data was collected on site from January to October at five sites with some data gaps as discussed in Section 2.1.4. Soil moisture sensor data is provided electronically.

2.1.3.1 Stilling Basin Data

A Global Water WL 16 pressure transducer within a single stilling basin recorded ponding depth on site from April to May. Data gaps and suspect data due to equipment malfunctions are discussed in Section 2.1.4.

2.1.3.2 Water Quality Data

No water quality data was collected during the 2017 monitoring period.

2.1.4 Monitoring Issues and Equipment

During the monitoring period, several equipment issues resulted in gaps in the data. Four soil moisture sensors had data gaps due to damaged cables, port connection issues, and data logger battery life at various times throughout the year. Additionally, the batteries died in one data logger resulting in a 2-month gap between data collection site visits.

The rain gauge was installed in April and connected to one of the data loggers. During the first data collection in June, it was observed that the gauge showed only two instances of measured precipitation, when in reality, there were several precipitation events during that same timeframe. The rain gauge was

found to have a buildup of dirt in the gauge's collection area and was thoroughly washed and tested to make sure it was registering data. The gauge appeared to be operational, but data collected during the rest of the monitoring period continued to show inconsistencies and inaccuracies compared to other sources. After analyzing all data, it was concluded that none of the rain data from this equipment is usable. Local weather station in the vicinity will be used in lieu of the Orchard Park rain gauge.

During the monitoring period, the pressure transducer required unexpected manufacturer maintenance resulting in large gaps in the data. The pressure transducer was installed in April. Data was collected without an issue through June. In September the pressure transducer was inoperable and needed to be sent back to the manufacturer for repairs. The pressure transducer at Orchard Park was replaced with one of the pressure transducers from the Creighton Prep site. This sensor was found to be inoperable as well during the next site visit to collect data. After also sending this pressure transducer back to the manufacturer for repair, some data was recovered and included in our findings.

It appeared that the WL16 Global Water pressure transducers had internal moisture issues due to a breakdown of water resistant features over the course of being exposed to the elements. Although these pressure transducers are designed to be completely submerged, only pressure transducers directly in the stilling basin within ponding depth had performance issues while none of the pressure transducers in the sealed wells did.

Table 2-1: Orchard Park Available Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Transducers:												
STB				x[1]	x[1]					x	x	-
Soil Moisture Sensors												
SMS-1	x	x	x	x	x	x	x	x				-
SMS-2	x	x	x	x	x[2]	x[2]	x[2]	x[2]				-
SMS-3	x[3]	x[3]	x[3]	x[3]	x[3]	x[3]	x[3]	x[3]	x[3]	x[3]		-
SMS-4	x	x	x	x	x	x	x	x	x	x		-
SMS-5	x	x	x	x	x	x	x	x	x	x		-

[1] STB data in April and May was suspect and not used during the analysis.

[2] SMS-2A_6" of Data Logger 2 didn't work from 5/16/17 to 6/15/17 and recorded suspect data from 6/15/17 forward

[3] SMS-3B_36" of Data Logger 3 didn't work from 1/16/17 forward

2.2 Creighton Prep

2.2.1 Site Description

The Creighton Prep site is located on the southern edge of the Creighton Preparatory High School near the intersection of N 72nd Street and Western Avenue. Drainage to the bioretention garden at the Creighton Prep site generally comes from parking lot runoff to the west through a 24-inch storm sewer with a contributing area of 2.1 acres (80% impervious) and receives overland flow runoff from a 7.7-acre irrigated grass turf sports field to the north. The bioretention garden was constructed in spring 2014. A 4-inch PVC pipe underdrain runs the length of the bioretention garden which regulates the amount of surface flow through the soils and subsurface drainage. For storm events producing runoff greater than 0.5-inches the primary cobble berm is overtopped and the area inlet collects and conveys stormwater to the 36-inch storm sewer downstream in Western Avenue.

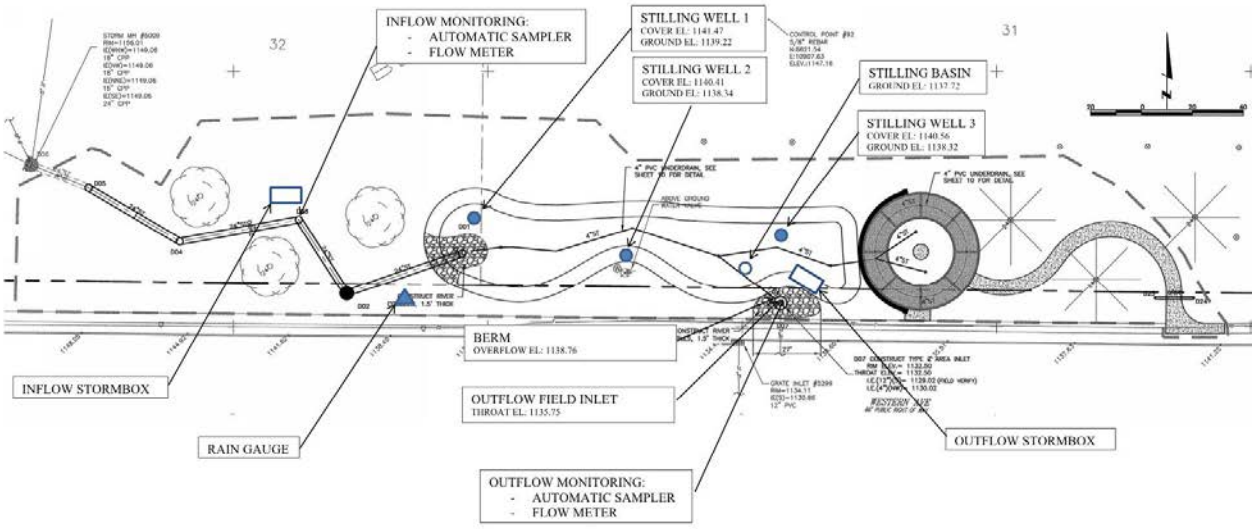

Figure 2-2: Creighton Prep Site Plan

2.2.2 Monitoring

The following equipment was used to collect data at the Creighton Prep site:

- ISCO 674 Rain Gauge
- ISCO 2150 Area Velocity Module
- WL16 Pressure Transducer and Data Logger Combination by Global Water

The area velocity meters were installed in the 24-inch inflow pipe and the 12-inch area inlet outflow pipe. The inflow and outflow rates were measured every 5 minutes once flow was detected. The inflow rates were summed for each event to determine a total inflow volume from the primary drainage area. The outflow discharge rates were similarly summed to estimate outflow volumes by event.

The local water table beneath the bioretention basin was monitored using three stilling wells. Each 2.5-inch diameter stilling well was installed to a depth of approximately 10 feet with 5 feet of well screen. A pressure transducer was installed to record depth of water every 15 minutes.

The ponding depth within the bioretention basin was monitored using a stilling basin and a pressure transducer. The stilling basin was made of 4-inch PVC pipe with 3/8-inch perforation holes on 1.5-inch centers. A pressure transducer was mounted on the inside of the stilling basin pipe at ground level and recorded the ponding depth every 5 minutes.

The rain gauge was installed for local precipitation data at the site. Rain gauge data was collected and stored along with area velocity meters in the ISCO controller.

2.2.3 Period of Record

During the 2017 monitoring period, the rain gauge, stilling basin pressure transducer, and area velocity meters were installed from April to November. Stilling well pressure transducers remained in place year-round and data was collected throughout the year.

2.2.3.1 Flow Meter Data

ISCO 2150 Area velocity flow meters recorded flow on site from April to September with some data gaps as discussed in Section 2.2.4. During this period of record, 37 inflow flow events and 48 outflow events were recorded. The largest inflow measured was approximately 27 cubic feet/second on 6/16/17 and the largest outflow recorded during the same event. Flow data is provided electronically.

2.2.3.2 Stilling Basin Data

A Global Water WL 16 pressure transducer within a stilling basin recorded ponding depth on site from April to May. During this monitoring period several ponding events were recorded. The maximum ponding event elevation was 0.3 feet on 5/16/17. However, this maximum does not correspond with the anticipated ponding for the inflow rate measured by the flow meters and indicates that the stilling basin was not operating accurately during the period of record. Data gaps due to equipment malfunctions are further discussed in Section 2.2.4. Complete ponding data is provided electronically.

2.2.3.3 Stilling Well Data

Global Water WL 16 pressure transducers within shallow monitoring wells recorded local water table levels on site from January to August with some data gaps as discussed in Section 2.2.4. Stilling Wells are located in the northeast corner, the south center, and the northwest corner of the bioretention cell. During the monitoring period, the well data varied greatly between wells for the same events. Stilling well data is provided electronically.

2.2.4 Water Quality Data

No water quality data was collected during the 2017 monitoring period.

2.2.5 Monitoring Issues and Equipment

During the monitoring period, several pressure transducers became inoperable and required manufacturer maintenance. Working pressure transducers were moved around the sites to replace those that became inoperable at locations where to minimize total site data gaps. The ponding depth data, collected by stilling basins, took priority over the stilling well data, so working pressure transducers were transferred from stilling wells to replace the inoperable pressure transducers in stilling basins. This transferring of pressure transducers resulted in data gaps for two of the three stilling wells at Creighton Prep for a majority of the year.

During the August site visit for data collection, the inflow area velocity meter was not responsive. After further investigation it was discovered that the batteries died, resulting in a data gap for the inflow and rain gauge data.

Table 2-2: Creighton Prep Available Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Transducers:												
STW-1	x	x	x	x	x	x	x	x				
STW-2	x	x	x	x	x	x						
STW-3	x	x	x	x								
STB				x	x							
Flow Meters:												
Inflow				x	x	x	x	x	x	x		
Outflow				x	x	x	x	x	x	x		
Precipitation:												
Rain Gauge				x	x							

2.3 UNO Welcome Center

2.3.1 Site Description

The UNO Welcome Center site is located on the west side of the University of Nebraska – Omaha, Nebraska campus at 6001 Dodge Street near the Welcome Center. Drainage to the bioretention garden at the UNO Welcome Center site generally comes from Welcome Center building runoff through two 8-inch drain pipes east of the bioretention garden. The bioretention garden was constructed in 2012. Two infiltration trenches, Type A and Type B, tie into a 4-inch PVC pipe underdrain which regulates the subsurface drainage. For the Type B infiltration trench, ponding depths greater than 1 foot overtop the segmental retaining wall into the Type A infiltration trench. For the Type A infiltration trench, ponding depths greater than 1 foot overtop the precast wall cap unit onto the river rock apron, where the trench drain inlet collects and conveys stormwater to the existing 4-inch PVC pipe.

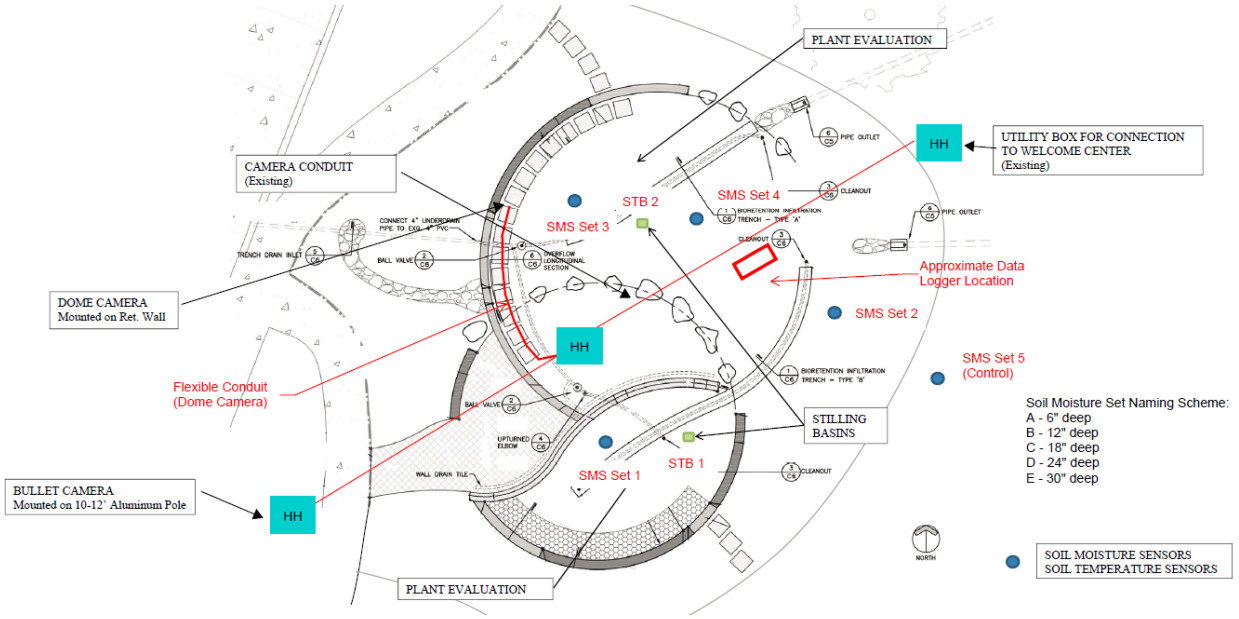

Figure 2-3: UNO Site Plan

2.3.2 Monitoring

The following equipment was used to collect data at the UNO Welcome Center site:

- 25 Campbell Scientific (Models: CS655-U-L40-PT-DS, CS655-U-L30-PT-DS, and CS655-U-L25-PT-DS) Soil Moisture Sensors
- 2 Campbell Scientific CS451-75-SA-7-SN Pressure Transducers

- Campbell Scientific CR6-NA-ST-SW Data Logger
- Two Cameras with Network Video Recording (NVR)

The soil moisture sensors were installed at five locations in and around the bioretention garden. At each of the five locations, a sensor was buried at 6 inches, 12 inches, 18 inches, 24 inches, and 30 inches below ground surface. The sensors recorded volumetric moisture content, temperature, and electric conductivity every 15 minutes.

The ponding depth within the bioretention garden was monitored using a stilling basin and a pressure transducer and at two locations. The stilling basins were made of 4-inch PVC pipe with 3/8-inch perforation holes on 1.5-inch centers. A pressure transducer was mounted on the inside of each stilling basin pipe at ground level and recorded the ponding depth every 5 minutes.

2.3.3 Period of Record

During the 2017 monitoring period, the two stilling basins with pressure transducers were installed in April to begin the sampling period for the wet season and 25 soil moisture/temperature sensors remained in place year-round.

2.3.3.1 Soil Moisture Sensor Data

Campbell Scientific Soil Moisture Sensor data was collected on site at 5 locations from January to December with some data gaps as discussed in Section 2.3.4. Soil moisture sensor data is provided electronically.

2.3.3.2 Stilling Basin Data

Campbell Scientific CS451-75-SA-7-SN pressure transducers within stilling basins recorded ponding depth on site at two locations from April to December. Data gaps due to equipment malfunctions are discussed in Section 2.3.4. Stilling basin data is provided electronically.

2.3.3.3 Water Quality Data

No water quality data was collected during the 2017 monitoring period.

2.3.4 Monitoring Issues and Equipment

During the monitoring period precipitation data from the UNO weather station was not downloaded with enough frequency to provide granularity of date for intensity. Precipitation data from the UNO weather station was only available as daily summaries. Working pressure transducers were moved around the sites to replace those that became inoperable at locations where data was more desired. The ponding depth

data, although appearing as "operational" did not show response to precipitation events during April and May.

Table 2-3: UNO Available Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Transducers:												
STB-1				x[1]	x[1]	x	x	x	x	x	x	x
STB-2				x	x	x	x	x	x	x	x	x
Soil Moisture Sensors:												
SMS-1	x	x	x	x	x	x	x	x	x	x	x	x
SMS-2	x	x	x	x	x	x	x	x	x	x	x	x
SMS-3	x	x	x	x	x	x	x	x	x	x	x	x
SMS-4	x	x	x	x	x	x	x	x	x	x	x	x
SMS-5	x	x	x	x	x	x	x	x	x	x	x	x

[1] In April and May, the pressure transducer in STB-1 was operable but was not recording a response to precipitation events that should have resulted in ponding.

2.4 Dundee Elementary

2.4.1 Site Description

A site visit was completed 6/27/17 at the Dundee Elementary Stormwater Demonstration Classroom to evaluate the site and discuss the proposed monitoring implementation plan. Overall, the plan includes the following elements:

- Rain gauge mounted to the Dundee Elementary School roof for precipitation data
- Pressure transducer within the 500-gallon rain silo to track harvested rainwater depths
- Monitoring camera on the building to monitor plant growth

At the time of this report, the monitoring equipment had been procured but not installed. The monitoring camera is in the possession of the school principal. A goal in the setup of this site is the inclusion of school students and staff to participate in the monitoring of the outdoor classroom area. The proposed monitoring activities could be included in science classes or clubs sponsored by the school to engage and educate the local school children on stormwater management.

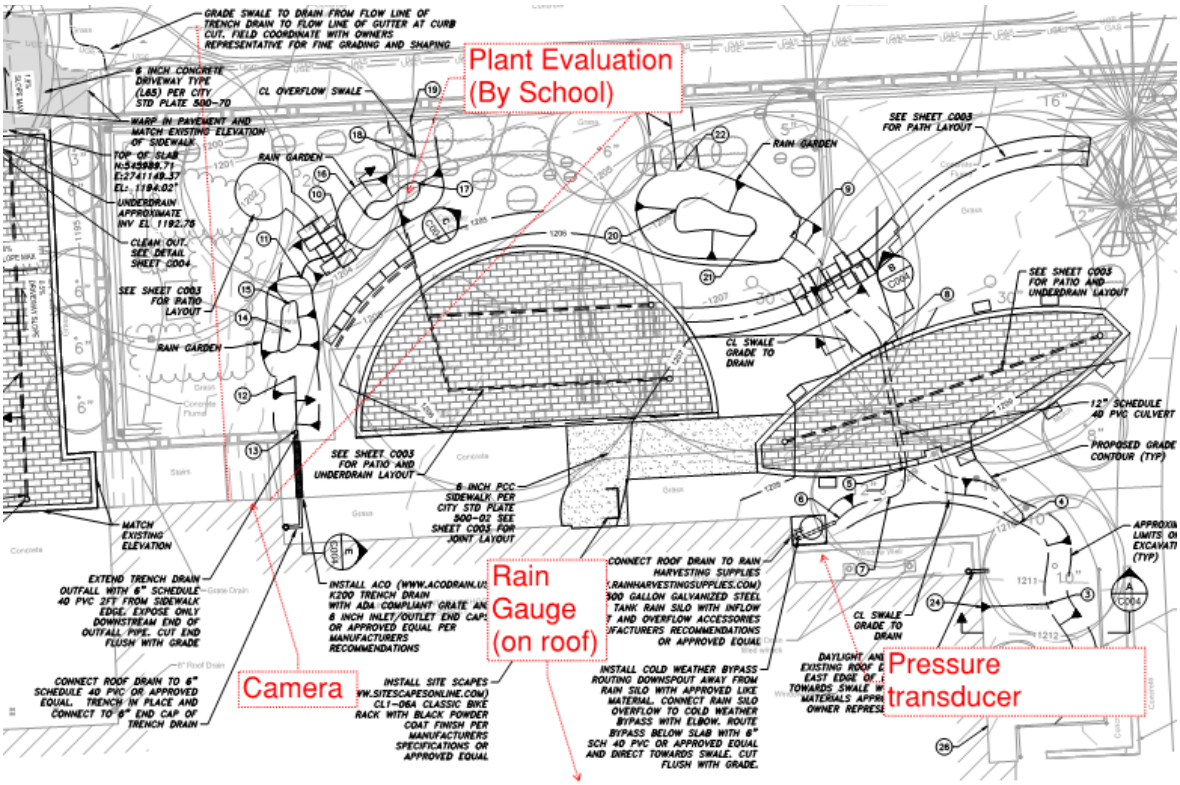

Figure 2-4: Dundee Elementary Site Plan

No data was collected during the 2017 monitoring period.

2.5 Adams Park

2.5.1 Site Description

A site visit was completed on 6/27/17 at the Adams Park wetland and detention facility to evaluate the site and discuss the proposed monitoring implementation plan. Overall, the plan includes the following elements:

- Rain gauge on the Adams Park Community Center roof for precipitation data
- Pressure Transducers on the future park road bridge near the box culvert and one additional site within the wetland to monitor water depth
- Either a pressure transducer or ultrasonic flow meter on outlet structure for flow monitoring

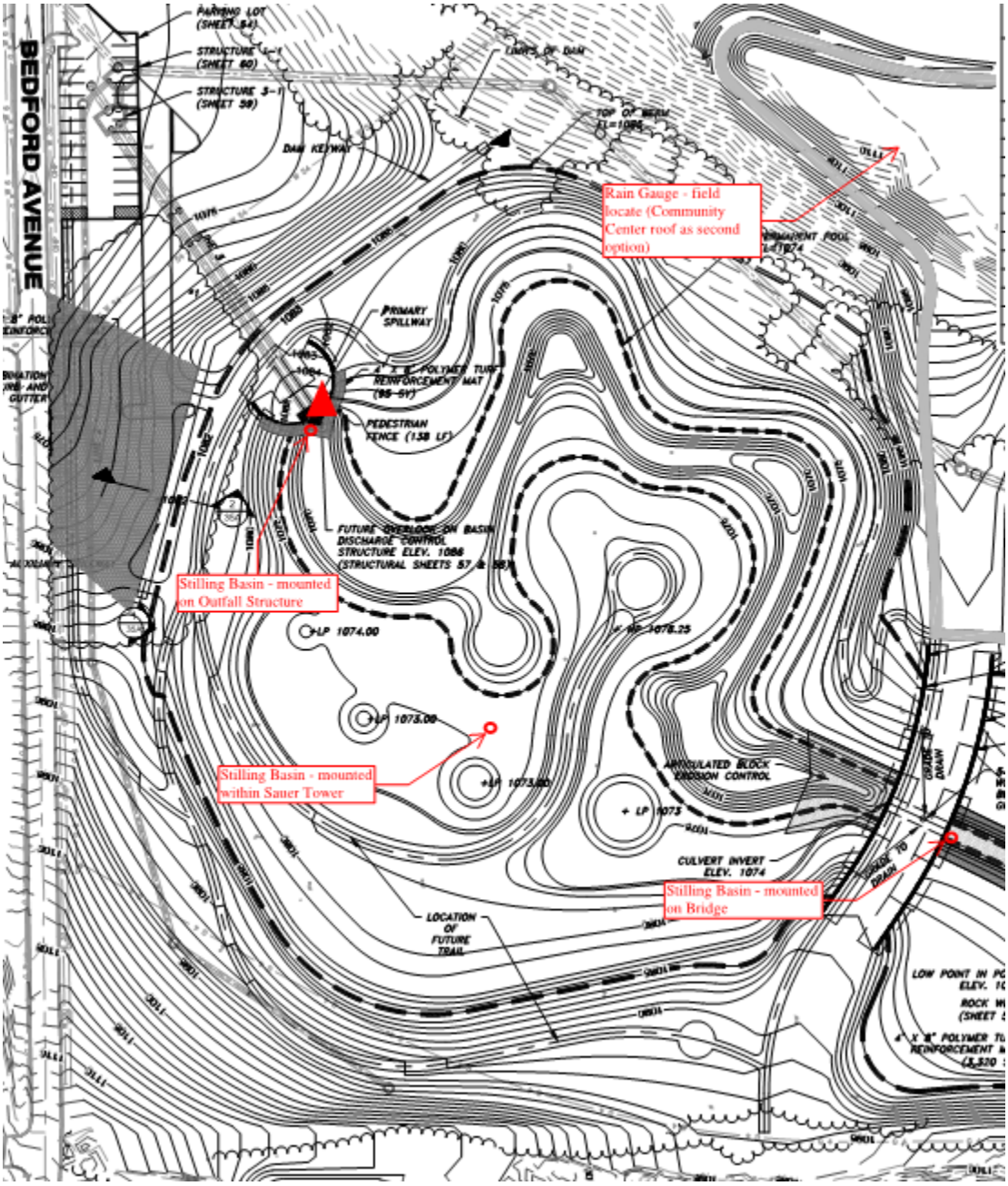

Figure 2-5: Adams Park Site Plan

No data was collected during the 2017 monitoring period.

3.0 SITE WEATHER CONDITIONS

3.1 Data

Daily weather history and observations from the Eppley Airfield Weather Station were downloaded from https://www.wunderground.com/history/airport/KOMA/. Appendix A contains monthly weather history and observation tables for the monitoring period.

Provisional rain data from the United States Geological Survey (USGS) 06610765 site at Little Papillon Creek at Ak-Sar-Ben in Omaha, Nebraska was used to supplement collected data since the on-site rain gauges had many data gaps or were inoperable throughout the 2017 monitoring period. USGS 06610765 provisional rain data was recorded at 5-minute intervals from March 1, 2017 through October 31, 2017.

3.2 Observations

During the monitoring period, the overall weather conditions were warmer and drier than normal, with below-average snowfall. The National Weather Service, in an article published in the Omaha World Herald on January 6, 2018, stated that "official data from Eppley Airfield showed Omaha had the sixth-warmest year on record, with an average temperature of 54 degrees. That average was 3 degrees above normal."

Based on the Eppley Airfield Weather Station data, the total precipitation is 2017 was 26.38 inches which is a departure from 30.63 inches annually. Further, there were 22 precipitation events that exceeded 0.5 inches and seven precipitation events that exceeded 1 inch. A summary of the 0.5-inch and 1-inch events are included in Table 3-1.

Table 3-1: 2017 Event Summary for 0.5-inch and 1.0-inch Events

Date	24-hour Rainfall Total
2/23/17	0.50
3/24/17	0.60
3/29/17	1.21
4/30/17	0.95
5/10/17	0.64
5/16/17	1.35
5/18/17	0.53
5/19/17	0.94
5/20/17	0.55
6/16/17	1.13
6/29/17	0.74
7/26/17	0.57
8/15/17	0.59
8/20/17	0.50
8/21/17	1.07
8/25/17	0.64
9/17/17	1.05
9/25/17	1.05
10/2/17	0.73
10/5/17	0.68
10/6/17	1.15
10/10/17	0.54

4.0 RESULTS

4.1 Orchard Park

Three events were evaluated at the Orchard Park site. Events were selected based on periods of available data and to reflect a range of rainfall events from 0.5-inches to 1-inch, singular events, and back-to-back events. Although five soil moisture sensor sets were installed, only SMS-1, SMS-2, SMS-4, and SMS-5 were used to analyze the following events for migration of the wetting front. SMS-3 was not used due to data gaps and vertical elevation correlation between soil moisture sensor depths. SMS-4, 6 inches below ground surface, SMS-5, 6 inches below ground surface, SMS-2, 6 inches below ground surface, and SMS-1, 36 inches below ground surface are located at approximately the same elevation. SMS-4, 36 inches below ground surface, SMS-5, 36 inches below ground surface, and SMS-2, 36 inches below ground surface are located at approximately the same elevation. SMS-4, SMS-5, SMS-2 are located within the bioretention garden extents. SMS-1 is the control and is located outside of the bioretention garden extents. The movement of the wetting front can be observed by comparing SMS-4, SMS-5, SMS-2, and SMS-1 volumetric moisture content (VMC) responses to rainfall.

4.1.1 Event 1: 5/10/2017 (0.60 inches)

This event was selected to most closely evaluate the water quality runoff event of 0.5 inches of runoff over a 24-hour period. The tributary area to Orchard park is highly impervious, indicating that this 0.60 inches of rainfall would result in approximately 0.5 inches of runoff. A plot of the VMC and rainfall data from the USGS rain gauge 06610765 demonstrates the bioretention garden's subsurface response to rainfall that approximately results in a water quality runoff event. Figure 5-1 depicts the findings of the Event 1 analysis.

The wetting front for this water quality runoff event infiltrates vertically into the engineered soil media but does not reach a depth 36 inches below ground surface. The wetting front does not extend laterally to the in-situ soils outside of the bioretention garden extents as seen by the lack of response in VMC for SMS-1 at 36 inches below ground surface. Additional observations for Event 1 are described in Table 5-1.

Figure 5-1: Event 1 Analysis

Table 5-1: Event 1 Observations

Callout ID	Sensor Set	SMS Description (depth below ground surface)	Observation
1	SMS-4	6 inches	• Moderate increase in VMC within 36 hours after rain event
2	SMS-4	36 inches	• Minimal to no increase in VMC within 24 hours after rain event
3	SMS-5	6 inches	• Sharp increase in VMC at tail end of rain event
4	SMS-5	36 inches	• No change to VMC following rain event
5	SMS-2	6 inches	• Moderate increase in VMC within 36 hours of rain event, followed by immediate drying
6	SMS-2	36 inches	• Minimal to no increase in VMC within 24-36 hours of rain event
7	SMS-1	6 inches	• Minimal to no increase in VMC during rain event
8	SMS-1	36 inches	• Minimal increase in VMC during rain event

4.1.2 Event 2: 6/16/2017 (1.32 inches)

This event was selected to most closely evaluate an event larger than the water quality runoff event of 0.5 inches over a 24-hour period. On 6/16/17 over 1 inch of rainfall fell over less than 3 hours. Event 2 is a larger, more intense event than Event 1, previously analyzed. A plot of the VMC and rainfall data from the USGS rain gauge 06610765 demonstrates the bioretention garden's subsurface response to intense rainfall that is more than two times the water quality runoff event. Figure 5-2 depicts the findings of the Event 2 analysis.

