ANNUAL REPORT

Arizona Pollutant Discharge Elimination System (AZPDES)
Small Municipal Separate Storm Sewer System (MS4) General Permit
(AZG2016-002)

Regulated Small Municipal Separate Storm Sewer Systems (MS4s) must submit an Annual Report (AR) to the Arizona Department of Environmental Quality (ADEQ) before September 30 each year. Permittees must complete an Annual Report and submit the original, signed document to:

Arizona Department of Environmental Quality
Surface Water Section/Stormwater & General Permits Unit (5415A-1)
1110 West Washington Street, Phoenix, AZ 85007

A. REGULATED SMALL MS4 INFORMATION

Annual Report for Reporting Year: 2017-2018

LTF Number:	65661	Name of MS4:	City of Buckeye			
Primary Contact:	Robert van den Akker			Title:	Manager, Public Works, Environmental Services	
Mailing Address:	23454 W. MC Hwy 85					
City:	Buckeye		Zip Code:	85326	County:	Maricopa
Telephone Number:	(623) 349-6805	Email Address:	rvandenakker@buckeyeaz.gov			

☐ Non-Traditional MS4 ☒ City/County Estimated Population: 68,453

Is another entity responsible for any satisfying any permit requirements (6.4b): ☐ Yes ☒ No. If yes, complete the following questions; if no, continue to Section B.	Identify Partnered Entity:
Provide a description of permit requirements being implemented by another entity:	Type of Legally-binding Agreement:

B. MAPPING (4.0 and 8.4(b))

1. Provide a narrative description of the permittee's mapping progress:

For this permit year, July 1, 2017, through June 30, 2018, 90% of the Urbanized Area has been reviewed, and the stormwater infrastructure mapped.

The data entry for the map work has included attributes of curbs, inlets, culverts and pipes, discharge points, basins, outlets, and outfalls identified by the City. The work includes field investigation of these systems and is concluded with desk work to finalize the GIS data. This data entry was performed by City staff. This work is available on the internet at:

https://buckeyearizona.maps.arcgis.com/apps/opsdashboard/index.html#/d0965135ce7c4f98916d4bc9da8841f9

The City of Buckeye's development standards require discharges from rights-of-way to drain into storm systems on privately owned property. The mapping of the urbanized area has shown this standard to be consistently met. As a result of the City's mapping efforts, it has been determined that, for the systems inspected to date, there are no outfalls and therefore no MS4 within the City. All storm systems found discharge to outlets draining to private systems.

The City continues to map the storm systems and follow dry washes to ensure development standards and permit compliance is met. Storm system mapping of the Urbanized Area as defined by the Decennial Census is on schedule to be completed by December 2020. Additional mapping of areas outside of the Decennial Census will continue as ongoing development and population influx increases the possibility of additional Urbanized Area to be included in the next Decennial Census of 2020.

The constant new development of the City makes mapping a critical effort of compliance.

2. Number of outfalls currently mapped: 0	**3. Outfall mapping –Percent Complete:** 100%
4. Storm Sewer System Mapping **Percentage Complete:** 90%	**5. Identification of Waters of the U.S. that receive discharges from the outfalls** **Percentage Complete:** 100%

6. Has land been annexed into the MS4 since the previous reporting year: ☒ Yes ☐ No (4.2).

If yes, complete the following:

a) Total area annexed since last annual report: 390 **acres**

b) **Mapping of new area – Percent complete:** 0%

c) Are BMPs fully implemented in annexed area: ☒ Yes ☐ No

d) **Provide a description of BMP implementation for areas annexed into the regulated MS4 since the last reporting period:**

Annexed areas are not located within the urbanized area; however, all areas annexed are entered into the permit required activities upon annexation.

C. PROGRAM EVALUATION (8.1.1 and 8.4d)

Provide a written assessment of the appropriateness of identified best management practices and progress toward achieving identified measurable goals for each minimum control measure.

The City has developed a solid foundation to its stormwater/pollution prevention program including providing dedicated staff and resources necessary to ensure implementation and development of a robust program. Below is a review of each of the Minimum Control Measures (MCMs) with a brief assessment of the appropriateness and progress of achieving the measurable goals. The City performed the mandated annual review of its stormwater program on June 25, 2018.

MCM1: Public Education and Outreach

According to the approved NOI, the City must determine the population demographics to gain an understanding of the citizenship that is to be educated and to answer the following question, "Who is our audience?" The City must be able to list the target audiences based on age groups, language types, education boundaries/concerns, geographic patterns, and other information as available in order to best address the outreach efforts to maximize not only effort, but also message necessary to promote the permit requirement of pollution prevention to the MS4.

The initial review of the demographic information has been complete and outreach efforts have been addressed accordingly. Results of the findings may be seen in MCM 1 of section D of this report.

It is equally important to have a funded and staffed program to implement BMPs and achieve goals. The City has established a dedicated funding source and has hired an Environmental Compliance Officer (Stormwater) to assist with implementation and execution of the City's stormwater program in fiscal year 2018 (FY18).

Outreach opportunities include partnering among City departments, regional organizations (STORM - *Stormwater Outreach of Regional Municipalities*), and other public entities to maximize coverage and distribution of the water quality/pollution prevention message.

The City is on track for meeting the required public outreach activities to provide protection of the MS4.

MCM2: Public Involvement and Participation

The City has committed to provide events for public participation and methods for the public to report illicit discharges and improper disposal (IDID). The Public Works Department hosts and invites citizens to assist in events such as clean-up of illegal dumping, individual and neighborhood clean-up events/activities, and the City's Adopt-A-Road program. The Public Works Department hosts a phone line and a website

that anyone may use to report pollution concerns. The City Manager's office hosts phone lines and a web application to receive citizens' concerns and forward to appropriate response staff. The City has expanded its presence on social media (e.g., Facebook, Twitter, Next Door) and continues to have interaction with citizens of varying demographics through these outlets promoting pollution prevention ideas and resources to report illegal dumping. The City launched its first annual *Draw a Better Buckeye* artwork contest targeting Buckeye students in grades 3 through 12. The City implemented a Storm Drain marking pilot program with the help of the Boy Scouts, and has seen significant activity with a voluntary Household Hazardous Waste drop off program.

The City provides significant opportunities for the community to recognize and report concerns and complaints as well as participate and become involved in community improvement and awareness regarding pollution prevention. These events help remove the potential of pollution from entering the City's rights-of-way.

The City is on track for meeting the required public involvement and participation requirements to remove pollutants from entering the MS4.

MCM3: Illicit Discharge Detection and Elimination (IDDE) Program

The City has committed to multiple BMPs to ensure appropriate coverage, authority and ability to implement IDDE programs.

Mapping: These activities include identification and documentation of the stormwater infrastructure, locating the MS4 within the developed areas to accurately pinpoint discharge points into Waters of the US. The City uses a Geographic Information System (GIS) database, and will continue its mapping program until the project is complete.

Monitoring outfalls: The City has mapped the required portion of its urbanized, developed area and has not discovered any outfalls to Waters of the US (as defined by Arizona Administrative Code R18-11). The City partnered with ADEQ to develop a pilot program which is outlined within the "Apollo" DMR report. Dry Weather screenings of the mapped areas and identified outlets were performed during this reporting year. Wet weather sampling was performed but was later determined to not be necessary as no outfalls are confirmed to exist within the City.

IDDE program: The City maintains regulatory authority, has written enforcement procedures, has performed inspections, and has maintained a list of all businesses in the city. The City has developed and implemented an ability to respond to complaints, and eliminate improper disposal as they are discovered. In FY18 staff began inspecting potential discharges to confirm those that may have the ability to impact the City's right-of-way.

Training: The City has established a training class for staff. Staff who work in the right-of-way, work with potential pollutants, or work in an area where they may observe pollution in the storm system have been trained to recognize, prevent, and report on pollution discharges.

Analytical Monitoring: The City has the ability to contract out analytical monitoring as needed should an illicit discharge to the MS4 be found that is unable to be stopped.

The City is on track for performing required activities to implement illicit discharge and improper disposal programs to protect the MS4.

MCM4: Construction Activity Stormwater Runoff Control

The City continues to complete the BMPs listed in the approved NOI.

Public Involvement: The City has multiple methods for residents to issue complaints for construction impacting the MS4 including the online complaint form, phone calls to the City, social media outlets, email, and more as outlined in MCM3.

Education: The City works alongside the general public and contractors to provide training on the latest versions of codes/ordinances, written policies/procedures, reporting mechanisms, and worksite BMPs. During Pre-Application Conferences (PAC) and pre-construction meetings, the City works alongside developers to ensure City code is understood and properly followed before, during, and after construction.

Waste, Erosion, and Sedimentation (WES) Controls: Contractors maintain erosion, sediment, and waste controls on their sites as required before plans may be reviewed. Construction sites are required to submit SWPPPs that are required by the CGP; although only the waste, erosion and sediment control portions of the SWPPPs are reviewed. The City has altered its wording in FY18 to refer to the process as WES. The receipt of complete WES plans allow the construction plans to be reviewed and approved. Engineering infrastructure inspectors and Development Services' building inspectors ensure WES controls are installed and functioning as they perform their daily inspections. Any sites requiring enforcement for WES failure are submitted to Public Works for follow-up. The City maintains a list of land disturbances to ensure routine inspections are conducted. The City is currently drafting updated policies and procedures.

The City has a thorough plan review process involving each department affected by construction or reconstruction activities. Review by several professional staff ensures the community is being provided the best development/redevelopment opportunity possible. Each department uses their expertise to ensure the developer is correctly abiding by City codes and ordinances.

The City Code allows for enforcement actions to be taken when issues arise from routine inspections, follow-up inspections, and complaints. The City has the authority to issue stop work orders, citations, and fines to stop encroachment of pollutants into the MS4.

Training: Management Staff received training which included the requirements for plan review and inspections of waste, erosion, and sediment (WES) controls. As a result, the construction BMP manual has been updated.

In FY18, the number of permits issued has been recorded, but the number of inspections of BMPs has not been recorded. Processes are in place to ensure BMPs are inspected frequently, as they are part of the approved plans; however, only failures of BMPs are recorded in the notes sections of individual reports. This is not searchable data, so the number of corrective actions required on construction sites is not able to be counted from the existing database. See section G5 below for schedules for completion of this activity.

Only those areas that have confirmed MS4 will receive recorded BMP inspections.

The City is on track to protect the MS4 from pollution related to construction activities.

MCM5: Post-Construction Stormwater Management in New Development and Redevelopment

The City maintains a Stormwater Drainage System Design Manual DM500, and provides updates as necessary to ensure the policies and procedures match current State and Federal law.

The City reviews site plans and requires as-builts for all completed and approved new development and redevelopment projects.

The City is on track to protect the MS4 from post-construction runoff from new development and redevelopment.

MCM6: Pollution Prevention and Good Housekeeping

Stormwater Pollution Prevention Plans (SWPPPs) have been developed for City facilities having the potential of discharging to the MS4, which include objectives, actions, schedules and an annual evaluation of the program's effectiveness. The City maintains a list of municipal facilities and prioritizes the facility inspections based on potential for pollutants to be discharged to the MS4. The goal is to have 20% of all facilities inspected and documented in each permit year.

