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Maintenance Plan

McDowell Road Basin and Storm Drain



Prepared for:

**Flood Control District of Maricopa County
(FCD No. 2004C052)**

KHA Project No. 091131012
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Maintenance Plan

McDowell Road Basin and Storm Drain Design

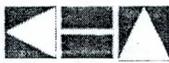


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**MAINTENANCE PLAN
for
MCDOWELL ROAD BASIN AND STORM DRAIN**

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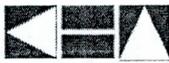
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1. Spook Hill Area Drainage Master Plan Update

The McDowell Road Basin and Storm Drain project is part of the recommended plan of the Spook Hill Area Drainage Master Plan Update (ADMPU). The Spook Hill ADMPU was conducted by the Flood Control District and completed in July 2002. The purpose of the Spook Hill Area Drainage Master Plan (ADMP) Update was to expand the Spook Hill Area Drainage Master Study (ADMS) conducted in July 1987 by quantifying the extent of flooding problems, to incorporate existing drainage structures into the ADMS model, and to develop alternative solutions to flooding problems for the contributing watershed.

The area of study for the Spook Hill ADMPU is comprised of the Buckhorn – Mesa Watershed Project drainage area. The Spook Hill floodway and flood retarding structure (FRS) form the western boundary of the study area. The southern boundary is formed by the Signal Butte floodway and FRS, the Bulldog Floodway, and the Apache Junction FRS. The northern boundary lies along the crest of the Usery and Goldfield Mountains and crosses the saddle of Usery Pass. The eastern boundary lies approximately along the Apache Trail. The total area of ADMPU study is approximately 35 square miles.

The McDowell Road Basin and Storm Drain project is the first of the ADMPU identified projects to be designed and constructed and is being implemented in accordance with the ADMPU guidelines. The other recommended ADMPU projects will follow after the McDowell Road Basin and Storm Drain project. Two other regional ADMPU projects include the Hermosa Vista/ Hawes Road Project and the Oak Street Basin and Storm Drain project, a summary of which follows.

The **Hermosa Vista/Hawes Road Project** includes a drainage system to capture runoff from the Usery Mountains and surrounding area. The drainage system will consist of a storm drain that will tie into the existing Madrid Basin at 90th St. and McDowell Road, go west along McDowell, south along Hawes Road and west along Hermosa Vista Drive. The project also includes a stormwater basin at Hawes Road and Culver St. This project will be designed later in year 2006 with construction anticipated to begin in 2007/2008.

The **Oak Street Basin and Storm Drain Project** has been identified in the ADMPU as a 9.4 acre flood control stormwater basin located at the northeast corner of Hawes Road and Oak Street. This location was chosen for its ability to receive and accommodate peak discharges from the Oak Street and Hawes Road storm drains before entering into the existing Thunder Mountain west channel.

2. McDowell Road Basin and Storm Drain Project Summary

The McDowell Road Basin and Storm Drain is located in the City of Mesa along McDowell Road from Hawes Road on the east and Sossaman Road (76th Street) on the west. The project consists of a large diameter reinforced concrete pipe storm drain and an off-line detention basin. The storm drain is located off the south edge of pavement of

McDowell Road. The detention basin is located at the southwest corner of McDowell Road and Sossaman Road. **Figure 1** provides a schematic layout of the project elements.

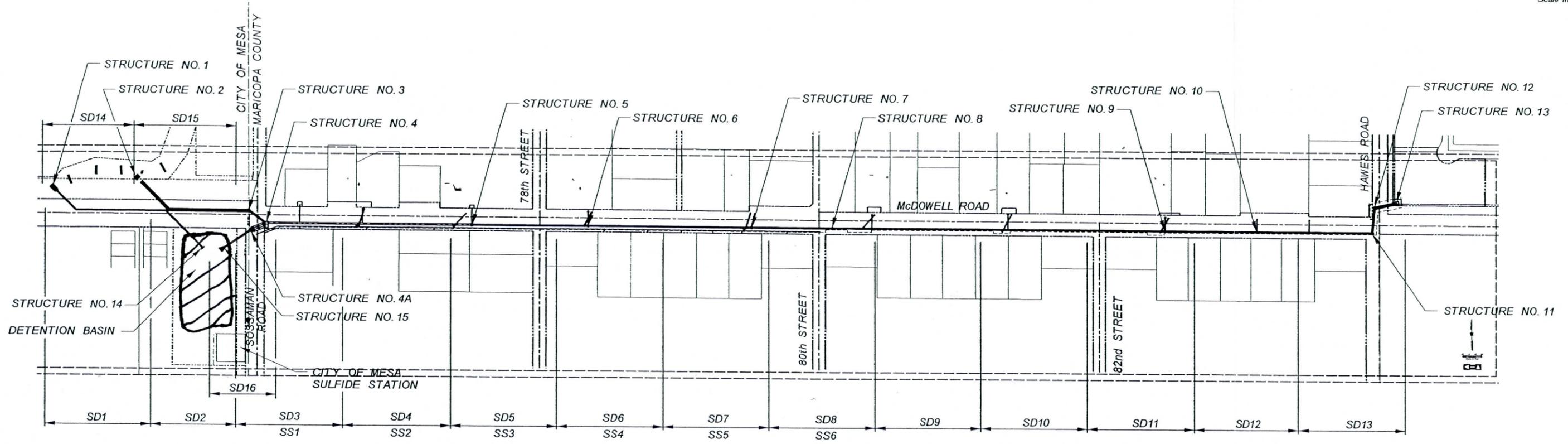
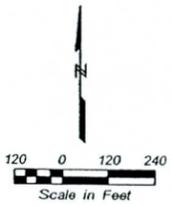
The project was developed to reduce the flooding potential south of McDowell Road between Hawes and Sossaman Roads. The ADMPU sized the storm drain for the 100-year return frequency storm event. The storm drain pipe sizes range from 54-inches to 90-inches. The main inlet structure for the McDowell Road storm drain is located within the existing detention basin of the Thunder Mountain Estates (TME) subdivision. The TME basin is located at the northeast corner of Hawes Road and McDowell Road. The inlet structure (referred to as the TME inlet) is a reinforced concrete structure that is 18-feet by 18-feet square and approximately 9-feet deep.