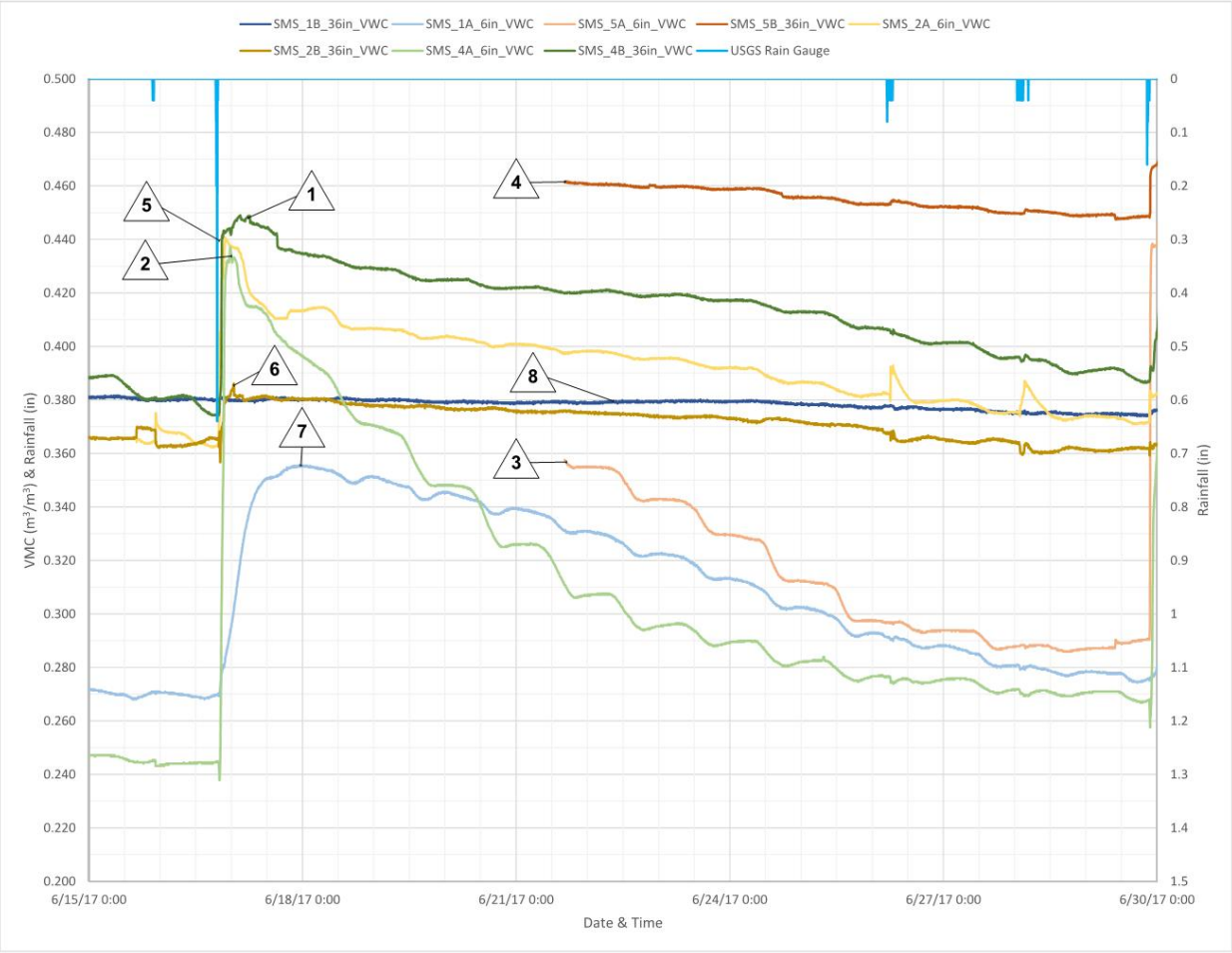

Figure 5-2: Event 2 Analysis

The wetting front for an event of this intensity and magnitude infiltrates into the top 6 inches of the soil profile adjacent to the bioretention garden extents. Water in the bioretention garden infiltrates vertically through the engineered soil profile to depths of 36 inches below ground surface, but does not extend laterally, indicated by the lack of VMC response for SMS-1 at 36 inches below ground surface. Additional observations for Event 1 are described in Table 5-2.

Table 5-2: Event 2 Observations

Callout ID	Sensor Set	SMS Description (depth below ground surface)	Observation
1	SMS-4	6 inches	• Sharp increase in VMC within 3 hours after event • Quicker drying of soil than SMS-4, 36-inch drying • Despite quickened drying, soil profile remains wetted for longer than 1 week following event
2	SMS-4	36 inches	• Sharp increase in VMC within 3 hours after event • Gradual drying of soil, where soil profile is wetted for longer than 1 week following event
3	SMS-5	6 inches	• Data gap for SMS-5 during the rain event • Drying mimicking SMS-4, 6-inch drying curve
4	SMS-5	36 inches	• Data gap for SMS-5 during the event • Drying more gradual than SMS-5, 6-inch drying curve
5	SMS-2	6 inches	• Moderate increase in VMC within 3 hours after event • Quicker drying of soil than SMS-2, 36-inch drying • Despite quickened drying, soil profile remains wetted for longer than 1 week following event
6	SMS-2	36 inches	• Sharp increase in VMC within 3 hours after event • Gradual drying of soil, where oil profile is wetted for longer than 1 week following event
7	SMS-1	6 inches	• Relatively sharp increase in VMC with peak VMC occurring at 24 hours after event • Relatively gradual drying of soil, where soil profile remains wetted for longer than 1 week following event
8	SMS-1	36 inches	• No increase in VMC during event

4.1.3 Event 3: 4/28/2017 to 5/1/2017 (1.44 inches)

This event was selected to most closely evaluate the site's response to back-to-back events. On 4/28/17 a rainfall event producing approximately the water quality runoff occurred, followed by an event on 4/30/17 that produced approximately two times the water quality runoff. The event on 4/28/17 was a morning rain of 0.44 inches of rainfall over a 12-hour period. On 4/29/17 0.08 inches of rainfall occurred, followed by 0.92 inches of rainfall over a 24-hour period on 4/30/17. A plot of the VMC and rainfall data from the USGS rain gauge 06610765 demonstrates the bioretention garden's subsurface response to prolonged rainfall that occurs in back-to-back events. Figure 5-3 depicts the findings of the Event 1 analysis.

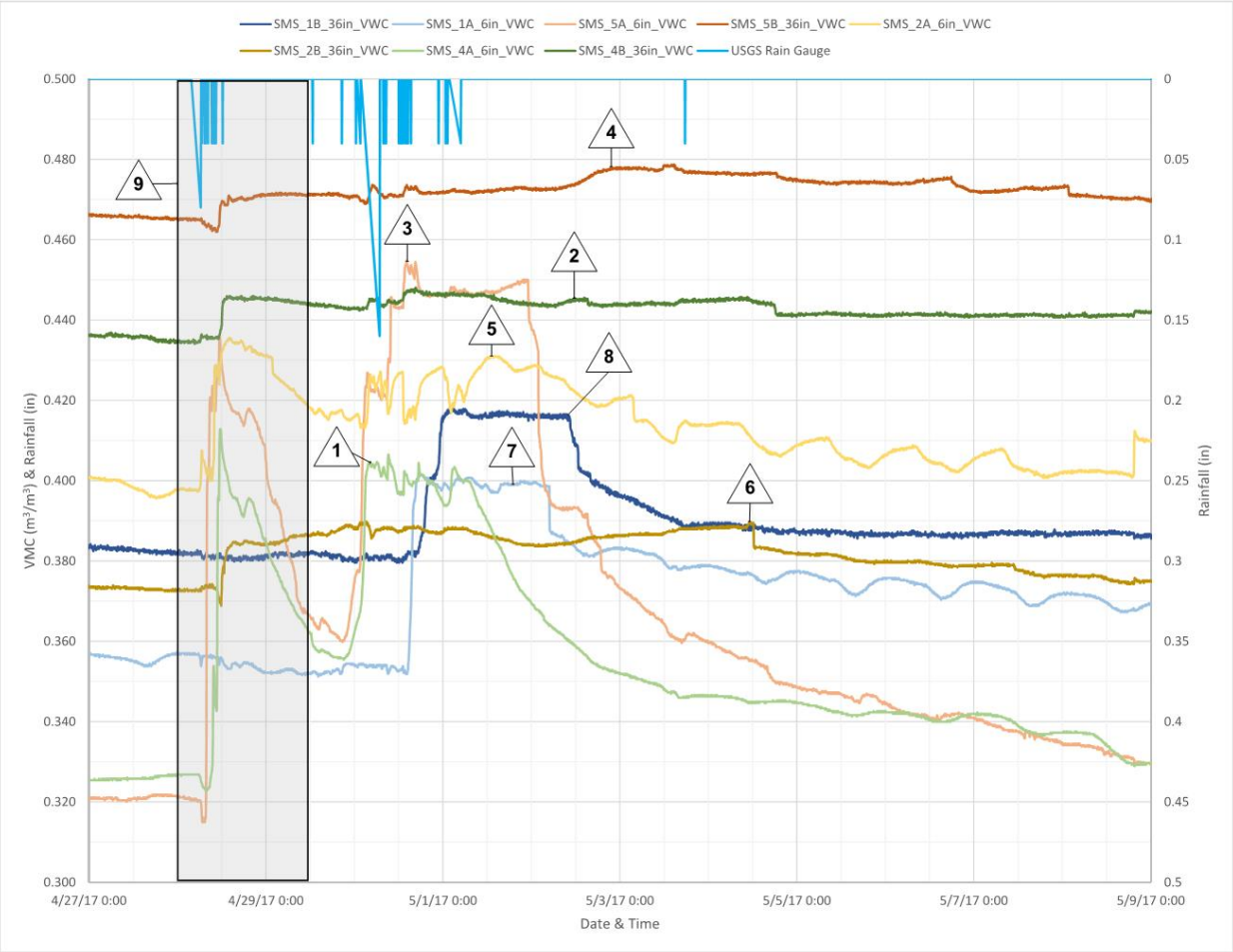

Figure 5-3: Event 3 Analysis

The wetting front for an event of this intensity and magnitude infiltrates into the top 6 inches of the soil profile adjacent to the bioretention garden extents. Water in the bioretention garden infiltrates vertically through the engineered soil profile to depths of 36 inches below ground surface, but does not extend laterally, indicated by the lack of VMC response for SMS-1 at 36 inches below ground surface. Additional observations for Event 1 are described in Table 5-3.

Table 5-3: Event 3 Observations

Callout ID	Sensor Set	SMS Description (depth below ground surface)	Observation
1	SMS-4	6 inches	• Responded similarly to Event 2, but had a period of prolonged wetting before subsequent drying of soil
2	SMS-4	36 inches	• Minimal additional increase in VMC after 4/30/17 event • Soil may be approaching saturated condition
3	SMS-5	6 inches	• Responded similarly to Event 2, but had a period of prolonged wetting before subsequent drying of soil
4	SMS-5	36 inches	• Minimal additional increase in VMC after 4/30/17 event • Soil may be approaching saturated condition
5	SMS-2	6 inches	• Responded similarly to Event 2, but had a period of prolonged wetting before subsequent drying of soil • SMS-2 had a slower drying rate than SMS-4 or SMS-5 possibly due to its proximity of adjacent in-situ soils. The clayey in-situ soils may be holding additional water after the event and contributing to the moisture content of the adjacent engineered soils.
6	SMS-2	36 inches	• Minimal additional increase in VMC after 4/30/17 event • Soil may be approaching saturated condition
7	SMS-1	6 inches	• Increase in VMC after prolonged wetting of soils 36 inches below the bottom elevation of the bioretention garden suggests vertical movement of wetting front before lateral movement.
8	SMS-1	36 inches	• Responded similarly to Event 2, but had a period of prolonged wetting before subsequent drying of soil
9	SMS-1,2,4,5	6 & 36 inches	• The VMC for all SMS sets (1, 2, 4, and 5) respond similarly to Event 1, an event of similar size

The following conclusions can be made on the performance of the Orchard Park Bioretention Garden:

1. Water quality runoff event does not invoke deep infiltration in bioretention garden.
2. An event twice the water quality runoff event encourages vertical infiltration into the subgrade of the facility but does not allow for lateral infiltration.
3. Prolonged rainfall exceeding 1-inch results in lateral infiltration.
4. The wetting front moves vertically through the engineered soil media and into the subgrade below before it extends outward into the adjacent in-situ soil profile.

4.2 Creighton Prep

Three storm events were evaluated at the Creighton Prep bioretention site. Events were selected based on periods of available data and to cover a range of events from the water quality event to the largest event of the season.

4.2.1 Event 1: 5/10/2017 (0.66-in)

This event was selected to most closely evaluate the water quality runoff event of 0.5 inches over a 24-hour period. Due to the equipment issues previously mentioned, this was one of a few where multiple stilling wells, the stilling basin, the rain gauge and inflow and outflow meters all were operational. This event was drawn out over several hours with a majority of the depth falling between 5:00 AM and 9:40 AM as shown in Figure 5-4. As expected, the basin bean to fill within an hour of the start of precipitation and quickly drained down to a dry state-an indication of the high porosity of the amended soils below. As expected, the stilling well response was delayed by several hours as the runoff infiltrated in the basin and quickly infiltrated into the deep subsurface or moved laterally out of the system.

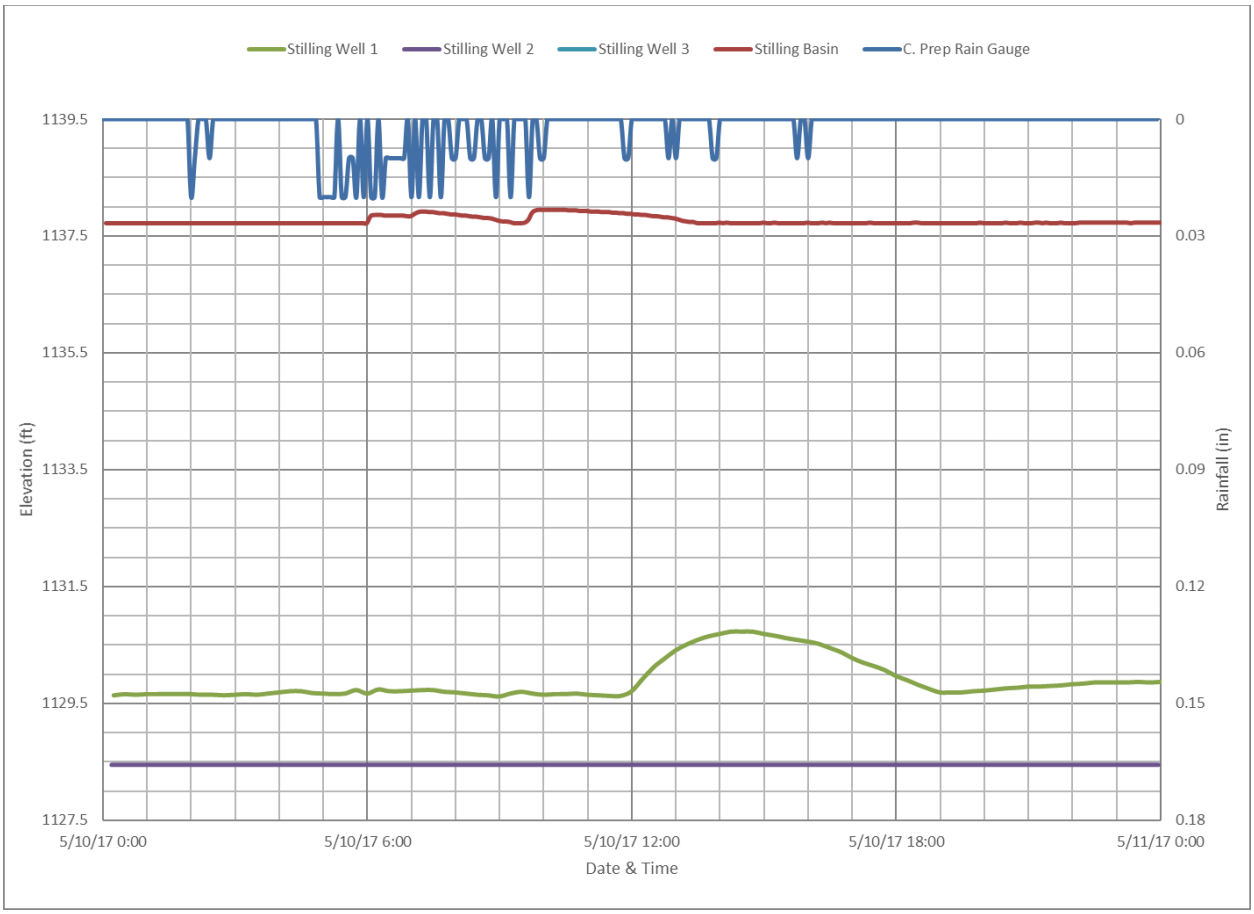

Figure 5-4: 5/10/17 Stilling Well & Stilling Basin

Measured inflow generally matched the precipitation pattern witnessed for the event. However, exceeded inflow for the duration indicating a high amount of runoff from the adjacent field or overspray by the irrigation system as shown in Figure 5-5.

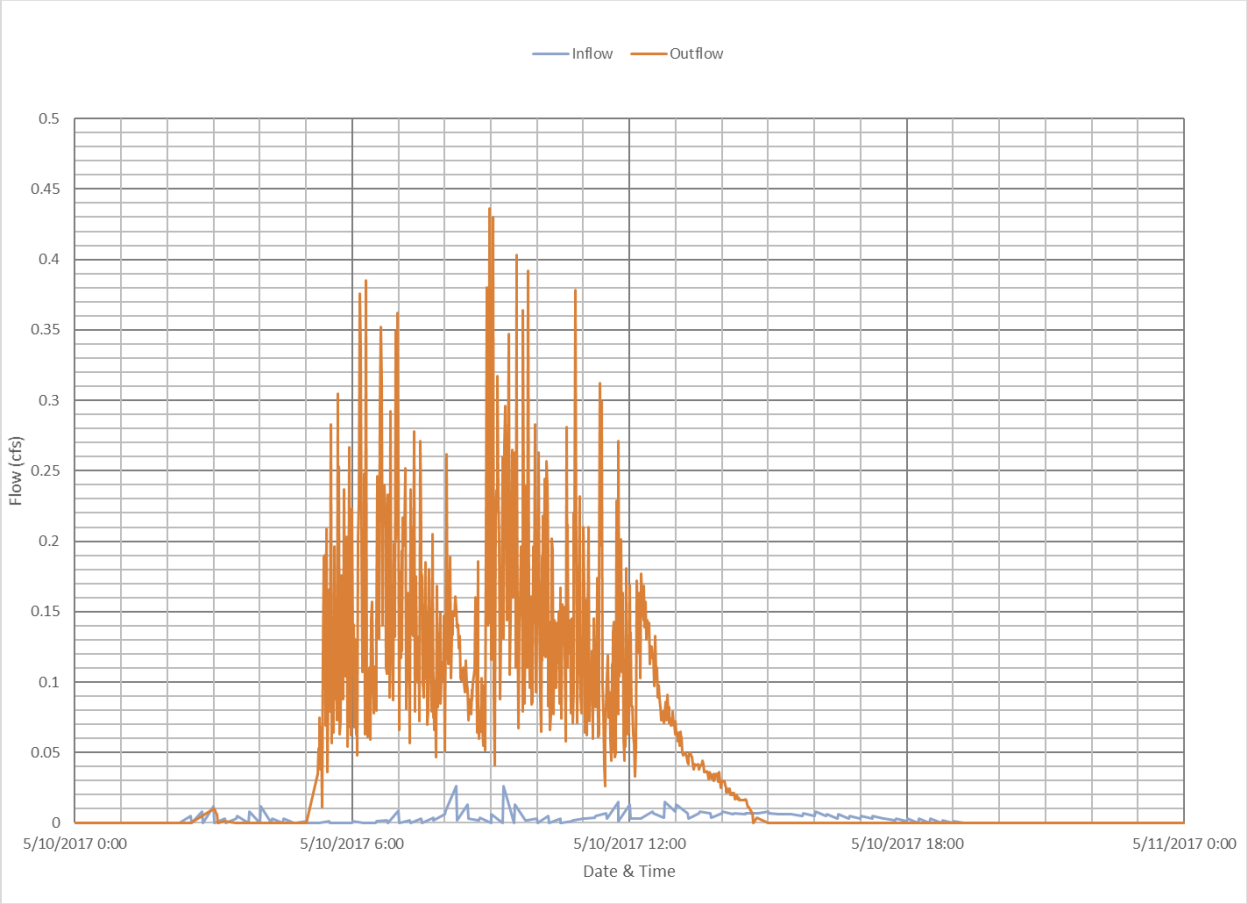

Figure 5-5: 5/10/17 Inflow & Outflow

4.2.2 Event 2: 6/12/17 to 6/18/17 (1.98-in)

This event was analyzed for several reasons. First, it provided insight on how the bioretention basin responds over several days of small rainfall. Ultimately, this period included a severe storm with high winds and intense rainfall demonstrating performance during a more extreme runoff event as shown in Figure 5-6. As noted in the Event 1 analysis, the groundwater level quickly returns to the baseline within hours of the rain event. As noted previously, the stilling basin and rain gage were not operational, so a detailed analysis of the hydrograph or ponding was not completed. However, a comparison of the inflow to the spike in the groundwater depth showed a lag of approximately 8 hours. This was not completely unexpected as periods of intense rainfall are more prone to running of directly not allowing the soil to absorb much of the water.

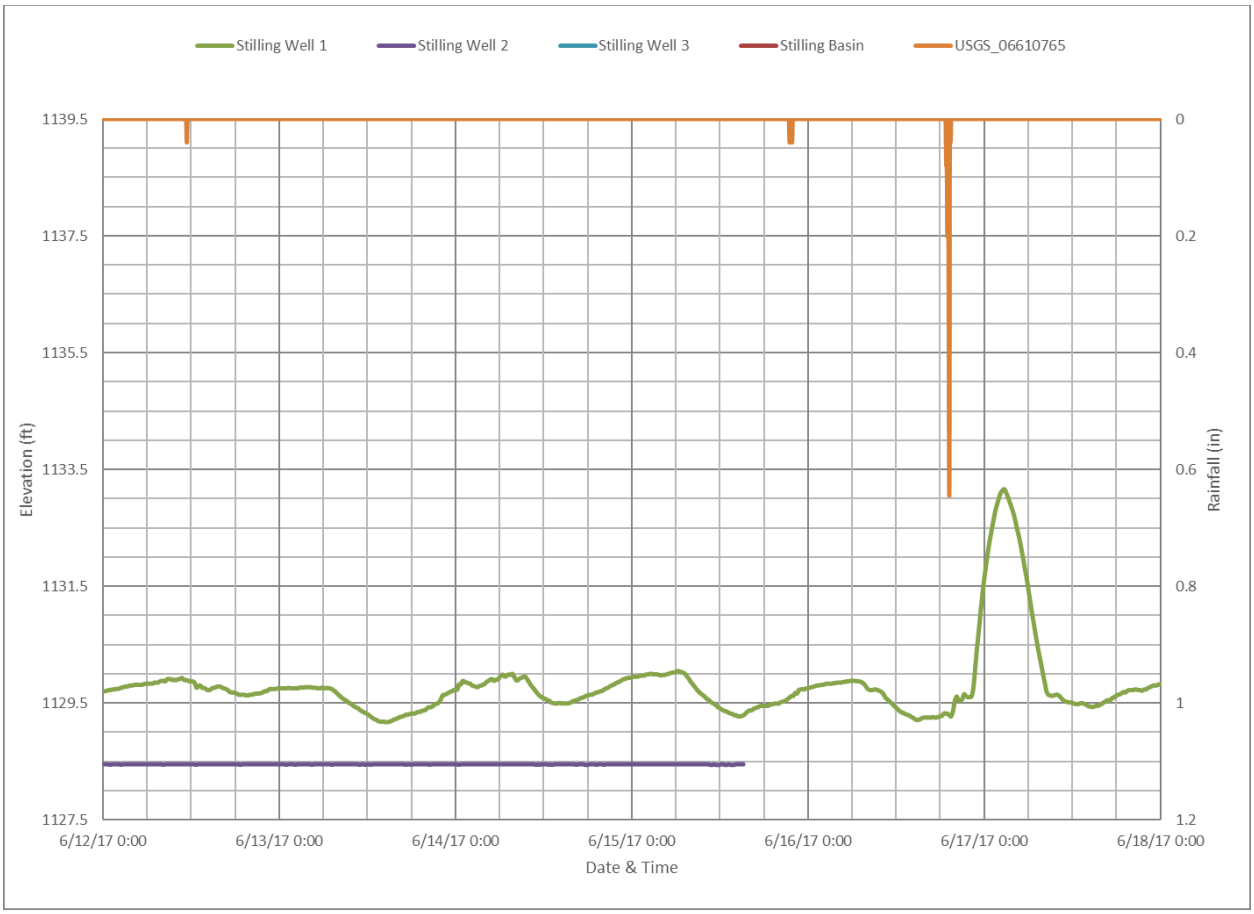

Figure 5-6: 6/12/17 to 6/18/17 Stilling Well & Stilling Basin

Figure 5-7 shows the inflow and outflow hydrograph for the Event 2 analysis from 6/12/17 to 6/18/17. Figure 5-8 isolates the 6/16/17 rainfall, demonstrating the peak inflow at 7 PM and the peak outflow at approximately the same time. It is hypothesized that the basin overtopped during this event since the peak outflow never exceeded 5 cubic feet/second. The outflow hydrograph is drawn out for several hours after the termination of the inflow hydrograph.