Staff working in ROW (including from Water Resources, Public Works, and Community Services Departments), are trained annually on pollution prevention and good housekeeping BMPs.

The City is on track to protect the MS4 from pollution generated from City facilities and operations.

D. MCM-1: PUBLIC EDUCATION AND OUTREACH (6.4.1 and 8.1.2)

D-1 Provide a Summary of Public Education and Outreach BMPs in the Table Following Table

Best Management Practice	Measurable Goal (how is progress being measured)	Theme or Message	Target Audience	Final Measure of Assessment (5.1.e.3)	Summary of Results and Effectiveness (8.1.2)
Demographics Determination	List the target audiences based on age groups, language types, education boundaries/concerns, geographic patterns, and other demographics as available.	NA	NA	Analysis of the 2010 Decennial Census data showed the majority of Buckeye's population has a high school education, an income of less than $100,000, are identified as 80% White by race and 40% Hispanic by ethnicity, with living conditions split 70/30 between homeowners and renters. Population ages: school age 20%, young adult 25%, adult 25%, and elderly adult 20% (the remaining 10% are younger than school age).	The Department and Division responsible for this BMP is Public Works, Environmental Services Division. (PWESD) Demographics have been reviewed and a list of potential target audiences has been created. Completed in 2017, listed under target audiences in this report.

Program Resources	Have a funded and staffed program, with a budget, equipment, and resources to reach target audiences.	NA	NA	Funding and staff for the program was approved for FY18 and continued into FY19. Budget and staff had been approved by Council, and were implemented in FY18. Funding is provided through the City's solid waste fee as this position assists with pollution prevention goals.	This activity is performed by PWESD. This goal was achieved by December 2017 (FY18).

Targeted Outreach	Use known pollution sources found through MCM3 activities and demographics determined in FY17 to choose and perform outreach activities. Goals also include number of targeted audiences addressed and number of people reached.	Pollution prevention	All ages.	The following activities and audiences were targeted: **Target - All Ages**: GAIN Event, Air-Fair, and Hometown Holiday Boutique, and Library Technology Kit Show and Tell. **Target – Young Adults:** Spring Clean-Up, Hometown Holiday Boutique, and Air-Fair – volunteer hours offered for students to help with the activity and hand out the pollution prevention information. Target - School Age/Young Adults: Eagle Scout project, *Draw a Better Buckeye* artwork contest, Public Works Week, Library Technology Kit show and tell, and classroom speaking engagement event. Also recruited Buckeye Youth Council and Boy Scout spokespersons. **Target - Adults:** Social Media, Website, Adopt-A-Road signs, e-blasts, billing insert, and GAIN Event – provided information for adults regarding proper waste disposal. Additionally, all new residents receive a pamphlet on proper waste disposal to avoid illegal dumping.	This activity is performed by PWESD. Based on the demographic information obtained, the city focused outreach based on the 2010 decennial data; the city found the following target audiences: school age 20%, young adult 25%, adult 25%, and elderly adult 20% (the remaining 10% are younger than school age), and with a 70/30 split between owners and renters of homes. The City was able to provide targeted pollution prevention education to the target audiences during this reporting year.

General Educational Activity and Materials	Provide outreach to the population on general topics including what is an MS4, stormwater pollution in the environment, and the benefits of public involvement. Report the type and number of outreach methods used, and the total number of people reached.	Pollution Prevention	General Population	The following activities were achieved: 3 speaking events 19 email blasts - 6,000 people reached with each email blast 8 fence line inspections of each home in the city annually with pollution prevention educational information posted as needed. 2 utility billing inserts 1 newspaper insert 2,000 educational flyers distributed by Utility Billing Facebook: 67,121 reached with 4,860 interactions YouTube outreach video views: 57 views Additionally, education through enforcement for waste storage has occurred: 29 violations issued 169 complaint inspections	This activity is performed by PWESD. Educational information has been provided through presentations to the Buckeye Youth Council, City Council, local elementary schools, direct email to residents, and educational and enforcement visits to residents. All activities performed have been related to education on stormwater permit compliance requirements or pollution prevention so that waste does not contact stormwater or enter the storm system.

Special Events	Provide at least one outreach event annually, and include the number of events held, the number of people spoken to, and the types of materials provided.	Pollution prevention	General	The following activities occurred: 9 events held including a classroom speaking event, an Eagle Scout project, Public Works Week school outreach, and six City-sponsored events. 4,130 people spoken to and 9,331 items distributed Materials provided include: brochures, flyers, booklets, pens/pencils/stickers, water bottles, Frisbees, and flyers targeting pollution prevention and environmental sustainability.	This activity is performed by PWESD. All activities performed have been related to education on stormwater permit compliance requirements or pollution prevention so that waste does not come into contact with stormwater.

D-2. DESCRIPTION OF CHANGES IN IDENTIFIED BMPS OR MEASUREABLE GOALS (8.1.3 and 8.4(l)

Have there been any modifications to BMPs during this reporting period: ☐ Yes ☒ No.

If yes, provide a brief explanation of each modification below (Add Rows as Necessary).

ADEQ Directed (8.1.4)	BMP Modified	Analysis of Why BMP Was Ineffective or Infeasible	Analysis of Why BMP is Expected to Achieve Goals
☐ Yes			
☐ Yes			

D-3. PUBLIC EDUCATION AND OUTREACH (6.4.1)
Provide a summary of activities planned for the next reporting period in the following table

Best Management Practice	Measurable Goal (steps to measure progress)	Summary of Planned Activities	Proposed Schedule
Targeted Outreach	Use known pollution sources found through MCM3 activities and demographics determined in FY17 to choose and perform outreach activities. Goals also include number of targeted audiences addressed and number of people reached.	In 2018 the City will use the demographic information from the FY17 research, along with goals met through the implementation of MCM3, to choose and perform outreach activities. Information to be presented include defining the MS4, use of printed materials, social media, web pages, billing inserts, and electronic mail distribution. Printed materials targeting specific age groups and messages will be created and distributed, and interdepartmental collaboration will be sought out to attach to existing educational methods throughout the city to reach our citizens. Additional work is anticipated to determine best methods for information dispersion in the population.	**All Ages:** GAIN Event, Air Fair, Hometown Holiday, Dog Days, establishment of a Volunteer Trainer program **Adults:** Social Media, Website, Adopt-A-Road signs, e-blasts, Household Hazardous Waste collection **School Age/Young Adults:** *Draw a Better Buckeye* artwork contest, Buckeye Youth Council, Public Works Week, and Project WET Water Festival
General Educational Activity	Provide outreach to the population on general topics including the definition of an MS4, stormwater pollution in the environment, and the benefits of public involvement. Report the type and number of outreach methods used, and the total number of people reached.	The City will continue outreach activity to the general public, providing information on pollution prevention to keep the environment clean. Actions will include creation of printed materials (e.g., flyers, bookmarks, brochures, etc.) addressing the pollution prevention message. Work with Marketing Department to create materials and social media campaigns.	On-going FY19

		Distribution of an e-newsletters addressing pollution prevention/watershed protection and/or water quality as topic(s) of focus.	
Special Events	Participate in at least one outreach event each year. Measurable goals will include the number of events or outreach activities held, the number of people directly spoken to, and types of outreach materials provided.	Participate in public and private groups within the community, discussing the importance of pollution and its impacts on stormwater quality, and how citizens and businesses may make a difference.	FY19 Home Owner Association (HOA) group meeting Create Volunteer Trainer program Boy Scout Public Health Merit Badge
Annual Evaluation	Use the efficiency matrix to determine the value of the outreach activity.	Evaluate the outreach program activities using an efficiency matrix of the resources expended vs. number of people reached, and adjust the program based on the results.	June 2019

E.	**MCM-2: PUBLIC INVOLVEMENT AND PARTICIPATION (6.4.2 and 8.1.2)**				
E-1.	**Provide a Summary of Public Involvement and Participation BMPs Implemented During the Reporting Period in the Following Table**				
Best Management Practice	**Measurable Goal (steps to measure progress)**	**Theme or Message**	**Target Audience**	**Percent of Target Audience Reached**	**Summary of Results and Effectiveness (8.1.2)**
Volunteerism	Measurable goals shall be the amount of material collected and the number of volunteers involved.	Pollution Prevention	Teenagers, adults	100%	This activity is performed by PWESD. 3 participants helped remove loose trash and debris from city roadways and ROW, including 23 tons of trash using 8 roll-off

					dumpsters at a city-organized, volunteer-operated, clean-up event (other volunteers assisted, but were not recorded). Participation in Adopt-A-Road program, bulk item pick-up, bulk-item drop-off, litter pick-up events on public property. Adopt-A-Road cleanup: • 6 activities • 55 participants • 46 bags of trash collected 20 Boy Scouts participated in a storm drain marking event 9 volunteers participated at the Hometown Holiday Boutique event 6 volunteers participated at the Air Fair 341 residents dropped off HHW
Reporting	Measurable goals shall be: • Maintain methods for citizens to issue complaints, • Record the number of reports received.	Pollution Prevention	Adults	100%	This activity is performed by PWESD. 10 reports received Reporting has been received using the following methods: A web site fillable form, direct emails, phone calls to City offices, (City Manager, Council, customer service representative, or direct Public Works. 14 web pages related to SWQ Program, pollution prevention, and citizen engagement (in

					addition to 50+ links for further information).

E-2. Description of Changes to BMPs and Measurable Goals (8.1.3 and 8.4(l))			
a) Have there been any modifications to BMPs during this reporting period: ☐ Yes ☒ No. If yes, complete Section b, below (Add Rows as Necessary).			
b) Summary of BMP Modifications			
ADEQ Directed (8.1.4)	**BMP Modified**	**Analysis of Why BMP Was Ineffective or Infeasible**	**Analysis of Why BMP is Expected to Achieve Goals**
☐ Yes			
☐ Yes			
☐ Yes			
☐ Yes			

E-3. PUBLIC EDUCATION AND OUTREACH/INVOLVEMENT (6.4.1) Provide a Summary of Activities Planned for the Next Reporting Period in the Following Table			
Best Management Practices	**Measurable Goal (steps to measure progress)**	**Summary of Planned Activities**	**Proposed Schedule**
Volunteerism	Participation in clean-up events, bulk item pick-up and drop-off events, Adopt-A-Road program, and residential household hazardous waste events.	Continue to schedule events and publicize to the community through various outlets (print, online, signage, etc.) regarding the need for cleaning up and stopping illegal dumping. Begin a volunteer trainer assistance program.	On-going FY19
Reporting	Contact to department by citizens advising of issues or concerns relating to pollution causing activities and water quality issues. Establishment and implementation of various communication options and opportunities. # of complaints/concerns received.	Maintain, monitor, and promote reporting methods regarding illegal dumping.	On-going FY19

F. MCM-3: ILLICIT DISCHARGE DETECTION AND ELIMINATION (IDDE) PROGRAM (6.4.3 and 8.1.2)					
F-1. Provide a Summary of Illicit Discharge Detection and Elimination BMPs Implemented During the Reporting Period in the Following Table					
Best Management Practice	**Measurable Goal (steps to measure progress)**	**Completed (Yes or No)**	**Date of Implementation**	**Percent of Target Audience Reached**	**Summary of Results and Effectiveness (8.1.2)**

