Spook Hill

AREA DRAINAGE MASTER PLAN

SUPPLEMENT

FCD Contract # 2004 C054

WP # 042284.01

October 2005

Prepared for:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

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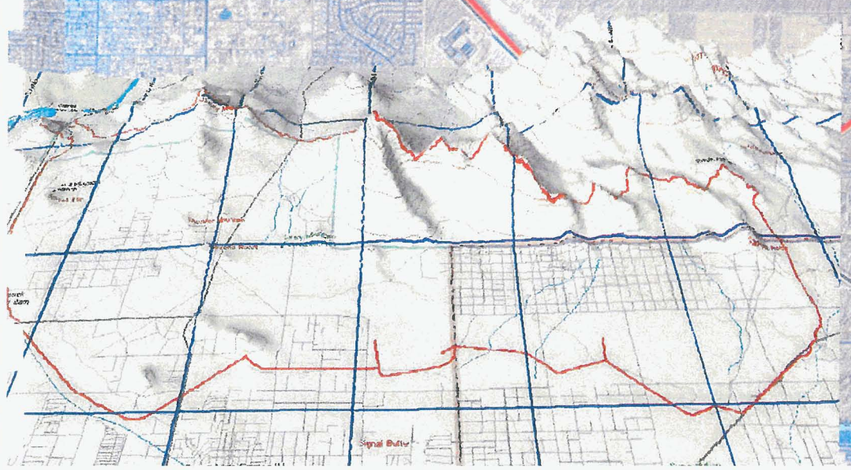

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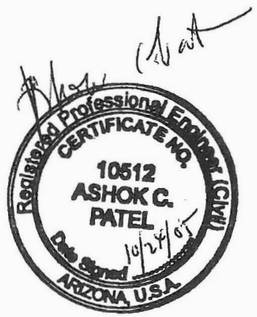

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PART 1 INTRODUCTION

Project Location & History

Project Location

The area of study for the Spook Hill ADMP is comprised of the Buckhorn – Mesa Watershed Project drainage area as shown in Figure 1 (*Study Area & HEC-1 Subarea Map*). The Spook Hill Floodway and Floodwater Retarding Structure (FRS) form the western boundary of the study area. The southern boundary is formed by the Signal Butte Floodway & FRS, the Bulldog Floodway, & 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 along the Apache Trail. The total area of study is approximately 35 square miles. This study concentrates on a local area that is bound to the west by Hawes Road, to the east by 90th Street, to the south by Culver Street, and to the north by McDowell Road.

Project History

In the early 1970s, the Soil Conservation Service (now called NRCS) began to develop the conceptual plans for a series of flood control structures in the Buckhorn-Mesa watershed. The structures were designed and constructed during the period from the late 1970s through the mid 1980s. These structures were designed to provide flood protection to the downstream agricultural properties by intercepting the runoff, detaining it, and discharging it into the Salt River. In the late 1980s, it became apparent that the areas upstream of these structures were going to experience significant development and, for that reason, in the mid 1980s the District contracted with Parsons, Brinkerhoff, Quade, & Douglass (PBQD) to prepare an Area Drainage Master Study (ADMS) to identify flooding problems in the watershed and propose solutions for possible implementation. However, the proposed alternative was never implemented, the area continued to develop, and the drainage issues remained. The *Spook Hill Area Drainage Master Plan (ADMP) Update* completed by Wood, Patel & Associates, Inc. (Wood/Patel) in September, 2002, expanded the existing Spook Hill ADMS completed in July 1987 by quantifying the extent of flooding problems, incorporated existing drainage structures into the model, developed alternative solutions to flooding problems for the contributing watershed and determined the feasibility of removing the jurisdictional status of the Buckhorn-Mesa Structures.

At the completion of the ADMP update, the District learned that the basin area located at the northeast corner of McDowell Road and 88th Street was being subdivided by a developer and subsequently had single family homes constructed on the site. In January 2005, the Flood Control District of Maricopa County (District) contracted Wood/Patel to develop a supplemental document to the ADMP. As a result, new locations for the basin site had to be evaluated. Consequently, a new basin location was selected at the northeast corner of Culver Street and Hawes Road (Culver – Hawes detention basin). This supplement will document the relocation of a flood control storage basin that was planned at the northeast corner of McDowell Road and 88th Street.

After the completion of the ADMP, a new detention basin was constructed along McDowell Road near 90th Street (Madrid detention basin). The basin was constructed as a part of the Madrid subdivision located along the south side of McDowell Road. The District requested that this analysis utilize the Madrid detention basin.

The purpose of this report is to update the ADMP by a supplemental document and refine the hydrology, hydraulics, basin layout and landscaping for the Culver - Hawes detention basin. This document contains preliminary information and conceptual designs as well as the final recommended alternative.