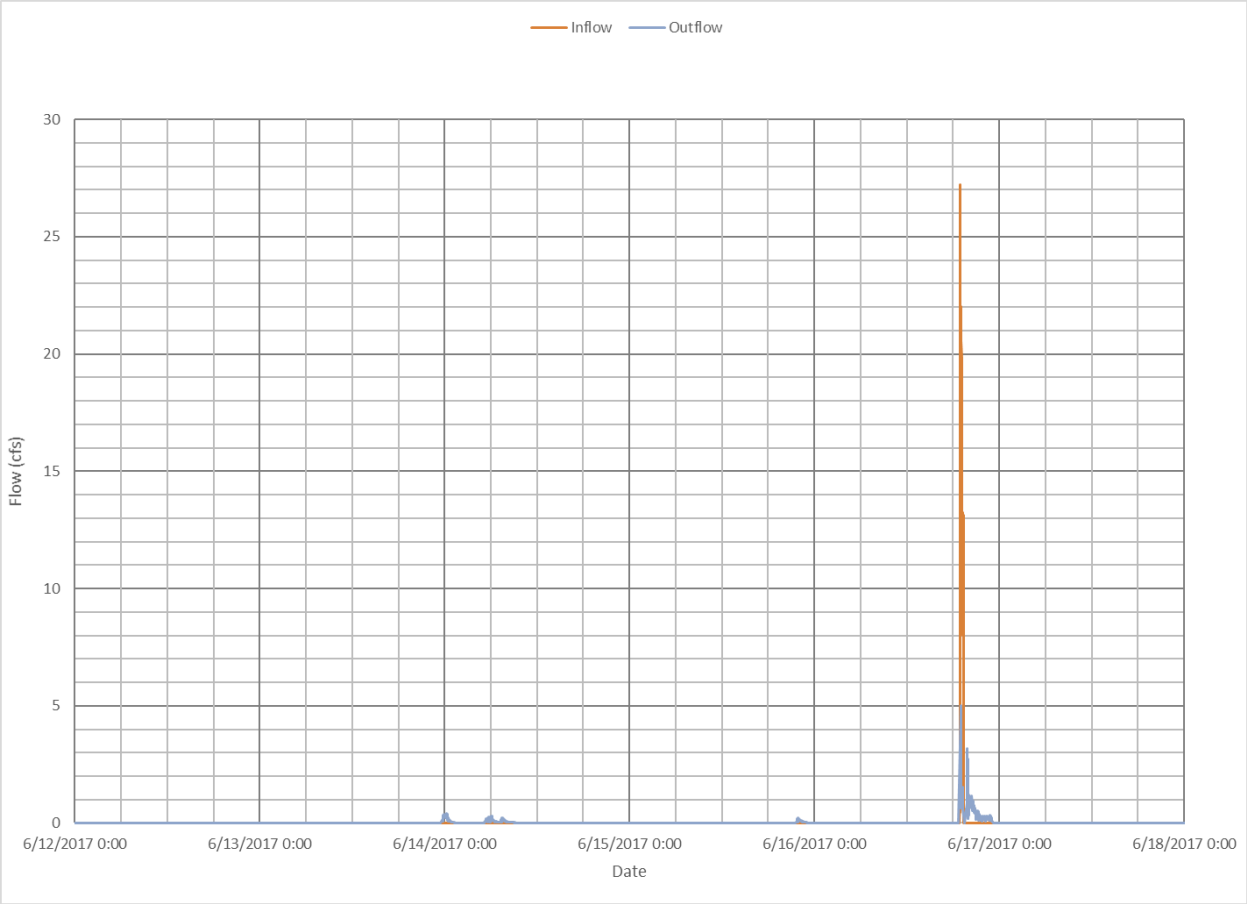

Figure 5-7: 6/12/17 to 6/18/17 Inflow & Outflow

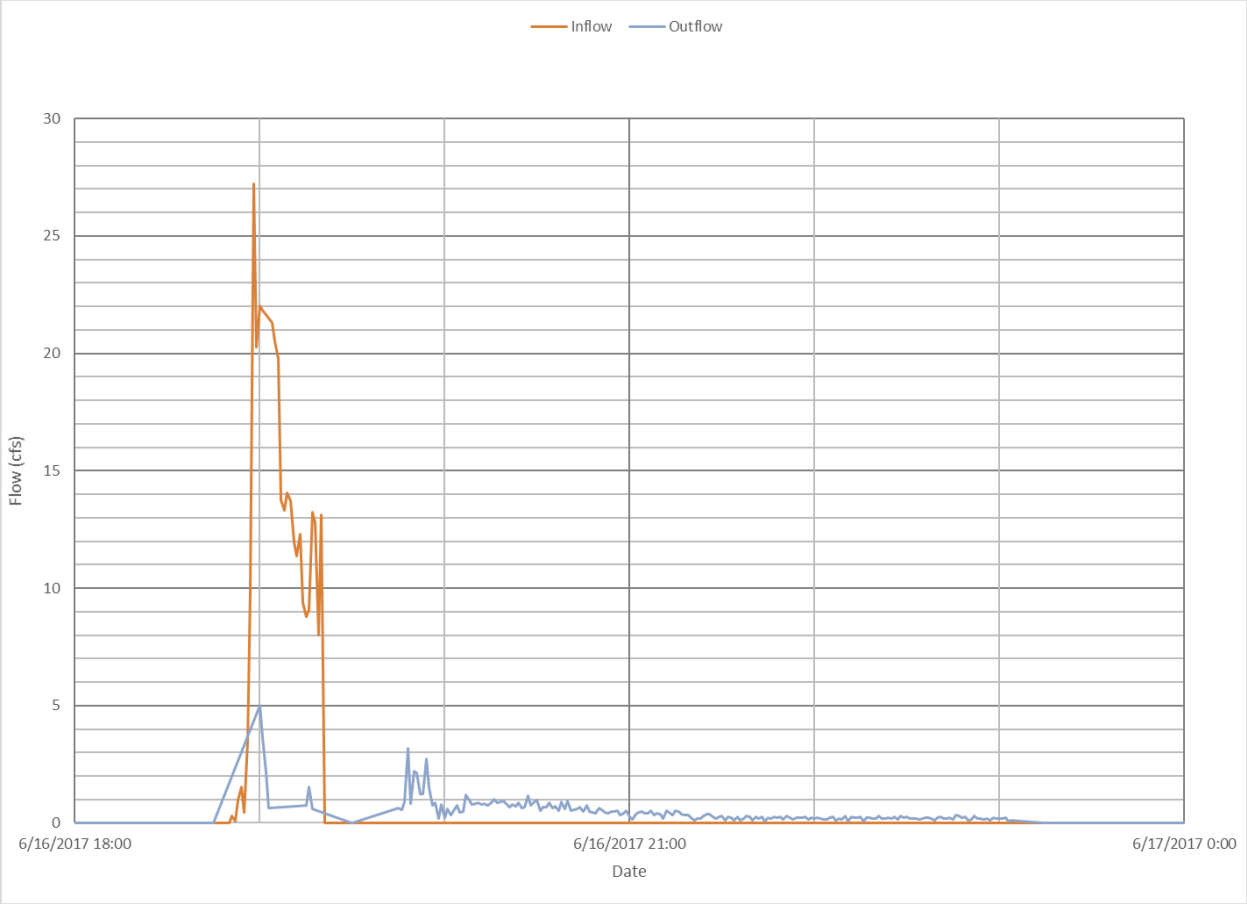

Figure 5-8: 6/16/17 to 6/17/17 Inflow & Outflow

4.2.3 Event 3: 5/16/17 to 5/20/17 (3.47-in)

Similar to Event 2, Event 3 was selected as a series of back to back events including two water quality events and approximately 1-inch plus events. The stilling basin was operational during the first few days of this event, but the results did not respond to the daily rainfall or groundwater elevation changes as anticipated. An evaluation of Figure 5-9 showed three similar peaks for groundwater. For each peak, the rising limb should be related to the absorption rate and the falling limb similar to the deep infiltration rate. For the peak following the 5/16/17 rainfall and 5/20/17 rainfall, the infiltration rate was calculated at 2.6 inches/hour. For the 5/19/17 rainfall, the infiltration rate was estimated at 5 inches/hour.

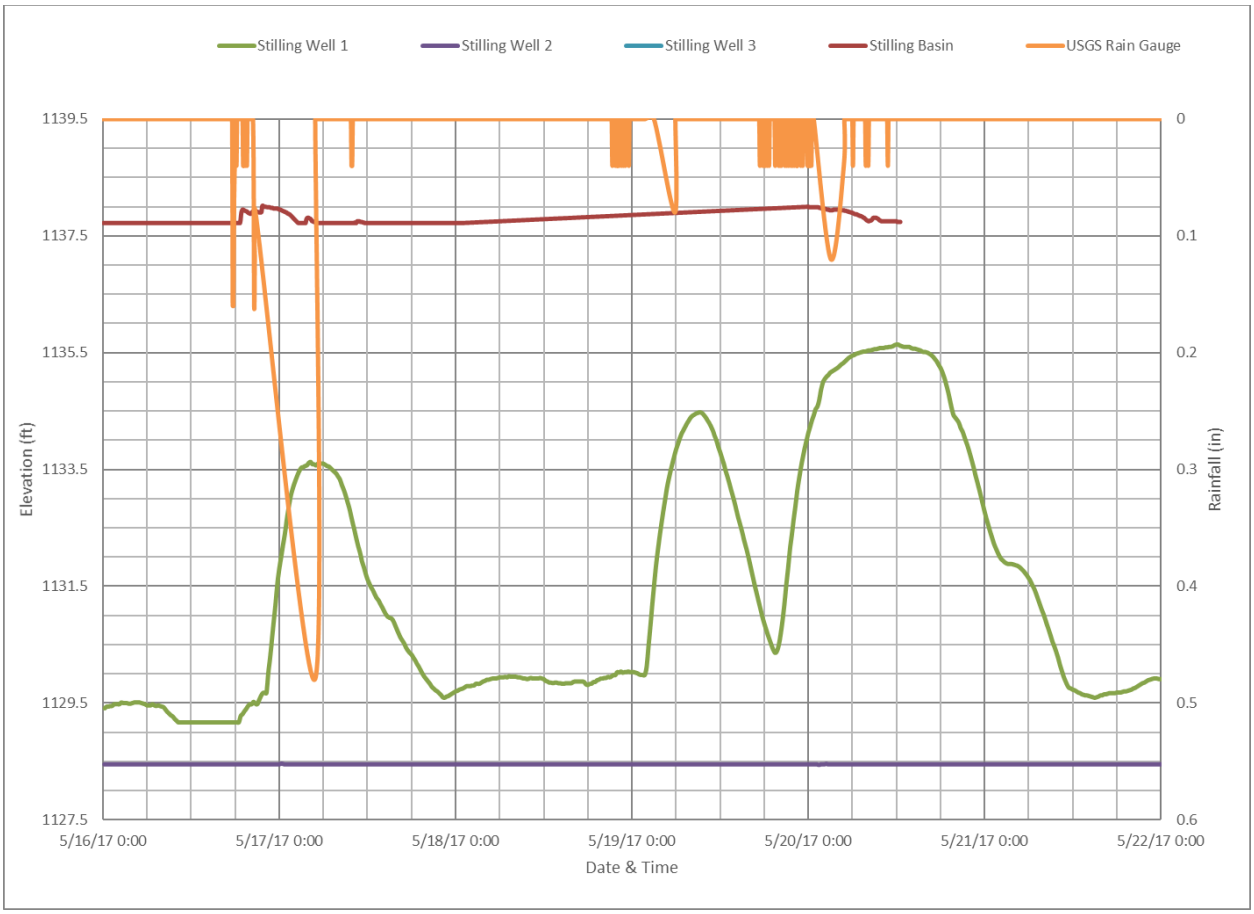

Figure 5-9: 5/16/17 to 5/22/17 Stilling Well & Stilling Basin

The response to the 5/19/17 rainfall also demonstrated the bioretention basin's ability to delay and shave peak outflow rates as shown in Figure 5-10. For the most intense rainfalls, the peak flowrate was shaved by up to 42% (5/19/17) while during the 0.53-inch event, shaved by 70%.

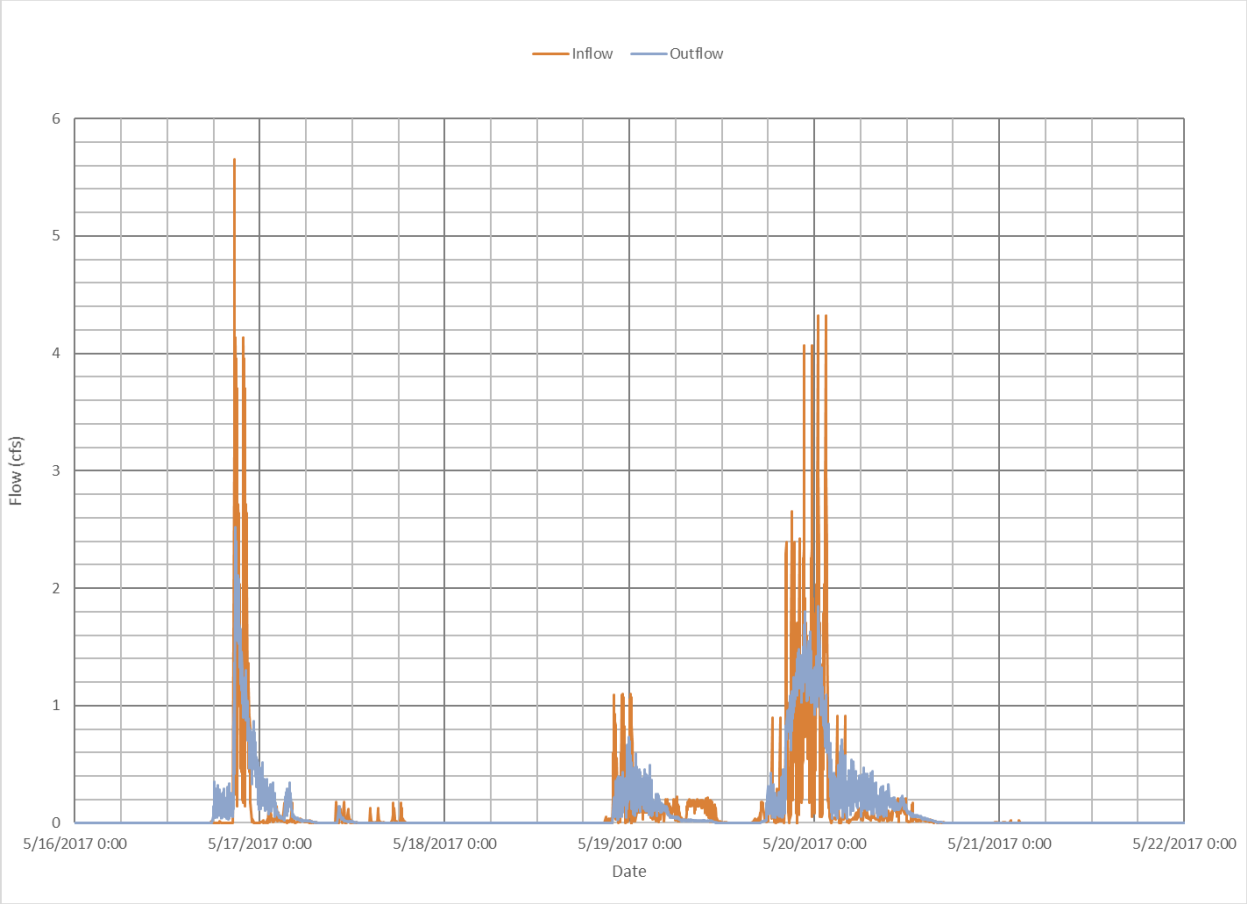

Figure 5-10: 5/16/17 to 5/22/17 Inflow & Outflow

The inflow and outflow data were plotted against the stilling basin and stilling well data as shown in Figure 5-11. As stated previously, the lag between the peak inflow and the spike in groundwater level is in excess of 8 hours. However, groundwater level returns to baseline within 12 to 24 hours. This indicates the importance of providing adequate surface storage volume is necessary to promote deep infiltration.

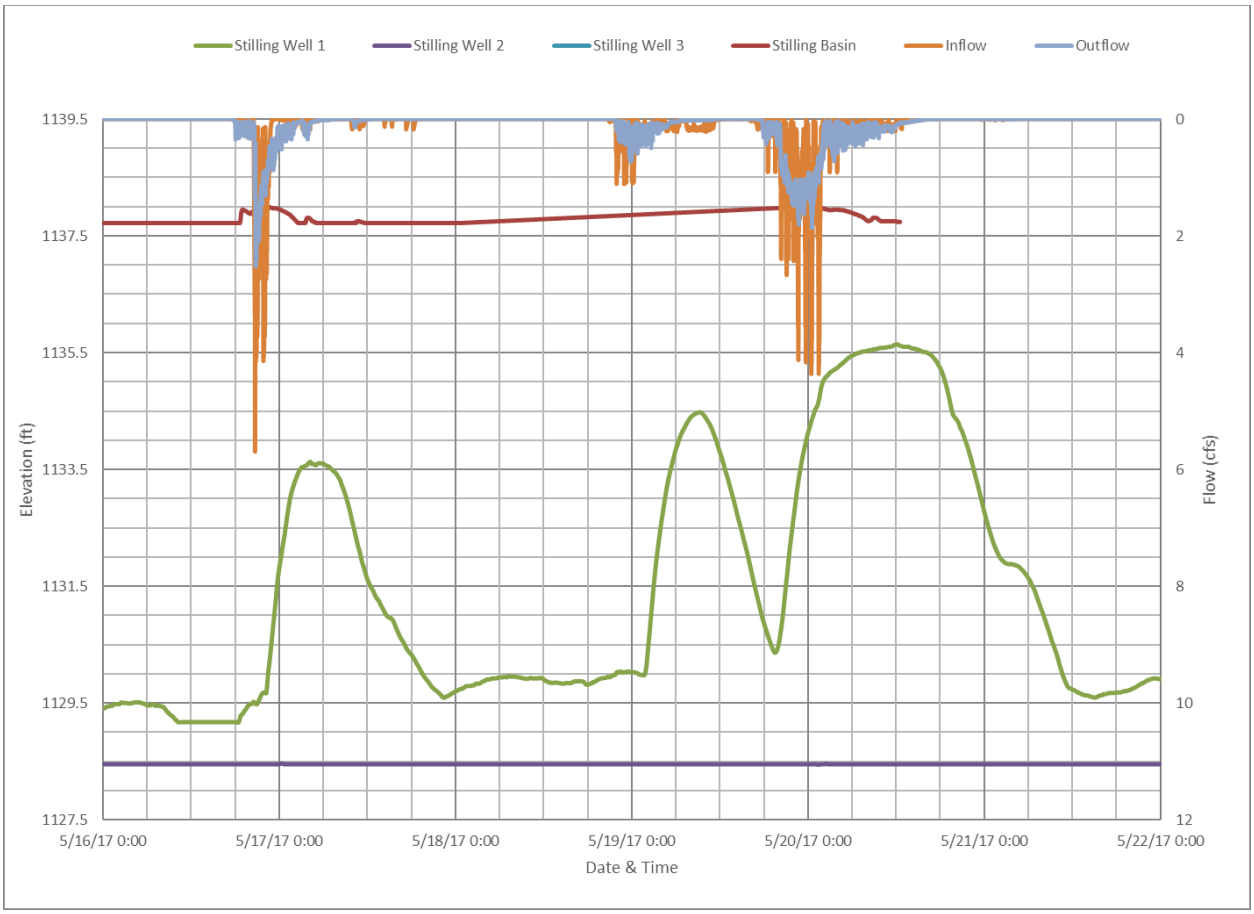

Figure 5-11: 5/16/17 to 5/22/17 Inflow, Outflow, Stilling Well, and Stilling Basin

The following conclusions can be made on the performance of the Creighton Prep Bioretention:

1. The site adequately shaves the peaks of the most frequent events (between 0.5 inches and 1 inch), reducing runoff into the storm system.
2. The system effectively infiltrates at depths in excess of 10 feet, at a rate quite high for the Hydrologic Soil Group C soils.
3. External factors, such as runoff from the adjacent field may skew inflow/outflow results.
4. While detailed precipitation data can be used to evaluate an event, the inflow and outflow data exhibit similar peakiness and intensity components to rainfall and can be used to evaluate overall system performance.

4.3 UNO Welcome Center

Two of the three storm events evaluated at Creighton Prep were also evaluated at the UNO Welcome Center bioretention garden site. For the UNO Welcome Center, Event 1 is defined as the rainfall on 5/10/17 and Event 2 is the rainfall occurring from 5/16/17 to 5/20/17. In addition to rainfall event analyses, subsurface temperature data was analyzed in relation to freeze-thaw from January to April.

4.3.1 Event 1: 5/10/2017 (0.59-in)

This event was selected to most closely evaluate the water quality runoff event of 0.5 inches of runoff due to the extremely high impervious tributary area to the bioretention garden. During this event, the stilling basin STB-2 adjacent to the Type A infiltration trench and soil moisture and temperature sensors were operational. (Stilling basin STB-1 adjacent to the Type B infiltration trench should have been operational but did not produce a response to this event.)

The bioretention garden began to fill as indicated by the response in STB-2 and infiltrate into the below substrate, as reflected in the soil moisture sensor data shown in Figure 5-12. For a rainfall event approximately equal (in volume) to the water quality runoff event (0.59 inches of actual rainfall is nearly equal to the 0.50-inch water quality runoff event), the bioretention garden only reaches half of the maximum designed ponding depth of 1 foot.

Figure 5-12 also demonstrates the implications of engineered soil systems. The VMC of saturated soils is typically around 0.48 to 0.49 m^3/m^3. The VMC of the engineered soils at a depth of 6 inches is in excess of 0.50 m^3/m^3, indicating a supersaturated state, which doesn't normally occur under natural soil conditions.

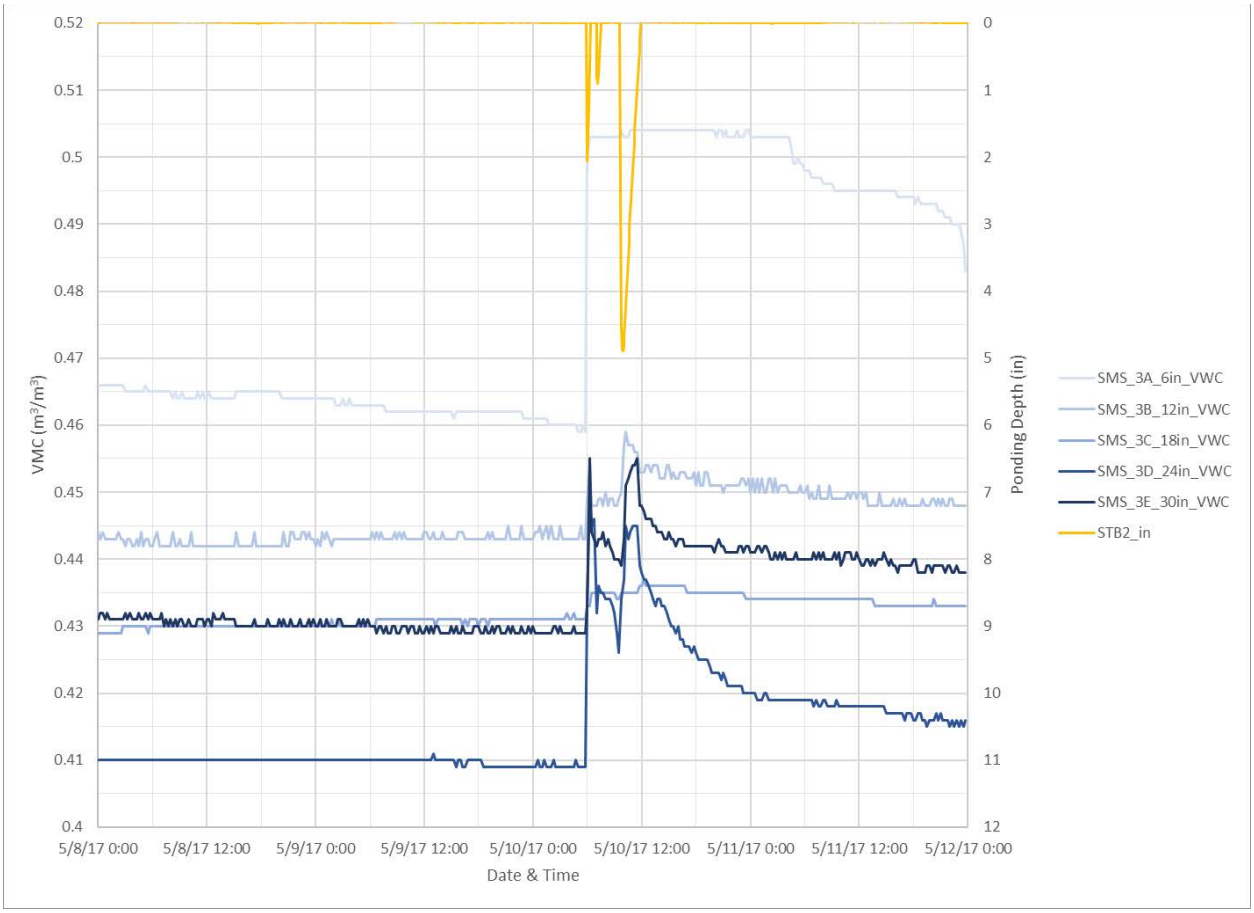

Figure 5-12: 5/10/17 Volumetric Moisture Content (VMC) and Stilling Basin

Soil moisture responds to infiltration sequentially with depth, demonstrated by the order in which the soil moisture sensors recorded an increase in moisture content, as shown in Figure 5-13. This order of response is as expected; as the wetting front moves vertically downward through the soil profile from the ground surface, the moisture content of the underlying soil increases. Likewise, after the ponded volume has dewatered, the soil dries from ground surface downward, with the sandy engineered soils drying out quicker than the underlying clayey soils, which hold more moisture than sandy soils. Table 5-4 shows the peak VMC and VMC 24 hours after rainfall has ceased at varying sensor depths.

Table 5-4: VMC Response at Varying Sensor Depths

Sensor Depth Below Ground Surface (in)	Peak VMC (m^3/m^3)	VMC (m^3/m^3) 24 hrs after Rainfall
6	0.458	0.400
12	0.426	0.414
18	0.432	0.427
24	0.445	0.444
30	0.433	0.432

The valve on the underdrain at the bottom of the 27-inch engineered subsurface profile maintains moisture in the native subgrade when the valve is closed and is likely creating a perched aquifer condition that results in a higher VMC in the soils at the 24-inch sensor depth than the in the soils at the 36-inch sensor depth.

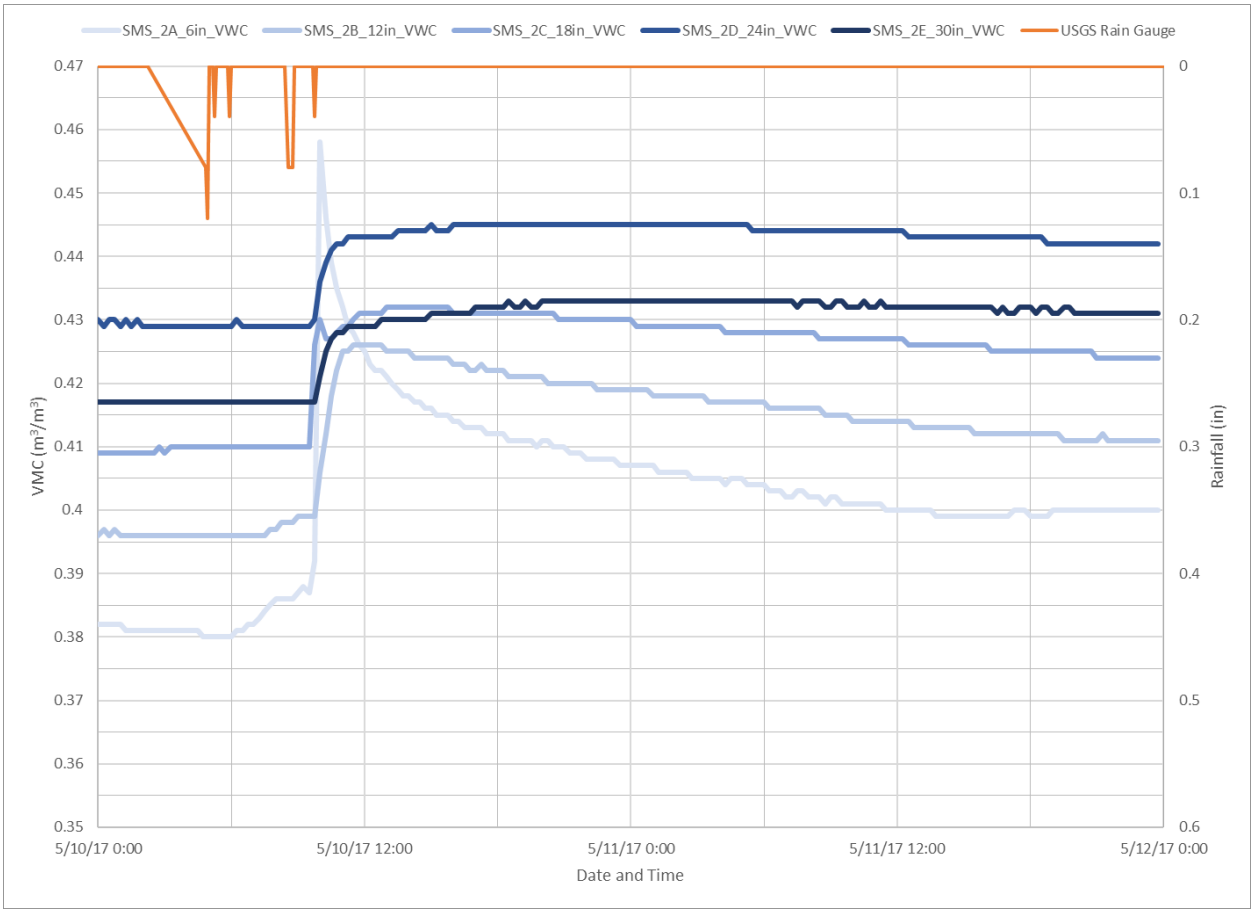

Figure 5-13: 5/10/17 Volumetric Moisture Content

Figure 5-14 shows that the response between volumetric moisture content and electrical conductivity (EC) are similar. As VMC increases, EC generally increases; as VMC decreases, EC generally decreases, both with similarly shaped response curves.

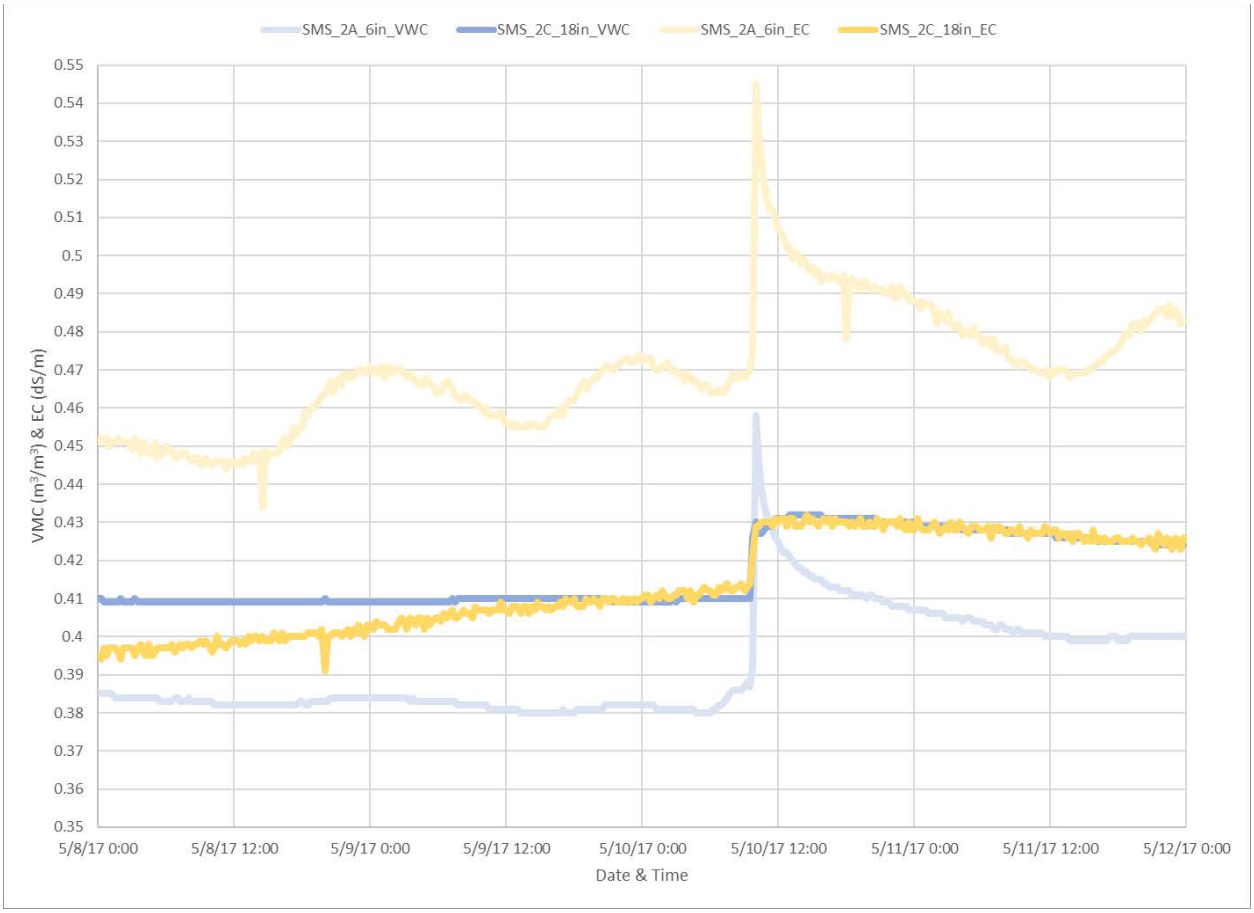

Figure 5-14: 5/10/17 SMS & VMC

4.3.2 Event 2: 5/16/17 to 5/20/17 (3.16-in)

The event on June 16th was greater than 1-inch, which for this site would generate approximately two times the runoff of the water quality runoff event due to the imperviousness of the tributary area. Additional rainfall was observed the following three days, with total precipitation exceeding 3 inches over the five-day period. Throughout the multi-day rainfall, the ponding height in the stilling basin did not exceed 8 inches (two-thirds of the maximum ponding height of 1 foot) as seen in Figure 5-15. As previously mentioned, engineered soils in the UNO Welcome Center bioretention garden approach supersaturated conditions following a rainfall event. For this event, the subgrade beneath the 17-inch engineered soil profile adjacent to SMS-4 also achieves supersaturated conditions.