Stormwater Sewer Mapping	Map 25% of the developed area each year to be completed in Permit Year 4, June of 2020.	Yes	01/17	There is no target audience	This work is performed by PWESD. PWESD has mapped storm systems in 90% of developed, urbanized area. The data has been entered into City's GIS program, and is available at this website: https://buckeyearizona.maps.arcgis.com/apps/MinimalGallery/index.html?appid=1c734055983745c6ad06caf82e088da6#viewer=d0965135ce7c4f98916d4bc9da8841f9 No MS4 has been found during this reporting year. See Section B of this report for more information.
Outfall Inventory	Map all outfalls to WOTUS per AAC R18-11 to be completed by January, 2017. Map all outfalls (discharges from the MS4 to a WOTUS), to be completed by Permit Year 4, June 2020.	Yes	01/17	There is no target audience	This work is performed by PWESD. To date, 90% of the storm system of the urbanized, developed area has been mapped, and all outfalls in this area have been accounted for. No outfalls have been identified, as there are no direct discharges to Waters of the United States (WOTUS). All discharges have been found to be outlets to private storm systems. No outfalls have been observed during this reporting year. See Section B of this report for more information.
Implement IDDE Program	Conduct inspection program, address and report inspection findings along with schedule	Yes	01/17	There is no target audience	This work is performed by Public Works Department, Environmental Services and Streets Divisions. PWESD has maintained regulatory authority and written enforcement procedures, inspected residential areas and businesses, and responded to complaints. All inspections include a review for potential illicit discharges and improper disposal to the City right-of-way. Inspection identification and response data is recorded in section F4 of this report.

	to correct issues.				Using an updated list of business licenses, staff prepared a system to perform Hot Spot Inspections (HSI) of businesses and city facilities to look for illicit discharges to the right-of-way (ROW). Staff performed inspections of each residence eight times per year for proper trash storage during the quarterly bulk trash placement days. Public Works Department, Streets Division, performed site inspections during street sweeping activities, recording illegal dumping to the ROW when it was observed. Although a number of inspections have been performed, zero (0) inspections have been performed in the city MS4 as no MS4 has been found. See Section B of this report for more information on the City storm system.
Training	Employee participation in annual training.	Yes	04/17	40%	This work is performed by Human Resources and PWESD. The Human Resources Department, Risk Management, has provided training to field staff via an online training program. 38 staff that work in the Right of Way, or work at City facilities that might come into contact with potential pollutants have been trained. Additional training was received by staff associated with maintaining the ROW to recognize and report illicit discharges.
Dry Weather Screening	Continue identification of outfall inventory within MS4	Yes	01/17	There is no target audience	This work is performed by PWESD. The City is mapping stormwater structures and inspecting the storm system as mapping occurs. See Section B of this report for more information on the City storm system. See the Apollo Report and DMR Report for FY18.
Wet Weather Monitoring	In lieu of a Wet Weather Monitoring program, the City implements a Proactive Inspection Program including:	Yes	01/17	There is no target audience	This work is performed by Public Works, Environmental Division and Streets Division. The Proactive Inspection Program includes storm system inspections for signs of illicit discharges, and inspections using the Hot Spot Inspection form. The City also has participated in the Apollo camera monitoring activity. During FY18, Public Works volunteered to participate in auto-visual outfall monitoring in collaboration with ADEQ. The selection of the monitored outlet best represents the identified outlets within the City. See Section B of this report for more information on the City storm system. See the Apollo and DMR report for FY18.

	MS4 inspections, number of illicit discharges found, number of actions taken to remove pollutants.				
Analytical Monitoring	Perform the following: Maintain a contract to be able to perform analytical monitoring as needed. Record the number of illicit discharge/ improper disposal (IDID) flows observed that require sampling. Record the number of enforcement	Yes	01/17	There is no target audience	This work is performed by PWESD. Public Works is able to perform analytical monitoring of flows that are not able to be stopped, but are determined to be illicit discharges. State-wide contracts are in place that the City may use to accomplish this goal if needed. No analytical monitoring was performed in FY18 as no illicit discharges to the MS4 were found. No enforcement actions were taken for illicit discharges to the MS4. No schedule to stop an illicit discharge was created as none were found.

	actions taken including: Type of enforcement action. Schedule to stop the IDID.				
Written IDDE Procedures, Activities, and Analysis	Write procedures for all six minimum control measures. Complete an Enforcement Response Plan by September 2018. Perform an annual analysis of the programs.	Yes	06/17	There is no target audience	This work is performed by PWESD. The written procedures were completed in FY18. The activities recorded include: • Quarterly bulk trash placement inspections on all residential properties. • Commercial, industrial, and municipal property inspections utilizing the Hot Spot Inspection (HSI) form. • An Enforcement Response Plan has been written including Educational notices, Notice to Correct, and Notice of Violations. The plan includes an opportunity to meet with City staff, citation to court and fine issuances (per City Code). An analysis of the program occurs annually.
Annual Evaluation	Review the illegal discharges observed, and the City's activities and responsiveness.	Yes	06/17	There is no target audience	The BMP activities listed for this section are on schedule and appropriate to achieve the goals of this MCM.

F-2. DESCRIPTION OF CHANGES IN IDENTIFIED BMPS OR MEASUREABLE GOALS (8.1.3 and 8.4(l))
BMP modifications: ☐ Yes ☒ No. If yes, provide a brief explanation of each modification below (Add Rows as Necessary).

ADEQ Directed (8.1.4)	BMP Modified	Analysis of Why BMP Was Ineffective or Infeasible	Analysis of Why BMP is Expected to Achieve Goals
☐ Yes			
☐ Yes			
☐ Yes			

F-3. IDDE Staff Training (6.4.3.10)

Frequency of Training	Date of Training Event	Training Subject	Number of Employees Trained
Annual	June 2018	The City provides online training that covers the purpose of the stormwater program, how to detect and report illicit discharges as part of routine job duties, and the importance of pollution prevention and maintaining a healthy environment. Each employee is required to take the online training and to have it completed by the end of the fiscal year.	38
One time	August 2, 2017	Recognizing and responding to illicit discharges to the Right of Way. How to record observations, how to forward the reports to PWESD.	16

F-4. Illicit Discharge Identification and Response (6.4.3.5)

Date of Discovery	Method of Discovery	Type of Pollutants	Source	Estimated Duration of Illicit Discharge	Estimated Quantity	Date of Elimination	Escalated Enforcement Action Required?
6/8/17	Complaint	Oil	Human	1 day	10 gallons	6/8/18	No spill. Items were contained. City picked up and removed items to safe location to properly dispose without incident. No MS4 impacted.
2/7/18	Complaint	Hydraulic Fluid	Human	1 hour	20 gallons	2/7/18	Fluid immediately contained with spill clean-up material then swept up and properly disposed. Further follow-up not required. No MS4 impacted.
1/23/18	Complaint	Vegetation	Human	<1 day	<10 gallons	1/23/18	Resident blowing dead vegetation into street. Materials swept up. No further action needed. No MS4 impacted.
12/1/17	Complaint	Odor	Vegetation	Unknown	Unknown	1/8/18	Source was a storm drain containing irrigation runoff and dead vegetation. Confirmed storm drain in the area is to be emptied every other month in the dry season and monthly in

							the wet season. Informed the complainant the smell inside his house is not related to City services. No MS4 impacted.
10/17/17	Inspection	Vegetation	Vegetation	Unknown	100 pounds	10/17/17	Cleared vegetation overgrowth within City owned stormwater drainage channel on Beloat Road.
12/6/17	Complaint	Sanitary Sewer Overflow/Grease	Filiberto's Restaurant	10 hours	<100 gallons	12/6/17	Owner required to clean-up inside and outside areas affected by spill. Required to clean underground stormwater retention basin. Material contained to private property – no City right-of-way. No MS4 impacted.
12/26/17	Inspection	Construction debris overflowing onto street	KHOV and Beazer/Meritage Homes	1 day	<600 pounds	12/28/17	Spoke to superintendent and advised of immediate clean-up needed. Issues resolved 12/28/17. No MS4 impacted.
1/31/18	Inspection	Construction debris overflowing onto street	DR Horton Homes	1 day	<600 pounds	2/5/18	Spoke to superintendent and advised of immediate clean-up and street sweeping. Superintendent advises streets are swept every 3 days. Scheduled to be swept 2/1/18. Issue

							resolved by 2/5/18. No MS4 impacted.
3/28/18	Complaint	Leaky gas can	Human	unknown	n/a	3/28/18	Upon arrival to location, no gas can was located. No MS4 impacted.
3/20/18	Complaint	Garbage truck leaking hydraulic fluid	Garbage truck	< 1 day	< 5 gallons	3/20/18	Soaked up spill with absorbent. Cleaned area. No MS4 impacted.
4/3/18	Complaint	Garbage truck leaking hydraulic fluid	Garbage truck	<1 day	5 gallons	4/3/18	Fluid soaked into pavement. No further clean-up applicable. No MS4 impacted.
4/4/18	Complaint	Sand onto right-of-way from irrigation breach	Irrigation canal breach	<1 day	200 pounds	4/9/18	Contacted canal owner and farmer requesting clean-up and repair. Public Works Street Sweeping Crews removed sand from roadway. No MS4 impacted.
5/10/18	Complaint	Landscaping company blowing vegetation into roadway	Human	1 hour	40 pounds	5/10/18	Landscaping company was contacted; provided educational information. Work crews were immediately contacted and cleaned up mess same day. No MS4 impacted.

F-5. Unpermitted Discharges to MS4 (6.4.3.11)

Facility Name	Type of Activity	SIC Code	AZPDES Permit Number (if known)
n/a	n/a	n/a	n/a

F-6. Illicit Discharge Detection and Elimination

Provide a Summary of Activities Planned for the Next Reporting Period in the Following Table

Best Management Practices	Measurable Goal (steps to measure progress)	Summary of Planned Activities	Proposed Schedule
Stormwater Sewer Mapping	Map 25% of the developed area each year to be completed in Permit Year 4, June of 2020.	Continue mapping the next 25% of the urbanized municipal area.	Complete by FY20, Permit Year 4.
Outfall Inventory	Map all outfalls to WOTUS per AAC R18-11 to be completed by January, 2017. Map all outfalls (discharges from the MS4 to a WOTUS), to be completed by Permit Year 4, June 2020.	Continue to record outlet locations and document inspections as they are found. Update WOTUS maps with tributaries (washes that flow to waters listed in AAC R18-11) as they are found.	Complete by FY20, Permit Year 4.
Implement IDDE Program	Conduct inspection program, address and report inspection findings along with schedule to correct issues.	Perform the Proactive Inspection Program, recording results and correction activities required for IDIDs found. Continue inspection of commercial, industrial, and City properties using the Hot Spot Inspection form.	On-going FY19.