The majority of the flow conveyed by the McDowell Road storm drain will be captured by the TME inlet and enter the system at this location. Additional storm drain area inlets (catch basins) are located and spaced along and just off the north edge of pavement on McDowell Road. These area inlets capture offsite flows from the drainage area north of McDowell Road, convey those offsite flows into the McDowell Road storm drain through connector pipes.

A unique feature of this project includes the design and construction of several small diameter cross culverts (18-inches to 24-inches in diameter) to convey low flows from the north side of McDowell Road into existing drainage channels and small washes on the south side of McDowell Road. A citizens' concern addressed during the development of the ADMPU and the McDowell Road Basin and Storm Drain project was to incorporate the capability of allowing low flows to continue to flow into the natural washes and not have the project totally intercept all the stormwater flow. The area inlets associated with the cross culverts were designed to allow low flows to bypass the area inlets (and hence bypass the McDowell Road storm drain) and flow into the cross culverts instead. During an event of higher storm flows, the flows will be divided between the area inlets (and be directed to the storm drain) and the cross culverts. The inlet/culvert system has been designed such that if the cross culverts were to become inoperable (such as the case of sediment and debris plugging the culvert) the area inlets have the capacity to capture the entire 100-year flows and direct those flows to the McDowell Road storm drain.

This feature also allows the existing vegetation located along the washes south of McDowell Road between Hawes Road and Sossaman Road to be subjected to storm water flows and hence a source of water. A secondary concern expressed by local residents is that the residents do like to experience low, controlled flows in the washes.

Note that the grates on the area inlet catch basins have been modified to allow a majority sediment and debris to be passed into the storm drain. The grates have been elevated four inches above the edge of the catch basin structure.



DESIGN FLOW RATES (100YR, 24 HR STORM)

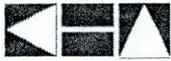
STATION	DISCHARGE
BASIN	300
10+50	404
12+00	704
14+90	698
20+00	694
25+47	658
33+18	615
38+94	589
45+38	581
62+45	559
63+50	519

LEGEND

SD - STORM DRAIN PLANS
 SS - SANITARY SEWER PLANS

3			
2			
1			
NO.	REVISION	BY	DATE
 FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION			
MCDOWELL ROAD BASIN AND STORM DRAIN PROJECT PCN 420.03.31			
100% PRELIMINARY NOT FOR CONSTRUCTION	DESIGNED	DEJ/JWH	04/07/06
	DRAWN	DKS/JWH	04/07/06
	CHECKED	RAE	04/07/06
	 Kimley-Horn and Associates, Inc.		
DRAWING NO.	KEY MAP		SHEET OF
G5			5 73





The outfall of the McDowell Road storm drain and detention basin system is the existing Las Sendas drainage channel that is parallel to and north of McDowell Road (west of Sossaman Road). The drainage channel is a regional drainage channel for the Las Sendas subdivision that is within a public facilities easement. The Las Sendas channel outfalls into the Spook Hill FRS.

The ADMPU, completed in 2002, indicated that 1,540 cfs was the maximum existing conditions peak discharge in the Las Sendas channel for the 100-year storm event. To ensure the flow would not exceed 1,540 cfs, a detention basin on the northwest corner of McDowell and Sossaman was originally identified in the ADMPU to attenuate peak discharges that will be entering the storm drain from the contributing watershed. This site was not available for purchase by the District or the City of Mesa at the time of design. Consequently, the detention basin site was moved to a five acre site on the southwest corner of McDowell and Sossaman Roads, which was purchased by the City of Mesa.

Hydraulic Splitter Structure

The ADMPU concept for the McDowell Road storm drain included a hydraulic splitter structure that will divert peak flows into the off-line detention basin while allowing bypass flows to flow to the Las Sendas channel. The structure will convey the majority of the discharge to the Las Sendas channel, but higher discharges will flow through a triple barrel 8-foot span by 3-foot rise reinforced concrete box culvert to the McDowell Road detention basin. The design of the hydraulic splitter structure ensures that the maximum flow in the Las Sendas channel will not exceed 1,540 cfs during the 100-year storm event. The splitter structure is located at the southeast corner of McDowell Road and Sossaman Road.

A secondary purpose of the hydraulic splitter structure is to transition the storm drain from a 90-inch diameter reinforced concrete pipe (RCP) to a low rise reinforced concrete box culvert, which is the "by-pass culvert." The by-pass culvert is required so the storm drain can be placed under an existing City of Mesa 8-inch diameter sanitary sewer line located in Sossaman Road and a 12-inch diameter sanitary sewer located in McDowell Road. The by-pass culvert is a 7-foot span by 4-foot rise reinforced concrete box culvert.