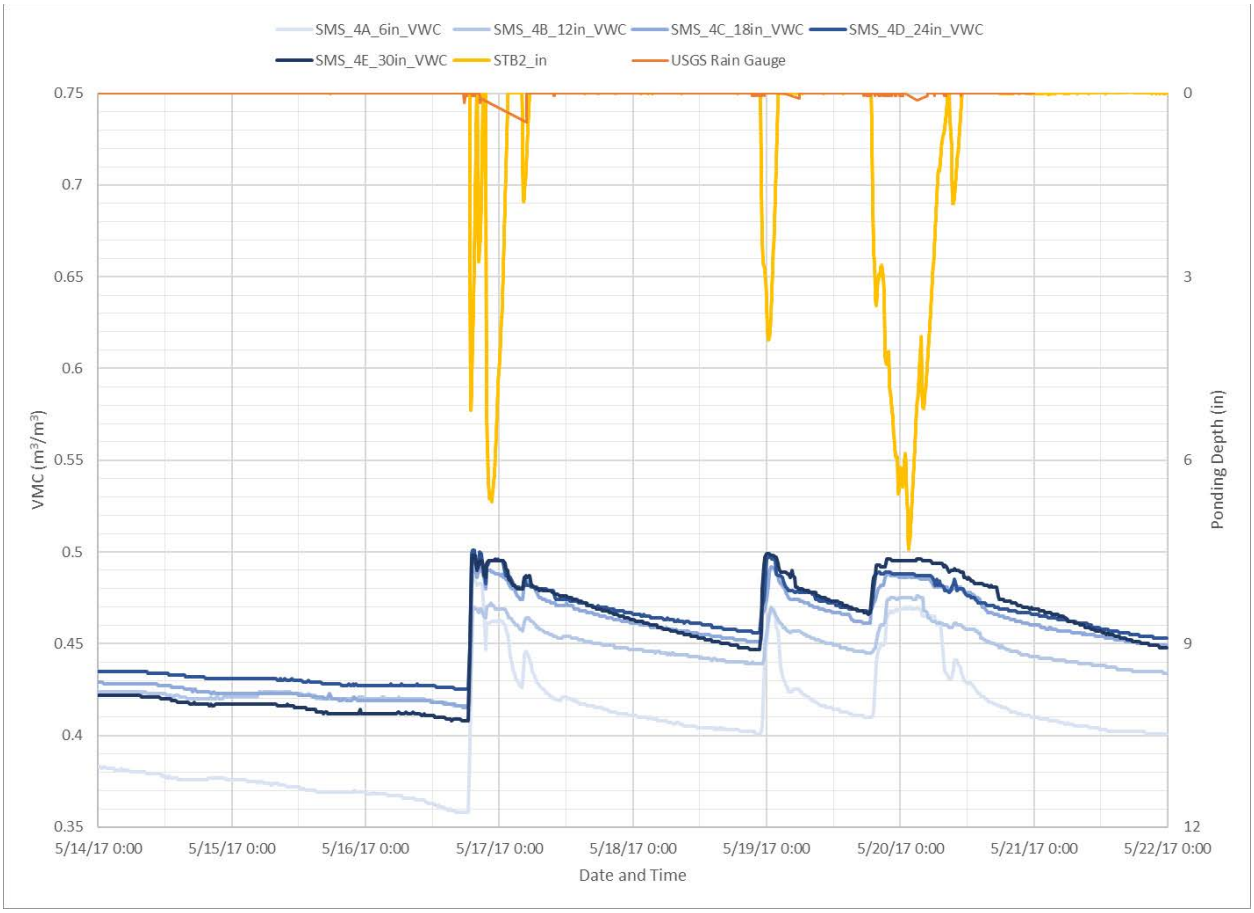

Figure 5-15: 5/16/17 to 5/20/17 VMC & Stilling Basin

4.3.3 Freeze-Thaw Analysis

Subsurface temperature data collected by the soil moisture sensors from January to April were analyzed to evaluate the effects of freeze-thaw on engineered soil profiles compared to in-situ soils. SMS-1 adjacent to Type B infiltration trench, SMS-3 adjacent to Type A infiltration trench, and SMS-5 the control in in-situ soils, were analyzed. Soil temperatures dropped below 32 degrees Fahrenheit (freezing) only during January (see Figure 5-16) and early February (see Figure 5-17) for the 2017 monitoring period. Of SMS-1, SMS-3, and SMS-5, only soil temperatures at 6 inches below ground surface for SMS-1, adjacent to the Type B infiltration trench, and SMS-5, the control, ever reached freezing temperatures. Soil temperatures at 6 inches below ground surface reached freezing temperatures after multiple sequential days of average ambient air temperatures less than 32 degrees Fahrenheit, and or following days when maximum ambient air temperatures did not exceed freezing.

The engineered soil at comparable soil depths was warmer than the in-situ soil. The engineered soil had a more moderate change in temperature than the in-situ soil at the 6-inch depth during cold weather conditions, taking longer to reach freezing temperatures, and thawing sooner than in-situ soils. This moderate response to cold conditions in engineered soil profiles is most likely due to their composition. Engineered soils have a sand content greater and have less water retaining capabilities than the clayey in-situ soils. During warm weather conditions the engineered soils heat up more quickly than the in-situ soils as seen in Figure 5-18.

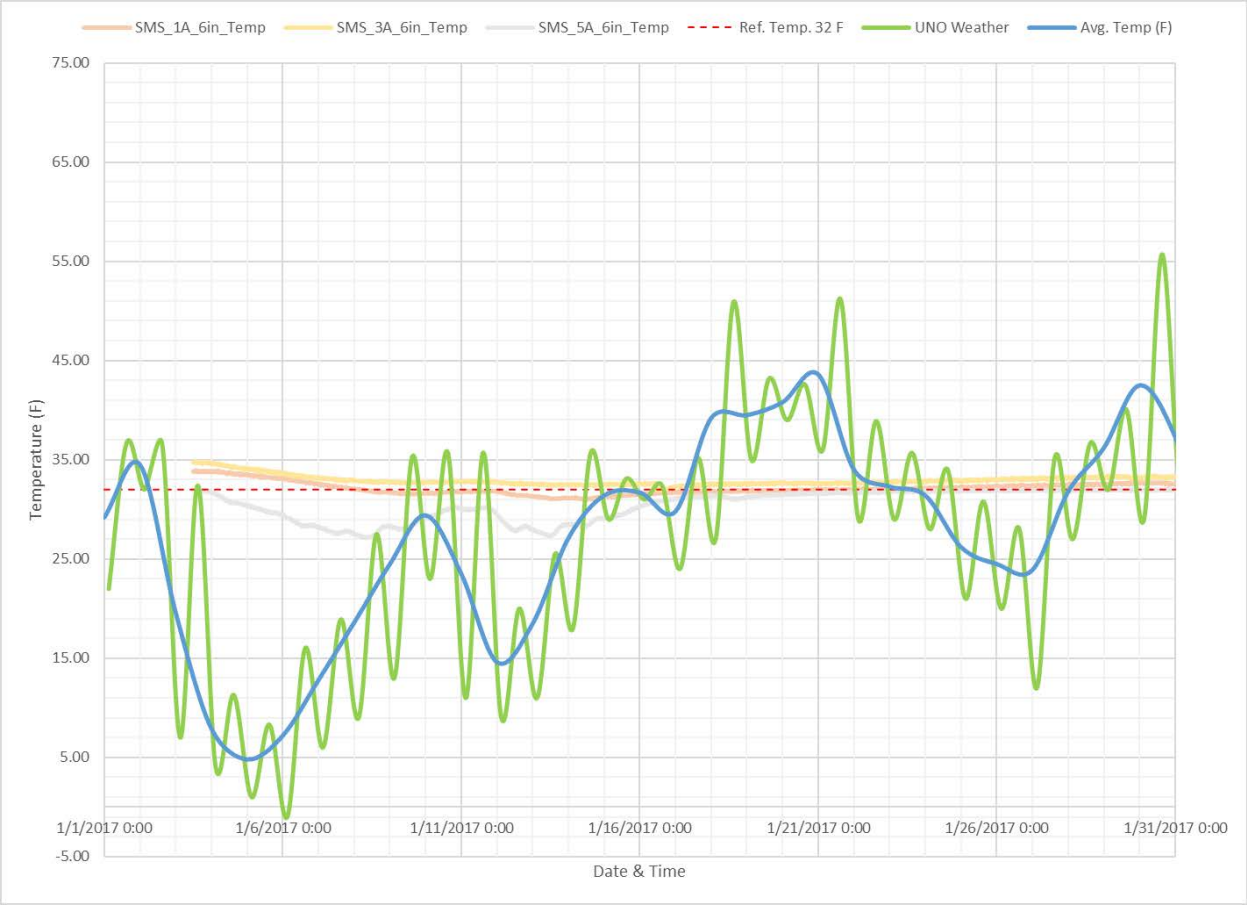

Figure 5-16: January 2017 Subsurface Temperatures

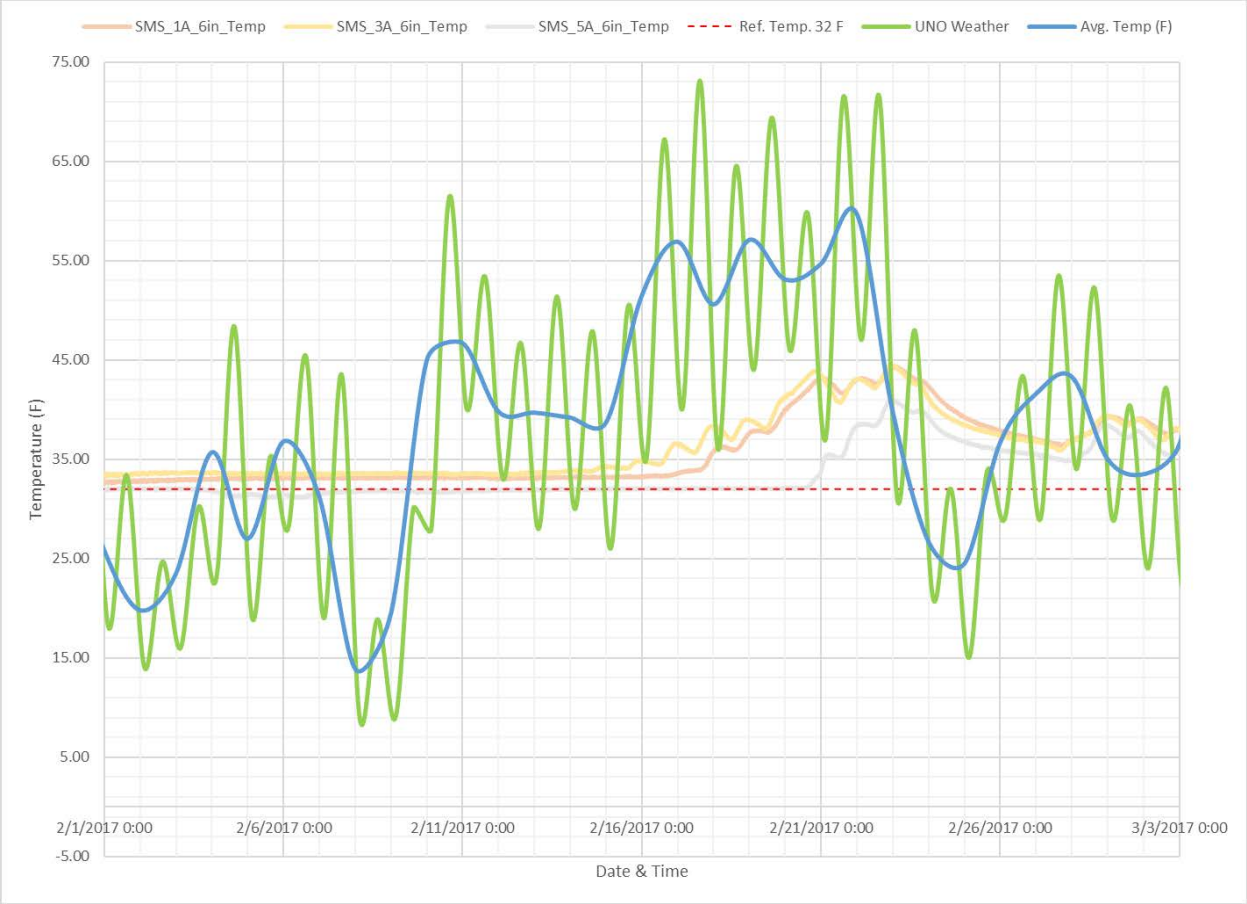

Figure 5-17: February 2017 Subsurface Temperatures

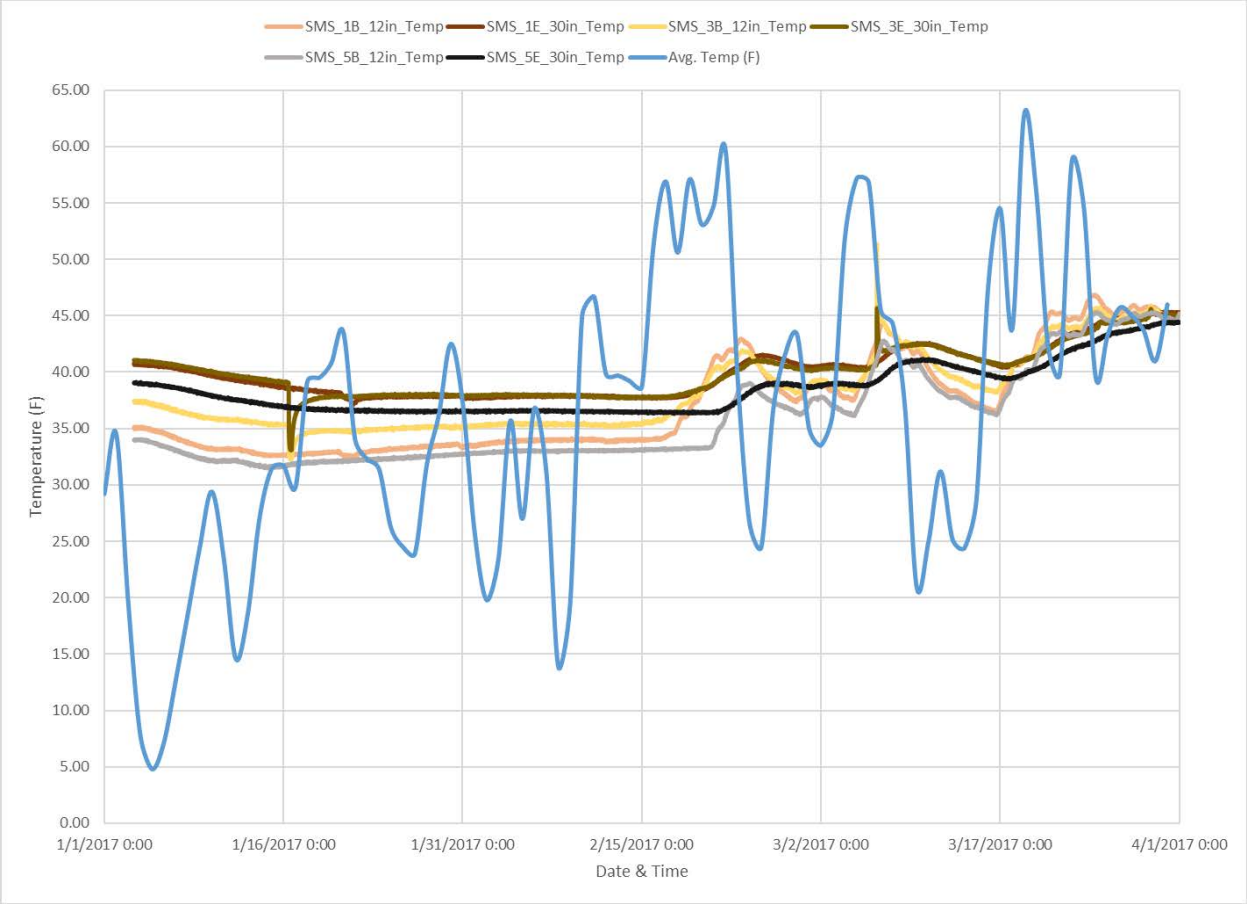

Figure 5-18: January to April 2017 Subsurface Temperatures

The following conclusions can be made on the performance of the UNO Welcome Center:

1. Site does not reach maximum ponding height for water quality event, 1-inch event, or back to back events. Indicates that subsurface conditions exceed design.
2. Wetting front moves vertically through the soil profile.
3. Soils generally dry in order of wetting.
4. Surface soil dries out faster than subsurface soils; encourages use of native plants with deep root structures and deep infiltration practices.
5. Engineered soils have a more moderate change in temperature during cold weather conditions than in-situ soils.

5.0 RECOMMENDATIONS AND NEXT STEPS

Based on the results from the 2017 monitoring period, several general conclusions and ultimately recommendations have been developed for the next study period. First, as described throughout the report, equipment issues and malfunctioning led to large gaps in the data. This, in turn reduced the number of rainfall events that could be analyzed and resulted in more abbreviated conclusions on the performance at each site.

The primary conclusion for the year is that data needs to be collected and analyzed on a more frequent basis, especially during the wet spring and summer months, to ensure that the field equipment is working properly. This notwithstanding, the following includes a summary of the performance of the sites evaluated and the next steps for each:

- Orchard Park
  - Repair/replace malfunctioning equipment in spring of 2018
    - Rain gauge
    - Pressure transducer in stilling basin
    - Data loggers (check batteries and replace as needed)
- Creighton Prep
  - Repair/replace malfunctioning equipment in spring of 2018
    - Rain gauge
    - Pressure transducers (replace pressure transducers that were transferred to other sites and repair or replace malfunctioning pressure transducers)
      - Stilling Well 2
      - Stilling Well 3
      - Stilling Basin
    - Flow meter (check batteries and replace as needed)
- UNO Welcome Center
  - Repair/replace malfunctioning equipment in spring of 2018
    - Pressure transducers (replace pressure transducers that were transferred to other sites and repair or replace malfunctioning pressure transducers)
      - Stilling Basin 1
      - Stilling Basin 2
- Dundee Elementary

- Install monitoring equipment procured in 2017 during the spring of 2018
  - Rain gauge on the Dundee Elementary School roof
  - Pressure transducer within the 500-gallon rain silo
  - Camera on the building

- Adams Park
  - Install monitoring equipment and begin study during spring of 2018
    - Rain gauge on the Adams Park Community Center roof
    - Pressure transducers on the future park road bridge near the box culvert and one additional site within the wetland to monitor water depth.
    - Flow meter on outlet structure

APPENDIX A WEATHER REPORTS

Daily Weather Observations January 2017*

2017	Temp. (°F)			Dew Point (°F)			Humidity (%)			Sea Level Press. (in)			Visibility (mi)			Wind (mph)			Precip. (in)	Events
Jan	high	avg	low	high	avg	low	high	avg	low	high	avg	low	high	avg	low	high	avg	high	sum	
1	37	29	21	24	20	14	78	64	44	30.06	29.97	29.92	10	10	10	13	9	22	0	
2	39	35	31	34	30	24	89	79	56	30.01	29.89	29.8	10	4	1	18	8	26	0.01	Rain
3	34	21	8	26	8	-1	82	64	48	30.41	30.25	29.99	10	10	6	28	24	37	0	
4	12	10	7	4	0	-5	77	65	37	30.42	30.3	30.19	10	6	2	17	13	-	0.03	Snow
5	10	6	1	3	-2	-6	77	66	47	30.32	30.26	30.19	10	10	9	21	10	25	0	Snow
6	18	9	0	3	-2	-9	73	61	38	30.47	30.39	30.32	10	10	10	9	5	-	0	
7	21	13	5	7	3	-2	77	66	49	30.78	30.67	30.45	10	10	7	17	7	-	0	
8	28	17	6	17	9	-1	76	66	49	30.71	30.43	30.24	10	10	9	24	10	32	0	
9	34	24	14	26	15	7	78	67	55	30.3	29.97	29.56	10	10	10	24	12	29	0	
10	36	31	25	30	22	15	89	70	51	29.95	29.67	29.37	10	9	3	33	12	43	0.12	Rain , Snow
11	34	24	13	27	14	2	78	67	56	30.03	29.82	29.65	10	9	4	30	16	37	T	Snow
12	22	17	11	10	5	-1	73	58	43	30.63	30.37	30.05	10	10	6	18	10	22	T	Snow
13	28	21	13	9	3	-2	61	44	27	30.77	30.67	30.58	10	10	10	14	7	16	0	
14	37	28	18	19	12	9	74	53	32	30.61	30.55	30.47	10	10	10	8	2	10	0	
15	35	32	28	29	23	15	85	67	49	30.47	30.29	30.16	10	7	2	10	4	12	0.15	Rain
16	35	34	32	31	29	28	89	86	82	30.16	30.01	29.89	7	4	1	17	9	22	0.38	Rain
17	34	30	25	29	24	21	89	82	75	30.14	30.09	30	10	7	4	20	9	22	T	Snow
18	49	37	24	40	30	20	88	79	70	30.15	30.01	29.89	10	9	5	18	11	21	0	
19	45	38	30	40	35	27	89	86	82	29.88	29.73	29.61	10	3	0	14	5	17	T	Fog , Rain
20	44	41	37	40	37	34	92	87	82	29.62	29.54	29.4	10	3	0	13	6	15	0.04	Fog , Rain
21	52	41	29	39	36	27	92	76	59	29.59	29.46	29.38	10	6	0	14	4	17	0.01	Fog
22	40	33	25	33	28	23	85	80	75	29.93	29.78	29.58	10	8	4	20	10	25	0	
23	36	34	31	28	27	26	85	80	75	29.95	29.89	29.81	10	9	6	17	8	23	0	
24	36	33	30	29	28	26	85	80	75	29.84	29.66	29.54	9	5	1	22	10	31	0.07	Snow
25	33	29	24	29	24	18	85	80	75	30.04	29.79	29.59	7	3	0	26	18	33	0.05	Rain , Snow
26	29	25	21	20	18	14	81	75	68	30.18	30.14	30.04	10	10	5	21	13	25	T	Snow
27	36	25	14	25	17	7	75	63	51	30.18	30.1	30.04	10	10	9	25	14	30	T	Snow
28	38	33	27	30	26	21	82	73	64	30.06	30.02	29.97	10	8	2	21	13	25	T	Rain , Snow
29	42	37	31	33	30	27	82	75	67	30.08	30.04	29.98	10	10	10	20	9	24	0	
30	56	41	26	33	27	22	85	60	35	30.02	29.89	29.8	10	10	7	30	12	35	0	
31	44	39	34	31	28	25	75	65	55	30.12	30.01	29.91	10	10	10	17	10	25	0	

*Source: Eppley Airfield Weather Station, Omaha, NE
https://www.wunderground.com/history/airport/KOMA/

Eppley Precip. 0.86 inches
0 # event > 0.5 in
0 # event > 1.0 in

Daily Weather Observations February 2017*

2017	Temp. (°F)			Dew Point (°F)			Humidity (%)			Sea Level Press. (in)			Visibility (mi)			Wind (mph)			Precip. (in)	Events
Feb	high	avg	low	high	avg	low	high	avg	low	high	avg	low	high	avg	low	high	avg	high	sum	
1	35	28	20	27	18	7	75	65	54	30.53	30.33	30.13	10	10	5	25	16	30	T	Snow
2	28	22	15	10	8	5	67	57	46	30.63	30.56	30.51	10	10	10	21	10	25	0	
3	32	25	17	13	9	4	68	51	34	30.66	30.54	30.36	10	10	10	18	8	21	0	
4	50	37	24	27	19	12	69	52	34	30.33	29.98	29.78	10	10	10	30	16	39	0	
5	37	29	20	21	18	14	77	61	44	30.18	30.09	29.98	10	10	7	22	8	27	0	
6	46	36	25	38	32	20	82	76	69	29.95	29.67	29.49	9	6	4	14	6	16	0	
7	44	33	21	38	23	12	89	75	60	29.99	29.73	29.49	10	7	2	26	16	32	T	Snow
8	21	14	6	15	8	0	80	67	54	30.42	30.12	29.93	10	5	0	22	14	26	0.17	Snow
9	30	19	7	16	8	0	73	62	51	30.47	30.3	29.98	10	10	10	21	11	25	0	
10	61	44	27	40	29	17	89	66	42	29.92	29.75	29.66	10	10	8	23	9	29	0	
11	55	44	32	41	35	28	89	72	54	30.17	29.91	29.78	10	10	7	18	10	22	0	
12	50	39	27	36	24	17	85	57	29	30.52	30.43	30.18	10	10	10	24	12	30	0	
13	54	39	24	28	22	17	75	51	26	30.44	30.23	30.07	10	10	10	21	9	26	0	
14	51	39	27	32	27	23	85	64	42	30.14	30.08	30.03	10	10	10	22	11	26	0	
15	51	37	23	27	24	21	88	59	30	30.15	30.04	29.85	10	10	10	17	7	22	0	
16	67	49	31	31	28	24	78	52	26	29.83	29.69	29.6	10	10	10	14	7	16	0	
17	75	55	34	37	32	28	82	51	19	29.72	29.62	29.54	10	10	10	18	11	23	0	
18	67	49	30	37	33	27	85	56	26	29.86	29.8	29.73	10	10	10	12	4	13	0	
19	71	56	40	52	45	32	79	63	47	29.91	29.84	29.79	10	10	9	25	13	32	0	
20	61	50	38	56	51	35	93	82	71	29.95	29.79	29.71	10	7	3	26	9	31	0.21	Rain
21	72	52	32	43	34	29	92	60	27	30.02	29.92	29.76	10	6	0	21	9	24	0	Fog
22	75	58	41	40	36	33	76	51	25	29.81	29.69	29.61	10	10	10	21	10	26	0	
23	45	39	33	36	32	28	89	80	70	29.82	29.69	29.58	10	8	1	24	15	32	0.5	Rain , Snow , Thunderstorm
24	35	29	23	30	22	15	89	79	68	30.09	29.8	29.57	10	4	0	31	21	41	0.13	Rain , Snow
25	34	24	14	21	15	10	80	61	41	30.19	30.08	29.92	10	10	10	21	9	26	0	
26	45	36	26	25	21	18	78	59	40	30.04	29.96	29.89	10	10	10	17	7	21	0	
27	57	40	23	30	25	18	81	55	29	30.03	29.89	29.7	10	10	10	28	8	34	0	
28	48	42	35	41	35	29	89	80	70	29.78	29.66	29.56	10	8	6	23	9	27	0.03	Fog , Rain

*Source: Eppley Airfield Weather Station, Omaha, NE
https://www.wunderground.com/history/airport/KOMA/

