STORMWATER MANAGEMENT FACILITIES OPERATION AND MAINTENANCE MANUAL (template)

PROJECT NAME

Prepared for:

Owner's Name
Owner's Address
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Owner's City State and Zip Code
Owner's Phone Number
Owner's Fax Number

Prepared by:

Engineering Company
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Date

Approved:

_____

MCESD **Date**

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I. Reasons for Stormwater Management Facility Maintenance

A. Compliance with Maricopa County Stormwater Post-Construction Permit

Owners of newly-developed or redeveloped property located within the urbanized areas of unincorporated Maricopa County are required to obtain a Stormwater Post-Construction Permit. The purpose of this permit is to ensure that property owners follow proper operation and maintenance procedures for stormwater management facilities located on their property. Requirements for inspection and maintenance are located in this Stormwater Management Facilities Operation and Maintenance (O&M) Manual. Additional information can be found in the *Maricopa County Drainage Design Manual: Erosion Control* and *Hydraulics* or by contacting the Maricopa County Stormwater Quality Program at 602-372-5557.

B. Preventive Measures to Reduce Maintenance Costs

The most effective way to maintain your stormwater quality facility is to prevent the pollutants from entering the facility in the first place. Common pollutants include sediment, trash and debris, chemicals, pet wastes, runoff from stored materials, illicit discharges into the storm drainage system and many others. A thorough maintenance program will include measures to address these potential contaminants, and will save money and time in the long run. Key points to consider in your maintenance program include:

- Educate property owners/residents/employees to be aware of how their actions impact water quality, and how they can help reduce maintenance costs.
- Keep properties, streets and curb & gutters, and parking lots free of trash, debris, and lawn clippings.
- Ensure the proper disposal of hazardous wastes and chemicals.
- Plan lawn care to minimize the use of chemicals and pesticides.
- Sweep paved surfaces and put the sweepings in a compost pile or back on the lawn.
- Be aware of automobiles leaking fluids. Use absorbents such as cat litter to soak up drippings – dispose of properly.
- Re-vegetate disturbed and bare areas to maintain vegetative stabilization.
- Clean out the upstream components of the storm drainage system, including inlets, storm sewers and outfalls.
- Do not store materials outdoors (including landscaping materials) unless they are properly protected from rain and from stormwater runoff.

II. General Site Description and Location of Stormwater Management Facilities

A. General Site Description

(Provide Project Description, site address, parcel #'s)

B. General Location of Stormwater Management Facilities

(Provide general location of Stormwater Management Facilities.)

Inspection or maintenance personnel may utilize the stormwater facility site plan located in Appendix B showing the locations of the Stormwater Management Facilities within this development.

III. Stormwater Management Facilities

(Provide a list and description of all stormwater management facilities [Examples include retention/detention basins, drywells, infiltration devices, swales, channels, pervious pavement, storm drain inlets, grates, rip-rap, outlet protection, velocity dissipation devices, dikes, retaining walls, channel stabilization, slope linings, spillways, scuppers, storm drain pipes, storm drain manholes, gutters, stormwater-related signage, bioswales, vegetation, bleed-off system, headwalls, etc.])

(Also describe how each facility is to function and operate over time.)

IV. Owner's Assurances

The owner assures that no action will be taken by any lot owner to disrupt or in any way impair the effectiveness of any Stormwater Management Facility and will set forth in deed restrictions, as applicable, the ability but not the duty of the Department to take corrective measures if it is determined at any time that stipulated permanent Stormwater Management Facilities have been eliminated, altered, or improperly maintained, including the ability of the Department to cause the work to be done and lien all costs against the property should the required corrective measures not be taken by the lot owner, following written notification, within a period of time set by the Director.

V. Access

All stormwater management facilities located on the site have a designated access location. Refer to the site plan located in Appendix B for access locations.

VI. Safety

Keep safety considerations at the forefront of inspection procedures at all times. Likely hazards should be anticipated and avoided. Never enter a confined space (outlet structure, manhole, etc) without proper training or equipment. A confined space should never be entered without at least one additional person present.

If a highly toxic or flammable substance is discovered, the inspector(s) should leave the immediate area and contact the **Maricopa County Sheriff** at **911**. If there is any question about a substance, leave the area immediately and contact the **Maricopa County Sheriff** at **(602) 876-1000**. Also, never open a sealed container to check the contents.

Potentially dangerous (e.g., fuel, chemicals, hazardous materials) substances found in the areas **must be** referred to the **Maricopa County Sheriff's Office**

immediately by calling 911. They will dispatch the appropriate Hazardous Materials Unit.