The storm drain was designed to operate under pressure flow from the outlet at the Las Sendas Channel to the splitter structure and from the splitter structure upstream for several hundred feet. This was done to control the hydraulic grade line (HGL) in the splitter structure. A controlled HGL in the splitter structure will regulate the flow to the by-pass and the basin to ensure that the maximum flow in the Las Sendas channel is less than 1540 cfs. **Table 1** shows the elevations of the splitter structure components. A peak discharge of 331 cfs will be flowing in the by-pass culvert before any discharge flows into the basin.



Table1. Hydraulic Splitter Structure Elevation Data.

Splitter Component	Elevation (ft)
HGL at Entrance to Splitter	1647.1
HGL at Exit to 7X4 RCBC	1646.0
Average HGL	1646.4
Splitter Floor Elevation	1635.4
Total Depth in Splitter and Head on 7-Foot Span by 4-Foot Rise RCBC By-Pass (ft)	11.0
Invert Elevation for Basin Culvert	1643.5
Total Head on Basin Culvert	2.9

The by-pass box culvert transitions to a twin 54-inch diameter reinforced concrete pipe storm drain that is 620 feet long and discharges into the Las Sendas channel. The twin pipes are located in the north half of McDowell Road and west of Sossaman Road in the westbound lane. The storm drain was placed under the west bound lanes of McDowell Road for approximately 405 feet. At the storm drain outfall into the Las Sendas channel, energy dissipation will be accomplished using an impact-type baffle wall energy dissipater.

Peak flows will be conveyed to the McDowell Road detention basin downstream of the splitter structure through a three barrel 8-foot span by 3-foot rise reinforced concrete box culvert. This is called the “detention basin culvert.” The detention basin culvert will be placed above the Sossaman Road 18-inch diameter sanitary sewer line and a 16-inch diameter City of Mesa water line.

McDowell Road Storm Drain and Detention Basin Elements

Table 2 below provides the size and location of the McDowell Road storm drain system elements. Note the station numbers are offset from the McDowell Road monument line and do not always identify the true pipe lengths. **Table 3** provides a summary of the McDowell Road detention basin physical parameters and **Table 4** provides a summary of the detention basin stage-storage-discharge rating table.

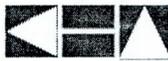


Table 2. McDowell Road Storm Drain Elements.

Beginning Station	Ending Station	Storm Drain Pipe Size	Pipe Length (ft)	Remarks
*RGRCP -- rubber gasket reinforced concrete pipe				
Main Line Including By-Pass Culvert				
4+52	9+60	2-54-inch	1132	Two barrel RGRCP which outlets to the Las Sendas Channel
9+67	10+48	7-ft X 4-ft RCBC	89	Single barrel reinforced concrete box culvert
10+40	14+96	90-inch	455	Single RGRCP
15+00	38+91	78-inch	2,376	Single RGRCP
38+96	62+44	72-inch	2,465	Single RGRCP
62+60	63+50	2-54-inch	95	Twin RGRCP
McDowell Road Detention Basin				
8+64	10+36	3-8-ft X 3-ft RCBC	60	Three barrel reinforced concrete box culvert from Splitter Structure to Basin
9+85	9+62	Transition	20	Transition from reinforced concrete box culvert to 66-inch RCP
9+61	8+55	66-inch	111	Single RGRCP
1+20	6+96	48-inch	891	Single RGRCP Basin Outlet to Las Sendas Channel

Table 3. McDowell Road Detention Basin Physical Parameters

Physical Parameter	Value/Unit
Stormwater volume detained (100-year)	6.2 af
Freeboard	1 foot
Peak Inflow (100-year from splitter structure)	302 cfs
Peak Outflow (100-year) 41-in restrictor plate	127 cfs
Maximum water surface elevation	1639 feet
Emergency spillway crest width	50 feet
Emergency spillway crest elevation	1639.7 feet
Emergency spillway discharge*	157 cfs

* assumes detention basin outlet pipe completely inoperable

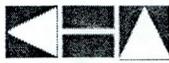


Table 4. McDowell Road Detention Basin Stage-Storage-Discharge Rating Table

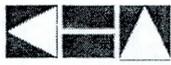
Stage (ft)	Storage (af)	Discharge (cfs)
0	0.0	0.0
1	0.2	15.9
2	0.6	34.8
3	1.0	53.9
4	1.6	71.2
5	2.2	85.8
6	3.0	97.5
7	3.9	107.0
8	5.0	116.2
9	6.2	127.5
10	7.6	144.3
11	9.2	171.0

The design discharges in the storm drain main line range from 519 cfs at the Thunder Mountain Estates detention basin to 704 cfs at the McDowell Road detention basin.

Storm Drain System Outfall – Las Sendas Channel

The outfall of the storm drain and the detention basin is the Las Sendas channel. A hydraulic splitter structure passes lower flows directly through the by-pass culvert directly to the Las Sendas channel. The majority of the runoff volume will go directly to the Las Sendas channel and will not enter the basin. Higher discharges rates in the McDowell Road storm drain that would exceed the 704 cfs in the storm drain will flow into the detention basin. The volume stored in the basin will be slowly metered out to the Las Sendas channel through the detention basin outlet pipe which is a 48-inch diameter RGRCP. The inlet structure of the 48-inch outlet pipe is fitted with a 41-inch restrictor plate orifice.