		Continue mapping and inspections of the City storm systems. Continue residential trash storage inspections.	
Training	Employee participation in annual training.	Conduct annual employee stormwater training.	On-going 2019
Dry Weather Screening	Continue identification of outfall inventory within MS4	Continue identification of outlet inventory within MS4.	On-going FY19
Wet Weather Monitoring	In lieu of a Wet Weather Monitoring program, Proactive Inspection Program results including: MS4 inspections, number of illicit discharges found, number of actions taken to remove pollutants.	Continue auto-visual outfall monitoring program. Continue the Proactive Inspection Program.	On-going FY19
Analytical Monitoring	Perform the following: Maintain a contract to be able to perform analytical monitoring as needed. Record the number of illicit discharge/ improper disposal (IDID) flows observed that require sampling. Record the number of enforcement actions taken including: Type of enforcement action. Schedule to stop the IDID.	Evaluate if an actual contract is needed with the City. Document all IDIDs observed, recording the number of enforcement actions taken and schedules to stop IDIDs.	On-going FY19

Written IDDE Procedures, Activities, and Analysis	Maintain procedures for all six minimum control measures. Complete an Enforcement Response Plan by September 2018. Perform an annual analysis of the programs.	Review all written procedures. Review IDDE program documentation and update as needed. Perform analysis of all programs. Update the SWMP and post online.	On-going FY19

G. MCM-4: CONSTRUCTION ACTIVITY STORMWATER RUNOFF CONTROL (6.4.4 and 8.1.2)

G-1. Provide a Summary of Construction Activity Stormwater Runoff Control BMPs Implemented During the Reporting Period in the Following Table

Best Management Practices	Measurable Goal	Date BMP was Implemented	Implementation Status (percent complete, date complete, on-going)	Summary of Results and Effectiveness (8.1.2)
Education/ Public Involvement	Number of complaints received regarding active site development construction activities. Numbers of applicants or potential applicants who have received educational information on construction Stormwater BMPs, number of web pages with construction Stormwater BMPs, and the number of hits those pages receive annually.	04/17 – Education 09/16 – Public Involvement	On-going	Starting in FY17, a standard comment has been issued regarding the need to copy the CGP to the City as we are now a permitted MS4. Additionally, the Engineering and Development Services Departments require all applicants to notify the City of their CGP permit, and to submit SWPPPs required by the AZPDES CGP. All applicants are informed to maintain the erosion and sedimentation controls. Drafted in FY18, all construction sites are being told to implement Waste, Erosion, and Sedimentation (WES) controls. No construction-related complaints have been received from the public during this reporting year. The City is updating its construction BMP manual processes and procedures. This work is on schedule and is appropriate to achieve the goals of this BMP for this program.

Control Wastes	**See below**	See below	See below	This activity is performed by the Engineering and Development Services Departments. Waste, Erosion, and Sediment (WES) controls are required on construction sites. See the BMPs Erosion/Sediment Control below.
BMPs Erosion/ Sediment Control	Measurable goals shall be the code authority to require erosion, sedimentation, and waste control on land disturbance sites.	03/18	On-going	This activity is performed by the Engineering and Development Services Departments. Authority over any potential discharge to the MS4 from construction is given to the City Engineer and Public Works and is addressed in City Code Section §19-2-1-D., §20-5-C, City's engineering standards, set in §23-2-1 and in the Stormwater Drainage System Design Manual 500 (DM500), which contains drainage and design standards adopted by City Council in 2007. Additionally, all contractors submitting plans are required to include the SWPPP required by the AZPDES CGP so that the waste, erosion, and sediment controls may be reviewed. A permit is not issued specifically for this work, but the plans are reviewed to ensure that BMPs are planned for the site. This terminology and information is being updated to be referred to as WES plan.

Inspections	Measurable goals include written procedures for site inspections and enforcement for land disturbance that is an acre or larger, or part of a common plan of development that is one acre or larger. Documentation of routine inspections and of inspections as a result of citizen reporting.	03/18	On-going.	Engineering and Development Services Departments are responsible for construction site inspections, and Public Works Department is responsible for follow-up Inspections for failures. Waste, erosion, and sediment BMPs are required as a part of the plans, and are a part of daily inspections. As BMPs are noted out of place, they are pointed out and a correction is requested. These requests are logged into the daily notes for each inspection performed. Any discharge found to enter or have the potential to enter the City MS4 is forwarded to the Public Works Department, Environmental Services Division (PWESD) for follow-up. The City has recorded zero “0” inspections for construction sites to ensure protection of the MS4.
Inventory	Measurable goal shall be the number of sites with land disturbance that is an acre or larger, or part of a common plan of development that is one acre or larger.	09/16	On-going	This activity is performed by the Engineering and Development Services Departments. An inventory of all sites is maintained by the departments responsible for issuing permits. The City has recorded zero “0” inventory of sites that discharge to the MS4.

Site Plan Review	Measurable goal shall be number of plans reviewed that include erosion, sedimentation and waste controls.	03/18	On-going.	This activity is performed by the Engineering and Development Services Departments. Plans have been submitted and reviewed for waste, erosion, and sediment (WES) controls. Plans not including stormwater pollution prevention plans are required to provide them before they may be moved forward with the development process. All plans submitted were required to implement BMPs for waste, erosion, and sedimentation controls. The City has recorded zero "0" site plan reviews as no construction has been found to discharge to the City MS4.
Enforcement	Measurable goals shall be the number of inspections, scheduled re-inspections, and follow-up compliance inspections performed, number of Notices of Violation issued, stop work orders issued, or other enforcement actions performed to stop encroachment of pollutants into the MS4.	03/18	On-going.	This activity is performed by PWESD in coordination with Engineering and Development Services Departments. Inspectors perform and record inspections, noting problems found. Violations are turned over to Public Works Environmental Services Division to begin IDDE enforcement activities. Currently the Public Works Department has the authority to issue violations if the construction debris encroaches onto the right-of-way. The Engineering and Development Services Departments also have the authority to shut down a site as an enforcement measure if needed. No enforcement activity occurred for protection of the City MS4 during FY18.

Training	Measurable goal shall be total number of staff associated with plan review, inspections, and enforcement versus the number of staff trained.	06/17	On-going	This activity is performed by PWESD in coordination with Engineering and Development Services Departments. One site plan review and inspection requirements training occurred with management staff. All staff associated with protection of the City MS4 have been trained.
Written Procedures	Measurable goal shall be to have all policies in place by permitted deadline.	03/18	On-going.	An enforcement procedure has been written. The City has a written BMP manual, and is currently drafting an updated manual to be completed in FY19 to coincide with the required WES plans.
Frequency of Inspections	Measurable goal shall be a written schedule for frequency of inspections and recording inspections based on this schedule. To be implemented by September 2017.	03/18	On-going.	The schedule has been completed, and any the City is prepared to inspect any construction site that may have the potential to discharge to the MS4.
Annual Evaluation	Evaluate activities for effectiveness and modify as needed for efficiency and pollution prevention compliance.	06/17	On-going	All work for this MCM is on schedule and is appropriate for the required goals. All BMPs are meeting the requirements of the permit for protection of the MS4.

G-2. Description of Changes in BMPs and Measurable Goals (8.1.3 and 8.4(l))			
BMP modifications: ☐ Yes ☒ No. If yes, provide a brief explanation of each modification below (Add Rows as Necessary).			
ADEQ Directed (8.1.4)	**BMP Modified**	**Analysis of Why BMP Was Ineffective or Infeasible**	**Analysis of Why BMP is Expected to Achieve Goals**
☐ Yes			
☐ Yes			
☐ Yes			

G-3. Construction Activity Complaints (6.4.4.5 and 8.4(i))	
Number of Complaints Received	**Number of Complaint Responses/Resolved**
0	n/a

G-4. Construction Activity Inspections			
Number of Active Construction Sites	**Number of Active Construction Sites Inspected**	**Number of Re-Inspections**	**Average Inspection Frequency**
0	100%	0	Stormwater pollution prevention inspections occur with every inspection. Minimum of monthly. Although there are thousands of sites in a fiscal year, and they have multiple inspections per month, only inspections related the City MS4 are presented here.

Number of Violations	Number of Enforcement Actions
0	0

G-5. Construction Activity Stormwater Runoff Control
Provide a Summary of Activities Planned for the Next Reporting Period in the Following Table

Best Management Practices	Measurable Goal (steps to measure progress)	Summary of Planned Activities	Proposed Schedule
Public Involvement	Number of complaints received regarding active site development construction activities.	Establish an educational opportunity for citizens to be aware of and report construction site concerns.	Ongoing
Education	Provide education to applicants and permittees on stormwater pollution prevention requirements for construction practices.	Coordinate between departments on methods used to provide information to applicants. Provide brochures for applicants regarding waste, erosion, and sedimentation controls.	Ongoing
Waste/ Erosion/ Sedimentation Control	Measurable goals shall be to maintain the authority to require erosion, sedimentation, and waste control on land disturbance sites.	Review codes and processes to ensure City maintains authority on construction sites. The City will update standard comments provided to all land development applicants informing them that Buckeye is a Phase II MS4, and they must implement Waste, Erosion, and Sedimentation controls. Written procedures will be implemented in FY18 as noted in the approved NOI.	Ongoing

Inspections	Measurable goals include written procedures for site inspections and enforcement for land disturbance that is an acre or larger, or part of a common plan of development that is one acre or larger.	Review/develop written procedures for construction site inspections as needed. The City will develop inspection methods that allow tracking of inspections and corrective actions as well as reporting the results.	On-going review and procedure updates as needed.
Inventory	Measurable goal shall be the number of active construction sites with land disturbance that is an acre or larger or part of a common plan of development that is one acre or larger.	Update the active construction site inventory list so that staff are able to easily identify land disturbance that is an acre or larger or part of a common plan of development that is one acre or larger.	Ongoing
Site Plan Review	Measurable goal shall be the number of sites with land disturbance that is an acre or larger, or part of a common plan of development that is one acre or larger.	As plans are made available to staff, review for accuracy of stormwater quality controls.	On-going review and procedure updates as needed.
Enforcement	Measurable goal shall be number of plans reviewed that include erosion, sedimentation and waste controls.	Enact enforcement response plan.	Completed
Training	Measurable goal shall be the total number of staff associated with the plan review, inspections, and enforcement versus the number of staff trained.	Ensure all staff involved with inspections of waste, erosion, and sedimentation controls are trained in plan review, inspections, and enforcement procedures.	Document review staff have been trained. Continue staff training once the BMP manual is updated.
Written Procedures	Measurable goal shall be to have all policies in place by permitted deadline.	Ensure all procedures and policies are up to date and accurate.	Annual review, staff training, and BMP manual update.