Eppley Precip. 1.04 inches
1 # event > 0.5 in
0 # event > 1.0 in

Daily Weather Observations March 2017*

2017	Temp. (°F)			Dew Point (°F)			Humidity (%)			Sea Level Press. (in)			Visibility (mi)			Wind (mph)			Precip. (in)	Events
Mar	high	avg	low	high	avg	low	high	avg	low	high	avg	low	high	avg	low	high	avg	high	sum	
1	44	35	25	32	26	20	82	63	43	30.3	30.06	29.78	10	10	7	30	15	36	0	
2	46	33	20	25	21	17	88	64	40	30.56	30.42	30.29	10	10	10	23	6	27	0	
3	52	37	21	23	19	15	81	55	29	30.57	30.39	30.2	10	10	10	28	13	35	0	
4	73	51	28	39	27	20	72	46	19	30.19	30.05	29.92	10	10	10	29	14	34	0	
5	66	59	52	50	48	43	77	64	51	29.93	29.8	29.65	10	10	10	30	19	38	0	
6	78	59	39	54	45	27	78	55	31	29.73	29.4	29.16	10	10	2	39	26	53	0.07	Rain , Thunderstorm
7	58	48	37	24	17	4	59	35	11	30.11	29.95	29.77	10	10	10	33	15	42	0	
8	57	46	34	21	15	7	44	30	16	30.26	30.16	30.06	10	10	10	17	7	22	0	
9	50	39	27	26	19	14	63	44	24	30.51	30.22	30.07	10	10	10	25	13	32	0	
10	28	23	17	15	3	-6	74	50	25	30.69	30.58	30.48	10	10	10	23	11	27	T	Snow
11	31	27	22	15	13	4	68	55	42	30.58	30.54	30.49	10	10	10	13	7	16	T	
12	41	33	25	31	22	12	70	58	46	30.52	30.16	29.95	10	9	2	30	16	37	0.03	Rain , Snow
13	32	24	21	27	20	13	86	76	57	30.45	30.22	29.97	10	7	2	29	17	36	0	Rain , Snow
14	33	27	20	15	13	11	68	58	47	30.51	30.46	30.4	10	9	6	13	6	16	T	Snow
15	40	29	18	18	14	10	67	54	40	30.52	30.4	30.25	10	10	10	22	13	25	0	
16	66	50	33	44	30	17	71	54	37	30.23	29.99	29.78	10	10	10	28	16	43	0	
17	68	52	35	41	34	20	83	49	15	30.32	30.09	29.82	10	10	8	32	14	40	0	
18	58	43	27	26	22	14	69	44	19	30.41	30.33	30.23	10	10	10	14	7	18	0	
19	82	61	40	51	36	23	71	50	29	30.21	29.99	29.81	10	10	10	25	14	31	0	
20	68	57	45	42	37	26	83	54	24	30.21	30.01	29.83	10	10	10	24	14	31	0	
21	49	43	37	36	29	22	79	60	40	30.46	30.35	30.19	10	10	7	29	13	35	0.01	Rain
22	51	42	33	24	21	16	59	43	26	30.47	30.36	30.17	10	10	10	24	15	29	T	Rain
23	76	61	45	52	37	21	52	45	37	30.15	29.85	29.6	10	10	10	41	20	49	T	Thunderstorm
24	71	57	42	52	44	37	89	67	44	30.01	29.87	29.66	10	6	2	22	14	27	0.6	Rain
25	44	42	40	38	37	36	86	83	79	30	29.96	29.92	10	8	2	24	14	30	0.45	Rain
26	50	45	40	42	39	36	92	82	71	29.98	29.93	29.89	10	8	3	12	6	13	T	Rain
27	52	46	40	42	40	35	89	76	63	30.04	29.97	29.93	10	10	9	12	5	14	T	Rain
28	51	42	33	42	38	31	89	79	68	30.15	30.09	30.03	10	9	7	17	8	21	T	
29	49	46	42	42	40	37	89	83	76	30.11	29.94	29.76	10	6	2	29	17	37	1.21	Rain
30	45	43	41	39	38	37	86	81	76	29.84	29.74	29.7	10	8	2	22	15	26	T	Rain
31	56	49	41	40	38	36	86	71	55	30.14	29.97	29.84	10	10	7	16	9	20	0	

*Source: Eppley Airfield Weather Station, Omaha, NE
https://www.wunderground.com/history/airport/KOMA/

Eppley Precip. 2.37 inches
2 # event > 0.5 in
1 # event > 1.0 in

Daily Weather Observations April 2017*

2017	Temp. (°F)			Dew Point (°F)			Humidity (%)			Sea Level Press. (in)			Visibility (mi)			Wind (mph)			Precip. (in)	Events
Apr	high	avg	low	high	avg	low	high	avg	low	high	avg	low	high	avg	low	high	avg	high	sum	
1	51	46	40	40	37	35	85	73	61	30.27	30.2	30.11	10	10	10	15	6	18	T	Rain
2	54	50	45	48	44	39	89	80	71	30.1	29.91	29.72	10	7	2	15	6	17	0.06	Rain
3	56	53	49	48	47	46	93	83	72	29.72	29.61	29.54	10	6	0	16	9	19	0.04	Fog , Rain
4	60	54	48	47	42	35	86	63	39	29.91	29.79	29.67	10	10	9	22	11	26	T	Rain
5	61	52	43	40	35	27	83	56	28	30.06	29.93	29.83	10	10	10	25	13	33	0	
6	59	48	36	38	31	26	79	55	30	30.25	30.19	30.07	10	10	10	22	12	30	0	
7	65	50	34	36	32	28	82	56	30	30.25	30.09	29.83	10	10	10	28	14	34	0	
8	77	65	53	53	46	36	78	59	40	29.81	29.65	29.54	10	10	10	23	16	29	0	
9	82	68	53	59	53	48	86	61	35	29.7	29.51	29.42	10	10	8	32	13	37	0.01	Rain , Thunderstorm
10	57	48	38	47	39	30	83	75	66	30.25	29.95	29.64	10	10	10	25	12	30	T	
11	63	47	30	35	30	25	78	54	30	30.37	30.27	30.18	10	10	10	14	5	18	0	
12	73	60	46	54	45	35	72	61	49	30.21	30.14	30.03	10	10	7	24	11	29	0.06	Rain
13	80	65	49	61	54	44	86	67	48	30.14	30.07	30.01	10	9	7	15	6	19	T	Fog , Rain , Thunderstorm
14	71	66	60	63	59	55	93	78	63	30.02	29.89	29.75	10	6	1	29	14	38	0.33	Rain , Thunderstorm
15	79	69	58	61	57	53	84	69	54	29.89	29.78	29.73	10	10	8	21	10	28	T	Rain , Thunderstorm
16	73	60	47	56	41	29	84	52	20	30.14	30.08	29.93	10	10	10	21	9	26	0	
17	73	58	43	47	44	39	86	61	35	30.18	30.1	29.99	10	10	10	18	7	22	0	
18	72	65	58	61	55	47	86	73	60	30	29.94	29.88	10	9	1	24	10	31	0.32	Rain , Thunderstorm
19	80	65	50	63	52	45	86	70	54	30.01	29.87	29.69	10	10	5	23	12	28	0.1	Rain , Thunderstorm
20	62	54	45	46	42	39	80	66	51	30.17	30.05	29.97	10	10	10	26	13	33	0.01	
21	60	50	39	40	37	34	89	63	37	30.19	30.16	30.11	10	10	8	21	9	25	0	
22	69	54	39	41	35	28	89	56	22	30.27	30.22	30.17	10	10	10	18	8	24	0	
23	73	57	40	41	32	26	79	48	17	30.19	30.06	29.87	10	10	10	25	10	30	0	
24	76	65	53	44	38	34	52	39	25	29.87	29.65	29.49	10	10	10	36	19	42	0	
25	62	52	42	46	41	37	89	78	66	29.61	29.53	29.44	10	8	2	24	15	34	0.06	Rain
26	45	41	37	37	33	31	85	74	62	29.71	29.66	29.58	10	10	4	26	17	33	T	
27	59	48	36	36	32	27	75	57	39	29.78	29.72	29.66	10	10	10	18	8	24	0	
28	49	44	38	38	36	32	86	71	56	30.09	29.88	29.78	10	6	2	25	12	34	0.45	Rain
29	47	44	41	38	36	33	82	74	65	30.14	30.06	29.97	10	9	3	30	17	40	0.03	Rain
30	44	42	39	40	37	35	89	84	79	29.98	29.69	29.47	10	5	1	36	16	47	0.95	Rain , Thunderstorm

*Source: Eppley Airfield Weather Station, Omaha, NE
https://www.wunderground.com/history/airport/KOMA/

Eppley Precip. 2.42 inches
1 # event > 0.5 in
0 # event > 1.0 in

Daily Weather Observations May 2017*

2017	Temp. (°F)			Dew Point (°F)			Humidity (%)			Sea Level Press. (in)			Visibility (mi)			Wind (mph)			Precip. (in)	Events
May	high	avg	low	high	avg	low	high	avg	low	high	avg	low	high	avg	low	high	avg	high	sum	
1	55	46	37	39	36	32	86	69	51	29.78	29.57	29.42	10	8	1	30	15	42	0.17	Rain
2	66	54	42	43	39	37	82	58	34	30.04	29.94	29.77	10	10	10	17	7	23	0	
3	66	55	43	49	42	38	89	65	40	30.13	30.05	30.01	10	10	10	18	6	22	0.02	Rain
4	72	56	39	46	40	36	92	60	28	30.11	30.07	30.02	10	9	6	26	10	32	0	
5	79	60	41	46	39	36	93	57	21	30.04	29.96	29.83	10	10	9	17	5	21	0	Fog
6	80	66	51	45	39	33	71	45	19	29.94	29.88	29.81	10	10	10	20	6	24	0	
7	85	68	51	51	44	39	64	46	27	29.98	29.9	29.79	10	10	10	23	12	31	0	
8	93	80	66	60	55	51	63	45	26	29.89	29.82	29.74	10	10	10	23	14	29	T	Rain , Thunderstorm
9	83	72	60	55	52	45	78	58	37	29.96	29.89	29.83	10	10	10	20	9	24	0	
10	67	60	53	60	54	46	87	72	56	29.98	29.87	29.81	10	8	2	24	10	29	0.64	Rain , Thunderstorm
11	73	62	50	54	47	40	89	63	37	30.05	30.01	29.96	10	9	7	18	9	24	0	
12	77	61	44	49	42	38	83	55	27	30.08	30.03	29.96	10	10	10	17	6	21	0	
13	82	67	52	50	44	36	77	49	21	29.97	29.87	29.75	10	10	10	26	11	33	0	
14	89	76	63	60	54	51	70	51	32	29.78	29.71	29.64	10	10	10	28	11	33	T	Rain
15	93	79	64	65	61	57	87	59	30	29.76	29.68	29.59	10	10	10	24	12	30	T	Rain
16	92	77	61	66	61	56	73	57	41	29.68	29.56	29.43	10	8	1	51	15	64	1.35	Rain , Hail , Thunderstorm
17	78	69	59	62	57	50	90	70	50	29.6	29.41	29.27	10	10	7	37	18	48	0.1	Rain , Thunderstorm
18	65	59	53	51	49	48	83	72	60	30.01	29.88	29.61	10	10	5	25	13	35	0.53	Rain , Thunderstorm
19	56	53	49	51	48	45	89	83	77	30.03	29.98	29.91	10	6	1	18	11	27	0.94	Rain
20	59	53	47	52	47	41	89	80	71	29.94	29.81	29.72	10	6	1	20	11	28	0.55	Rain , Thunderstorm
21	69	57	44	46	41	37	80	59	37	30.09	30.03	29.91	10	10	7	24	13	33	T	Rain
22	75	62	49	52	49	44	86	61	35	30.07	29.92	29.82	10	10	10	23	9	31	T	Rain , Thunderstorm
23	61	54	47	47	45	42	86	71	55	29.91	29.87	29.82	10	10	6	25	11	33	0.02	Rain
24	69	59	49	49	45	42	86	62	37	29.81	29.73	29.66	10	10	10	17	8	21	0	
25	77	63	49	54	49	44	80	61	41	29.67	29.61	29.52	10	10	10	26	13	33	T	
26	81	69	57	59	54	49	84	59	33	29.85	29.73	29.61	10	10	10	20	8	25	T	
27	72	64	55	58	53	49	86	72	57	29.94	29.88	29.83	10	10	4	23	8	30	0.28	Rain , Thunderstorm
28	83	68	53	53	47	39	83	53	23	29.91	29.88	29.84	10	10	10	28	8	35	0	
29	76	65	53	49	43	37	67	46	25	30.02	29.96	29.85	10	10	10	26	10	34	0	
30	81	66	51	47	42	36	77	49	20	30.05	30.01	29.95	10	10	10	23	9	29	0	
31	78	62	46	51	45	41	80	54	27	30.12	30.06	30.01	10	10	10	12	4	14	0	

*Source: Eppley Airfield Weather Station, Omaha, NE
https://www.wunderground.com/history/airport/KOMA/

Eppley Precip. 4.6 inches
5 # event > 0.5 in
1 # event > 1.0 in

Daily Weather Observations June 2017*

2017	Temp. (°F)			Dew Point (°F)			Humidity (%)			Sea Level Press. (in)			Visibility (mi)			Wind (mph)			Precip. (in)	Events
Jun	high	avg	low	high	avg	low	high	avg	low	high	avg	low	high	avg	low	high	avg	high	sum	
1	85	69	52	62	54	46	83	63	43	30.07	30.01	29.92	10	10	9	18	8	23	0	
2	90	79	67	67	62	55	84	58	32	29.99	29.95	29.88	10	10	7	21	12	27	0.01	Rain , Thunderstorm
3	91	78	65	63	61	58	87	61	34	29.99	29.94	29.88	10	10	10	16	8	23	0	
4	94	80	66	65	62	55	81	55	28	29.92	29.84	29.76	10	10	10	13	3	15	0	Thunderstorm
5	95	78	60	59	51	43	84	51	17	29.91	29.84	29.81	10	10	10	16	7	19	0	
6	87	76	65	55	51	47	68	48	27	30.04	30	29.93	10	10	10	14	8	18	0	
7	85	72	59	54	50	46	78	53	27	30.11	30.05	29.99	10	10	10	13	6	16	0	
8	88	75	62	53	50	47	67	47	27	30.02	29.93	29.82	10	10	10	16	9	21	0	
9	91	78	64	60	55	51	68	48	27	29.83	29.75	29.66	10	10	10	22	13	27	0	
10	94	83	72	70	66	61	73	59	44	29.65	29.62	29.56	10	10	10	28	18	35	0	
11	96	86	75	69	68	65	74	59	44	29.73	29.65	29.61	10	10	10	32	21	41	0	
12	85	79	73	73	69	66	79	71	63	29.88	29.78	29.73	10	10	2	28	13	35	0.03	Rain , Thunderstorm
13	95	82	69	71	67	55	74	62	49	29.77	29.69	29.59	10	10	4	35	22	42	0.31	Rain , Thunderstorm
14	89	78	66	67	63	58	81	59	36	29.86	29.78	29.68	10	9	1	26	7	32	0.28	Rain , Thunderstorm
15	96	79	62	68	63	58	90	60	30	29.86	29.79	29.7	10	10	2	20	9	23	0.22	Rain , Thunderstorm
16	91	80	69	74	67	61	90	71	52	29.78	29.66	29.5	10	9	0	51	10	60	1.13	Fog , Rain , Thunderstorm
17	84	74	63	68	64	56	93	70	47	29.78	29.66	29.58	10	10	10	20	7	27	0.01	Rain
18	82	71	60	57	53	47	78	54	30	29.88	29.84	29.78	10	10	7	26	12	33	0	
19	87	74	60	59	52	46	78	52	25	29.99	29.95	29.89	10	10	10	21	6	27	0	
20	94	78	62	60	55	49	78	50	22	29.98	29.91	29.84	10	10	10	16	8	22	0	
21	97	83	69	69	62	55	68	51	33	29.86	29.74	29.63	10	10	10	26	15	36	0	
22	92	83	73	72	64	58	67	56	44	29.73	29.63	29.58	10	10	10	25	13	31	T	Rain
23	78	69	59	63	54	48	78	58	38	30.09	29.92	29.78	10	10	10	25	13	31	0	Thunderstorm
24	82	67	52	48	43	36	77	49	20	30.19	30.14	30.09	10	10	10	24	9	29	0	
25	78	65	52	46	44	40	77	52	26	30.32	30.24	30.18	10	10	10	22	8	28	0	
26	79	68	56	58	52	48	84	60	35	30.22	30.15	30.09	10	10	9	16	7	21	0.14	Rain , Thunderstorm
27	82	68	53	65	57	48	83	65	47	30.14	29.96	29.73	10	10	10	29	15	34	0	
28	93	79	65	71	65	61	81	61	41	29.8	29.67	29.57	10	10	7	29	13	40	0.18	Rain , Thunderstorm
29	84	74	64	68	64	58	84	70	55	29.9	29.77	29.68	10	9	1	25	9	33	0.74	Rain , Thunderstorm
30	81	72	63	63	61	57	90	69	48	29.99	29.91	29.8	10	9	2	23	8	28	0.09	Rain , Thunderstorm

*Source: Eppley Airfield Weather Station, Omaha, NE
https://www.wunderground.com/history/airport/KOMA/

Eppley Precip. 3.14 inches
2 # event > 0.5 in
1 # event > 1.0 in

Daily Weather Observations July 2017*

2017	Temp. (°F)			Dew Point (°F)			Humidity (%)			Sea Level Press. (in)			Visibility (mi)			Wind (mph)			Precip. (in)	Events
Jul	high	avg	low	high	avg	low	high	avg	low	high	avg	low	high	avg	low	high	avg	high	sum	
1	86	73	60	64	58	52	90	63	36	30.06	30	29.95	10	10	10	14	5	19	0	
2	84	76	68	69	64	61	87	73	58	30.07	29.99	29.95	10	10	6	24	7	29	0.16	Rain , Thunderstorm
3	89	78	66	74	68	64	93	74	55	29.99	29.95	29.9	10	10	7	23	5	29	T	Fog , Rain , Thunderstorm
4	87	78	69	71	67	64	84	68	51	30.04	29.99	29.96	10	9	2	28	7	32	0.26	Rain , Thunderstorm
5	91	78	65	69	66	63	93	69	44	30.09	30.05	29.99	10	8	0	12	3	16	0	Fog
6	95	83	70	74	69	66	79	64	49	30.06	29.97	29.89	10	10	10	16	7	21	0	
7	83	76	68	73	62	58	85	65	45	30.11	30.05	29.94	10	10	10	18	8	23	0	
8	88	76	64	67	63	61	87	65	43	30.12	30.04	29.99	10	10	10	14	5	16	T	
9	95	81	67	71	68	64	93	70	46	30.02	29.89	29.7	10	10	10	24	11	30	0	
10	92	85	78	75	70	65	69	60	51	29.81	29.77	29.71	10	10	10	17	8	23	0	
11	96	84	71	76	72	66	90	70	49	29.93	29.79	29.68	10	10	10	23	12	29	0.02	Rain , Thunderstorm
12	90	82	74	74	70	62	87	67	46	30	29.84	29.71	10	10	10	32	8	43	0.03	Rain , Thunderstorm
13	86	79	72	71	69	67	87	73	59	30.13	30.07	29.98	10	9	5	14	4	15	0.15	Rain
14	89	77	65	70	67	61	90	71	52	30.17	30.13	30.08	10	10	10	10	5	16	0	
15	95	83	71	73	70	68	90	67	43	30.12	30.07	29.99	10	10	10	15	8	20	0	
16	98	84	70	75	70	66	90	64	38	30.01	29.96	29.89	10	10	10	13	6	17	0	
17	96	86	75	74	69	65	82	61	39	29.96	29.91	29.86	10	10	10	21	11	27	0	
18	91	84	76	75	72	69	82	66	49	30	29.96	29.91	10	10	10	18	9	23	0.03	Thunderstorm
19	96	87	78	78	73	69	74	62	49	30.04	29.95	29.86	10	10	10	26	15	32	T	Thunderstorm
20	98	89	80	77	72	69	72	57	42	29.94	29.9	29.83	10	10	10	16	8	20	0	
21	103	93	82	75	72	70	69	53	37	29.86	29.76	29.66	10	10	10	21	12	26	0.01	
22	93	84	75	77	74	67	91	71	50	29.91	29.79	29.67	10	10	7	21	9	23	T	Rain
23	92	80	68	72	66	58	100	68	36	29.98	29.92	29.89	10	6	0	18	6	22	0	Fog
24	87	74	60	67	62	58	90	68	46	30.02	29.98	29.93	10	10	10	18	8	24	0	
25	97	86	74	74	69	64	74	61	48	29.99	29.95	29.89	10	10	10	22	15	27	0	
26	83	77	71	75	72	70	94	84	74	30.02	29.96	29.89	10	8	1	20	7	24	0.57	Rain , Thunderstorm
27	86	77	67	70	65	62	93	69	45	30.04	30.01	29.97	10	8	0	16	8	21	0	Fog
28	85	75	64	69	64	62	93	72	51	30.05	30.02	29.99	10	10	9	10	5	20	T	
29	85	77	68	65	62	61	87	67	47	30.12	30.08	30.03	10	10	10	15	8	19	0	
30	84	75	66	63	58	56	68	56	43	30.2	30.16	30.12	10	10	10	15	8	20	0	
31	84	74	63	63	59	56	78	62	46	30.16	30.13	30.07	10	10	10	13	5	17	0	

*Source: Eppley Airfield Weather Station, Omaha, NE
https://www.wunderground.com/history/airport/KOMA/

Eppley Precip. 1.23 inches
1 # event > 0.5 in
0 # event > 1.0 in

Daily Weather Observations August 2017*

2017	Temp. (°F)			Dew Point (°F)			Humidity (%)			Sea Level Press. (in)			Visibility (mi)			Wind (mph)			Precip. (in)	Events
Aug	high	avg	low	high	avg	low	high	avg	low	high	avg	low	high	avg	low	high	avg	high	sum	
1	90	79	67	67	64	61	87	65	46	30.11	30.08	30.03	10	10	10	23	5	28	T	
2	87	75	63	69	65	60	87	69	50	30.09	30.05	29.99	10	10	10	12	5	16	0	
3	76	66	56	67	59	52	84	67	49	30.15	30.03	29.94	10	10	10	25	12	32	0	
4	81	67	52	55	51	47	83	58	32	30.16	30.11	30.02	10	10	10	15	5	18	0	
5	70	66	62	60	56	52	84	71	58	30.04	29.97	29.9	10	10	7	17	8	22	0.09	Rain
6	79	71	63	63	60	58	90	72	54	30.03	29.97	29.94	10	10	10	12	5	15	0	
7	83	72	60	62	59	58	93	68	43	30.17	30.1	30.03	10	9	5	16	7	18	0	
8	83	70	56	62	57	53	93	68	43	30.22	30.16	30.08	10	10	9	15	8	18	0	
9	83	74	65	62	61	59	84	66	47	30.12	30.06	30	10	10	10	18	10	24	T	Rain
10	83	74	65	66	63	60	87	72	54	30.12	30.06	30.02	10	9	1	18	7	23	0.24	Rain , Thunderstorm
11	83	70	57	62	58	55	93	67	40	30.14	30.1	30.06	10	10	10	13	6	16	0	
12	83	72	61	58	55	53	84	62	39	30.14	30.08	29.99	10	10	10	15	7	19	0	
13	82	74	66	63	59	55	73	59	45	30.02	29.92	29.8	10	10	10	23	12	28	0.01	Rain
14	88	78	67	68	64	55	84	59	34	29.83	29.79	29.76	10	10	10	15	7	19	0	Thunderstorm
15	88	78	67	71	65	60	90	73	55	29.93	29.86	29.78	10	9	1	24	12	35	0.59	Rain , Thunderstorm
16	84	76	68	70	66	61	87	69	51	29.88	29.76	29.68	10	10	7	21	11	29	0.12	Rain
17	84	75	65	63	60	56	84	61	37	29.91	29.87	29.8	10	10	10	22	10	28	0	
18	88	77	66	67	62	59	87	63	39	29.92	29.89	29.84	10	10	10	14	6	17	T	
19	88	74	59	63	60	55	90	63	35	29.97	29.9	29.81	10	10	10	18	8	25	0.03	Thunderstorm
20	85	77	69	69	66	64	84	68	51	29.99	29.92	29.83	10	10	2	25	9	29	0.5	Rain , Thunderstorm
21	83	75	66	73	65	61	79	71	62	30.08	29.97	29.89	10	8	2	32	17	40	1.07	Rain , Thunderstorm
22	78	68	58	64	58	47	93	64	35	30.17	30.09	29.99	10	9	7	17	7	22	0	
23	80	69	57	58	55	49	86	62	38	30.16	30.1	30.01	10	10	10	15	5	19	0	Fog
24	82	73	63	60	58	57	78	62	45	30.05	30	29.94	10	10	10	25	14	32	0	
25	84	74	64	66	62	58	87	71	55	30.12	30.05	30	10	9	4	24	14	29	0.64	Rain , Thunderstorm
26	87	78	68	72	66	61	93	74	55	30.13	30.04	29.99	10	10	10	18	10	26	0	
27	85	74	63	69	66	61	93	74	55	30.08	30.04	30	10	6	0	15	7	19	T	Fog , Rain
28	80	70	59	61	59	55	93	71	48	30.12	30.08	30.05	10	10	10	15	7	19	0	
29	79	68	56	64	57	54	97	73	48	30.14	30.1	30.05	10	6	0	10	4	13	0	Fog
30	85	70	55	63	59	53	93	70	47	30.13	30.09	30.05	10	9	7	8	3	13	0	Fog
31	85	72	58	64	61	55	93	70	47	30.14	30.09	30.05	10	9	4	15	5	21	0	Fog

*Source: Eppley Airfield Weather Station, Omaha, NE
https://www.wunderground.com/history/airport/KOMA/

Eppley Precip. 3.29 inches
4 # event > 0.5 in
1 # event > 1.0 in

Daily Weather Observations September 2017*

2017	Temp. (°F)			Dew Point (°F)			Humidity (%)			Sea Level Press. (in)			Visibility (mi)			Wind (mph)			Precip. (in)	Events
Sep	high	avg	low	high	avg	low	high	avg	low	high	avg	low	high	avg	low	high	avg	high	sum	
1	79	71	63	65	61	57	87	73	58	30.11	30.06	30.01	10	8	6	18	11	21	T	Rain
2	84	74	63	68	64	60	90	74	58	30.03	29.99	29.97	10	9	4	14	7	17	0	
3	89	76	62	69	64	59	97	72	46	30.08	29.99	29.83	10	5	0	21	10	26	0	Fog
4	78	68	58	66	60	54	84	65	45	30.09	29.92	29.78	10	10	7	17	10	22	0	
5	71	60	48	52	45	40	86	59	31	30.18	30.14	30.1	10	10	9	25	10	32	0	
6	72	60	47	49	45	40	86	59	31	30.21	30.16	30.12	10	10	10	15	6	20	0	
7	81	66	50	51	47	44	86	57	28	30.13	30.08	29.99	10	10	10	14	6	21	0	Fog
8	87	72	56	62	55	49	80	59	37	30.09	30.06	30.04	10	10	10	15	7	18	0	
9	85	74	62	59	57	54	78	59	40	30.22	30.15	30.1	10	10	10	20	10	24	0	
10	85	75	65	63	60	57	78	59	40	30.27	30.18	30.12	10	10	10	24	11	28	T	Rain , Thunderstorm
11	85	74	62	60	58	55	78	59	40	30.18	30.13	30.06	10	10	10	15	8	18	0	
12	86	71	56	62	59	54	93	67	40	30.06	29.96	29.83	10	9	7	9	2	14	0	
13	90	76	61	63	59	55	90	62	34	29.83	29.75	29.68	10	10	7	15	6	17	0	
14	96	82	67	61	57	51	73	48	23	29.72	29.69	29.63	10	10	10	30	15	39	0	
15	92	79	66	67	61	56	74	56	38	29.8	29.74	29.69	10	10	10	30	16	35	0	
16	76	67	57	68	61	54	84	79	74	30.1	29.93	29.8	10	9	2	23	11	28	1.05	Rain , Thunderstorm
17	72	61	50	54	50	46	86	65	44	30.22	30.14	30.06	10	10	10	18	7	22	0	Rain , Thunderstorm
18	74	69	64	66	63	55	87	80	73	30.05	29.95	29.86	10	8	2	17	9	22	0.26	Rain , Thunderstorm
19	90	79	67	68	66	64	93	69	44	29.88	29.72	29.55	10	8	3	33	19	39	0	
20	81	70	59	69	58	51	84	60	36	29.88	29.74	29.56	10	10	10	24	11	28	0	
21	93	76	59	73	66	54	79	64	49	29.88	29.79	29.69	10	10	10	29	15	36	0	
22	95	86	77	72	69	67	79	61	43	29.85	29.8	29.77	10	10	10	30	20	36	0	
23	92	82	72	68	66	62	84	63	41	29.94	29.88	29.83	10	10	10	26	15	35	0	
24	89	77	64	71	66	60	87	68	48	29.94	29.88	29.83	10	10	3	26	10	35	0.2	Rain , Thunderstorm
25	69	64	59	63	60	56	93	89	84	29.99	29.94	29.88	10	7	1	21	9	28	1.05	Rain , Thunderstorm
26	65	60	54	56	52	50	87	77	67	30.19	30.08	29.96	10	8	3	18	9	23	0.03	Rain
27	73	61	49	54	49	46	93	67	41	30.31	30.24	30.19	10	6	0	9	3	12	0	Fog
28	79	63	47	53	49	45	93	63	32	30.27	30.22	30.15	10	8	0	12	3	15	0	Fog
29	81	64	47	52	49	44	89	60	30	30.28	30.23	30.18	10	10	2	13	6	17	0	Fog
30	79	69	59	49	47	44	57	45	32	30.26	30.17	30.05	10	10	10	23	15	28	0	

*Source: Eppley Airfield Weather Station, Omaha, NE
https://www.wunderground.com/history/airport/KOMA/