The starting water surface condition at the downstream end of the McDowell Road storm drain at the outfall of the by-pass into the Las Sendas channel was set at the crown of the twin 54-inch diameter RGRCP storm drain outlet pipes. A peak discharge of 1,540 cfs in the Las Sendas channel results in a hydraulic depth of 3.8 feet in the channel. This was estimated using a normal Manning’s calculation based on the existing conditions in the Las Sendas channel. This would not cause backwater in the storm drain, but the energy dissipation structure at the outlet into the Las Sendas channel will be an impact-type baffle wall, so the starting condition of the hydraulic grade line for the 100-year storm event for the storm drain was placed at the crown.



Other Junction Structures

A junction structure is located in the northwest portion of the McDowell Road and Sossaman Road intersection. This structure transitions the 7-foot span by 4-foot rise RCBC and the twin 54-inch diameter RGRCP pipes. The RCBC was designed and constructed to pass under the existing Sossaman Road sanitary sewer.

A junction structure is located on the west side of Hawes Road north of McDowell Road. This structure transitions the twin 54-inch RGRCP pipes to a single 72-inch RGRCP pipe. This 72-inch pipe crosses McDowell Road to another junction structure that directs storm drain flows west into the downstream 72-inch RGRCP pipe.

There are several other junction structures on the McDowell Road mainline storm drain. These junction structures function to allow changes in pipe slope, change in pipe inverts, change in pipe diameter, and/or accommodate the confluence of local connector pipes.

By-Pass Culvert

The by-pass culvert is a single barrel 7-foot span by 4-foot rise reinforced concrete box culvert that will operate with a total head of 11.0 feet (under the 100-year storm event conditions), which is the depth of water in the hydraulic splitter structure. The by-pass culvert transitions from a box section to a double 54-inch diameter RGRCP on the north side of McDowell Road in the west bound traffic lanes of McDowell Road.

Detention Basin Culvert

The detention basin culvert is a three barrel 8-foot span by 3-foot rise reinforced concrete box culvert that is designed to go over the top of the 18-inch diameter sewer line that runs north and south along McDowell Road. To ensure clearance over the sewer line, the invert of the basin culvert is 1643.5 and depth of flow in the culvert of 2.9 feet that is based on the HGL in the splitter structure. The RCBC is 60 feet long and will transition to a 66-inch diameter RCP. The transition section will be 20 feet long and the 66-inch RCP will be 111 feet long. The slope will increase from 1% for the RCBC splitter structure to 6.5% for the RCP.

The energy dissipater at the outlet of the 66-inch diameter RCP was sized as a SAF type stilling basin. Large landscape rock was used as the energy dissipation baffles. The floor of the basin was constructed with flowable concrete around the base of the landscape rocks.

The basin outlet culvert is a 48-inch diameter RCP with a 41-inch diameter restrictor plate. This culvert will meter out flow in the basin to the Las Sendas Channel. The culvert will have typical headwalls with a riprap apron on the downstream end to prevent erosion.



McDowell Road Storm Drain Outfall Structure

The McDowell Road storm drain outfall structure is an impact wall type energy dissipater. This structure was designed to dissipate energy to minimize erosion damage to the Las Sendas channel from stormwater discharges from the storm drain. This structure will ensure non-scouring velocities at the outlet. The structure was sized according to standards developed by the Natural Resources Conservation Service (NRCS).

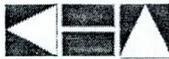
Thunder Mountain Estates Inlet (TME Inlet Structure)

The peak discharge rate to the Thunder Mountain detention basin for the 100-year storm event is 519 cfs. The TME inlet was sized to accept this peak inflow rate. The inlet is design to flow under weir flow with a maximum head of two feet on the sides of the structure. The crest elevation of the inlet was set 6-inches above the existing ground in the Thunder Mountain basin. This will minimize sediment in the basin from being transported into the storm drain system. The maximum depth of flow (two feet) over the weir/sides of the inlet is 6-inches below the invert of the block wall openings that are in the wall around the basin site, essentially giving the basin 6-inches of freeboard depth before any flow (above the 100-year storm event) would exit the wall openings.

Detention Basin Landscape Considerations

The McDowell Road Detention Basin was designed in accordance with the ADMPU and with the City of Mesa's Site Development Design Standards and Desert Uplands requirements. Using these design considerations, the stormwater detention basin was designed to include the following features:

- The grading plan transitions into the existing landform and is designed to emulate the surrounding desert terrain. The overall shape of the basin is irregular and the slopes are designed to be gentle and natural, as opposed to anything with straight side slopes and a square form.
- The existing desert topsoil was salvaged and replaced after basin grading operations. This aids in creating an undisturbed appearance of the basin while preserving the seed base and organic material in the soil.
- The landscape was designed to screen views of the inlet and outlet structures and to provide a natural vegetative pattern to maintain the natural appearance of the site.
- The landscaping palette (plants) for the site include only native plant species specific to the desert uplands area.
- Native hydroseed was applied to all areas disturbed by the construction of the basin. The hydroseed mix includes trees, shrubs, grasses and wildflowers.
- Enhanced planting was provided on the north and east sides of the basin site, along McDowell and Sossaman roads. In addition to the hydroseed, container trees (15 gallon size), shrubs and groundcovers were planted and placed on



irrigation with an underground automatic irrigation system to aid in the establishment of the vegetation.