H.	MCM-5: POST-CONSTRUCTION STORMWATER MANAGEMENT IN NEW DEVELOPMENT AND REDEVELOPMENT (6.4.5 and 8.1.2)			
H-1.	**Provide a Summary of Post-Construction Activity Stormwater Runoff Control BMPs Implemented During the Reporting Period in the Following Table**			
BMP	**Measurable Goal (steps to measure progress)**	**Completed (Yes or No)**	**Cite Local Code(s) Being Used (If available, web link for code(s))**	**Summary of Results and Effectiveness (8.1.2)**
Runoff Control Assessment	Measurable goal, review this Storm Water Drainage System Design Manual, DM500-1.3 and update as necessary.	Yes	The Buckeye Development Code 2010 (Amended 2018.08.07) is a regulatory document that provides direction on how development or redevelopment will occur within Buckeye. The Buckeye The Engineering Design Standards guides the design process for all development in the city. Section 5-0 Grading and Drainage Contains the Storm Water Drainage System Design-DM 500 These documents are available on our website: www.buckeyeaz.gov DEVELOPMENT CODE: https://www.buckeyeaz.gov/home/showdocument?id=6149 DM500 https://www.buckeyeaz.gov/home/showdocument?id=442	The City has performed the necessary activities to maintain up-to-date codes and ordinances to protect water quality.
Site Plan Reviews	Measurable goals will include maintaining a plan review process for all public and private construction occurring within the City, and the number of applications received and reviewed.	Yes		Completed in FY18 per the approved NOI. All plans are reviewed using drainage manual #DM500-1.3.
Inventory	An inventory of post-construction structural stormwater control measures will be maintained. Measurable goal will be an inventory of	Yes		There currently are no known structures.

	post-construction controls in place.			
Inspections	Measurable goal will be the number of inspections performed.	Yes	The Buckeye Development Code 2010 (Amended 2018.08.07) is a regulatory document that provides direction on how development or redevelopment will occur within Buckeye. The Buckeye The Engineering Design Standards guides the design process for all development in the city. Section 5-0 Grading and Drainage Contains the Storm Water Drainage System Design-DM 500 These documents are available on our website: www.buckeyeaz.gov DEVELOPMENT CODE: https://www.buckeyeaz.gov/home/showdocument?id=6149 DM500 https://www.buckeyeaz.gov/home/showdocument?id=442	No known structures exist to be inspected.

H-2. Post-Construction Stormwater Management in New Development and Redevelopment (8.4(j))	
Number of Sites Requiring Post-Construction Controls	**Number of Post-Construction Stormwater Controls Inspected**
0	n/a
Number of Post-Construction Stormwater Control Violations	**Number of Post-Construction Stormwater Control Violations Resolved**
0	n/a

H-3. Description of Changes in BMPs or Measurable Goals (8.1.3 and 8.4(l))			
BMP modifications: ☐ Yes ☒ No. If yes, provide a brief explanation of each modification below (Add Rows as Necessary).			
ADEQ Directed (8.1.4)	**BMP Modified**	**Analysis of Why BMP Was Ineffective or Infeasible**	**Analysis of Why BMP is Expected to Achieve Goals**
☐ Yes			
☐ Yes			
☐ Yes			

H-4. Post-Construction Stormwater Management in New Development and Redevelopment (6.4.1) Provide a Summary of Activities Planned for the Next Reporting Period in the Following Table			
Best Management Practices	**Measurable Goal (steps to measure progress)**	**Summary of Planned Activities**	**Proposed Schedule**
Runoff Control Authority	Measurable goal: review the Storm Water Drainage System Design Manual, DM500-1.3 and update as necessary.	Review Stormwater Drainage System Design Manual DM500-1.3 Update the BMP manual for WES.	On-going. BMP manual is in the process of being updated, to be completed in FY19.
Site Plan Reviews	Measurable goals include: maintaining a plan review process for all public and private construction occurring within the City, and the number of applications received and reviewed.	As plans are presented, review for stormwater quality. Provide suggested improvements as needed.	On-going
Inventory	An inventory of post-construction structural stormwater control measures will be maintained. Measurable goal will be an inventory of post-construction controls in place.	Continuation of inventory and inspection process.	On-going
Inspections	Measurable goal will be the number of structures and the number of inspections performed.	Update as needed	On-going

I.	POLLUTION PREVENTION AND GOOD HOUSEKEEPING FOR MUNICIPAL OPERATIONS (6.4.6)		
I-1.	**Summary of Pollution Prevention and Good Housekeeping BMPs in the Following Table**		
Facility Name (Group Facilities as Appropriate)	**Best Management Practices**	**Measurable Goal (steps to measure progress)**	**Summary of Results and Effectiveness (8.1.2)**
Public Works Fleet Management and Water Resources Maintenance Yard	SWPPP	Create a SWPPP for this site by the end of Permit Year 1. To fulfill the requirements as detailed in the SWPPP including all actions, schedules, and objectives, as well as an annual evaluation of the effectiveness of the SWPPP.	This activity is performed by PWESD. A SWPPP for this facility is complete.
Earl Edgar Maintenance Building	SWPPP	Create a SWPPP for this site by the end of Permit Year 1. To fulfill the requirements as detailed in the SWPPP including all actions, schedules, and objectives, as well as an annual evaluation of the effectiveness of the SWPPP.	This activity is performed by PWESD. A SWPPP for this facility is complete.
Public Works Yard	SWPPP	Create a SWPPP for this site by the end of Permit Year 1. To fulfill the requirements as detailed in the SWPPP including all actions, schedules, and objectives, as well as an annual evaluation of the effectiveness of the SWPPP.	This activity is performed by PWESD. A SWPPP for this facility is complete.

I-2.	Description of Changes in BMPs and Measurable Goals (8.1.3 and 8.4(l))		
BMP modifications: ☐ Yes ☒ No. If yes, provide a brief explanation of each modification below (Add Rows as Necessary).			
ADEQ Directed (8.1.4)	**BMP Modified**	**Analysis of Why BMP Was Ineffective or Infeasible**	**Analysis of Why BMP is Expected to Achieve Goals**
☐ Yes			
☐ Yes			
☐ Yes			

I-3.	Updates to Operation and Maintenance Programs (6.4.6 (a-g))
N/A	

I-4. Pollution Prevention and Good Housekeeping for Municipal Operations
Provide a Summary of Activities Planned for the Next Reporting Period in the Following Table

Best Management Practices	Measurable Goal (steps to measure progress)	Summary of Planned Activities	Proposed Schedule
Inventory	Measurable goal will be an updated list of municipal facilities, updated annually.	Update the inventory of public buildings. Create a SWPPP when applicable, and add facilities to inspection schedule as needed.	Complete. To be updated annually.
Facility Prioritization	Measurable goal will be a prioritization of the municipal facilities including the reason for the prioritization, and the frequency of inspections. To be updated annually.	Determine activities performed at each facility, the existence of potential pollutants at each facility, and steps necessary to contain pollutants or BMPs necessary to maintain pollution prevention.	Complete. To be updated annually.
Inspections	Measurable goal will be to perform inspections of 20% of all facilities each permit year, to be completed in Permit Year 5.	Perform stormwater pollution prevention inspections of each facility owned or operated by the municipality.	All major working facilities located in the Urbanized Area where inspected in Permit Year 1. This activity is On-going: Inspect remote and low activity facilities for compliance in FY19 and FY20. FY19 – 40% FY20 – 40%
Facility BMP Update	Measurable goal will be to perform inspections on all high priority facilities annually, and to implement recommended best management practices to control pollution from municipal operations.	Perform inspections on high priority facilities owned or operated by the municipality. Provide stormwater quality improvement suggestions as needed.	Complete. To be updated annually.
O&M Procedures	Measurable goals shall include a schedule for inspections, maintenance procedures and schedules, to be completed by September 2017.	MS4 maintenance activities.	On-going in FY19

MS4 Operations and Maintenance Activities	Measurable goal shall include number of stormwater structures inspected, the number maintained, and shall include but not limited to the number of miles swept and number of inlets inspected and cleaned. An ongoing activity.	Perform and record MS4 maintenance	On-going in FY19
Training	Measurable goals shall include the number of staff trained on stormwater pollution prevention and good housekeeping annually.	Staff training on stormwater pollution prevention and good housekeeping techniques.	On-going in FY19

J. Receiving Waters and Monitoring (7.0)					
Name of Receiving Water Included in Appendix B	**Number of Outfalls**	**Receiving Water Listed as Impaired, Not-Attaining and/or OAW**	**Listed Pollutants**	**TMDL**	**Analytical Monitoring Conducted this Reporting Year?**
n/a	0	n/a The Osborn Road /Tuthill /Acacia Wash had been listed as a WOTUS, but it has since been found to flow into a privately owned and designed storm system.	n/a	☐ Yes ☒ No	☐ Yes ☒ No
				☐ Yes ☐ No	☐ Yes ☐ No
				☐ Yes ☐ No	☐ Yes ☐ No
				☐ Yes ☐ No	☐ Yes ☐ No
				☐ Yes ☐ No	☐ Yes ☐ No

Receiving Water	How many outfalls will be sampled?	List parameter(s) to be analyzed	Provide a description of selected BMPs and how they will specifically address the pollutant(s) causing the impairments or how the BMPS will be protective of the OAW
n/a	0	n/a	n/a The City is performing automatic visual sampling looking for sign of pollutants such as trash and turbidity. See Section B regarding the City mapping activities for information on the MS4 and outfalls.

Certification

The annual report must be signed by either a principal executive officer or ranking elected official, or by a duly authorized representative (refer to Permit Part 9.9(a)).

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 information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature

09/19/2018
Date (mm/dd/yyyy)

Roger Klingler
Name (printed)

City Manager
Title

SMALL MS4 DISCHARGE MONITORING REPORT (DMR) FORM FOR PERMIT NO. AZG2016-002

c. Visual Monitoring - Outfalls or Screening Points

1.b.: Receiving Water: Tuthill/Acacia/Osborn Road Wash. This wash empties into a retention basin at the SE corner of the development approximately 1.75 miles from the outlet to the drainage basin. Overflow empties into a Maricopa County Flood Control District basin south of I-10 that is a designed structure with a 100 year 2 hour event.