Vertical drops may be encountered in areas located within and around the facility. Avoid walking on top of retaining walls or other structures that have a significant vertical drop. If a vertical drop is identified within the stormwater management facility that is greater than 30" in height, make the appropriate note/comment on the maintenance inspection form.

If any hazard is found within the facility area that poses an immediate threat to public safety, contact the Maricopa County Sheriff's Office immediately!

VII. Field Inspection Equipment

It is imperative that the appropriate equipment is taken to the field with the inspector(s). This is to ensure the safety of the inspector and allow the inspections to be performed as efficiently as possible. Below is a list of the equipment that may be necessary to perform the inspections of a Stormwater Management Facilities:

- Protective clothing and boots.
- Safety equipment (vest, hard hat, confined space entry equipment).
- Communication equipment.
- Maricopa County Approved Operation and Maintenance Manual for the site including stormwater management facility location maps.
- Clipboard.
- Stormwater Management Facility Inspection Forms (See Appendix D).
- Manhole Lid Remover.
- Shovel.
- First Aid Kit

Some of the items identified above need not be carried by the inspector (manhole lid remover, shovel, and confined space entry equipment). However, this equipment should be available in the vehicle driven to the site.

VIII. Inspecting and Maintaining Stormwater Management Facilities

The quality of stormwater entering surface waters and groundwater within the County relies heavily on the proper operation and maintenance of permanent best management practices.

This section contains a general overview of stormwater management facility O&M guidelines and documentation procedures. Appendix A contains the

Standard Operating Procedures (SOP) for each of the stormwater management facilities located on site.

A. Inspection Procedures

All stormwater management facilities shall be inspected by a qualified individual at a minimum of one time per year and during or after each rainfall event. Inspection should follow the inspection guidance found in the SOP located in Appendix A of this manual. The person(s) conducting the inspection activities shall complete the appropriate inspection report located in Appendix D. A separate form shall be filled out in the field for all stormwater management facilities inspected. If a stormwater management facility cannot be inspected, the inspector shall record an explanation of the circumstances on the form. The inspection report should describe any maintenance activities that are recommended.

A copy of each inspection form shall be kept indefinitely and provided to Maricopa County Environmental Services (MCESD) upon request. Completed forms are to be kept in Appendix E.

B. Maintenance Procedures

Stormwater Management Facility Maintenance consists of two categories: scheduled and unscheduled. A description of each category follows.

1. Scheduled Maintenance

The majority of this work consists of regularly scheduled mowings and trash and debris pickups for stormwater management facilities. This work also includes items such as drywell settling chamber cleaning and the removal of debris/material that may be clogging the inlet grates and trash racks. It may also include activities such as; weed control, mosquito treatment, and algae treatment. These activities normally will be performed numerous times during the year.

2. Unscheduled maintenance

Unscheduled maintenance will involve the repair of facilities after storms and flooding. The frequency and scope of this type of maintenance cannot be predicted. Some examples of unscheduled maintenance are:

- Embankment repair to keep erosion or rock riprap or earth fill sloughing from weakening dam structure.
- Debris removal during and following storms.
- Inlet and outlet channel repairs to halt erosion and maintain hydraulic capacity.
- Inlet and outlet structure repair so that the facility will function as intended.

It is important that adequate funding be provided for unscheduled maintenance such that repairs can be made immediately after flood or inundation damage occurs.

C. Maintenance Personnel

Maintenance personnel must be qualified to properly maintain stormwater management facilities. Inadequately trained personnel can cause additional problems resulting in additional maintenance costs.

D. Maintenance Records

The owner is responsible to make records of the installation of stormwater management facilities and of all maintenance and repairs. Records of maintenance performed are to be kept in Appendix F. They shall be kept indefinitely and provided to Maricopa County Environmental Services (MCESD) upon request.

IX. Appendices

Appendix A - Standard Operating Procedures

(Include one set of operating procedures, including schedules, for each of the Stormwater Management Facilities identified in Section III. You may wish to include procedures from a manufacturer or the following, largely taken from the *City of Chandler Property Owners Manual for Stormwater Management* and from from the *Drainage Design Manual for Maricopa County: Hydraulics* sections 9.3, 9.5, and 9.7.)