- Existing Saguaros and salvageable Ironwood trees impacted by the construction of the basin were salvaged and replanted on-site.
- Ironwood, Palo Verde and Native Mesquite species were planted throughout the basin to help reestablish the native tree species found on the site.

3. McDowell Road Basin and Storm Drain Maintenance Plan

The purpose of this report is to provide a general awareness of the anticipated maintenance activities required for the project. This report provides general guidelines for conducting maintenance activities for the elements of the McDowell Road Basin and Storm Drain project. The guidelines and activities noted in this report are only for this project.

This report does not supersede any standard operating procedures established by the Flood Control District of Maricopa County, the Maricopa County Department of Transportation, or the City of Mesa. All maintenance activities conducted by the District, McDOT, or the City of Mesa shall comply with all existing and applicable national, state, and local codes, safety standards (OSHA), and protocols. The District and the City of Mesa already have established Best Management Practices (BMPs) that are implemented to meet stormwater quality requirements as part of the National Pollution Discharge Elimination System (NPDES) program. By way of reference, those applicable BMPs are incorporated into this report.

The McDowell Road Basin and Storm Drain Maintenance Plan is divided into two parts and furnished in **Appendix A** and **Appendix B**. **Appendix A** contains the maintenance activities for the storm drain elements while **Appendix B** contains the maintenance plan for the landscaping elements of the project. **Appendix C** provides a copy of the construction plans for the McDowell Road Basin and Storm Drain project.

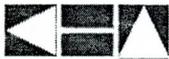
Appendix A is formatted into five parts:

1. Routine Inspection and Cleaning
2. Solid Waste Best Management Practices
3. Staff/Contractor Training and Coordination
4. Record Keeping and Evaluation
5. Operational Improvement, Structural Retrofit, and Design Changes

Appendix B is formatted in five parts as well:

1. General
2. Products
3. General Plant Care
4. Irrigation System
5. General Maintenance

**APPENDIX A
MAINTENANCE PLAN
MCDOWELL ROAD BASIN AND STORM DRAIN**



APPENDIX A

Maintenance Plan for McDowell Road Basin and Storm Drain System Elements

I. Routine Inspection and Cleaning

1. Inspect and clean as needed, all area inlets and catch basins annually or before the sump is 40% full.
2. Stencil catch basins per standard BMP (e.g.: "Rain only in the Drain")
3. Inspect and clean as needed, all area inlets and catch basins after major storm events and in known problem areas more than once a year.
4. Inspect and clean as needed, all storm drain pipe system in known problem areas more than once a year.
5. Develop flushing schedule of the storm drain based on experienced gained over time and from amount of debris and sediment accumulation in the drain.
6. **Inspect and clean as needed**, the Thunder Mountain Estates inlet sump and **debris rack**.
7. Cleaning activities may occur on a year round basis; however, known problem areas shall be targeted prior to the rainy season which correspond to summer monsoon (July through September) and the winter rainy season (November through March).
8. Inspect and clean as needed, all storm drain facilities that have been affected by emergency response activities (fire response, hazmat response, etc.).
9. Remove and transport collected solid waste debris and sediment to landfill.
10. Las Sendas Channel Outlet Structure (Impact Energy Dissipator) – Inspect and clean as needed. Inspect for local erosion around outlet and repair as needed.
11. Las Sendas Channel Outlet Structure (48-inch outlet pipe from detention basin) – Inspect and clean as needed. Inspect for local erosion around outlet and repair as needed.
12. Detention Basin Inlet Structure (Headwall for 66-inch storm drain) - Inspect and clean as needed. Inspect for local erosion around outlet and repair as needed. Inspect energy dissipator boulders and dissipator floor for structural integrity after major storm drain flows. Make appropriate repairs if necessary.
13. **Detention Basin Outlet Structure** (Headwall for 48-inch storm drain). **Inspect and clean as needed**. Inspect for local erosion around structure and repair as needed. Remove debris and sediment accumulation from inlet of pipe.
14. Headwall Safety Railings and Access Barriers. Inspect and clean as needed. Check structural integrity of railings and barriers and bolts. Paint as needed.
15. Conduct storm drain video survey on a semi-annual basis.
16. Conduct visual storm drain survey on an as-needed basis or after major storm events.
17. Check for illicit discharges to the storm drain, catch basin, and inlets as part of the routine annual condition survey.
18. McDowell Road Detention Basin. Inspect basin for accumulation of sediment and debris. If sediment buildup occurs to an average depth of 3 inches, remove sediment using City of Mesa standard practices. Inspect basin slopes for signs of

During storm event.



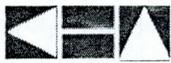
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16. Conduct visual storm drain survey on an as-needed basis or after major storm events.
17. Check for illicit discharges to the storm drain, catch basin, and inlets as part of the routine annual condition survey.
18. McDowell Road Detention Basin. Inspect basin for accumulation of sediment and debris. If sediment buildup occurs to an average depth of 3 inches, remove sediment using City of Mesa standard practices. Inspect basin slopes for signs of

During storm event.



erosion and rilling. Repair erosion and rills as necessary. Inspect emergency spillway location and spillway crest area. Make sure spillway crest is free of objectionable materials such as debris and illegal dumped materials. Make note of signs of off-road vehicle activity (ATVs, motorcycles, etc.) and damages caused by such activity. Inspect basin during major flow events and after drawdown of flood pool. Inspect south embankment for any signs of piping or erosion holes. Repair as required.