Date	1.a. Outfall or Screening Point Name/ID/Photo #	1.c. Sample collection Season				1.d. Monitoring Type (DW-ID, WW)	1.e. Sheen	1.f. Color	1.g. Foam	1.h. Solids (specify)	1.i. Odor (specify)	1.j. Other (specify)
		SW1	SW2	WW1	WW2							
8/24/2017	Apollo #08242017-1550	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
8/29/2017	Apollo #08292017-2350	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
9/5/2017	Apollo #09052017-0906	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
9/7/2017	Apollo #09072017-1706	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
9/9/2017	Apollo #09092017-0636	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
9/10/2017	Apollo #09102017-0106	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
9/11/2017	Apollo #09112017-1106	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
9/12/2017	Apollo #09122017-1836	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
9/14/2017	Apollo #09142017-1036	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
9/15/2017	Apollo #09152017-1006	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
9/21/2017	Apollo #09212017-1318	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
9/22/2017	Apollo #09222017-0645	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
9/26/2017	Apollo #09262017-1012	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
9/26/2017	Apollo #09262017-1542	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
9/27/2017	Apollo #09272017-0625	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
9/27/2017	Apollo #09272017-2327	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
10/2/2017	Apollo #10022017-1540	n/a	n/a	n/a	n/a	WW	-	-	-	-	-	-
10/30/2017	Apollo #10302017-1404	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
10/30/2017	Apollo #10302017-1520	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
10/31/2017	Apollo #10312017-1430	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
11/1/2017	Apollo #11012017-1323	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
11/3/2017	Apollo #11032017-0523	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-

Date	1.a. Outfall or Screening Point Name/ID/Photo #	1.c. Sample collection Season				1.d. Monitoring Type (DW-ID, WW)	1.e. Sheen	1.f. Color	1.g. Foam	1.h. Solids (specify)	1.i. Odor (specify)	1.j. Other (specify)
		SW1	SW2	WW1	WW2							
11/4/2017	Apollo #11042017-0752	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
11/4/2017	Apollo #11042017-0952	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
11/5/2017	Apollo #11052017-0830	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
11/6/2017	Apollo #11062017-2129	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
11/10/2017	Apollo #11102017-0908	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
11/10/2017	Apollo #11102017-0910	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
11/10/2017	Apollo #11102017-1601	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
11/10/2017	Apollo #11102017-2120	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
11/12/2017	Apollo #11122017-0059	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
11/13/2017	Apollo #11132017-1216	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
11/13/2017	Apollo #11132017-0949	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
11/14/2017	Apollo #11142017-0549	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
11/14/2017	Apollo #11042017-0549	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
11/14/2017	Apollo #11142017-0504	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
11/17/2017	Apollo #11172017-1010	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
11/18/2017	Apollo #11182017-0446	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
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11/19/2017	Apollo #11192017-1451	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
11/20/2017	Apollo #11202017-1552	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
11/21/2017	Apollo #11212017-0945	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
11/23/2017	Apollo #11232017-1000	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
11/24/2017	Apollo #11242017-0535	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
11/25/2017	Apollo #11252017-2331	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
11/26/2017	Apollo #11262017-0817	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
11/26/2017	Apollo #11262017-0749	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
11/27/2017	Apollo #11272017-0850	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
11/27/2017	Apollo #11272017-0736	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
11/27/2017	Apollo #11272017-1500	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
12/8/2017	Apollo #12082017-1500	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
12/17/2017	Apollo #12172017-1500	n/a	n/a	n/a	n/a	WW	-	-	-	-	-	-

Date	1.a. Outfall or Screening Point Name/ID/Photo #	1.c. Sample collection Season				1.d. Monitoring Type (DW-ID, WW)	1.e. Sheen	1.f. Color	1.g. Foam	1.h. Solids (specify)	1.i. Odor (specify)	1.j. Other (specify)
		SW1	SW2	WW1	WW2							
12/19/2017	Apollo #12192017-1500	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
1/9/2018	Apollo #01092018-1249	n/a	n/a	n/a	n/a	WW	-	-	-	-	-	-
1/9/2018	Apollo #01092018-2049	n/a	n/a	n/a	n/a	WW	-	-	yes	-	-	-
1/9/2018	Apollo #01092018-2149	n/a	n/a	n/a	n/a	WW	-	-	yes	-	-	-
1/9/2018	Apollo #01092018-2249	n/a	n/a	n/a	n/a	WW	-	-	yes	-	-	-
1/9/2018	Apollo #01092018-2349	n/a	n/a	n/a	n/a	WW	-	-	-	-	-	-
1/9/2018	Apollo #01092018-2049	n/a	n/a	n/a	n/a	WW	-	-	yes	-	-	-
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1/10/2018	Apollo #01102018-0149	n/a	n/a	n/a	n/a	WW	-	-	yes	-	-	-
1/10/2018	Apollo #01102018-0249	n/a	n/a	n/a	n/a	WW	-	-	yes	-	-	-
1/10/2018	Apollo #01102018-0349	n/a	n/a	n/a	n/a	WW	-	-	yes	-	-	-
1/10/2018	Apollo #01102018-0849	n/a	n/a	n/a	n/a	WW	-	-	yes	-	-	-
1/11/2018	Apollo #01112018-1700	n/a	n/a	n/a	n/a	WW	-	-	-	-	-	-
2/5/2018	Apollo #02052018-1800	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
2/15/2018	Apollo #02152018-1929	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
2/15/2018	Apollo #02152018-0913	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
2/16/2018	Apollo #02162018-0903	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
2/22/2018	Apollo #02222018-1009	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
2/26/2018	Apollo #02262018-1332	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
2/27/2018	Apollo #02272018-0659	n/a	n/a	n/a	n/a	WW	-	-	-	-	-	-
2/27/2018	Apollo #02272018-0813	n/a	n/a	n/a	n/a	WW	-	-	-	-	-	-
3/1/2018	Apollo #03012018-1112	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
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4/4/2018	Apollo #04042018-1800	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
4/14/2018	Apollo #04142018-1700	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
4/18/2018	Apollo #04182018-1800	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
5/1/2018	Apollo #05012018-1800	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
5/18/2018	Apollo #05182018-1800	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-

Date	1.a. Outfall or Screening Point Name/ID/Photo #	1.c. Sample collection Season				1.d. Monitoring Type (DW-ID, WW)	1.e. Sheen	1.f. Color	1.g. Foam	1.h. Solids (specify)	1.i. Odor (specify)	1.j. Other (specify)
		SW1	SW2	WW1	WW2							
6/8/2018	Apollo #06082018-0601	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
6/8/2018	Apollo #06082018-0600	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
6/14/2018	Apollo #06142018-0448	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
6/15/2018	Apollo #06152018-1125	n/a	n/a	n/a	n/a	DW-ID	yes	-	-	-	-	-
6/15/2018	apollo #06152018-1155	n/a	n/a	n/a	n/a	DW-ID	-	-	yes	-	-	-
6/15/2018	Apollo #06152018-1225	n/a	n/a	n/a	n/a	DW-ID	-	-	yes	-	-	-
6/15/2018	Apollo #06152018-1255	n/a	n/a	n/a	n/a	DW-ID	-	-	yes	-	-	-
6/16/2018	Apollo #06162018-0325	n/a	n/a	n/a	n/a	WW	-	-	yes	-	-	-
6/16/2018	Apollo #06162018-0355	n/a	n/a	n/a	n/a	WW	-	-	yes	-	-	-
6/16/2018	Apollo #06162018-0725	n/a	n/a	n/a	n/a	WW	-	-	yes	-	-	-
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6/16/2018	Apollo #06162018-0755	n/a	n/a	n/a	n/a	WW	-	-	yes	-	-	-
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6/16/2018	Apollo #06162018-0955	n/a	n/a	n/a	n/a	WW	-	-	yes	-	-	-
6/20/2018	Apollo #06202018-0637	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
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6/21/2018	Apollo #06212018-2303	n/a	n/a	n/a	n/a	WW	-	-	-	-	-	-
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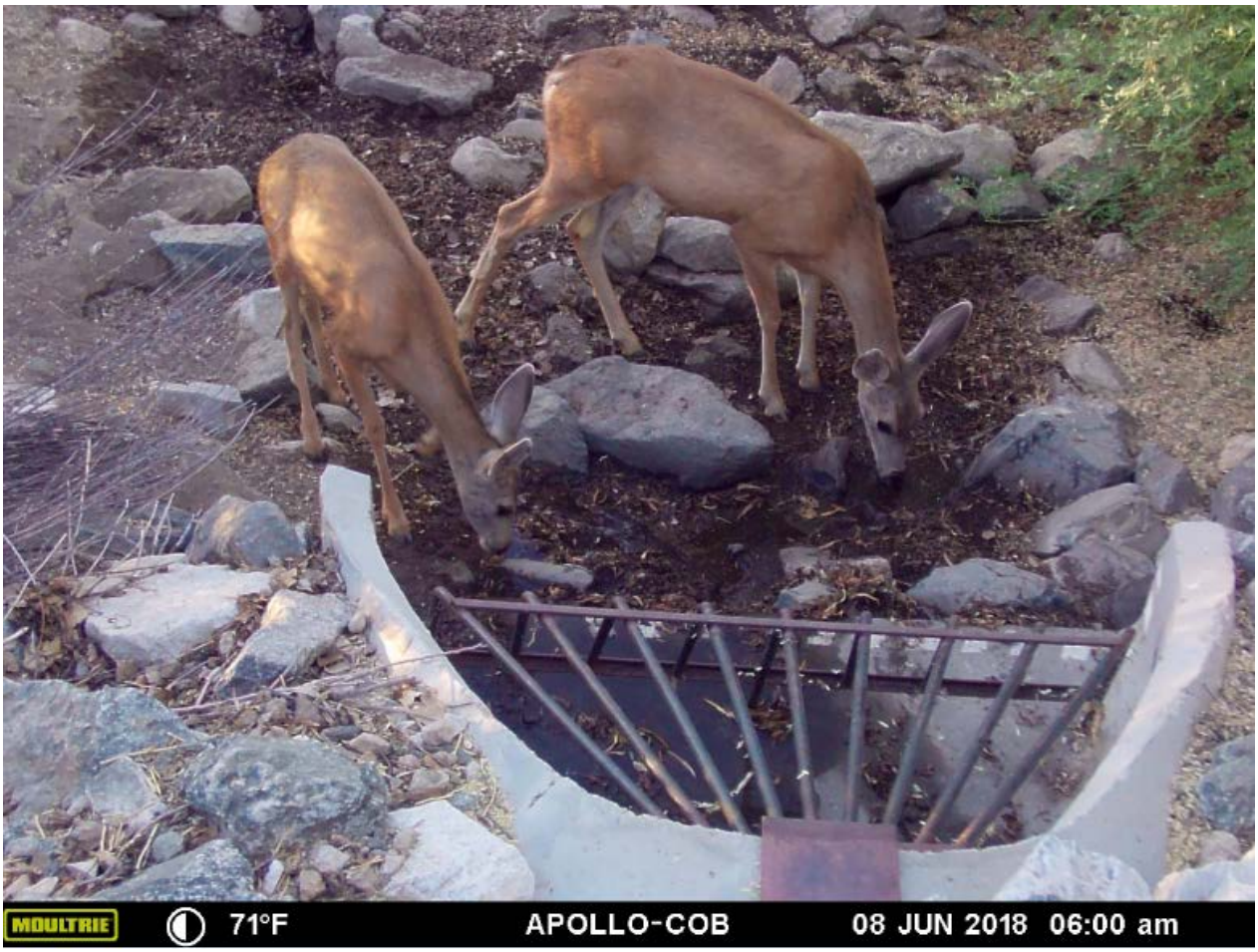
6/22/2018	Apollo #06222018-0305	n/a	n/a	n/a	n/a	WW	-	-	-	-	-	-
6/24/2018	Apollo #06242018-0351	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-
6/24/2018	Apollo #06242018-1008	n/a	n/a	n/a	n/a	DW-ID	-	-	-	-	-	-



APOLLO

Auto Visual Monitoring – a pilot program with collaboration between the City of Buckeye Public Works and the Arizona Department of Environmental Quality

FY18 Permit Cycle – July 1, 2017 through June 30, 2018

By: Amy Murray and Robert van den Akker

Contents

Project Management Team

Amy Murray – City of Buckeye
Meghan Smart – ADEQ (pictured Figure 1)
Robert van den Akker – City of Buckeye (pictured Figure 1)

Figure 1

Introduction

A collaboration between the State of Arizona Department of Environmental Quality (ADEQ) and the City of Buckeye Public Works Department was created and designed to help develop and enhance the outfall monitoring requirement of the municipal stormwater permit to capture the "first flush" of an outfall. This auto visual outfall monitoring pilot program, along with the camera named "Apollo" on loan from ADEQ, has collectively been referred to as "Apollo-COB Project" or simply "Apollo".