Streets and Parking Lots

Storm water runoff is most often collected and channeled along paved streets and parking lots and conveyed towards and into stormwater system components such as catch basins, scuppers, and spillways. Stormwater collects sediment, trash, debris, oil, and any other pollutant that may be deposited along paved areas. This potential polluted runoff is then discharged untreated into retention basins, parks, channels, community lakes, and even rivers. Maintaining paved areas free sediment, trash, debris, oil, etc. will assist in minimizing pollutants entering the system. The following healthy household habits can make a big difference;

- Picking up trash and debris
- Picking up pet waste
- Sweep up sediment, debris, and yard waste instead of washing driveways and sidewalks
- Properly dispose of household hazardous waste
- Use pesticides and fertilizers as directed by the manufacturer
- Cover and properly store hazardous materials to prevent spills
- Clean up spills using a dry absorbent and dispose of properly
- Park vehicles that leak fluids on private property
- Use a commercial car wash for heavily soiled vehicles
- Maintain pool drainage on private property

Retention/Detention Basins

Retention basins are depressed areas that are often utilized as greenbelts, landscaped open areas, common areas, parks, and even community lakes. Stormwater is discharged into such basins via a variety of stormwater system components and is allowed to percolate into the soil. Retention/detention basin may require maintenance including but not limited to the following;

- Retention/detention basins may require maintenance or new installation of drywell(s) to mitigate standing water that persists for periods exceeding 36 hours
- Retention/detention basin silt removal should occur when the accumulated depth exceeds 6 inches on average in basins without sediment traps. In basins with sediment traps, silt removal should occur when accumulation exceeds 4 inches
- Detention basin surfaces which are non-vegetated shall be scarified to breakup silt deposits and surface crusting on an annual basis. Use of heavy equipment for basin maintenance can cause excessive compaction of the basin surface and its use is discouraged for basin maintenance
- Maintain spillways and stormwater pipes to discharge into retention basins at least 6” above the bottom of the basin with a sediment trap
- Maintain by removing sediment, trash, and debris captured by trash racks at outfall points
- Ensure trash racks are secured at storm water pipe outfalls where they were originally required on grading and drainage plans
- Ensure that guardrails are maintained and secured on head walls, retaining walls, etc., where a fall hazard of 30 inches or greater is present

- Weed Control: Weed growth can adversely affect the use, appearance, and hydraulic characteristics of a basin. Therefore, weed growth shall be controlled. Extensive use of herbicides in basins where the primary or secondary purpose is groundwater recharge is not acceptable.
- Repair of Eroded Slopes: Immediate repair of eroded slopes can minimize the ultimate cost for this activity. Small areas can be repaired by hand with on-site materials. Large eroded areas are much more difficult and expensive to correct because they may require larger equipment and placement of imported material.

Drywells

A drywell is a structure that is commonly installed in retention basins and paved areas, such as streets and parking areas for the management and disposal of stormwater. Drywells allow for the settling out of sediment and debris in an upper chamber (single stage) or in a separate chamber (dual stage). Water within the settling chamber will enter an overflow pipe where it can percolate into the ground. Drywells are registered and regulated by the Arizona Department of Environmental Quality (ADEQ).

Drywells are highly susceptible to loss of effectiveness due to clogging of well screens and silt accumulation in the drainage rock. Clogging well screens can be caused by chemical encrustation of well screen materials by water soluble minerals compounded by alternating cycles of wetting and drying. Drywell efficiency can be restored by periodic jetting with water and compressed air to remove silt.

The inlet chamber of a Dual Chamber Drywell serves as a trap for heavy sediments and trash. Inlet chambers should be cleaned periodically as described below. The amount of sediment, which deposits in the inlet chamber can be significantly reduced by maintaining an adequate sediment trap around the drywell inlet.

Drywell inlet grates shall be maintained two to four inches above the bottom elevation of retention basins.

It is the owner's, or owner's representatives', responsibility to clean and maintain each dry well to ensure that each remains in proper working order. The regular maintenance schedule is not recommended to exceed 3 years. Drywells that cease to drain a retention basin with 36 hours should be replaced or refurbished by the owner or his representative.

Once a year, at a minimum, the settling chamber should be inspected, and it should also be inspected after any major inflow to the drywell. Sediment shall be removed from the chamber at such time that approximately 15 to 20% of the original volume of the chamber is filled. All sediment removed from a settling chamber shall be disposed of either at an authorized sanitary landfill or at any other suitable location approved by the governing jurisdiction.