II. Solid Waste Best Management Practices

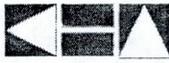
1. As much debris, silt, trash and sediment as possible shall be removed from the storm drain system when cleaning.
2. Provide proper containment for the temporary storage of removed debris during cleaning. Surface types of temporary storage sites should be of concrete, asphalt or other type of impermeable material.
3. Waste collected from storm drain systems shall be dewatered as necessary for proper disposal to the landfill. Dewatering sites should not drain to storm drains or creeks.
4. Check catch basins, inlets, and basin site for signs of illegal dumping. Remove dumped wastes as appropriate. Post "No Dumping" signs if required.

III. Staff/Contractor Training and Coordination

1. Provide a referral and follow-up process between storm drain operation and maintenance and illicit connection and illegal dumping investigation staff for problems found in the field.
2. Provide staff training for storm drain operation and maintenance personnel at least once a year with emphasis on controlling storm water pollution through storm drain operation and maintenance.
3. Include provisions for storm water pollution prevention in contract specifications for conducting storm drain operation and maintenance.

IV. Record Keeping and Evaluation

1. Maintain records tracking all cleaning activities. The records shall show when and which facilities have been inspected and cleaned. Spill and illegal dumping incidents and responses to both incidents shall also be documented and tracked.
2. Document any unusual flows observed during inspection (particularly dry weather flows) and the follow-up actions/referrals.
3. Review the records annually to critique the effectiveness of storm drain operation and maintenance activities. Modifications of storm drain operation and maintenance activities shall be identified in the annual individual work plans.



V. Operational Improvement, Structural Retrofit and Design Changes

1. Review the storm drain operation and maintenance program annually and if needed, identify operational improvements, opportunities for structural retrofit and design changes.
2. Operation and maintenance provisions shall be included in planning and design phases of Capital Improvement Projects (for retrofit) to ensure that storm water quality issues are considered in the design of storm drain systems.

**APPENDIX B
MAINTENANCE PLAN
LANDSCAPING**



APPENDIX B

Maintenance Plan for McDowell Road Basin and Storm Drain Project Landscaping

1 GENERAL

1.01 SCOPE

- A Provide all supervision, labor, materials, equipment and transportation required for continuous landscape maintenance, complete as specified

1.02 QUALITY ASSURANCE

A Requirements of Regulatory Agencies:

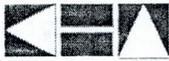
1. Perform all work in accordance with all applicable laws, codes, and regulations required by authorities having jurisdiction over such work.
2. Provide for all inspections and permits required by Federal, State, and local authorities in furnishing, transporting, and installing of all agricultural chemicals.
3. The County Agricultural Commissioner's Office must, by law, be given a monthly record of all herbicides, insecticides and disease control chemicals used.

B Applicable Standards: Apply standards as described in the following:

Arizona Nursery Association Current Standards

C Work Force:

1. The landscape maintenance provider shall have a full time foreman assigned to the job. He shall have a minimum of four years experience in landscape maintenance supervision, with experience or training in entomology, pest control, soils, fertilizers and plant identification.
2. The landscape maintenance provider's labor force shall be thoroughly familiar and trained in the work to be accomplished and perform the task in a competent, efficient manner acceptable to the City of Mesa.



3. The work force shall be directly employed and supervised by the foreman. The work force shall be under supervision at all times. Notify City of Mesa of all changes in supervision.
4. The landscape maintenance provider's labor force shall have proper identification at all times and be uniformly dressed in a manner satisfactory to the City of Mesa.

1.03 SUBMITTALS

Submit to the Owner for approval, two (2) copies each of the following items:

- A Schedule: Schedule of maintenance operations and monthly status report including list of all equipment and materials proposed to be used for the job and watering schedule.
- B Restricted Weed, Pest, and Disease Control Application Recommendations: Written application recommendation by a licensed agricultural pest control advisor for all weed, pest and disease controls restricted by the Director of Agriculture proposed for this work.
- C Licenses and Insurance: All licenses and insurances required by the City of Mesa, the State, or Federal government pertaining to this work.
- E Chemicals: Monthly record of all herbicides, insecticides and disease control chemicals used for the project.
- F Site Conditions: Initial documentation of site conditions (included existing planting and irrigation system) with corrective recommendations, if any, and cost and schedule for corrections.
- G Maintenance Manual: Include in a single, 3-ring binder a landscape maintenance manual containing an indexed collection of all schedules, records and permits listed above, as well as a documentation of condition of planting, irrigation, and landscaping at each site visit recording plant materials which are damaged or dying, if any.

1.04 SCHEDULING & COORDINATION

- A Hours: Perform all maintenance during hours mutually agreed upon between the City of Mesa and the maintenance provider.
- B Work Force: Work force shall be present at the project site as necessary to perform specified maintenance in accordance with the approved maintenance schedule.



- C Site Visits: Visit the site once a month for general maintenance. Frequency of site visits should be re-evaluated at the time of every visit as to whether or not the site needs to be visited more frequently.