The State of Arizona Small Municipal Separate Stormwater Sewer "MS4" Permit #AZG2016-002, section 6.4.3.8(b) *Visual Monitoring,* allows for an alternative practice to visual discharge monitoring of outfalls. The Apollo project was proposed by ADEQ to test an alternative method that allows frequent, repetitive, and automated documentation of the outfall via programmed photography. The City of Buckeye volunteered to test this monitoring method.

With the addition of programmed photography, it was proposed the municipality would be able to monitor the area for up to half-hour intervals in an attempt to observe the "first flush" outfall discharge. Staff visited the monitoring location on a routine basis to check the status of the outfall and camera in place of the permit requirement of running to the outfall during potential rain events for wet weather monitoring.

Stormwater Quality Program

The City was charged with implementation of a stormwater quality program on September 29, 2016. This monitoring program is in direct response to the City's Arizona Pollution Discharge Elimination System (AZPDES) Permit #2016-002 (the general permit issued by the State of Arizona in place of the federal National Pollution Discharge Elimination System (NPDES) Small MS4 permit).

In addition to, and separate from the auto visual monitoring during wet weather, the City used this opportunity to capture visual assessments of the variety of wildlife, (including varmints) living in the area, the potential effects of neighborhood irrigation runoff on outfalls, and detection of illegal dumping. Visual monitoring began on August 23, 2017, and continued daily through June 30, 2018, (FY18, Permit Year 2 – the first full year of the City of Buckeye's AZPDES permit).

Project Area Description

This study focused on an outfall located in the Verrado subdivision. Verrado is located within the east-central portion of Buckeye, Arizona, a city the Phoenix Metropolitan area of Maricopa County, an area of the Sonoran Desert of the Southwestern United States.

As detailed in the City of Buckeye General Plan (Imagine Buckeye 2040), the planning area of the city includes 642 square miles, making it the largest planned land area in the state of Arizona. According to the 2010 decennial census, the City had a population just over 50,000, with more than 18,000 homes, and based on current estimates, the population is over 70,000 with more than 23,000 homes with the majority of homes having been built after the year 2000. According to the 2010 Decennial Census, the Buckeye population has a significant mix of demographic types; however, the majority of the Buckeye population has an average of a high school education, identify themselves as 80% White by race, and 40% Hispanic by ethnicity. The population consists of 20% school age children, 25% young adults, 25% adults, and 20% elderly (the remaining 10% are younger than school age). The average household income is less than $100,000, with 70% home ownership by first-time home buyers. Living condition consists of a 70/30 split between owners and renters.

Verrado is a high-profile area with small-town charm boasting over 70 parks nestled in the southeast foothills of the White Tank Mountains and features a Main Street with shops servicing many of the community's needs.

Tree-lined streets, access to trails, swimming, golf, activities, celebrations and more makes this community one of the most desired in Arizona and very unique in the Phoenix Metropolitan area. An overhead photo of a sample of the community may be seen in Figure 2.

Figure 2

This subdivision consists of approximately 3,200 residential homes and more than 60 non-residential properties encompassing 3.5 square miles (2,247 acres).

The development of this community began in 2002. It is unique in that it's Community Master Plan, approved November 17, 1999, designates the stormwater drainage structures to be owned and maintained by the City of Buckeye. No other newly developed (post- 2000) subdivision in the City has this designation.

Outfall Location

The City of Buckeye and the State of Arizona chose the Tuthill/Acacia/Osborn Road Wash (the wash) within the Verrado neighborhood as its monitoring location (see Figure 3).

Figure 3

The watershed, outfall (see red dot on Figure 3), and the wash (see blue line on Figure 3) are a general representation of 10 similar features within this large subdivision along the two mile stretch of Acacia Road located adjacent to the wash. All ten outfalls were scrutinized for this project and all had negative constraints ranging from being too close to homes and pedestrian walkways, to over-vegetated areas, or vegetation that was too large, or difficulty in access to the outfall. This location (see Figure 4) was decided due to its ease of access, direct discharge to a wash[1], low profile area, significant low brush vegetation masking visibility from neighboring properties, and distance from pedestrian walkways. Additionally, this location had safe street parking, as frequent site visits were important to retrieve data and monitor equipment status.

The monitoring area is located at the central portion of the Verrado community near the intersection of N. Acacia Way and W. Springfield Street, just south of Indian School Road. The outfall empties approximately 25' above the high water mark of the wash. The watershed seen in Figure 3 spans approximately 15 residential acres containing nearly three miles of curb and gutter.

Figure 4

During FY18, confirmation of the wash, regional drainage flows, and collaboration with the Flood Control District of Maricopa County, proved that this area was not, by definition, an outfall as it did not discharge to a Water of the United States (WOTUS) directly, nor was it a tributary to a WOTUS. From this point forward this discharge point will be referred to an as outlet, not an outfall[2].

[1] This connection to a Water of the United States has been disproven.
[2] A point source that discharges to Waters of the United States as defined in 40CFR122.26(b)(9)

Outlet Drainage Area and Rainfall Totals

According to data collected by the Flood Control District of Maricopa County, The Phoenix Valley averages 24 rain events per year measuring ½" or less, and experiences an average annual rainfall of 8 inches. During 2017 and 2018, the region was continuing to experience a multi-decade time of drought. The total number of rain events with a threshold of .01" of measurable rainfall or greater during the monitoring period of July 1, 2017, through June 30, 2018, was 16. The City experienced a drought year with 4.5" of measurable rainfall during FY18. Precipitation records from Maricopa County Flood Control District's historical data period July 1, 2017-June 30, 2018, for White Tanks Flood Relief Structure (FRS) #4 (ID# 87800), Buckeye, Arizona, shown graphically in Figure 5 below.

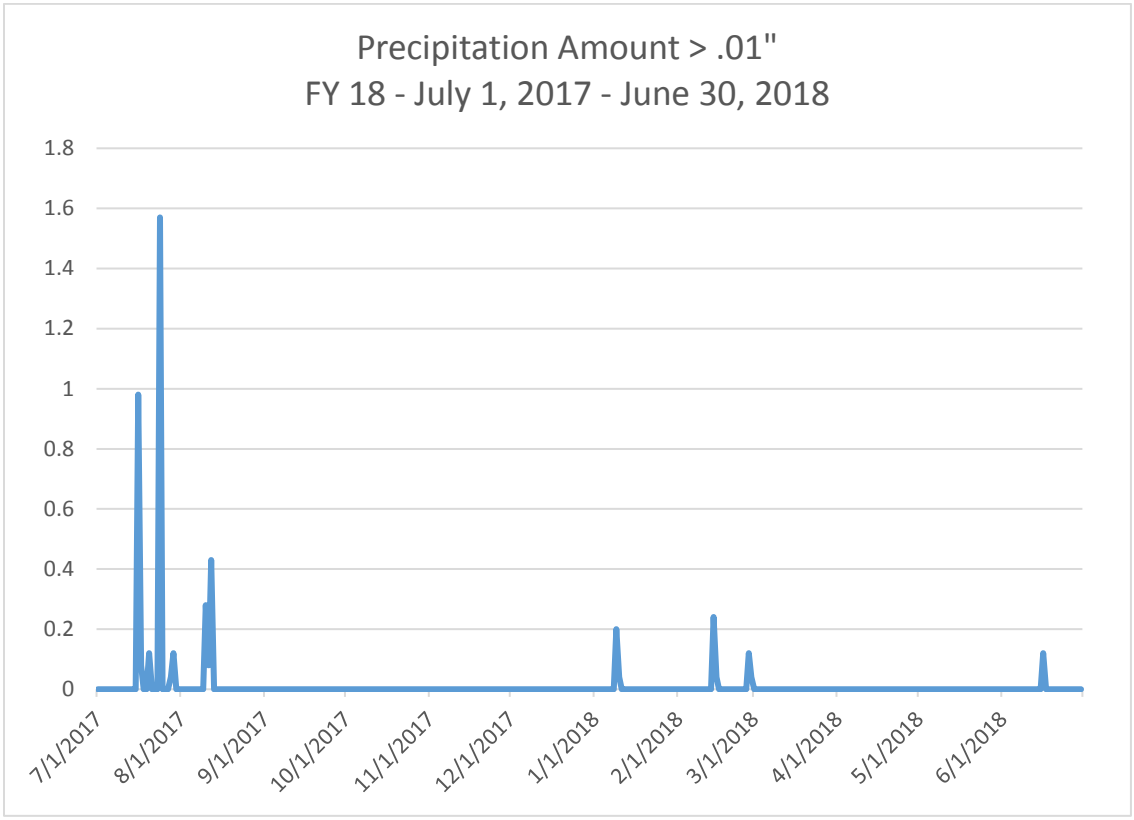


Figure 5

Stormwater Flow Design

Stormwater runoff drains from residential homes to the curb and gutter system of Shadow Drive, Springfield Street, and N. Acacia Way. Rainfall entering the wash flows approximately 1¾ miles south to a retention basin designed to hold a 100 year flow, located at the southeasternmost corner of the development.

Should rainfall exceed the drainage basin storage volume, overflow would continue south to a Flood Control District of Maricopa County (FCD) earthen flow way, and continue underneath Interstate 10. The FCD's channels empty to a 500-year design basin named "White Tanks Flood Relief Structure #4 Dam" (FRS #4). Should rainfall exceed the FCD's White Tanks FRS #4 design, flow would then discharge to the Blue Horizons subdivision retention basins. The FCD is currently redesigning FRS #4 to redirect flow to larger channels that will flow to the Southeast.

Note: As discussed earlier, but significantly noted again, because there is no discharge to a WOTUS, the discharge point from the subdivision to the wash is noted by City as an outlet or discharge point, not an outfall which by definition may only drain to a WOTUS.

Weather Sources

The City utilized various weather sources (Flood Control District of Maricopa County, National Weather Service, Weather Underground, local meteorologists, etc.) to forecast precipitation opportunities.

When days of dry weather (no rainfall forecasted) were present, the photo controls were set at various options to gauge the effectiveness of the data capture including motion detection, hourly, and half-hour settings. When rain was forecast, photo capture camera setting options were set to increased frequency.

Figure 6

Camera Details, Settings, Data Storage

The State of Arizona loaned the City of Buckeye a Moultrie M-550 (Gen2) Digital Game Camera (Moultriecam) with metal encasing (Figure 6). The City mounted the equipment onto a metal pole and posted signage. The camera was equipped with a metal covering which the City was able to lock in place to help deter tampering and theft. Additionally, ADEQ recommended use of a non-threatening sign to deter tampering with the camera, which the city installed shortly after camera placement (Figure 7 and Figure 8). During this program the City did not experience vandalism.

The camera was supplied with various setting capabilities to capture photos, which the City tested and changed based on weather conditions. Staff placed makeshift markers (utilizing rocks from the area) to indicate 5', 10', and 15' distances from the discharge point of the outlet to assist with determining the approximate volume of flow.