Eppley Precip. 2.59 inches
2 # event > 0.5 in
2 # event > 1.0 in

Daily Weather Observations October 2017*

2017	Temp. (°F)			Dew Point (°F)			Humidity (%)			Sea Level Press. (in)			Visibility (mi)			Wind (mph)			Precip. (in)	Events
Oct	high	avg	low	high	avg	low	high	avg	low	high	avg	low	high	avg	low	high	avg	high	sum	
1	81	70	58	55	51	46	63	53	42	30.04	29.86	29.74	10	10	3	30	19	39	0.08	Rain , Thunderstorm
2	84	73	62	65	59	51	84	68	51	29.85	29.8	29.74	10	9	2	28	16	36	0.73	Rain , Thunderstorm
3	77	67	57	65	59	52	87	74	60	30.35	30.07	29.8	10	9	2	23	10	31	0.09	Rain , Thunderstorm
4	71	62	52	51	48	45	89	67	44	30.43	30.35	30.24	10	10	10	13	7	16	0	
5	67	62	57	63	59	50	93	81	69	30.21	30.06	29.97	10	5	1	13	6	14	0.68	Rain
6	72	65	57	68	59	54	93	89	84	29.98	29.74	29.51	10	4	0	20	7	25	1.15	Fog , Rain , Thunderstorm
7	73	64	55	54	52	49	93	69	44	29.66	29.56	29.45	10	8	2	21	9	26	0.29	Rain
8	78	65	52	53	51	46	86	63	40	29.78	29.65	29.6	10	10	10	15	9	20	0	
9	62	52	42	43	38	33	71	54	36	30.23	30.06	29.82	10	10	5	30	18	37	0.14	Rain , Thunderstorm
10	48	44	40	37	36	35	82	72	61	30.3	30.26	30.23	10	9	4	21	12	26	0.54	Rain , Thunderstorm
11	63	50	36	45	38	32	85	64	43	30.26	30.19	30.1	10	10	10	14	5	17	0	
12	68	58	48	52	48	44	86	70	53	30.11	30.02	29.89	10	9	3	22	12	27	0	
13	59	57	54	51	50	47	86	79	72	30.07	30.03	29.99	10	10	10	17	8	20	T	
14	60	55	49	56	52	41	93	82	71	30.07	29.91	29.76	10	8	2	30	11	40	0.28	Rain , Thunderstorm
15	62	52	41	40	36	33	76	56	36	30.38	30.29	30.1	10	10	10	29	10	36	0	
16	74	57	39	41	37	34	85	54	23	30.36	30.25	30.11	10	10	10	21	10	27	0	
17	72	59	46	47	43	39	77	58	38	30.12	30.06	29.99	10	10	10	13	9	16	0	
18	78	63	47	51	46	43	86	61	36	30.04	29.95	29.91	10	10	10	16	9	21	0	
19	78	60	42	54	48	39	89	64	39	30.09	30.02	29.96	10	10	10	16	9	20	0	Fog
20	78	67	56	58	54	49	83	66	48	29.98	29.84	29.69	10	10	10	33	20	42	T	
21	76	64	51	62	55	39	84	68	51	29.99	29.7	29.6	10	10	7	29	16	36	0.08	Rain , Thunderstorm
22	69	56	42	41	35	28	77	50	22	30.13	30.04	29.96	10	10	10	15	6	18	0	
23	66	56	46	40	35	29	65	50	34	30.08	29.97	29.86	10	10	10	38	18	47	T	
24	56	48	40	33	28	23	57	42	27	30.14	30.09	30.01	10	10	10	38	20	44	0	
25	70	55	40	41	34	27	70	51	31	30.05	29.84	29.63	10	10	10	13	7	15	0	
26	63	53	42	40	35	23	76	58	39	30.07	29.72	29.48	10	10	10	40	17	50	0	
27	38	33	27	22	21	19	75	64	52	30.14	30.1	30.06	10	10	9	33	20	43	T	Snow
28	50	35	20	22	16	5	81	48	15	30.17	30.07	29.92	10	10	10	10	7	12	0	
29	68	50	31	42	28	17	77	53	28	29.9	29.79	29.65	10	10	10	24	10	31	T	Rain
30	49	41	32	33	22	17	56	48	39	30.25	30.06	29.89	10	10	10	35	20	45	0	
31	38	31	23	27	20	14	75	60	44	30.29	30.15	29.94	10	10	9	17	8	21	T	Snow

*Source: Eppley Airfield Weather Station, Omaha, NE
https://www.wunderground.com/history/airport/KOMA/

Eppley Precip. 4.06 inches
4 # event > 0.5 in
1 # event > 1.0 in

Daily Weather Observations November 2017*

2017	Temp. (°F)			Dew Point (°F)			Humidity (%)			Sea Level Press. (in)			Visibility (mi)			Wind (mph)			Precip. (in)	Events
Nov	high	avg	low	high	avg	low	high	avg	low	high	avg	low	high	avg	low	high	avg	high	sum	
1	50	41	32	37	30	24	85	71	56	29.92	29.73	29.61	10	10	10	25	11	30	T	
2	55	44	32	36	33	28	85	66	46	30.3	29.99	29.73	10	10	7	22	11	29	0	
3	50	39	28	34	28	24	78	62	46	30.38	30.24	30.04	10	10	7	15	7	21	T	Rain
4	54	49	43	40	37	35	83	69	54	30.04	29.9	29.78	10	9	7	10	5	13	0	
5	48	39	30	40	32	21	76	59	41	30.2	29.94	29.79	10	10	9	25	14	32	0	
6	46	36	25	23	20	19	75	56	37	30.32	30.27	30.22	10	10	10	13	7	16	0	
7	46	36	26	28	24	19	81	63	44	30.48	30.43	30.35	10	10	10	16	6	19	0	
8	52	38	23	28	24	19	88	63	38	30.44	30.29	30.15	10	9	7	16	8	22	0	Fog
9	40	32	23	29	16	6	70	53	35	30.53	30.41	30.19	10	10	10	25	14	32	0	
10	36	28	19	16	11	8	62	50	38	30.54	30.39	30.21	10	10	10	23	14	27	0	
11	46	41	36	39	33	17	89	67	44	30.21	30.13	30.06	10	6	0	18	7	23	0.01	Fog , Rain
12	50	40	30	38	32	26	85	66	46	30.45	30.38	30.2	10	8	2	13	5	15	0.12	Rain
13	45	37	28	40	34	24	89	83	76	30.44	30.33	30.17	10	5	0	21	10	25	0	Fog
14	56	51	45	52	47	39	89	83	76	30.15	29.95	29.83	10	6	2	15	8	19	T	Rain
15	53	40	27	49	32	21	89	64	38	30.25	30.11	29.9	10	10	8	25	13	31	0	
16	49	37	24	28	24	19	81	63	45	30.25	30.12	29.87	10	10	10	23	11	28	0	
17	61	51	41	53	44	29	86	70	53	29.84	29.6	29.5	10	8	4	25	11	32	0.01	
18	49	39	29	41	30	20	85	67	49	30.23	29.94	29.57	10	10	5	32	17	41	0.22	Rain
19	55	39	23	29	23	17	81	54	27	30.25	30.11	29.91	10	10	10	17	9	21	0	
20	59	46	32	29	26	25	75	52	28	29.89	29.72	29.6	10	10	10	20	10	24	0	
21	43	31	18	28	17	10	75	58	40	30.47	30.19	29.73	10	10	10	32	16	39	T	Rain
22	41	28	15	20	14	9	80	57	34	30.48	30.29	30.05	10	10	10	20	9	23	0	
23	62	45	28	38	31	20	75	58	40	30.05	29.94	29.73	10	10	10	14	7	14	0	
24	72	55	37	41	37	29	76	54	32	29.99	29.67	29.47	10	10	10	35	13	45	0	
25	60	45	29	35	31	26	85	59	32	30.24	30.16	30.01	10	10	10	15	3	20	0	
26	57	45	33	37	33	28	82	65	47	30.22	30.11	29.99	10	10	10	12	6	12	0	
27	67	52	37	45	38	31	76	57	37	29.96	29.75	29.6	10	10	7	22	13	28	0	
28	56	43	29	42	30	19	83	55	27	30.37	30.07	29.66	10	10	10	28	12	37	0	
29	52	37	22	25	19	12	81	51	21	30.37	30.23	30.09	10	10	7	21	7	24	0	Fog
30	57	43	29	28	24	18	78	51	24	30.32	30.25	30.19	10	10	10	22	6	28	0	

*Source: Eppley Airfield Weather Station, Omaha, NE
https://www.wunderground.com/history/airport/KOMA/

Eppley Precip. 0.36 inches
0 # event > 0.5 in
0 # event > 1.0 in

Daily Weather Observations December 2017*

2017	Temp. (°F)			Dew Point (°F)			Humidity (%)			Sea Level Press. (in)			Visibility (mi)			Wind (mph)			Precip. (in)	Events
Dec	high	avg	low	high	avg	low	high	avg	low	high	avg	low	high	avg	low	high	avg	high	sum	
1	58	44	29	27	23	21	69	47	25	30.21	30.1	30.01	10	10	10	21	10	25	0	
2	59	42	25	27	24	19	78	51	23	30.2	30.13	30.08	10	10	10	9	4	10	0	
3	60	46	32	51	38	24	77	65	53	30.1	29.87	29.54	10	10	8	20	11	24	0	
4	63	46	29	55	35	14	86	64	41	30.08	29.66	29.39	10	10	10	39	18	48	T	
5	44	35	26	27	16	9	53	45	36	30.18	30.11	30.06	10	10	10	31	16	39	0	
6	45	32	18	28	21	10	82	66	49	30.46	30.26	30.12	10	9	2	30	16	38	0.01	Snow
7	28	20	11	9	6	4	67	53	38	30.53	30.38	30.14	10	10	10	23	11	29	0	
8	37	27	17	25	19	8	75	68	61	30.1	30.03	29.96	10	10	9	21	9	25	0	
9	37	31	24	24	20	17	75	63	51	30.24	30.14	29.98	10	10	10	23	13	30	0	
10	54	40	25	26	23	19	78	57	35	30.13	30.08	30.02	10	10	10	22	10	26	0	
11	49	37	25	32	24	16	69	51	33	30.37	30.08	29.92	10	10	10	38	20	48	0	
12	41	28	14	25	18	9	80	66	51	30.41	30.19	29.79	10	10	10	21	7	24	0	
13	52	40	28	31	26	21	78	58	37	30.01	29.8	29.63	10	10	10	38	19	48	0	
14	42	38	33	27	26	24	75	63	51	30.15	30.09	30.01	10	10	10	17	7	22	0	
15	49	40	31	25	24	22	70	55	39	30.15	29.95	29.75	10	10	10	22	10	28	0	
16	53	41	29	28	24	20	70	53	35	30.01	29.87	29.75	10	10	10	17	7	20	0	
17	37	32	27	28	25	22	85	75	64	30.09	30.02	29.97	10	8	4	16	7	19	T	Rain , Snow
18	55	40	24	31	26	20	88	60	32	30.01	29.94	29.86	10	8	1	16	9	21	0	
19	50	38	26	29	22	13	82	53	23	30.2	30.09	29.91	10	10	10	18	9	22	0	
20	46	34	22	26	15	10	60	44	27	30.17	30.01	29.84	10	10	10	21	11	26	0	
21	43	34	24	32	25	19	85	67	49	30.13	29.95	29.81	10	5	2	25	12	31	0.14	Rain , Snow
22	28	22	15	19	15	11	81	76	71	30.29	30.19	30.1	10	10	9	17	9	22	T	Snow
23	23	19	15	16	12	9	80	73	65	30.39	30.32	30.22	10	7	1	17	8	20	0.06	Snow
24	23	18	12	14	11	4	80	67	54	30.38	30.33	30.28	10	6	1	17	10	22	0.17	Snow
25	14	8	2	4	-1	-6	76	64	52	30.64	30.51	30.39	10	9	2	21	9	24	T	Snow
26	6	1	-5	-4	-8	-13	79	64	49	30.84	30.75	30.65	10	10	10	16	7	19	0	
27	7	-1	-9	1	-6	-15	87	68	49	30.87	30.72	30.53	10	6	1	18	9	20	0.03	Snow
28	25	16	7	11	6	-1	76	66	55	30.55	30.46	30.36	10	8	1	22	11	24	T	Snow
29	18	12	6	13	7	-2	80	74	67	30.55	30.34	30.17	10	6	0	23	10	27	T	Fog , Snow
30	6	3	-1	-2	-7	-9	72	64	56	30.69	30.62	30.55	10	9	2	24	14	29	0.01	Snow
31	-1	-7	-14	-10	-15	-22	72	65	58	30.98	30.87	30.62	10	10	4	20	12	23	T	Snow

*Source: Eppley Airfield Weather Station, Omaha, NE
https://www.wunderground.com/history/airport/KOMA/

Eppley Precip. 0.42 inches
0 # event > 0.5 in
0 # event > 1.0 in

Daily Weather Observations January 2017*

2017	Temperature			Dew Pot			Humidity			Speed			Pressure			Precip. Accum.
Jan	High	Avg	Low	High	Avg	Low	High	Avg	Low	High	Avg	Gust	High	Avg	Low	Sum
1	36.7	29.2	22	25	21	16.6	80	71	59	17	4	17	30.05	29.97	29.9	0
2	36.5	34.5	32	34	31	22.8	95	87	66	23	4	23	30	29.9	29.79	0
3	32.4	19.6	7	29	9	0.3	90	73	61	31	10	31	30.41	30.2	30	0
4	11.3	7.9	4	4	0	-3	84	71	54	23	5	23	30.43	30.35	30.26	0
5	8.3	4.8	1	4	0	-4.2	86	76	64	22	4	22	30.33	30.27	30.21	0
6	16	7.2	-1	5	0	-6	81	70	59	12	2	12	30.49	30.41	30.33	0
7	18.9	12.8	6	8	4	1.2	81	72	58	20	3	20	30.78	30.62	30.46	0
8	27.5	18.6	9	18	11	3.3	82	74	66	25	6	25	30.74	30.49	30.24	0
9	35.3	24.5	13	29	16	7.4	80	74	64	16	6	18	30.31	29.94	29.57	0
10	35.7	29.4	23	32	23	15.8	92	76	59	34	5	34	29.94	29.65	29.36	0.11
11	35.7	23.5	11	29	16	3.8	82	76	69	29	8	29	30.02	29.83	29.63	0
12	20	14.6	9	10	6	0.2	81	69	47	16	5	16	30.65	30.33	30.02	0
13	25.5	18.5	11	9	4	0.2	73	57	36	13	4	13	30.79	30.71	30.62	0
14	35.7	27.1	18	16	12	7.9	74	55	39	6	1	6	30.65	30.56	30.46	0
15	33.1	31.4	29	29	21	14.7	93	70	52	11	2	11	30.47	30.31	30.16	0.11
16	32.4	31.7	31	31	30	29.1	95	95	93	14	4	14	30.17	30.03	29.9	0.32
17	35.2	29.8	24	30	26	22.4	95	89	77	17	3	17	30.14	30.06	29.98	0
18	50.9	39.2	27	41	32	25.5	93	83	69	16	3	16	30.14	30.01	29.87	0
19	43.2	39.5	35	40	37	33.1	96	92	85	10	2	10	29.87	29.73	29.59	0
20	42.6	40.8	39	41	39	37.8	96	95	94	14	3	14	29.6	29.49	29.39	0.01
21	51.2	43.6	36	41	38	33.3	96	85	66	16	2	16	29.56	29.47	29.37	0
22	38.9	34	29	34	30	27.3	93	90	83	19	5	19	29.91	29.74	29.56	0
23	35.7	32.3	29	29	28	26.9	93	86	77	17	4	17	29.95	29.89	29.82	0
24	34	31.4	28	29	28	27	95	91	84	26	6	26	29.83	29.68	29.53	0.06
25	30.8	26.2	21	29	25	19	95	93	89	26	5	26	30.04	29.82	29.59	0.09
26	28.1	24.5	20	21	19	16.3	90	83	75	17	4	17	30.2	30.12	30.04	0
27	35.2	23.9	12	26	19	8.4	86	76	61	25	5	25	30.17	30.11	30.05	0
28	36.7	31.8	27	31	27	23.3	88	83	72	21	4	21	30.08	30.03	29.98	0
29	40.1	36.2	32	35	31	28.1	88	83	76	18	3	18	30.07	30.03	30	0
30	55.7	42.5	29	36	29	26.6	91	69	37	20	3	22	30	29.9	29.81	0
31	41.2	37.3	33	31	29	26.3	82	72	58	17	4	17	30.11	30.01	29.9	0

*Source: UNO Department of Geography / Geology Station, Omaha, NE

https://www.wunderground.com/weather/us/ne/omaha/KNEOMAHA52

Precip.	0.7
# event > 0.5 in	0
# event > 1.0 in	0

Daily Weather Observations February 2017*

2017	Temperature			Dew Pot			Humidity			Speed			Pressure			Precip. Accum.
Feb	High	Avg	Low	High	Avg	Low	High	Avg	Low	High	Avg	Gust	High	Avg	Low	Sum
1	33.4	25.8	18	28	19	6.3	84	72	58	23	7	23	30.53	30.32	30.1	0
2	24.7	19.8	14	10	8	5.9	75	63	52	22	4	22	30.64	30.58	30.51	0
3	30.2	23.5	16	14	10	6	68	60	42	16	4	16	30.68	30.52	30.36	0
4	48.4	35.7	23	29	21	13.4	78	60	43	29	7	29	30.36	30.07	29.77	0
5	35.2	27	19	23	19	14.5	83	70	53	19	4	22	30.17	30.07	29.97	0
6	45.4	36.8	28	40	32	22.8	88	82	74	12	2	12	29.97	29.73	29.49	0
7	43.5	31.2	19	39	23	13	94	82	71	30	7	30	30.01	29.74	29.48	0
8	18.9	13.9	9	14	8	2.3	89	79	59	21	6	21	30.43	30.19	29.94	0
9	30.1	19.5	9	18	9	3.3	78	67	59	21	4	21	30.49	30.24	29.99	0
10	61.4	45	28	41	31	18.1	79	63	48	18	3	18	29.99	29.83	29.67	0
11	53.4	46.7	40	41	37	35.2	85	74	59	18	5	18	30.16	29.95	29.74	0
12	46.7	39.8	33	38	26	19	89	62	34	21	5	21	30.5	30.32	30.14	0
13	51.4	39.7	28	30	23	18.3	71	53	31	22	3	22	30.46	30.26	30.06	0
14	47.9	39.2	30	34	29	26.2	85	72	53	21	6	21	30.12	30.07	30.01	0
15	50.5	38.7	26	28	26	22	90	63	37	26	4	26	30.15	29.99	29.83	0
16	67.2	51.5	35	36	30	26	69	50	30	8	2	8	29.83	29.7	29.57	0
17	73.1	56.9	40	40	35	30	72	52	25	18	4	18	29.68	29.6	29.52	0
18	64.5	50.6	36	38	35	32.1	84	57	34	11	3	11	29.82	29.76	29.69	0
19	69.4	57.1	44	54	46	33.8	86	68	50	22	5	22	29.87	29.81	29.75	0
20	59.8	53.1	46	57	51	40.6	95	86	71	21	4	21	29.91	29.79	29.67	0.14
21	71.5	54.7	37	44	39	35.3	92	63	27	17	4	17	29.99	29.85	29.72	0
22	71.5	59.7	47	43	38	34.9	70	50	31	21	6	21	29.76	29.67	29.59	0
23	47.9	39.8	31	38	34	30.2	94	87	70	27	8	27	29.78	29.67	29.56	0.51
24	32	26.7	21	30	23	18	94	92	87	26	8	26	30.1	29.83	29.56	0.07
25	33.7	24.5	15	22	17	11.4	88	72	42	19	3	19	30.21	30.06	29.92	0.01
26	43.4	36.7	29	26	23	20.4	76	60	42	14	2	14	30.01	29.95	29.89	0
27	53.5	41.6	29	36	27	21.5	74	59	35	24	4	24	30.02	29.85	29.67	0
28	52.3	43.3	34	47	38	32	91	84	66	23	4	23	29.77	29.66	29.55	0.04

*Source: UNO Department of Geography / Geology Station, Omaha, NE
https://www.wunderground.com/weather/us/ne/omaha/KNEOMAHA52

Precip.	0.77
# event > 0.5 in	1
# event > 1.0 in	0

Daily Weather Observations March 2017*

2017	Temperature			Dew Pot			Humidity			Speed			Pressure			Precip. Accum.
Mar	High	Avg	Low	High	Avg	Low	High	Avg	Low	High	Avg	Gust	High	Avg	Low	Sum
1	40.4	35	29	32	26	23.2	91	75	54	27	6	27	30.28	30.01	29.74	0
2	42.2	33.5	24	27	23	19.6	88	71	44	19	3	19	30.55	30.42	30.28	0
3	50.4	36.5	22	26	21	17.4	82	61	38	28	5	28	30.57	30.37	30.17	0
4	71.3	51.9	32	41	30	23.2	69	49	22	24	5	24	30.18	30.05	29.91	0
5	63.5	57.2	50	52	49	41.2	81	75	63	28	7	28	29.92	29.76	29.61	0
6	76.2	56.8	37	56	47	26.8	82	63	33	37	1	37	29.7	29.41	29.12	0
7	55.9	45.5	35	26	20	6.9	64	41	14	27	4	27	30.1	29.9	29.7	0
8	56.2	44.3	32	20	17	11.8	54	35	21	17	2	17	30.25	30.14	30.03	0
9	47.4	37.2	26	29	20	16.1	65	52	30	25	7	25	30.49	30.26	30.03	0
10	26.8	21	15	16	4	-2.6	74	50	30	22	6	22	30.68	30.58	30.47	0
11	29.7	25	20	16	13	4.5	76	64	46	14	3	14	30.58	30.53	30.49	0
12	38.6	31.2	23	32	21	13.9	89	69	58	34	6	34	30.54	30.26	29.97	0.03
13	30.1	25.2	20	27	18	14.2	92	84	76	33	8	33	30.45	30.23	30	0
14	30.6	24.4	18	16	14	12.9	83	70	53	11	4	11	30.5	30.45	30.4	0
15	38.1	28.6	19	20	15	11.2	72	62	48	20	6	20	30.51	30.38	30.24	0
16	64.5	47.7	31	48	32	18.5	69	57	46	25	7	25	30.24	30.01	29.77	0
17	66.1	54.5	42	48	36	22.3	82	56	20	27	6	27	30.28	30.03	29.79	0
18	57.7	43.8	29	30	23	18.4	70	47	24	19	3	19	30.39	30.3	30.2	0
19	80.9	62.8	44	55	37	21.6	58	42	33	24	6	24	30.2	29.99	29.78	0
20	64.8	56.2	47	46	40	30.2	80	56	28	25	6	25	30.17	29.98	29.79	0
21	49.7	42.3	35	36	29	24.6	89	59	46	27	6	27	30.43	30.28	30.14	0.01
22	48.6	39.9	31	27	23	17.7	65	52	36	23	7	23	30.45	30.3	30.14	0
23	73.8	58.7	43	55	39	24	63	53	45	38	8	38	30.14	29.85	29.56	0
24	69.3	54.6	39	54	45	38.3	94	87	54	30	7	30	29.99	29.8	29.6	0.57
25	40.9	39.5	38	39	37	36.5	94	93	92	26	6	26	29.99	29.94	29.9	0.31
26	48.1	43.3	38	42	39	37.1	95	89	80	10	2	11	29.97	29.92	29.88	0
27	48.8	45.7	42	42	41	39.8	92	83	75	11	2	11	30.02	29.97	29.91	0
28	48.8	45	41	42	40	37.8	88	83	79	14	2	14	30.13	30.05	29.97	0.0
29	47.5	43.7	39	43	40	38.2	94	92	82	30	8	30	30.09	29.9	29.72	1.2
30	42.7	41	39	39	38	37.7	95	92	87	22	6	22	29.82	29.75	29.68	0.0
31	53.2	46	39	41	39	37.1	94	81	63	16	4	16	30.11	29.97	29.82	0.0

*Source: UNO Department of Geography / Geology Station, Omaha, NE

https://www.wunderground.com/weather/us/ne/omaha/KNEOMAHA52

Precip.	2.1
# event > 0.5 in	2
# event > 1.0 in	1

Daily Weather Observations April 2017*

2017	Temperature			Dew Pot			Humidity			Speed			Pressure			Precip. Accum.
Apr	High	Avg	Low	High	Avg	Low	High	Avg	Low	High	Avg	Gust	High	Avg	Low	Sum
1	48.2	43.9	39	40	38	36.7	90	82	72	14	3	14	30.24	30.17	30.09	0.00
2	52.7	48.4	44	48	44	40.2	93	86	79	13	2	13	30.1	29.9	29.7	0.03
3	56.1	51.9	47	49	48	46.3	96	90	78	15	4	15	29.75	29.63	29.51	0.07
4	57.4	51.6	45	46	42	37.4	94	74	48	19	5	19	29.89	29.77	29.65	0.00
5	57.6	50.4	43	41	36	30.3	78	62	38	22	6	22	30.05	29.93	29.81	0.01
6	55.3	46.4	37	39	32	25.2	84	59	33	21	6	21	30.24	30.15	30.05	0.00
7	63.4	50	36	39	34	29.5	78	53	36	21	5	21	30.22	30.01	29.8	0.00
8	75.3	63	50	56	48	38.5	72	59	48	23	6	23	29.81	29.65	29.49	0.00
9	79.2	67.3	55	60	56	47.9	86	70	39	24	6	26	29.64	29.5	29.36	0.03
10	55.4	45.5	35	48	40	30.7	88	82	74	29	5	29	30.22	29.9	29.58	0.00
11	62.9	46.8	30	37	32	27.5	89	61	34	13	2	13	30.37	30.27	30.17	0.00
12	70.4	59.5	48	55	46	37.2	77	64	54	23	4	23	30.19	30.09	29.99	0.08
13	79.5	66.2	52	60	56	48.8	87	69	51	13	2	13	30.1	30.03	29.95	0.00
14	70	65.4	60	64	59	55.8	95	85	74	17	5	23	29.97	29.83	29.69	0.36
15	77.5	68	58	63	58	54.3	91	75	57	20	3	20	29.84	29.76	29.67	0.02
16	70.7	60.8	51	57	41	30.8	85	54	24	24	5	24	30.1	29.98	29.85	0.00
17	72.7	60.9	49	49	46	42.1	79	59	43	16	2	16	30.15	30.05	29.94	0.00
18	71	63.7	56	61	55	48.2	93	77	59	24	4	24	29.96	29.9	29.83	0.32
19	78.8	63.6	48	65	53	46	92	82	59	22	6	22	29.98	29.81	29.64	0.33
20	60	53.2	46	46	43	39.1	91	74	55	27	6	27	30.14	30.02	29.9	0.00
21	56.9	49.8	42	41	39	36	87	67	47	18	4	19	30.16	30.11	30.07	0.00
22	66.2	54.5	42	39	35	29.2	81	50	26	19	4	19	30.24	30.18	30.13	0.00
23	72	57.3	42	41	34	27.7	79	44	21	22	2	22	30.16	30	29.84	0.00
24	73.7	62.8	51	46	40	34.9	57	44	31	33	6	33	29.84	29.64	29.44	0.00
25	63.2	51.6	40	46	42	38	93	80	54	22	6	22	29.59	29.49	29.4	0.09
26	40.8	37.7	34	38	33	31.3	93	82	74	28	8	28	29.71	29.63	29.55	0.00
27	57.7	46	34	37	33	28.6	81	64	43	17	2	17	29.76	29.7	29.65	0.00
28	50.4	43	35	38	36	33.1	94	86	58	25	5	25	30.07	29.9	29.74	0.50
29	44	41.4	38	38	36	34.5	93	82	74	32	7	32	30.12	30.03	29.93	0.06
30	41.9	39.3	36	40	37	35.2	94	94	92	35	8	35	29.95	29.7	29.45	0.84

*Source: UNO Department of Geography / Geology Station, Omaha, NE
https://www.wunderground.com/weather/us/ne/omaha/KNEOMAHA52