Project Participation

Interagency Coordination

The successful completion of this project required the active participation of multiple agencies. These include the District, the City of Mesa (City), and the Maricopa County Department of Transportation (MCDOT). The consultant and the District have held regular monthly meetings. A meeting was also held with the HOA for the Madrid subdivision to discuss potential modifications to the existing basin within the Madrid subdivision for this project.

Public Involvement

Public involvement was a very important aspect of this project and the project team gathered input from the public to present the recommended design. The project team conducted the open-house public meeting on August 18, 2005. Comments from the attendees regarding the project were generally positive. Information from the meeting is included in Appendix C.

Basis of Design

This supplement utilized several items developed by the ADMP. The HEC-1 model titled REC_FC24.DAT from the ADMP was modified for this study. The model is the recommended alternative model with future condition land use conditions applied for the 100-year, 24-hour storm event.

Two-foot topography from the ADMP was used for the development of the 15% plans. United States Geological Survey (USGS) quadrangle maps were used for the modification of the drainage sub-basin boundaries for the update to the HEC-1 models.

The City of Mesa supplied current ¼ section maps for water, sewer, gas and storm drain locations.

Soils information used in the HEC-1 modeling was based on NRCS Soils Data.

A geotechnical investigation and soil borings, *Geotechnical Report Hermosa Vista Basin NEC Hawes Road and Culver Street Maricopa County, Arizona Contract FCD 2003C012 Assignment No. 5* by Kleinfelder, Inc., were conducted at the proposed basin site in June 2005. The investigation was to determine if bedrock exists at the proposed basin depths. The report determined that no bedrock was found within the potential excavation limits and conventional grading techniques could be applied for the basin excavation.

Sediment deposition was analyzed based on JE Fuller's report, *Spook Hill Area Drainage Master Plan Update Existing Conditions Sedimentation Analysis*, dated March 29, 2000. This report provided sediment yield estimates on a per year basis.

Information regarding the detention basin constructed within the Madrid subdivision was obtained from a report prepared by JMI & Associates, Inc. titled, *Revised Drainage Report for Madrid*, dated June 11, 2004. The report contained stage-storage rating curves for the basin that were incorporated into HEC-1 modeling developed with this supplemental update.

Additional Reports and Studies

There were additional studies done and reports prepared as part of the ADMP project which were not included in this supplemental report, except by reference. A brief summary of the additional reports and studies is as follows:

- *Storm Drain Material Analysis* – An analysis and data compilation prepared for the City of Mesa to aid in their decision regarding the use of a modified Corrugated Metal Pipe for the storm drain analysis and cost estimates. Report and data compilation by Wood/Patel, April 2000.
- *Existing Conditions Sediment Yield* – An analysis of the sediment yield to be expected at the FRS structures in the existing condition. Technical memorandum prepared by JE Fuller Hydrology & Geomorphology, Inc. for Wood/Patel, February 2000.
- *Existing Conditions Sedimentation Analysis for Spook Hill ADMP Update* – A detailed analysis of the sediment yield to be expected at the FRS structures in the existing condition. Report prepared by JE Fuller Hydrology & Geomorphology, Inc. for Wood/Patel, March 2000.

TONTO NATIONAL FOREST

USERY MTS.

GOLDFIELD MOUNTAINS

TONTO NATIONAL FOREST

USERY MOUNTAIN RECREATION AREA

SPOOK HILL RECREATION AREA

Usery Mts

Usery Pass

Usery Pass Road

Mesa Gun Club

Pass Mountain

Bulldog Canyon

Bulldog Wash

Red Mountain

Spook Hill

Thunder Mtn.

Stone Mtn.

Raven's Roost

Harmony Villa

Granite Reef Estates

Saddle Rock

Prospect Pt.

Bulldog Mt.

MARICOPA CO.
PINAL CO.

BM 1894

BM 1927

Trailer Park

Signal

SOSSAMAN ROAD

HAWES ROAD

ELLSWORTH ROAD

CRISMON ROAD

SIGNAL BUTTE ROAD

MERIDIAN ROAD

N

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION

Spook Hill ADMP

STUDY AREA & HEC-1 SUB-AREA MAP

	BY	DATE
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DRAWN	S. CAMPBELL	06/00
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FIGURE 1

SHEET OF 1 1

PART 2 HYDROLOGY

Introduction

Several existing condition and future condition models were developed with the ADMP. This study utilized the future conditions 100-year, 24-hour model developed in the ADMP. The model was modified to reflect the new basin location based on current District methodology.

HEC-1 Methodology

Hydrology for the Spook Hill ADMP Update was developed using the U.S. Army Corps of Engineers, *HEC-1 Flood Hydrograph Package* (HEC-1) computer program. The District's *Drainage Design Manual for Maricopa County, Arizona, Volume I, Hydrology (DDMI),* provides guidance in the development of rainfall-runoff models within Maricopa County and supplements the HEC-1 User's Manual. The District has also developed the computer program Drainage Design Menu System for Windows (DDMSW) as an aid in the application of methods described in DDMI. The DDMSW was used for the development of HEC-1 input parameters. This methodology was used for both the Maricopa County and Pinal County portions of the Spook Hill ADMP study area.