2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A Fertilizers:

Sierra Chemical Company
1001 Yosemite Drive
Milpitas, CA 95035
(408) 263-8080

B Herbicides:

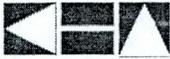
Chevron Chemical Company
575 Market Street
San Francisco, CA 94105
(415) 894-0880

Rhone-Poulenc Chemical Company
Agro Chemical Division
P.O. Box 125
Mon Mouth Junction, NJ 08852
(201) 297-0100

Ciba-Geigy Corporation
Agricultural Division
P.O. Box 1830
Greensboro, NC 27419
(919) 292-7100

Elanco Products Company
740 S. Alabama St.
Indianapolis, IN 46285
(317) 261-3638

The DOW Chemical Company
P.O. Box 1706
Midland, MI 48640
(517) 636-0236



3M Company-Agri Chemicals Project
3M Center, Bldg. 223-6SE
St. Paul, MN 55144
(317) 261-3000

2.02 MATERIALS

- A General: The maintenance provider, unless otherwise indicated, shall provide all materials and equipment.
- B Water: As available from the City of Mesa. Transport as required
- C Fertilizers:
1. Tightly compressed slow-release and long lasting complete fertilizer tablets bearing manufacturer's label of guaranteed analysis of chemicals present.
 2. Balanced, once-a-season application controlled-release fertilizers with a blend of coated prills which supply controlled-release nitrogen, phosphorus and potassium, and uncoated, rapidly soluble prills containing nitrogen and phosphorus.
- D Herbicides, Insecticides, and Fungicides: Best quality obtainable with original manufacturers' containers, properly labeled with guaranteed analysis. Use non-staining materials.
- E Replacement Tree Guys, Stakes, Ties and Wires: Match existing materials on the site (Provide detail(s) in 8-1/2 in. x 11 in. format if necessary).

2.03 EQUIPMENT

- A General: Use only the proper tool for each job. Maintain tools in sharp, properly functioning condition. Clean and sterilize pruning tools prior to usage.
- B Insect/Disease Prevention: Take measures to prevent introduction of insect or disease-laden materials onto the site.

3 GENERAL PLANT CARE

3.01 PREPARATION



A Protection:

1. Protect new planting areas from damage.
2. Provide temporary protection fences, barriers and signs as required for protection. Posts and signs may need to be put up where people are driving or walking through the site.
3. Evaluate if additional barriers such as fencing are needed to prevent people driving or walking through the site resulting in damage to the landscaping.

B Replacements:

1. Immediately treat or replace plants that become damaged or injured as a result of Maintenance Provider's operations or negligence, as directed by City of Mesa, at no cost to the City.
2. Replacement plants shall match size, condition and variety of plants replaced.

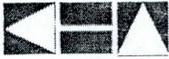
3.02 PLANTING

A Watering Basins:

1. Maintain watering basins around plants so that enough water can be applied to establish moisture through major root zones.
2. In rainy season, open basins to allow surface drainage away from the root crown where excess water may accumulate. Restore watering basins at end of rainy season.
3. For supplemental hand watering of watering basins, use a water wand to break the water force.
4. Reset plants to proper grades or upright position.

B Weed Control:

1. All areas between plants, including watering basins, shall be weed free.
2. Use only recommended and legally approved herbicides to control weed growth.



3. Avoid frequent soil cultivation that destroys shallow roots and breaks the seal of pre-emergent herbicides.

C Fertilization:

1. Recently installed plant materials: Verify from City of Mesa month of actual completion date of planting installation including amount and type of applied fertilizers.
2. Established plant materials: Insert 21-gram fertilizer tablets (20-10-5; N-P-K) in holes around dripline and between trunk and dripline. Punch or drill holes 6 to 8 inches deep. Apply one (1) tablet for each 1/2 inch trunk diameter or each foot of height or spread.

D Pruning:

1. Prune trees to select and develop permanent scaffold branches that are smaller in diameter than the trunk or branch to which they are attached, which have vertical spacing of from 18 to 48 inches and radial orientation so as not to overlay one another.
2. Prune trees to eliminate diseased or damaged growth, narrow V-shaped branch forks that lack strength and to reduce toppling and wind damage by thinning out crowns.
3. Prune trees to maintain growth within space limitations, maintain a natural appearance and to balance crown with roots.
4. No stripping of lower branches ("raising up") of young trees will be permitted.
5. Retain lower branches in a "tipped back" or pinched condition with as much foliage as possible to promote caliper trunk growth (tapered trunk). Cut lower branches flush with the trunk only after the tree is able to stand erect without staking or other support.
6. Do primary pruning of deciduous trees during the dormant season. Prune damaged trees or those that constitute health or safety hazards at any time of year as required.
7. Make all cuts clean and close or flush with the trunk, without cutting into the branch collar. "Stubbing" will not be permitted. Cut smaller branches flush with trunk or lateral branch. Make larger cuts (1 in. in diameter or larger) parallel to shoulder rings, with the top edge of the cut at the trunk or lateral branch.



9. Branches too heavy to handle shall be precut in three stages to prevent splitting or peeling of bark. Make the first two cuts 18 in. or more from the trunk to remove the branch. Make the third cut at the trunk to remove the resulting stub.
10. Do not prune or clip shrubs into balled or boxed forms.
11. Take extreme care to avoid transmitting disease from one infected plant to another. Properly sterilize pruning tools before going from one infected plant to all other plants.

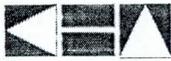
E Staking and Guying of Trees:

1. Inspect stakes and guys at least every three (3) months to check girdling of trunks or branches, and to prevent rubbing that causes bark wounds. Eyescrews in specimen tree trunks are preferred to looped wire and hose.
2. Remove existing stakes or guys when trees attain a trunk caliper of 4 inches. Recommend replacement to City of Mesa if trees are still unstable at this time.
3. Conform to the recommended industry standard procedures of staking and guying and as specified in the construction documents.