Drywell maintenance may include, but is not limited to;

- Removal of sediment, trash, and debris
- Replacement of filter fabrics (if any) and petrochemical absorbent
- Cleaning/replacement of screens
- Opening of liner weep holes

- Purging of accumulated silt out of the aggregate fill by jetting, surging, or pumping
- Ensure interceptor grates and drywell access covers are properly secured within the support frame

Catch Basins
Catch basins are storm drain inlets installed along the street curb and gutter, street shoulders, paved areas, and landscaped areas. Catch basins located in landscaped areas and paved areas without curb and gutter consist of a concrete box structure with an inlet grate covering the structure. Catch basins along curb and gutter locations consist of an inlet opening within the curb and may also have an inlet grate incorporated within the gutter. Catch basins may or may not have a depressed bottom to allow for deposition of sediment and/or debris prior to discharging runoff via a pipe to a retention/detention basin, underground retention system, drywell or bubbler box. Catch basins that are not properly maintained may cause or contribute to street flooding or standing water issues.
Maintenance of catch basins may include, but are not limited to;

- Removal of sediment, trash, and debris from the catch basin and lateral sections of pipe
- Ensure that inlet grate is properly secured within support frame

Scuppers and Spillways
Scuppers are concrete structures installed along the curb and gutter of paved areas. Stormwater enters scuppers from the street where it is conveyed beneath a sidewalk and along a sloped concrete spillway into a retention basin, landscaped area, etc. Scuppers that are not properly maintained may cause or contribute to street flooding or standing water issues. Maintenance of scuppers, spillways and transition areas may include, but are not limited to;

- Removal of sediment, trash, and debris from the scupper inlet and spillway
- Removal of sediment, trash, and debris from splash pads
- Ensure positive flow line towards the center of the retention area. Maintain transition from spillway to turf or landscaped area to promote positive drainage and prevent standing water

Culverts and Equalizer Pipes
Culverts are concrete structures that allow for vehicle access over an open channel. Such structures are found near entrances to communities or businesses.

Equalizer pipes are linear sections of pipe that allow for drainage from one retention area to another. These pipes are subsurface with pipe openings into each retention area. Equalizer pipes may also be connected to headwalls. Maintenance of culverts and equalizer pipes may include, but are not limited to;

- Removal of sediment, trash, and debris from culverts and pipes to prevent standing water issues
- Maintain turf or landscaped areas at culvert and pipe openings to ensure positive flow towards the center of retention areas

Headwalls
Headwalls are concrete structures that are installed at subsurface, pipe discharge points. Headwalls may be utilized at equalizer pipe openings or at outfalls leading from

a catch basin from the street. Headwalls generally have guardrails attached to the top and sides or wings. Grates or trash racks are installed across the pipe openings to prevent children and animals from entering the pipe, and to catch trash and debris. Splash pads are required at outfall points and are intended to decrease the velocity of stormwater flows into turf or landscaped areas, and to trap sediment and debris. Maintenance of headwalls may include, but is not limited to;

- Removal of sediment, trash, and debris from inside pipe openings and lateral sections of pipe
- Removal of sediment, trash, and debris from trash racks and splash pads
- Removal of vegetative matter that may hinder the flow of stormwater into the retention area
- Ensure structural integrity of headwalls, guardrails, and trash racks
- Ensure positive flow line towards the center of the retention area. Maintain transition from spillway to turf or landscaped area to promote positive drainage and prevent standing water

Bubbler Box

A bubbler box is a concrete structure that consists of a grate on the top and may or may not have an opening on the front. Bubbler boxes are found in retention areas and are generally connected via lateral pipe sections from a catch basin(s). Bubbler boxes may also be directly connected via pipe to a drywell interceptor chamber. Maintenance of bubbler boxes include, but are not limited to;

- Removal of sediment, trash, and debris from within the bubbler box and lateral sections of pipe
- Ensure that grate is properly secured within support frame

Underground Retention Storage Structures

Underground retention structures or tanks are most commonly constructed of large corrugated metal pipe, and are generally found in commercial and industrial areas. The subsurface tanks receive stormwater from catch basins installed within paved areas. The tanks are installed so as to drain towards and into a drywell interceptor chamber, via a subsurface pipe connection. Maintenance of underground retention structures may include, but are not limited to;

- Removal of sediment, trash, and debris from tanks
- Ensure inlet grates are properly secured within support frame

Also see http://www.stormwatercenter.net/Manual_Builder/Maintenance_Manual/7-%20Maintenance%20Frequency%20Table-NA/cost_frequency.pdf for reference. Note that it is based on an Eastern, wet climate.)

Appendix B - Site plan (do not include drawings when submitting for recording)

Appendix C - Construction drawings (do not include drawings when submitting for recording)

Appendix D - Inspection Form(s) (Sample forms may be found found at http://www.stormwatercenter.net/; click on “Manual”, then “Checklists”. Also try (from the home page) clicking on “Program Resources”, then “STP Maintenance”, then “Maintenance Inspection Checklists, Reminders and Notifications”; scroll down for some sample checklists for additional sample forms.)

Appendix E – Completed Inspection Form(s)

Appendix F – Maintenance Records