Precip.	2.7
# event > 0.5 in	2
# event > 1.0 in	0

Daily Weather Observations May 2017*

2017	Temperature			Dew Pot			Humidity			Speed			Pressure			Precip. Accum.
May	High	Avg	Low	High	Avg	Low	High	Avg	Low	High	Avg	Gust	High	Avg	Low	Sum
1	54.1	44.2	34	40	36	32.8	95	82	56	34	6	34	29.75	29.58	29.42	0.14
2	67	56.2	45	46	41	39.1	81	61	40	16	1	16	30	29.88	29.75	0.00
3	67	58.8	50	50	43	37.6	84	63	39	15	0	15	30.09	30.02	29.96	0.05
4	68.6	56.5	44	46	41	36.9	91	60	33	21	3	21	30.08	30.03	29.99	0.00
5	78.7	62.2	45	46	39	35.3	77	46	22	15	1	15	30.01	29.9	29.78	0.00
6	79.1	66.9	54	44	40	34.4	66	39	21	17	0	17	29.89	29.83	29.77	0.00
7	84.4	70.8	57	53	46	39	54	43	30	22	2	22	29.93	29.83	29.73	0.00
8	92.3	79.9	67	62	56	53.2	67	52	28	21	3	21	29.84	29.76	29.68	0.00
9	82.5	70.7	58	57	53	46.4	80	59	40	19	1	19	29.9	29.83	29.76	0.00
10	63.7	59.7	55	61	54	46.8	95	86	55	17	2	17	29.94	29.84	29.74	0.59
11	69.8	60.7	51	53	48	38.8	87	64	42	18	1	18	30.02	29.97	29.91	0.00
12	76.3	62.4	48	45	41	38.3	70	47	31	13	0	13	30.04	29.98	29.92	0.00
13	79.8	66.9	54	51	45	38.3	70	47	25	23	2	23	29.93	29.81	29.69	0.00
14	90.2	75.5	60	59	55	51.3	75	53	34	22	2	22	29.72	29.65	29.58	0.01
15	92.7	78.4	64	66	62	57	83	59	35	23	3	23	29.71	29.61	29.52	0.00
16	90	74.8	59	67	62	56.8	94	67	42	28	5	28	29.62	29.48	29.34	1.16
17	74.3	66.1	58	63	57	51.5	95	83	56	25	6	25	29.54	29.37	29.19	0.2
18	61.8	56.7	51	52	50	48.7	92	79	69	23	6	23	29.96	29.74	29.53	0.36
19	52.4	49.3	46	50	47	45	95	94	92	24	6	24	29.99	29.92	29.86	0.89
20	55.5	50.9	46	52	47	42.7	97	91	81	17	4	17	29.92	29.81	29.69	0.55
21	66	53.9	41	45	41	37.4	91	68	42	21	4	21	30.08	29.99	29.89	0.00
22	73.5	62.3	51	55	50	44.4	87	69	38	18	1	18	30.04	29.91	29.77	0.01
23	57.7	52.8	47	49	45	43.3	91	77	61	20	3	20	29.88	29.83	29.79	0.06
24	66.7	57	47	48	45	43.1	91	71	44	15	2	15	29.79	29.71	29.62	0.00
25	74.2	63.1	52	55	50	45.3	84	65	49	27	4	27	29.63	29.55	29.47	0.00
26	78.7	70.4	62	59	54	48.3	85	60	38	18	1	18	29.78	29.67	29.56	0.00
27	70.3	62.8	55	59	52	46.3	90	67	50	17	1	17	29.89	29.83	29.77	0.26
28	80.2	67.3	54	54	47	37.7	87	53	24	28	1	28	29.88	29.84	29.8	0.00
29	74.2	65.1	56	50	43	36.4	69	45	27	21	1	22	29.97	29.88	29.8	0.00
30	79.3	66.1	52	46	41	34.3	71	43	21	19	0	19	30.02	29.96	29.9	0.00
31	77	65.1	53	47	43	38.5	68	45	31	8	0	8.0	30.07	30.01	29.95	0.00

*Source: UNO Department of Geography / Geology Station, Omaha, NE

https://www.wunderground.com/weather/us/ne/omaha/KNEOMAHA52

Precip.	4.1
# event > 0.5 in	4
# event > 1.0 in	1

Daily Weather Observations June 2017*

2017	Temperature			Dew Pot			Humidity			Speed			Pressure			Precip. Accum.
Jun	High	Avg	Low	High	Avg	Low	High	Avg	Low	High	Avg	Gust	High	Avg	Low	Sum
1	82.8	70.8	59	62	54	44.8	73	57	48	14	2	14	30.03	29.94	29.86	0.00
2	87	76.8	66	67	62	56.5	92	66	38	20	2	20	29.94	29.88	29.82	0.07
3	89.2	77	64	65	61	58.5	86	61	38	13	0	13	29.93	29.86	29.8	0.00
4	93	81.2	69	66	62	55.3	80	55	34	10	0	10	29.86	29.78	29.69	0.00
5	92.5	79.2	66	64	54	40.4	83	46	19	13	0	13	29.84	29.78	29.73	0.00
6	83.9	75	66	55	52	48.9	66	46	31	15	1	15	29.99	29.92	29.84	0.00
7	83.4	73.4	63	55	50	47.7	65	46	31	9	0	9	30.06	29.99	29.93	0.00
8	86.2	74.2	62	55	51	46.6	65	45	28	14	0	16	29.97	29.86	29.76	0.00
9	88.5	76.4	64	62	57	52.4	72	51	33	20	2	20	29.79	29.69	29.59	0.00
10	91.5	80.4	69	71	67	61.8	80	66	50	24	4	24	29.6	29.55	29.5	0.00
11	93	82.9	72	72	69	66.1	80	65	49	28	4	28	29.66	29.6	29.55	0.00
12	82.5	76.2	69	73	69	66.1	90	78	64	27	2	27	29.79	29.71	29.63	0.08
13	90.6	82.1	73	74	70	57.1	82	68	49	29	3	29	29.74	29.62	29.51	0.00
14	88	76.1	64	68	63	58	93	70	41	24	1	24	29.88	29.78	29.69	0.42
15	95.8	80.9	65	68	62	57.9	89	57	31	14	0	14	29.9	29.81	29.72	0.16
16	88.5	78.1	67	73	67	62.1	94	76	57	47	5	47	29.82	29.64	29.46	1.56
17	83.5	73.9	64	69	64	56.1	96	81	48	21	3	21	29.82	29.71	29.6	0.03
18	80.5	70.3	60	57	52	46.6	80	57	31	17	2	27	29.93	29.86	29.79	0.00
19	85.2	73.8	62	55	51	45.4	74	47	26	20	0	20	30.04	29.98	29.92	0.00
20	94	80.4	66	60	54	48.6	68	44	23	18	1	18	30.01	29.9	29.79	0.00
21	95.3	82.2	69	71	64	57	74	55	38	24	6	24	29.8	29.68	29.56	0.00
22	92.2	82.3	72	70	65	60.3	76	59	48	22	5	22	29.67	29.58	29.5	0.00
23	73.9	67.9	62	64	53	47.5	81	61	45	24	4	24	30.04	29.85	29.67	0.00
24	81.5	66.9	52	47	42	36.9	72	43	21	21	3	21	30.14	30.09	30.04	0.00
25	76.5	64.9	53	45	43	41.2	69	45	29	14	4	18	30.26	30.19	30.12	0.00
26	76.2	65.3	54	59	52	44.1	92	64	43	16	2	16	30.16	30.1	30.03	0.36
27	79	68.6	58	66	58	49.3	76	68	58	27	6	27	30.09	29.88	29.66	0.00
28	90.9	76.9	62	72	66	60.8	93	71	44	25	5	25	29.78	29.65	29.52	0.3
29	82.9	73.7	64	70	65	59.9	93	73	58	23	4	23	29.8	29.69	29.59	0.57
30	80	70.4	61	64	60	54.5	94	77	49	20	2	20	29.94	29.83	29.72	0.05

*Source: UNO Department of Geography / Geology Station, Omaha, NE
https://www.wunderground.com/weather/us/ne/omaha/KNEOMAHA52

Precip.	3.3
# event > 0.5 in	2
# event > 1.0 in	1

Daily Weather Observations July 2017*

2017	Temperature			Dew Pot			Humidity			Speed			Pressure			Precip. Accum.
Jul	High	Avg	Low	High	Avg	Low	High	Avg	Low	High	Avg	Gust	High	Avg	Low	Sum
1	86.2	72.3	58	65	58	49.3	92	65	37	13	1	13	30	29.94	29.89	0.00
2	84.2	75.1	66	69	64	60.9	90	75	55	14	2	14	30.03	29.95	29.88	0.11
3	90.3	80.7	71	73	69	66.6	91	76	52	14	3	14	29.92	29.86	29.81	0.05
4	86	77.8	69	71	67	64.6	87	72	56	21	3	21	29.98	29.93	29.88	0.00
5	91.4	79.8	68	69	66	64.1	89	66	42	10	2	10	30.04	29.98	29.92	0.00
6	94.5	83.4	72	75	70	65.5	81	64	51	15	4	15	29.99	29.9	29.82	0.00
7	83.4	76.7	70	73	61	57	74	60	45	18	5	18	30.05	29.95	29.86	0.00
8	88.5	76.5	64	67	63	60.7	89	66	44	13	2	13	30.06	29.99	29.92	0.00
9	93.7	82.5	71	73	69	64.8	81	64	48	22	4	22	29.95	29.8	29.64	0.00
10	91.8	85	78	76	71	66.5	77	65	56	21	4	21	29.74	29.69	29.64	0.00
11	93.7	82	70	77	72	65.9	89	73	58	23	6	23	29.83	29.72	29.6	0.01
12	87.7	80.6	73	74	69	65	88	72	51	24	4	24	29.93	29.78	29.63	0.32
13	85.8	77.7	69	71	69	67.1	95	80	58	10	2	10	30.05	29.98	29.91	0.23
14	89.8	78.1	66	71	67	61.8	87	71	48	11	2	11	30.11	30.06	30.01	0.00
15	94.6	82.8	71	75	71	67.3	89	70	48	12	2	12	30.06	29.99	29.91	0.00
16	98.1	85.6	73	74	69	66.3	82	60	36	9	2	11	29.95	29.88	29.81	0.00
17	92.5	83.3	74	74	70	66.4	84	65	44	18	4	18	29.89	29.83	29.77	0.00
18	89.3	81.7	74	76	72	68.7	88	74	58	14	4	14	29.92	29.87	29.82	0.01
19	94.1	85.7	77	80	74	70.2	81	71	60	26	5	26	29.95	29.86	29.77	0.00
20	96.8	87.2	77	78	73	69.7	78	65	47	17	2	17	29.87	29.81	29.75	0.00
21	100	89.9	79	78	73	70.7	78	60	42	19	4	19	29.77	29.67	29.58	0.01
22	90.3	83.2	76	77	73	67.2	92	75	55	19	4	19	29.83	29.71	29.59	0.00
23	88.8	79.1	69	71	66	59.9	94	68	42	18	3	18	29.91	29.85	29.8	0.00
24	85.1	74.6	64	68	63	59.4	85	68	53	15	4	15	29.96	29.9	29.85	0.00
25	94.2	83	71	77	70	65.6	82	70	50	22	6	22	29.93	29.86	29.8	0.00
26	82.5	76.8	71	73	71	67.9	96	89	73	25	3	25	29.93	29.87	29.81	0.48
27	84.3	75.3	66	70	65	62.4	96	74	51	16	3	16	30.0	29.95	29.9	0.00
28	84.7	75.3	66	68	64	62.2	88	71	49	12	1	12	29.99	29.95	29.92	0.00
29	83.9	76.1	68	66	63	61.3	80	67	53	16	3	16	30.06	30.01	29.96	0.00
30	86.3	75.9	65	63	60	57.1	74	61	45	14	3	14	30.14	30.09	30.05	0.00
31	83.2	73.8	64	63	60	56.9	80	64	51	10	2	10	30.11	30.06	30.01	0.00

*Source: UNO Department of Geography / Geology Station, Omaha, NE

https://www.wunderground.com/weather/us/ne/omaha/KNEOMAHA52

Precip.	1.2
# event > 0.5 in	0
# event > 1.0 in	0

Daily Weather Observations August 2017*

2017	Temperature			Dew Pot			Humidity			Speed			Pressure			Precip. Accum.
Aug	High	Avg	Low	High	Avg	Low	High	Avg	Low	High	Avg	Gust	High	Avg	Low	Sum
1	88.5	77.8	67	68	64	60.7	83	67	49	20	2	20	30.06	30.01	29.96	0.00
2	87.3	76.1	64	69	65	60.3	87	70	54	10	2	10	30.03	29.98	29.92	0.00
3	76.8	68.1	59	67	58	50.9	85	71	57	22	6	28	30.09	29.99	29.88	0.00
4	79.6	66.4	53	55	52	49.5	88	62	38	13	1	13	30.12	30.05	29.97	0.00
5	67.2	63.7	60	60	56	52.3	88	75	62	17	4	17	29.99	29.92	29.84	0.06
6	76.7	69.2	61	63	60	58.7	91	78	59	12	3	12	29.97	29.92	29.88	0.00
7	80.4	71.3	62	62	60	58.5	90	73	49	15	3	15	30.11	30.04	29.97	0.00
8	82.7	71.5	60	62	59	56.2	87	67	48	15	2	15	30.16	30.08	30.01	0.00
9	79.3	71.5	63	65	61	58.7	84	71	59	16	3	16	30.06	29.99	29.93	0.00
10	81.4	73.4	65	66	63	59.3	90	79	53	16	2	16	30.04	30	29.95	0.24
11	81	70.4	59	62	59	56.9	91	69	48	12	2	12	30.1	30.05	29.99	0.00
12	81.3	71.8	62	59	56	54.4	77	60	46	13	2	13	30.07	29.99	29.92	0.00
13	79.8	72.1	64	64	60	55.4	86	69	55	20	5	20	29.96	29.84	29.73	0.01
14	88.8	78.5	68	70	64	57.2	94	70	42	13	3	13	29.76	29.73	29.7	0.01
15	85	75.4	65	72	65	60.8	93	80	66	22	6	22	29.84	29.76	29.69	0.66
16	81.5	73.8	66	70	66	61.8	93	83	62	20	4	20	29.79	29.7	29.61	0.18
17	82.9	72.8	62	62	60	57.4	89	68	45	21	3	21	29.86	29.8	29.74	0.00
18	88	77.4	66	67	63	60.8	82	65	44	17	2	17	29.88	29.83	29.77	0.00
19	87.4	73.9	60	66	61	53.5	90	64	36	20	4	20	29.9	29.82	29.74	0.00
20	83.9	75.4	66	69	66	63.5	93	78	57	21	5	21	29.9	29.81	29.73	0.35
21	82.6	73.8	65	74	67	61.9	94	83	73	30	7	30	29.98	29.9	29.81	0.96
22	75.8	68.8	61	63	55	46.3	95	68	40	16	2	16	30.12	30	29.88	0.01
23	79.7	68.3	57	59	55	51.8	89	65	41	12	2	12	30.12	30.03	29.95	0.00
24	80	71.3	62	63	59	56.1	81	70	53	20	5	20	30.0	29.94	29.88	0.00
25	81.7	71.8	62	68	62	59.1	93	76	61	23	6	23	30.06	30	29.94	0.47
26	86	76.1	66	72	66	61.2	87	76	59	17	4	17	30.09	30.01	29.92	0.00
27	83.2	75.8	68	70	67	63	95	78	58	16	3	16	30.0	29.97	29.93	0.00
28	77.1	68.4	59	63	59	56.7	90	73	54	19	4	19	30.07	30.03	30.0	0.00
29	78.2	68.7	59	60	59	56.9	93	73	53	11	2	11	30.08	30.03	29.99	0.00
30	84.3	72.4	60	63	61	58	92	71	48	9	1	9	30.09	30.04	29.99	0.00
31	83	72.7	62	64	62	59.1	90	70	52	11	2	11	30.08	30.03	29.98	0.00

*Source: UNO Department of Geography / Geology Station, Omaha, NE

https://www.wunderground.com/weather/us/ne/omaha/KNEOMAHA52

Precip.	3.0
# event > 0.5 in	2
# event > 1.0 in	0

Daily Weather Observations September 2017*

2017	Temperature			Dew Pot			Humidity			Speed			Pressure			Precip. Accum.
Sep	High	Avg	Low	High	Avg	Low	High	Avg	Low	High	Avg	Gust	High	Avg	Low	Sum
1	78	70.2	62	65	62	59	91	79	64	17	5	17	30.05	29.99	29.94	0.00
2	82.5	73.2	64	69	65	60.7	90	78	63	13	3	13	29.97	29.94	29.91	0.00
3	87	75.9	64	70	66	62.7	95	76	52	18	3	18	30	29.88	29.76	0.00
4	76.7	69.8	62	67	60	53.8	90	71	48	21	5	21	30.03	29.88	29.73	0.00
5	68.3	59.8	51	54	45	41.2	77	60	39	33	5	33	30.15	30.09	30.03	0.00
6	69.3	58.9	48	49	45	44.1	86	64	42	16	3	16	30.17	30.12	30.08	0.00
7	79.9	65.1	50	53	48	46	87	59	34	9	2	12	30.1	30.02	29.94	0.00
8	85.4	72.3	59	63	56	50.9	77	60	43	9	4	12	30.05	30.02	29.99	0.00
9	83.5	73.7	63	62	58	54.2	72	60	44	15	5	20	30.17	30.1	30.03	0.00
10	83.7	75.1	66	65	60	58.7	79	65	45	16	5	20	30.21	30.13	30.06	0.01
11	84.2	73.5	63	61	59	55.8	78	63	45	12	4	12	30.13	30.06	30	0.00
12	85	73.8	62	62	60	57.7	86	64	45	11	1	11	30	29.89	29.77	0.00
13	88.2	76	63	62	60	57.2	85	62	40	11	2	11	29.78	29.7	29.62	0.00
14	92.8	80.2	67	61	58	54.8	77	53	29	26	6	26	29.67	29.62	29.58	0.03
15	89.7	78.4	68	68	60	57.8	74	61	50	27	6	27	29.73	29.67	29.62	0.00
16	76.6	65.3	55	68	62	53.2	94	86	80	19	6	19	30.04	29.89	29.73	0.69
17	69.8	58.7	50	51	49	46.5	90	78	55	18	4	18	30.18	30.1	30.01	0.01
18	71.8	67.2	63	66	62	54.1	95	90	75	18	4	18	30.01	29.91	29.81	0.29
19	79.1	78.5	77	69	69	69.3	76	74	72	9	8	29	29.51	29.51	29.51	0.00
20	77.6	72.1	66	55	53	51.2	63	55	45	7	3	10	29.81	29.77	29.74	0.00
21	90.2	77.8	65	74	67	53	83	70	57	24	7	24	29.82	29.73	29.64	0.00
22	93.8	84.4	75	73	70	68.4	85	68	45	26	7	26	29.78	29.74	29.69	0.00
23	89.2	79.9	70	70	67	64.2	87	67	46	26	6	26	29.87	29.81	29.75	0.00
24	87.5	75.1	62	71	66	59.1	89	74	48	27	5	27	29.89	29.83	29.76	0.14
25	65.2	61.1	57	63	59	55.9	96	95	88	15	3	15	29.92	29.86	29.81	1.07
26	62.5	57.2	52	56	52	50.6	96	86	70	17	4	17	30.15	30.03	29.91	0.06
27	71.3	60.7	50	52	50	47.8	93	71	47	10	2	10	30.28	30.21	30.14	0.00
28	77.5	64	50	54	50	47.2	91	64	36	11	1	11	30.23	30.17	30.11	0.00
29	79.5	66.6	53	56	51	48.4	83	62	34	16	3	16	30.23	30.18	30.14	0.00
30	76.2	67.1	58	52	49	45.3	64	54	42	23	7	23	30.22	30.1	29.98	0.00

*Source: UNO Department of Geography / Geology Station, Omaha, NE
https://www.wunderground.com/weather/us/ne/omaha/KNEOMAHA52

Precip.	2.3
# event > 0.5 in	2
# event > 1.0 in	1

Daily Weather Observations October 2017*

2017	Temperature			Dew Pot			Humidity			Speed			Pressure			Precip. Accum.
Oct	High	Avg	Low	High	Avg	Low	High	Avg	Low	High	Avg	Gust	High	Avg	Low	Sum
1	78.4	67.4	56	58	53	46.7	87	62	49	31	8	31	30	29.83	29.65	0.21
2	81.3	70.9	60	68	61	53.1	91	75	57	27	6	27	29.8	29.74	29.67	0.67
3	74.9	65.8	56	65	59	50.5	92	82	72	24	4	24	30.3	30.01	29.72	0.09
4	68.8	61	53	51	48	46	79	66	49	10	3	11	30.41	30.3	30.19	0.00
5	64.1	60.4	56	62	57	50.4	96	90	72	9	1	9	30.19	30.06	29.92	0.64
6	68.2	61.8	55	67	59	54.3	97	97	94	20	3	20	29.93	29.69	29.46	0.64
7	71.3	61.8	52	56	53	51.2	97	81	53	20	3	20	29.62	29.51	29.41	0.38
8	76.8	65.4	54	55	51	45.4	80	65	46	23	4	23	29.74	29.65	29.56	0.00
9	58.8	49.8	40	45	38	33.3	87	62	45	31	9	31	30.21	29.98	29.75	0.06
10	45.6	41.7	37	39	36	35.4	93	84	70	20	6	20	30.28	30.23	30.18	0.57
11	61.8	48	34	46	38	32	91	71	45	14	3	14	30.25	30.17	30.08	0.00
12	66	56.7	47	54	49	45.2	94	81	64	21	6	21	30.08	29.97	29.85	0.00
13	57.6	55.1	52	52	50	48.2	90	85	80	17	4	17	30.03	29.99	29.94	0.00
14	57.2	52.3	47	56	51	42	96	92	81	30	4	35	30.04	29.89	29.73	0.2
15	60.9	50.2	39	41	37	34.4	83	65	38	24	4	25	30.36	30.2	30.04	0.00
16	72.8	56.2	39	42	39	35	85	57	30	19	3	19	30.33	30.2	30.08	0.00
17	72.7	59.7	46	48	44	40.3	80	61	41	12	3	12	30.09	30.01	29.94	0.00
18	78.5	63.9	49	53	48	44.5	84	63	39	15	3	15	29.99	29.92	29.86	0.00
19	76.6	63.4	50	57	51	44.8	84	64	48	16	4	16	30.04	29.97	29.9	0.00
20	75.8	66.2	56	60	55	50.4	84	70	59	32	7	32	29.92	29.77	29.63	0.00
21	74.6	62.5	50	64	54	40.4	90	74	58	25	7	25	29.94	29.74	29.55	0.06
22	69	56	42	41	36	30.6	83	54	25	16	2	16	30.1	30.01	29.92	0.00
23	62.7	54.7	46	42	35	30.9	64	49	33	42	7	42	30.05	29.93	29.82	0.00
24	53.2	46.7	40	35	29	23.4	61	51	32	37	9	37	30.12	30.06	30	0.00
25	71.3	56.3	41	42	35	29.2	65	49	33	12	3	12	30.05	29.82	29.59	0.00
26	59.7	48.4	37	41	36	23.6	75	58	47	39	1	39	30.05	29.74	29.44	0.00
27	37.1	33.5	30	23	21	19.9	69	61	57	31	9	31	30.13	30.08	30.04	0.00
28	50.8	36.8	22	23	15	5.5	79	50	16	12	1	12	30.16	30.03	29.9	0.00
29	67.5	51	34	42	27	11.2	77	51	34	25	2	25	29.9	29.76	29.63	0.00
30	49	41.4	33	36	24	18	62	53	43	39	7	39	30.23	30.04	29.85	0.00
31	36.2	30.6	25	27	20	16	85	66	52	19	2	19	30.27	30.1	29.92	0.00

*Source: UNO Department of Geography / Geology Station, Omaha, NE

https://www.wunderground.com/weather/us/ne/omaha/KNEOMAHA52

Precip.	3.3
# event > 0.5 in	4
# event > 1.0 in	0

Daily Weather Observations November 2017*

2017	Temperature			Dew Pot			Humidity			Speed			Pressure			Precip. Accum.
Nov	High	Avg	Low	High	Avg	Low	High	Avg	Low	High	Avg	Gust	High	Avg	Low	Sum
1	48.8	39.5	30	39	31	25.2	85	75	65	20	4	20	29.92	29.76	29.6	0.00
2	51.7	44.1	36	38	36	30.3	91	76	54	21	5	21	30.27	29.99	29.7	0.00
3	46.9	38.3	29	35	29	25.4	85	70	54	13	3	16	30.35	30.19	30.03	0.00
4	52.7	47.8	42	41	38	35.3	81	75	62	9.0	0	9.0	30.04	29.89	29.74	0.00
5	46.9	38	29	41	30	19.6	84	69	43	25	6	25	30.2	29.98	29.75	0.00
6	43	34.6	26	24	21	20.1	80	65	42	14	3	14	30.31	30.25	30.19	0.00
7	43.2	36.8	30	29	25	22.4	80	66	50	14	2	14	30.47	30.39	30.31	0.00
8	51	38.2	25	31	26	22.4	89	65	45	18	2	18	30.42	30.27	30.13	0.00
9	38.8	30.5	22	30	17	7.5	77	59	43	22	6	22	30.51	30.33	30.14	0.00
10	34.2	26.2	18	18	12	8.4	68	57	49	21	6	21	30.52	30.36	30.2	0.00
11	43.6	38.9	34	39	32	18.4	93	75	52	16	2	16	30.21	30.13	30.05	0.00
12	48.9	42.8	36	39	33	28.8	94	75	48	13	1	13	30.43	30.31	30.19	0.05
13	43.7	37.4	31	41	35	27.8	93	89	76	18	2	18	30.42	30.28	30.15	0.00
14	54.1	48.9	43	52	47	40.8	95	92	89	16	3	16	30.15	29.98	29.81	0.00
15	51.8	41.1	30	50	32	21.1	95	69	48	17	5	24	30.22	30.04	29.86	0.00
16	46.7	36.8	27	30	25	20	79	66	52	22	4	22	30.23	30.04	29.85	0.00
17	60.2	50.6	40	55	45	30.1	91	80	64	23	4	23	29.85	29.66	29.47	0.00
18	46.2	37.8	29	41	30	22.2	93	74	56	33	8	33	30.21	29.88	29.54	0.16
19	54	39.3	24	32	25	19.9	84	61	34	17	1	17	30.25	30.07	29.89	0.00
20	57.3	46.3	35	31	28	25.6	68	51	35	12	2	18	29.89	29.74	29.58	0.00
21	44.7	32.3	20	29	18	10.2	68	55	39	32	7	32	30.45	30.07	29.69	0.00
22	40.2	28.2	16	21	15	9.7	79	60	41	17	1	17	30.46	30.25	30.05	0.00
23	62.4	47.6	32	41	34	20.9	78	59	45	9.0	1	9.0	30.05	29.88	29.7	0.00
24	69.3	56.5	43	44	40	33.8	69	57	38	34	5	34	29.95	29.69	29.44	0.00
25	59.8	47	34	37	34	30.2	87	65	40	11	0	11	30.21	30.08	29.95	0.00
26	59.5	48.7	37	40	36	31	78	65	49	8.0	0	8.0	30.2	30.08	29.95	0.00
27	67.3	54.5	41	47	40	32.6	74	62	44	21	4	21	29.95	29.76	29.57	0.00
28	55.1	47.9	40	47	32	19.4	81	56	31	25	7	25	30.33	29.97	29.6	0.00
29	49.7	39	28	25	20	15.9	72	46	27	21	3	21	30.33	30.2	30.07	0.00
30	55.7	45	34	29	24	21.1	72	48	27	13	2	18	30.31	30.24	30.17	0.00

*Source: UNO Department of Geography / Geology Station, Omaha, NE
https://www.wunderground.com/weather/us/ne/omaha/KNEOMAHA52

Precip.	0.2
# event > 0.5 in	0
# event > 1.0 in	0

Daily Weather Observations December 2017*

2017	Temperature			Dew Pot			Humidity			Speed			Pressure			Precip. Accum.
Dec	High	Avg	Low	High	Avg	Low	High	Avg	Low	High	Avg	Gust	High	Avg	Low	Sum
1	57.9	45.9	34	28	24	21.3	61	47	31	22	3	22	30.19	30.08	29.98	0.00
2	57.1	43.8	30	28	25	22.8	75	50	27	8.0	1	8.0	30.17	30.11	30.05	0.00
3	57.9	48	38	51	40	25.5	81	70	49	20	5	20	30.1	29.81	29.52	0.00
4	61.4	44.5	27	56	38	15.3	86	73	54	36	7	36	30.05	29.7	29.35	0.00
5	43	34	25	28	18	10.8	62	52	42	30	5	30	30.19	30.12	30.05	0.00
6	41.7	29.2	16	29	21	10.6	80	71	57	31	7	31	30.45	30.28	30.11	0.00
7	27.2	19	10	10	7	4.7	77	64	46	23	3	23	30.53	30.34	30.15	0.00
8	33.4	26	18	25	20	7.9	80	75	63	20	3	20	30.15	30.06	29.96	0.00
9	34.8	30.1	25	25	21	18.9	82	73	60	20	4	20	30.24	30.11	29.99	0.00
10	52.2	41.1	30	29	26	21.9	72	55	40	20	2	20	30.14	30.08	30.02	0.00
11	46.3	35.8	25	33	24	16.5	71	57	42	40	8	40	30.35	30.13	29.91	0.00
12	41.4	29	16	28	20	12.4	84	72	60	17	2	17	30.39	30.09	29.8	0.00
13	48.9	41.6	34	32	28	24.1	71	58	43	37	8	37	30.0	29.83	29.65	0.00
14	39.1	35.9	32	29	27	25.9	82	71	61	19	2	20	30.15	30.07	29.99	0.00
15	47.5	39.2	30	28	26	23.7	80	62	45	22	3	22	30.15	29.94	29.73	0.00
16	52	43.5	35	29	26	22	74	53	39	16	1	16	29.99	29.86	29.73	0.00
17	36.9	32.3	27	29	26	23.8	87	82	72	12	2	15	30.07	30.0	29.93	0.00
18	53.9	40.2	26	33	29	23.9	92	70	38	16	2	18	30.01	29.94	29.86	0.00
19	46.5	39.5	32	32	25	15	77	55	31	15	3	21	30.16	30.02	29.89	0.00
20	43	36	29	27	17	11.2	63	46	36	17	5	19	30.16	29.99	29.81	0.00
21	40.7	31	21	31	26	19.1	92	80	58	18	5	21	30.11	29.95	29.8	0.06
22	26.1	21.7	17	20	16	13.6	91	82	69	12	3	15	30.28	30.19	30.1	0.02
23	21.5	18.6	15	16	13	11	87	80	72	14	2	16	30.37	30.32	30.26	0.01
24	22.7	17.5	12	14	11	6.3	90	79	64	11	2	15	30.38	30.34	30.3	0.09
25	12.9	7.7	2	6	1	-4.1	81	71	51	18	3	19	30.64	30.51	30.38	0.00
26	5.7	1.4	-2	-1	-6	-10	80	70	58	12	2	14	30.85	30.74	30.63	0.00
27	6.3	0.9	-4	2	-5	-11	84	70	51	14	2	17	30.89	30.75	30.61	0.00
28	10	8.1	6	4	2	1.1	82	77	75	15	6	18	30.6	30.54	30.48	0.00
29	16.3	10.9	5	13	8	0.8	89	82	77	9.0	4	20	30.51	30.35	30.2	0.00
30	5.4	1.3	-2	0	-5	-8.3	80	71	64	14	5	23	30.71	30.62	30.54	0.00
31	-2.9	-5.3	-7	-8	-9	-12	80	79	78	13	4	13	30.77	30.73	30.69	0.00