F Replacement of Plants: Immediately bring to City's attention, all dead plants and those in a state of decline. Replacement plants shall be of a size, condition and variety acceptable to City, to be paid for by the City unless due to negligence of the Maintenance Provider.

G Maintenance of Existing Plantings to Remain:

1. General: Conform to applicable paragraphs regarding pruning, watering, spraying and fertilizing of new plant materials as specified in this section.
2. Symptoms: Be alert to symptoms of construction damage to existing plantings as evidenced by wilting, unseasonal or early flowering or loss of leaves, and insect or disease infestation due to declining vigor.
3. Notification: Submit in writing of evidences of declining vigor immediately upon discerning the problem. Take appropriate interim measures to mitigate the severity of the problem as specified in this section.



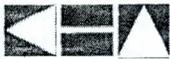
4. Proposal: Submit written proposal and cost estimate for the correction of all conditions before proceeding with permanent correction work.

3.04 GROWDCOVERS

- A Watering: Check for moisture penetration throughout the root zone at least once a month. Water as frequently as necessary to maintain healthy growth of groundcovers.
- B Weed Control:
 1. Control weeds, preferably with selective systemic herbicides.
 2. Minimize hoeing of weeds in order to avoid plant damage.
- C Fertilization:
 1. Recently installed plant materials: Verify with City of Mesa actual completion date of planting installation and rate of prior application of fertilizers.
 2. New plant materials: Place one (1) 5-gram tablets (20-10-5; N-P-K) beside the root ball about an inch from root tips.
 3. Established Plant Materials: Do not use complete fertilizers unless soil test shows specific nutrient deficiencies.
- D Replacement: Replace dead and missing plants after obtaining City of Mesa's agreement to pay for replacement. Damages due to Maintenance Provider's negligence shall be paid for without charge to Owner.

3.05 HYDROSEED

- A Watering: Watering hydromulched areas. Initial watering of seeded areas will be done to maximize growth of seedlings. The Maintenance Provider shall water and perform soil preparation and reseedling as required to maintain a fully established stand of plants. The method of watering shall be the Maintenance Provider's responsibility. The Maintenance Provider may utilize the alternate hydroseed irrigation system to water those seed mix areas which can be watered by the system if approved and agreed upon by the City.



B Protective Devices: Protective devices shall be provided as required to protect seeded areas from traffic. The Maintenance Provider shall repair and reseed areas damaged by traffic, erosion or poor germination and reseed to obtain successful germination based on the supplier's specified germination rates and species used.

C Weed Control:

1. Control weeds, preferably with selective systemic herbicides.
2. Minimize hoeing of weeds in order to avoid plant damage.

3.06 INSECTS, PESTS, AND DISEASE CONTROL

A Inspection: Inspect all plant materials for signs of stress, damage and potential trouble from the following:

1. Presence of insects, moles, gophers, ground squirrels, snails and slugs in planting areas.
2. Discolored or blotching leaves or needles.
3. Unusually light green or yellowish green color than normal green color of trees.

C Personnel: Only licensed, qualified, trained personnel shall perform spraying for insect, pest and disease control

B Application:

1. Spraying for insect, pest and disease control shall be done only by qualified, trained personnel.
2. Spray with extreme care to avoid all hazards to any person or pet in the area or adjacent areas.

4 IRRIGATION SYSTEM

4.01 GENERAL

A Existing Damaged/Faulty Irrigation Items: Repair all damaged or faulty irrigation items documented at initial site visit. City of Mesa shall approve estimate of costs for repairs prior to starting work.



- B Maintenance Provider Damages to System: Repair without charge to City of Mesa all damages to system caused by Maintenance Provider's operations. Do all repairs within one (1) watering period.
- C Non-Maintenance Provider Damages to System: Report promptly to City of Mesa all accidental damage not resulting from Maintenance Provider's negligence or operations.
- D Rainy Season Operation: Do not run the irrigation system during rainy season. Set and program automatic controllers for seasonal water requirements.
- E Soil Moisture Monitoring: Once a month, use a probe or other acceptable tool to check the moisture of representative plants' rootballs as well as its surrounding soil.

4.02 CLEANING AND MONITORING THE SYSTEM

- A Irrigation System Flushing: At least twice yearly remove end cap from each system and flush pipe lines of grit, dirt and gravel.
- B Pump Filter and Strainer Cleaning: Clean pump filter and strainer once a year and as often as necessary to keep the irrigation systems free of sand and other debris.
- C Irrigation System Monitoring: Continually monitor the irrigation systems to verify that they are functioning. Make program adjustments required by changing field conditions.

5 GENERAL MAINTENANCE

5.01 CLEANING

- A Landscape Waste and Mulch: Sweep walkways and dispose of pruned materials, clippings, and leaves and dispose of pruned materials. Remove any dead trees or shrubs found on site including capping off the water to the removal location.
- B Trash: Pick-up and dispose of trash throughout the basin site.
- C Maintenance Containers: Remove from the site containers and evidence of maintenance activities.
- D Site Disturbance: Re-grade, rake out, and clean up any disturbed areas due to people driving or walking through the site. Posts and signs may need to



be put up where people are driving or walking through the site. Evaluate if additional barriers such as fencing are needed to prevent damage to the landscaping resulting from people driving or walking through the site

**APPENDIX C
MAINTENANCE PLAN
CONSTRUCTION PLANS**

Construction Plans to be added when report finalized