The date/time stamp, photo quality (high 7MP), fast flash, temperature, motion detection and time lapse features were each tested to determine efficiency of capturing a "first flush" scenario.

Figure 7

Settings included various capture modes:

- Continuous motion detection with a 5-second delay
- 30-minute intervals between specified times during one or two periods of the day (morning and afternoon)
- 1 photo between specified intervals during morning and afternoon hours
- Hourly photos between specified intervals during forecasted times

Figure 8

The City used a 16 MP SD card to store images. Images were downloaded onto a permanent server which allowed for adequate review and documentation. The camera photo capture settings were increased prior to rain events down to 30-minute intervals. Photos were captured more frequently during forecasted rain event periods in order to attempt to capture the first flush and subsequent visual flow activities.

The Multriecam was user friendly, and easy to set-up and operate. This collaboration allowed the City to capture much more data than a staff member could have the possibility of collecting from frequent visits to the site. The photos were of good quality and were able to assist the City in showing the flow patterns of discharge through this outlet. Interval and motion detection photos were both tested. The motion detection proved insensitive to small flows and the desired first flush was not able to be captured. Thirty- and 60-minute intervals were attempted without first flush rain flows being captured.

The flare at the end of the outlet pipe did not allow for a method to determine low flow volume. In an attempt to add a gauge of flow volume, 2" marks were painted onto the flared edge of the outlet at 2" intervals.

Findings

This outlet receives irrigation flow frequently each week, with flows reaching the 5' to 15' distance mark beyond the end of the outlet, but flows rarely discharged into the wash. During measurable rainfall events where runoff was able to enter the wash from the outlet, the flow patterns did indicate two instances of significant foaming. Very little trash was observed and turbidity was not able to be detected. Volume of flow was very difficult to measure. Photo documentation as seen in the photos series in Figure 9 included rain events, irrigation flow, dry weather events, and wildlife.

Wildlife:

- Coyote
- Dog
- Rabbit
- Ground Squirrel
- Squirrel
- Quail
- Dove
- Owl
- Bobcat
- Javelina
- Rats-(Sonoran & other)
- Mule Deer
- Chipmunk
- Roadrunner
- Rattlesnake

Figure 9

The wash - unable to see outfall and wash at the same time

Outfall with 2” markings added

Camera angle adjusted to see discharge point. No outfall markings observed

First light rain capture - January 9, 2018

First full rain event capture – January 9, 2018

Normal irrigation flow observed – volume too low to measure

Foam observed during rainfall - January

Normal irrigation flow to the 10’ mark

Foam observed during rainfall – June

Roadrunner

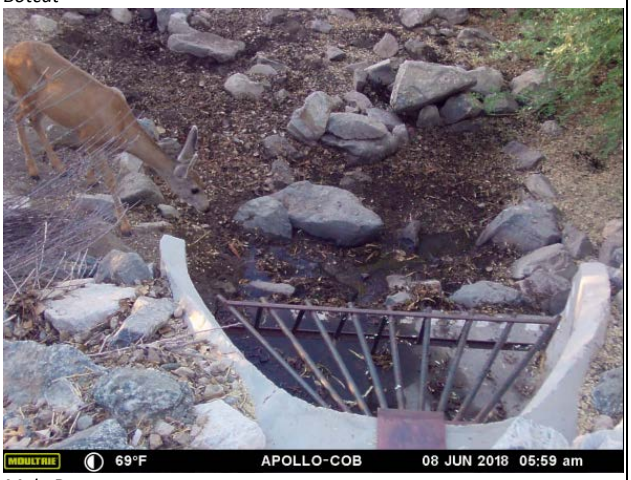
Coyote entering culvert

Rats

Javelina

Botcat

Quail



Mule Deer

Squirrel

Owl

Lessons Learned

Outfall? Outlet?

As mentioned previously, the outlet point was chosen based on current knowledge of the time. The outlet drains to a named wash (Tuthill/Acacia/Osborn Road Wash) that was thought to be a tributary that discharged directly to the Gila River. However, upon mapping of the City's stormwater infrastructure and review of drainage documentation from Flood Control District of Maricopa County (FCDMC), staff determined this to not be an outfall by definition, but a discharge outlet. This outlet drains to a designed retention basin located 1¾ miles south.

The retention basin has an overflow structure that discharges to a Maricopa County Flood Control District dam known as White Tanks Flood Relief Structure #4 Dam (FRS #4). FRS #4 is designed to hold a 500-year rain event. FRS #4 has a redesign plan to direct flow to another Flood Control District structure on Cotton Lane (adjacent to the Loop 303) in Goodyear.

While performing this visual assessment, the City was also mapping its stormwater infrastructure (curbs, gutters, inlets, outlets, basins, pipes, culverts, etc.) and discovered the City's drainage is typically stored in private retention basins. There are also a few drains that flow to irrigation canals; therefore, this discharge point is representative of all stormwater structures throughout the City in that they do not discharge to a WOTUS.

Development of the city, dramatically increased since 2000, has followed good stormwater quality regulations that meet or exceed current development standards. These standards were established many years prior to the issuance of the stormwater permit.

Getting the Right Angle

The camera was placed landward of the wash. Placement of the camera in the wash, if it were a WOTUS, would have required obtaining a 404[3] permit from the U.S. Army Corps of Engineers

[3] Section 404(a) of the Clean Water Act provides the federal government authority over dredging and filling in Waters of the United States (WOTUS).

and a 401[4] permit from the State of Arizona. The City decided to place the camera in an area where the outlet could be visually monitored, a section of the wash's southern flow could be seen, and without having to obtain permitting.

The camera set-up was not at the best angle to capture discharges from the outlet and wash. Additionally, the angle of the sunlight negatively affected the outcome of the photos. Heavy shadows falling during late afternoon obscured many photos. Future monitoring events include testing camera angle and direction to find the best picture location.

The camera's photo resolution was seven (7) mega pixels with a small lens. Moving forward, it is suggested to obtain the highest mega pixel and largest lens trail camera possible to capture higher-quality photos.

While our method of camera use and placement did not achieve the desired result of obtaining "first flush"; other placement areas of the carema, and possibly a more senstaive camera might meet the permit required method of data collection.

What's the Volume?

Staff were unable to determine the volume of discharge. Most flows were slow, low volume, taking up small portions of the discharge area outlet apron with unknown duration of flow and unknown percolation rates of the soil.

Missing information included:

- Soil percolation rates
- Flow rate over time
- Beginning and end time of flows

Two inch marks were added to the outlet structure to gauge width of discharge at the exit point of the structure, and non-intrusive markers (larger rocks standing on end) were added to gauge distance of flow at 5', 10', and 15' points. Although these markings did help in qualitative analysis, quantitative analysis was not possible.

Summary

In summary, the daily water discharge to this outlet during non-rain events was found to be from the neighborhood irrigation system of individual homes and common areas of the development, as well as occasional washing of personal vehicles. This type of runoff rarely exceeded 15' past at the end of the outlet and did not contribute flow into the wash.

Foam of unknown origin and content (seen in Figure 9) was observed during several rain events, and would not have been observed without this camera capturing live flow. It is common knowledge that possible sources of foam could include organic detritus from heavily watered and maintained lawns and flower beds.

[4] Section 401(a)(1) of the Clean Water Act requires a permit from the State for activities that discharge to WOTUS.

The City does not recommend our camera placement method for use to capture visual assessments of "first flush." The rainfall events that caused flow captured by motion detection occurred during the late night and early morning when natural light was not present (also, typically on weekends). Due to lack of natural light, the photos lacked density and perception, so turbidity and color were not observable. That being said, this visual monitoring enabled staff to capture routine irrigation runoff, loose trash, qualitative discharge volumes, and wildlife populations. This information has assisted City staff to identify possible waste problems, erosion and sedimentation control issues, and added knowledge on necessary efforts to stop or identify sources of pollution being discharged from this residential community (Figure 10).

Analysis: Camera vs. Self-Monitoring

	Camera Set-Up	Manual Inspections
AZPDES Permit Compliance	Yes. Need to tweak location.	Yes
Identify Need of Infrastructure Maintenance Activities	No	Yes
Other Information	Yes • Irrigation flow rates • Varmints • Wildlife	No

Figure 10

Capturing data through photographs saved City staff from having to physically monitor 16 rainfall events equating to a labor and equipment expense savings of approximately 64 hours or between $2,000 – $4,000 in resource costs*.

**Resource costs calculation includes a summation of staff and equipment usage for the 16 forecasted rain events, the mid-range average Environmental Compliance officer salary, $2 per hour on-call costs during non-operating hours per City policy, and a 4-hour minimum work time per event to obtain necessary equipment and wait for potential rain events to occur.*

Positive Outcomes

- Qualitative analysis of flows (light or heavy flow)
- Observable flows
- Bulk material/trash deposits
- Irrigation flow documentation
- Identify areas of erosion
- Wildlife sightings
- Varmint identification (Figures 9 and 12)
- Monitoring areas difficult or costly to access
- Wonderful collaboration project opportunity with ADEQ and a municipality
- Development of an auto monitoring process for outfalls (Figure 11)

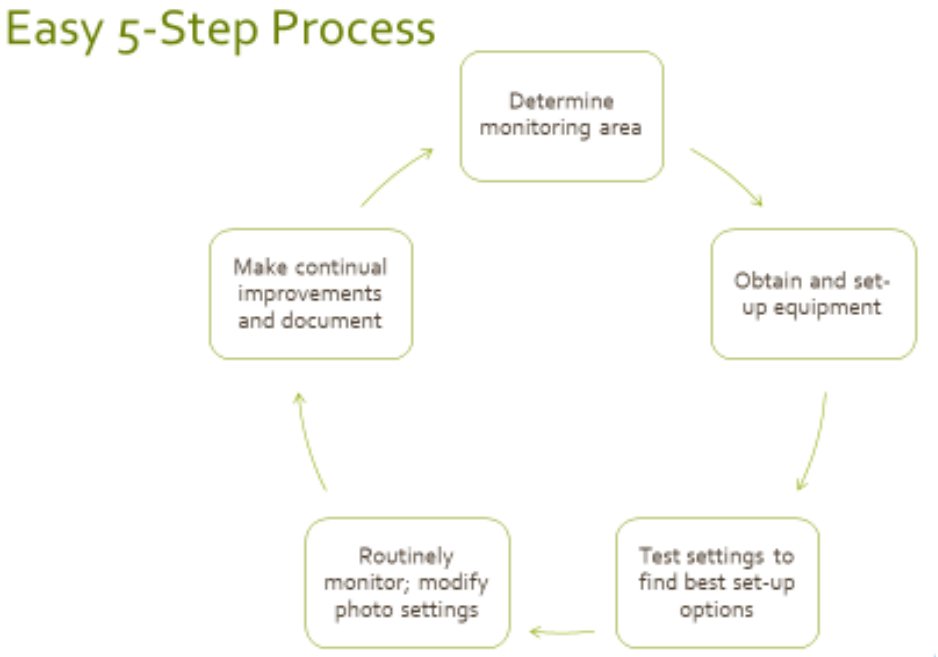


Figure 11

Figure 12