*Source: UNO Department of Geography / Geology Station, Omaha, NE

https://www.wunderground.com/weather/us/ne/omaha/KNEOMAHA52

Precip.	0.2
# event > 0.5 in	0
# event > 1.0 in	0

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F 816-333-3690
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City of Omaha
ETJ Land Use

Zoning by Square Mile

Omaha Only		Omaha & ETJ	
Zone	Sq Mi	Zone	Sq Mi
AG	4.56	AG	61.74
AV	4.26	AV	4.32
CBD	0.86	CBD	0.86
CC	4.95	CC	5.34
CH	0.02	CH	0.02
DR	13.13	DR	33.36
DS	0.45	DS	0.50
GC	1.22	GC	1.30
GI	8.97	GI	10.15
GO	1.43	GO	1.46
HI	2.62	HI	2.76
LC	0.20	LC	0.21
LI	0.38	LI	0.44
LO	0.29	LO	0.30
MH	0.23	MH	0.48
MU	3.37	MU	4.73
NBD	0.21	NBD	0.21
R1	2.78	R1	3.90
R2	9.36	R2	10.60
R3	10.27	R3	11.22
R4	10.66	R4	21.48
R4(35)	15.31	R4(35)	15.56
R5	3.35	R5	4.56
R5(35)	1.84	R5(35)	1.87
R6	2.82	R6	3.63
R7	3.57	R7	3.89
R8	0.65	R8	0.66
RR	1.45	RR	1.74

Land Use	Omaha	ETJ	Total
Agricultural	4.56	53.05	57.60
Commerical	50.21	13.01	63.22
Idustrial	7.68	0.49	8.17
Residential	50.59	24.44	75.03

N

Land Use

- Agricultural
- Commercial
- Industrial
- Residential
- City Limits

ATTACHMENT E

ATTACHMENT E

City of Omaha Stormwater Program Public Education and Outreach Activities					
EVENT	**DATE**	**ACTIVITY**	**TARGET MARKET**	**PEOPLE**	**COMMENTS**
TD2 Bioretention Presentation	1/25/2017	Presentation/ Demonstration	Construction/ Commercial	30	Lunch & learn with TD2 to discuss bioretention design, lesson learned, etc...
Indian Hill Science Night	1/26/2017	Education Booth	Residential/ Community	250	Watershed model during their Science Family Night.
UNO/UNL Stormwater Class lecture	2/1/2017	Conference Presentation	Community	15	Presentation on green infrastructure at your home.
Annual Sediment and Erosion Control Seminar	2/2/2017	Workshop	Construction/ Commercial/ Residential	271	Annual seminar to construction industry.
Rain barrel workshop - GS Troop 42695	2/5/2017	Workshop	Residential	10	Workshop on rain barrels.
2017 Omaha Home Show & Garden Expo	2/9/2017	Education Booth	Residential	1,000	Booth in conjunction with Omaha Recycling, Keep Omaha Beautiful; handing out & discussing info.
Master Gardener Theather - Home Show presentation	2/9/2017	Presentation/ Demonstration	Residential	5	Presentation on green infrastructure at your home.
UNL Urban Soils lecture	2/13/2017	Presentation/ Demonstration	Community/ Construction/ Commercial	18	Lecture on stormwater & green infrastructure in Omaha.
2017 Spring Stormwater Symposium	3/8/2017	Education Booth	Construction/ Commercial	120	Hosted by NeFSMA, UNL Extension, IECA.
Pecha Kucha - GOC	3/20/2017	Education Booth	Community/ Residential	100	Green Omaha Coalition event; table with materials & discussions with attendees.
Class Presentation	4/3/2017	Presentation/ Demonstration	Community/ Residential	20	Presentation on Stormwater and GI to 8th grade class that are doing a project about their schoolyard and runoff.
UNO/UNL Stormwater Class lecture	4/5/2017	Presentation/ Demonstration	Community/ Construction/ Residential	15	Presentation on green infrastructure maintenance.

City of Omaha Stormwater Program Public Education and Outreach Activities					
2016 National Watershed & Stormwater Conference	4/4/2017	Presentation/ Demonstration	Commercial/ Construction/ Residential	50	In conjunction with Douglas County Environmental Services.
UNO/UNL GI Tour	4/8/2017	Tour	Community/ Commercial/ Residential	30	Toured UNO Welcome Center, Creighton Prep, 58th & Maple, Adams Park, Spring Lake Park, Elmwood Park.
Wheeler Elementary School Presentation	4/10/2017	Presentation/ Demonstration	Community/ Residential	95	Presentation to fourth grade students on stormwater runoff & how it relates to a job.
NWEA presentation	4/18/2017	Presentation/ Demonstration	Commercial/ Construction/ Residential	100	Presentation on green infrastructure monitoring efforts.
Humans & the Environment class presentation	4/20/2017	Presentation/ Demonstration	Community/ Residential/ Commercial	40	Presentation on stormwater and green infrastructure in Omaha.
Earth Day Omaha	4/22/2017	Education Booth	Community/ Residential	5,000	Handed out brochures and materials on all things stormwater (rain gardens, bioretention, GI, rain barrels, etc.) Estimated total attendance of event upwards of 10,000.
Earth Day Omaha - Rain barrel & rain garden demos	4/22/2017	Presentation/ Demonstration	Community/ Residential	30	Three demonstrations at the GOC Demonstration Tent.
Dundee Elementary School 2nd Grade presentation	4/25/2017	Presentation/ Demonstration	Community/ Residential	25	Watershed model and discuss demonstration project taking place at school.
Nebraska Medical Center Sustainability Fair	4/27/2017	Education Booth	Residential/ Community	50	Staffed a booth to discuss stormwater & GI practices. Handed out materials on those topics.
Together We Build a Better City - P&R	5/9/2017	Education Booth	Residential/ Community	300	Event focused on city provided services, goal is to have all EQCD programs there if possible. Tables with info & room for activities (Frisbee).
Spring into Summer - Parks Dept	5/12/2017	Education Booth	Residential/ Community	675	Event focused on having fun for the citizens of Omaha. Set up frisbee game & handed out materials for stormwater & GI.

ATTACHMENT E

City of Omaha Stormwater Program Public Education and Outreach Activities					
MCC Class Presentation	5/18/2017	Presentation/ Demonstration	Community/ Residential/ Commercial	27	Present on stormwater, green infrastructure & tour bioretention gardens.
WEF Collection Systems Presentation	5/24/2017	Conference Presentation	Construction/ Commercial/ Community	50	Invited Session Nebraska and Iowa - Tapping into Omaha Parks with Green Infrastructure.
WEF CS 2017 GI Tour	5/24/2017	Tour	Construction/ Commercial/ Community	10	10 of each fact sheet: Adams Park, UNO, Fontenelle Park, Elmwood Park, Spring Lake Park.
NUSA Presentation	5/26/2017	Conference Presentation	Community/ Residential	30	Present with Steve Rodie on Green Infrastructure in Omaha.
SAFE 2017	6/3/2017	Education Booth	Residential/ Community	750	Will be doing the same setup as past years - frisbee toss game & handing out frisbees w/basic stormwater info.
Green Infrastructure at Home - Big Garden Workshop	6/12/2017	Workshop	Residential/ Community	8	Hands-on workshop at the Big Garden campus, including classroom presentation & building a rain garden on NW corner of campus.
Sustainable Space Potluck	6/22/2017	Education Booth	Residential/ Community	15	Partner with KOB & Omaha Planning Department to convert a vacant lot into a community landscape including a rain garden, permeable pavers, & pollinator garden. Potluck is aimed at engaging the neighborhood into the project.
UNO Sustainability Academy	7/26/2017	Tour	Residential/ Construction	35	Steve Rodie lead a tour of students in summer program.
Sustainable Panel Discussion	7/27/2017	Presentation/ Demonstration	Community	65	Academy of Sustainability 2017
Terracon lunch-n-learn	8/10/2017	Presentation/ Demonstration	Construction/ Commercial	15	Present to Terracon on construction & post-construction stormwater information. Also touch on basic usage of permix.
Indian Hill Outreach	8/16/2017	Meeting	Community/ Residential	2	Discussed how to address eroding area along steps with sustainable plantings.

ATTACHMENT E

City of Omaha Stormwater Program Public Education and Outreach Activities					
World O! Water	9/9/2017	Event Sponsor	Community/ Residential	2,400	Half-day family event with over 50 organizations with act ivies and information all centered around water.
MORE Nature Night - Oakdale Elementary	9/14/2017	Education Booth	Community/ Residential	150	Set up frisbee game, handed out storwmater & GI information geared to homeowners & kids.
Green Infrastructure Tour	9/21/2017	Tour	Community/ Construction/ Commercial	95	Tour- two full charter buses - various GI sites from across the metro.
Walk for the Animals	9/24/2017	Education Booth	Residential/ Community	750	Annual event to raise money for the Nebraska Humane Society. Shared information on proper pest waste disposal & handed out pet waste bag dispensers. 41 Tennis balls also handed out.
Fly into Fall	9/30/2017	Education Booth	Community/ Residential	300	Event hosted by the Parks & Recreation Department.
MORE Nature Night - Montclair Elementary	10/5/2017	Education Booth	Community/ Residential	350	Set up frisbee game, handed out storwmater & GI information geared to homeowners & kids.
PCWP October Meeting	10/27/2017	Meeting	Construction/ Commercial/ Community	14	Discussed & handed out materials related to construction & post-construction stormwater.
Environmental Planning & Policy Class - UNL	10/11/2017	Presentation/ Demonstration	Community/ Commercial/ Residential	25	Presentation on stormwater and green infrastructure in Omaha.
Kennedy Elementary - Adams Park Field Trip	10/13/2017	Tour	Community	65	Discuss stormwater & how the City utilized Adams Park to manage it in a more sustainable way. Part of their 5th grade project-based-learning project.
Kennedy Elementary - Project Based Learning Panel	11/3/2017	Presentation/ Demonstration	Community	65	Sit on a panel of experts while 5th grade students presented on their project-based-learning project.
2017 Iowa Stormwater Summit	12/7/2017	Presentation/ Demonstration	Commercial/ Construction/ Community	110	Presentation on stormwater and green infrastructure in Omaha.
Zach Jilek - presentation to Lyman Richie for ISW	12/13/2017	Distribution	Construction	48	Industrial Stormwater topics & concrete washout.

Keep Omaha Beautiful Public Education and Outreach Activities						
EVENT	**DATE**	**ACTIVITY TYPE**	**LOCATION**	**TARGET AUDIENCE**	**PEOPLE**	**# OF PRESENTATIONS**
School Presentation	2/21/2017	Presentation/ Demonstration	St. Margaret Mary's School (123 N 61st St)	Community	55	2
School Presentation	3/1/2017	Presentation/ Demonstration	McMillan Junior High School (3802 Redick Ave)	Community	85	3
School Presentation	3/2/2017	Presentation/ Demonstration	McMillan Junior High School (3802 Redick Ave)	Community	71	3
School Presentation	3/3/2017	Presentation/ Demonstration	Wheeler Elementary (6707 S 178th St)	Community	208	2
School Presentation	3/3/17	Presentation/ Demonstration	Wheeler Elementary (6707 S 178th St)	Community	104	1
School Presentation	3/8/2017	Presentation/ Demonstration	Chandler View Elementary (7800 S 25th St, Bellevue - OPS)	Community	93	2
School Presentation	3/22/2017	Presentation/ Demonstration	Oakdale Elementary (3534 S 108th St)	Community	46	1
School Presentation	3/24/2017	Presentation/ Demonstration	St. Margaret Mary's School (123 N 61st St)	Community	63	2
School Presentation	4/3/2017	Presentation/ Demonstration	McMillan Junior High School (3802 Redick Ave)	Community	67	3
School Presentation	4/4/2017	Presentation/ Demonstration	McMillan Junior High School (3802 Redick Ave)	Community	77	3
UNO's 60 Minutes of Service	4/5/2017	Presentation/ Demonstration	UNO Community Engagment Center (6400 So. University Dr.)	Community	58	1

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Keep Omaha Beautiful Public Education and Outreach Activities						
EVENT	**DATE**	**ACTIVITY TYPE**	**LOCATION**	**TARGET AUDIENCE**	**PEOPLE**	**# OF PRESENTATIONS**
School Presentation	4/7/2017	Presentation/ Demonstration	Oakdale Elementary (3534 S 108th St)	Community	46	2
School Presentation	4/11/2017	Presentation/ Demonstration	Northwest High School (8204 Crown Point Ave) with UNO students included	Community	17	1
School Presentation	4/17/2017	Presentation/ Demonstration	Oakdale Elementary (3534 S 108th St)	Community	48	2
Community Center Presentation (Preschool)	4/18/2017	Presentation/ Demonstration	Kids Can (4860 Q St)	Community	32	1
School Presentation	4/19/2017	Presentation/ Demonstration	House of Montessori (400 S 39th St,)	Community	35	2
School Presentation	4/25/2017	Presentation/ Demonstration	Sacred Heart (2207 Wirt St)	Community	143	2
School Presentation	4/25/2017	Presentation/ Demonstration	Castelar Elementary (2316 S 18th St)	Community	140	1
School Presentation	4/25/2017	Presentation/ Demonstration	Legacy School (6860 N 166th Ave)	Community	40	1
UNMC Sustainability Fair	4/27/2017	Education Booth	UNMC (S 42nd St & Emile St)	Community	119	0
School Presentation	5/1/2017	Presentation/ Demonstration	Burke High School (12200 Burke St)	Community	56	3
School Presentation	5/5/17	Presentation/ Demonstration	Paddock Elementary (3535 Paddock Rd)	Community	12	1
School Presentation	5/16/2017	Presentation/ Demonstration	Westgate Elementary (7802 Hascall St)	Community	23	1

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Keep Omaha Beautiful Public Education and Outreach Activities						
EVENT	**DATE**	**ACTIVITY TYPE**	**LOCATION**	**TARGET AUDIENCE**	**PEOPLE**	**# OF PRESENT ATIONS**
School Presentation	5/17/17	Presentation/ Demonstration	Joslyn Elementary (11220 Blondo St)	Community	69	1
School Presentation	5/19/17	Presentation/ Demonstration	Mount View Elementary (5322 N 52nd St)	Community	82	4
School Presentation	5/22/17	Presentation/ Demonstration	Uta Halee (10625 Calhoun Rd)	Community	5	1
School Presentation	6/9/17	Presentation/ Demonstration	Boystown (13727 Flanagan Blvd)	Community	20	1
School Presentation	6/13/17	Presentation/ Demonstration	Jefferson Elementary (4065 Vinton St)	Community	98	3
School Presentation	6/14/17	Presentation/ Demonstration	Kellom Elementary (1311 N 24th St)	Community	7	1
School Presentation	6/16/17	Presentation/ Demonstration	Dodge Elementary (3520 Maplewood Ave)	Community	98	2
School Presentation	6/19/17	Presentation/ Demonstration	Boystown (13727 Flanagan Blvd)	Community	23	1
School Presentation	6/21/17	Presentation/ Demonstration	Wilson Focus School (5141 F St)	Community	65	1
Metro Community College Summer Bridge Program	6/23/17	Presentation/ Demonstration	Dewey Park (550 Turner Blvd)	Community	22	1
School Presentation	6/26/17	Presentation/ Demonstration	Boystown (13727 Flanagan Blvd)	Community	30	1
School Presentation	6/27/17	Presentation/ Demonstration	Sherman Elementary (5618 N 14th Ave)	Community	102	2

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Keep Omaha Beautiful Public Education and Outreach Activities						
EVENT	**DATE**	**ACTIVITY TYPE**	**LOCATION**	**TARGET AUDIENCE**	**PEOPLE**	**# OF PRESENTATIONS**
School Presentation	7/14/17	Presentation/ Demonstration	Boystown (13727 Flanagan Blvd)	Community	36	1
School Presentation	7/17/2017	Presentation/ Demonstration	Boystown (13727 Flanagan Blvd)	Community	35	1
General KOB Overview with Metro CC students	7/19/2017	Presentation/ Demonstration	Keep Omaha Beautiful Office (1819 Farnam Street)	Community	4	1
School Presentation	7/19/2017	Presentation/ Demonstration	Imagination Station (17908 Pierce Plaza)	Community	26	1
School Presentation	7/24/2017	Presentation/ Demonstration	Boystown (13727 Flanagan Blvd)	Community	20	1
MavKids Camp	7/26/2017	Presentation/ Demonstration	University of Nebraska Omaha (6001 Dodge St)	Community	88	2
School Presentation	7/31/2017	Presentation/ Demonstration	Boystown (13727 Flanagan Blvd)	Community	36	1
School Presentation	8/7/2017	Presentation/ Demonstration	Boystown (13727 Flanagan Blvd)	Community	38	1
School Presentation	8/8/2017	Presentation/ Demonstration	Brownell Talbot (400 N Happy Hollow Blvd)	Community	25	1
UNO Volunteer Fair	8/23/2017	Education Booth	UNO Barbara Weitz Community Engagement Center (6400 South, University Drive Road North)	Community	84	0
Metro Community College	8/29/2017	Presentation/ Demonstration	Hanscom Park (3201 Woolworth)	Community	14	1

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Keep Omaha Beautiful Public Education and Outreach Activities						
EVENT	**DATE**	**ACTIVITY TYPE**	**LOCATION**	**TARGET AUDIENCE**	**PEOPLE**	**# OF PRESENTATIONS**
Northwest High School - Environmental Science Class	9/6/2017	Presentation/ Demonstration	Northwest High School (8204 Crown Point Ave)	Community	31	1
Leadership Class	9/13/2017	Presentation/ Demonstration	Nathan Hale Middle School (6143 Whitmore St)	Community	106	2
Volunteer Fair	9/13/2017	Education Booth	Creighton University (602 N 20th St.)	Community	55	0
Leadership Class	9/14/2017	Presentation/ Demonstration	Nathan Hale Middle School (6143 Whitmore St)	Community	107	2
Northwest High School - Environmental Science Class	9/18/2017	Presentation/ Demonstration	Northwest High School (8204 Crown Point Ave)	Community	26	1
IL UNO and Northwest High School	9/19/2017	Presentation/ Demonstration	Northwest High School (8204 Crown Point Ave)	Community	35	1
Goldenrod Festival	9/21/2017	Education Booth	Lauritzen Gardens (100 Bancroft St)	Community	722	25
UNO Service Learning group	9/28/2017	Presentation/ Demonstration	UNO Campus - Arts and Sciences Building (222 University Dr. North)	Community	31	1
School Presentation	10/4/2017	Presentation/ Demonstration	Norris Middle School (2235 S 46th St)	Community	24	1
UNO 60 Minutes of Service	10/4/2017	Presentation/ Demonstration	UNO Barbara Weitz Community Engagement Center (6400 South, University Drive Road North)	Community	34	1

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Keep Omaha Beautiful Public Education and Outreach Activities						
EVENT	**DATE**	**ACTIVITY TYPE**	**LOCATION**	**TARGET AUDIENCE**	**PEOPLE**	**# OF PRESENT ATIONS**
School Presentation	10/9/2017	Presentation/ Demonstration	Central High School (124 N 20th St)	Community	9	1
School Presentation	10/10/2017	Presentation/ Demonstration	Chandler View Elementary (7800 S 25th St, Bellevue - OPS)	Community	20	1
King Science Zoology Class	10/11/2017	Presentation/ Demonstration	King Science and Technology Center (3720 Florence Blvd)	Community	32	1
School Presentation	10/12/2017	Presentation/ Demonstration	Sherman Elementary (5618 N 14th Ave)	Community	18	1
School Presentation	10/17/2017	Presentation/ Demonstration	Chandler View Elementary (7800 S 25th St, Bellevue - OPS)	Community	96	2
School Presentation	10/18/2017	Presentation/ Demonstration	Oakdale Elementary (3534 S 108th St)	Community	23	1
School Presentation	10/19/2017	Presentation/ Demonstration	Ashland Park Robbins Elementary (5050 S 51st St)	Community	109	4
Norris All School Family Night	10/20/2017	Education Booth	Norris Middle School (2235 S 46th St)	Community	75	0
School Presentation	10/23/2017	Presentation/ Demonstration	Spring Ridge Elementary (17830 Shadow Ridge Dr)	Community	26	1
School Presentation	10/25/2017	Presentation/ Demonstration	Central High School (124 N 20th St)	Community	12	1
OPS Science Curriculum Leadership Team	11/6/2017	Presentation/ Demonstration	Teacher Administrative Center (3215 Cuming St)	Community	4	1
School Presentation	11/8/2017	Presentation/ Demonstration	Ashland Park Robbins Elementary (5050 S 51st St)	Community	109	4

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Keep Omaha Beautiful Public Education and Outreach Activities						
EVENT	**DATE**	**ACTIVITY TYPE**	**LOCATION**	**TARGET AUDIENCE**	**PEOPLE**	**# OF PRESENT ATIONS**
School Presentation	11/16/2017	Presentation/ Demonstration	Norris Middle School (2235 S 46th St)	Community	28	1
School Presentation	11/17/2017	Presentation/ Demonstration	Norris Middle School (2235 S 46th St)	Community	29	1
Northwest Neighborhood Alliance Meeting	1/15/2017	Meeting Announcement	Saddlebrook Library (14850 Laurel Ave.)	Residential	25	1
Midtown Neighborhood Alliance Meeting	1/31/2017	Meeting Announcement	UNO's Community Engagement Center (6400 So. University Dr.)	Residential	13	1
South Omaha Neighborhood Alliance Meeting	2/2/2017	Meeting Announcement	The Salvation Army Kroc Center (2825 Y St.)	Residential	40	1
Omaha Home and Garden Expo	2/9/2017 - 2/12/2017	Education Booth	Centurylink Center Omaha (455 No. 10th St.)	Community	367	0
Downtown Kiwanis Club Meeting	2/17/2017	Presentation/ Demonstration	UNO Scott Conference Center (6450 Pine St.)	Community	63	1
Kiwanis of Greater Omaha Meeting	2/20/2017	Presentation/ Demonstration	German American Society (3717 S 120th St.)	Community	37	1
West Omaha Cosmpolitan Club	2/22/2017	Presentation/ Demonstration	Garden Cafe Meeting Room (11040 Oak St.)	Community	23	1
North Omaha Neighborhood Alliance	2/23/2017	Meeting Announcement	Better Together Campus (3223 North 45th Street)	Residential	18	1
Omaha Spring Cleanup Kickoff Meeting	2/28/2017	Presentation/ Demonstration	UNO Community Engagment Center (6400 So. University Dr.)	Residential	97	1
PEO Philanthropy Group	3/14/2017	Presentation/ Demonstration	Living Faith Methodist Church (5310 S 182nd Ave)	Community	36	1

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Keep Omaha Beautiful Public Education and Outreach Activities						
EVENT	**DATE**	**ACTIVITY TYPE**	**LOCATION**	**TARGET AUDIENCE**	**PEOPLE**	**# OF PRESENTATIONS**
Omaha Association of Health Underwriters Meeting	3/29/2017	Presentation/ Demonstration	Champions Run Golf Course (13800 Eagle Run Dr)	Commercial	84	1
Wells Fargo Volunteer Fair	3/29/2017	Education Booth	Scott Conference Center (6450 Pine St)	Community	38	0
Wells Fargo Green Team Board Meeting	4/13/2017	Presentation/ Demonstration	Wells Fargo Bank (10010 Regency Cir)	Community	8	1
NE Scifest	4/20/2017	Education Booth	SAC Air Museum (28210 W Park Hwy, Ashland, NE 68003)	Community	370	0
NE Scifest	4/21/2017	Presentation/ Demonstration	Durham Museum (801 S 10th St,)	Community	675	6
Earth Day Omaha	4/22/2017	Education Booth	Elmwood Park (802 S 60th St)	Community	750	0
Party for the Planet	4/22/2017	Education Booth	Henry Doorly Zoo (3701 S 10th St)	Community	350	0
TREEmendous Trees Celebration	4/27/2017	Education Booth	Lauritzen Gardens (100 Bancroft St)	Community	405	0
Work Training Class A	4/28/2017	Presentation/ Demonstration	Ollie Webb Center (1941 S 42nd St #122)	Community	6	1
Downtown Omaha Inc. Membership Meeting	5/4/2017	Presentation/ Demonstration	Scottish Rite Masonic Center (202 S 20th St)	Community	47	1
WCR Business Resource Luncheon	5/11/2017	Presentation/ Demonstration	Champions Run Golf Course (13800 Eagle Run Dr)	Community	80	1
Spring into Summer	5/12/2017	Education Booth	Zorinsky Lake (3808 S 154th St)	Community	397	0
Work Training Class B	5/12/2017	Presentation/ Demonstration	Ollie Webb Center (1941 S 42nd St #122)	Community	4	1

Keep Omaha Beautiful Public Education and Outreach Activities						
EVENT	**DATE**	**ACTIVITY TYPE**	**LOCATION**	**TARGET AUDIENCE**	**PEOPLE**	**# OF PRESENTATIONS**
Omaha Jaycees Membership Meeting	5/17/2017	Presentation/ Demonstration	DJ's Dugout (777 N. 114th Street)	Community	27	1
Wells Fargo Volunteer Week	6/12/17	Presentation/ Demonstration	Wells Fargo Regency (10010 Regency Cir)	Community	15	1
Sustainable Spaces Community Potluck	6/22/17	Education Booth	3101 Florence Blvd.	Community	24	0
Service Learning Community Partner Fair	7/11/17	Education Booth	UNO Barbara Weitz Community Engagement Center (6400 South, University Drive Road North)	Community	25	0
General KOB Overview with Partnership 4 Kids	7/20/2017	Presentation/ Demonstration	Keep Omaha Beautiful Office (1819 Farnam Street)	Community	5	1
Girl Scout Volunteer Rally	7/24/2017	Education Booth	Ralston Arena (7300 Q St)	Community	163	0
Kinghorn Gardens Monthly Staff Meeting	8/7/2017	Presentation/ Demonstration	St. Philip Neri Church (8200 N 30th St)	Community	35	1
Creighton CODA group	8/26/2017	Presentation/ Demonstration	Carter Lake (809 Carter Lake Shore Dr)	Community	52	1
Boys Scouts Roundtable	9/5/2017	Meeting Announcement	Ralston High School (8969 Park Dr, Ralston)	Community	47	1
World O! Water	9/9/2017	Education Booth	Chalco Hills (8901 S 154th St)	Community	480	0
Farnam Festival	9/16/2017	Workshop	Blackstone District (39th & Farnam)	Community	350	0

Keep Omaha Beautiful Public Education and Outreach Activities						
EVENT	**DATE**	**ACTIVITY TYPE**	**LOCATION**	**TARGET AUDIENCE**	**PEOPLE**	**# OF PRESENTATIONS**
Collective For Youth Site Directors Meeting	9/20/2017	Meeting Announcement	TAC Building (3215 Cuming St.)	Community	32	1
Aksarben Young Professionals Cleanup	9/22/2017	Presentation/ Demonstration	Stinson Park (2285 South 67th Street)	Community	25	1
Heartland Workers Center Cleanup	9/30/2017	Presentation/ Demonstration	Highland South Park (2512 D St)	Community	30	1
Durham Teacher's Night	10/6/2017	Education Booth	Durham Museum (801 S 10th St,)	Community	196	0
BIGS in Benson: Steps to a Stronger Community	10/12/2017	Education Booth	Benson Library	Community	25	1
Northwest Omaha Neighborhood Alliance Meeting	10/12/2017	Meeting Announcement	Saddlebrook Library (14850 Laurel Ave.)	Residential	15	1
Youth Fall Cleanup - Levi Carter Park Site	10/21/2017	Presentation/ Demonstration	Levi Carter Park (4405 Carter Lake Shore Drive)	Community	65	1
Uta Hallee Roots and Shoots Club	11/17/2017	Presentation/Demonstration	Uta Halee (10625 Calhoun Rd)	Community	9	1

Target Markets

Community – Schools, non-profit groups, homeowner associations, etc...
Industry – Applies to those in the regulated community
General Public – Applies to citizens of the community & the general public

Stormwater Facebook Page	
2017 Month	**Total Post Reach**
January	269
February	621
March	5,548
April	4,857
May	2,916
June	2,787
July	12,851
August	2,636
September	2,265
October	5,967
November	3,368
December	1,851
Total	**45,936**
Total Posts	**69**

Omaha Stormwater Website		
2017 Month	**Users**	**Page Views**
January	437	1,343
February	553	2,044
March	547	2,038
April	562	1,903
May	555	2,099
June	457	1,559
July	450	1,251
August	475	1,494
September	489	1,565
October	450	1,710
November	353	1,363
December	349	1,524
Totals	**5,677**	**19,893**