Hydrologic models were prepared for the following rainfall events for the existing and future watershed conditions as part of the Spook Hill ADMP:

Existing Conditions:
100-year/24-hour, 100-year/6-hour and 10-year/6-hour, with sub-basins and points of concentration defined for the 100-year frequency.

Future Conditions:
100-year/24-hour, 100-year/6-hour, 100-year/2-hour, 10-year/6-hour, with sub-basins and points of concentration defined for the 100-year frequency.

As mentioned previously, the future conditions 100-year, 24-hour model was modified and utilized in this study. The HEC-1 sub-area map is included as Figure 1 (see Appendix B). Also included in Appendix B is a HEC-1 schematic diagram and runoff summary table.

HEC-1 Input Data Development

The input parameters for the Spook Hill ADMP Update HEC-1 Models were measured from or were primarily based on the following sources of data:

- Detailed topographic mapping (i.e., 1"=200' with a contour interval of 2') prepared by Kenney Aerial Mapping, Inc., based on photography flown on December 30, 1999. The vertical datum is NAVD 1988.
- Land use data is based on adopted General Plans from the municipalities of Mesa and Apache Junction for their respective areas and from Landis Aerial Mapping for areas lying within Maricopa County.
- Soil type data, based on the Soil Survey of Aguila-Carefree Area, Parts of Maricopa and Pinal Counties, Arizona (SCS, 1986).
- NOAA Atlas II precipitation data as documented in DDMI
- Existing Structure Information

Hydrologic Parameters

Detailed documentation and computation sheets for various components of the HEC-1 model have not been included with this submittal. However, a brief outline is presented here to familiarize the reader with the Spook Hill HEC-1 model.

Rainfall Event Parameters

Precipitation Data:

Adjusted point rainfall precipitation depths for the study events were computed for the study area.

Rainfall Distribution:

24-hour Rainfall Distribution. The dimensionless storm patterns documented in the DDMI were used in his study.

Sub-Basin Parameters

Sub-Basin Boundaries:

The study area shown in Figure 1 encompasses approximately 35 square miles. The study area for the existing conditions model has been delineated into sub-basins using USGS 7.5-minute quadrangle maps.

Land Use and Soil Data:

Land use data is based on adopted general plans from the municipalities of Mesa and Apache Junction and from Landis Aerial Mapping for areas lying within Maricopa County and Pinal County. A combination of electronic planimetering and AutoCAD software was used to compute the sub-basin areas, the area of each soil group in each sub-basin and the area of each land use category in each sub-basin.

Unit Hydrograph:

The Clark Unit-Hydrograph option in HEC-1 was used for all sub-basins in accordance with current District methodology.

Precipitation Losses:

The Green-Ampt precipitation loss option was used for all sub-basins.

Time of concentration Flow Paths:

Time of concentration flow path data was determined for each sub-basin using the USGS Quads and supplemented by the detailed topographic mapping.

Retention/Detention Basin and Impoundment Area Data

Retention/Detention Basin and Impoundment Area Data:

In cases where a portion of a sub-basin drains to a retention/detention basin, flow diversions are used to divert the volume of water corresponding to the measured capacity of the retention/detention basin. The percentage of the flow that can be diverted (i.e., the DQ-record information) corresponds to the percentage of the sub-basin area that drains to the retention/detention basin. The flow was then discharged from the basin at a rate which would empty the basin in 36-hours. Retention/detention basin and impoundment area storage volumes were derived as-built information.

Storm Drainage Systems

Existing Storm Drainage Systems:

There are no sub-surface regional storm drain systems within the study area; however, there are small cross drainage culverts under the existing surface streets on some of the smaller washes. Several existing developments have drainage features that were developed to address site-specific drainage issues (open channels, storm drains, etc.). These features have been incorporated into the hydrologic model where applicable.

Cumulative Area Computations for Combined Hydrographs

When hydrographs generated from subareas or routings are combined, HEC-1 requires a drainage area specified on the HC-record. This area is used to compute an interpolated hydrograph for the "combined hydrograph" based on the data given on the JD-records (the JD record is used to compute the aerial reduction factor based on the area experiencing rainfall at any given time). For this study, areas have been computed for each combine node based on the total area of all the sub-basins located upstream of the combine node. These "Cumulative Area Computations" list the areas and names for all of the upstream sub-basins for each combine node. The drainage area specified for each of the combine nodes represents the maximum drainage area that may contribute flow to the combine node. It is recognized that a combine node may only receive a fraction or none of the runoff hydrograph from some of the upstream sub-basins.

PART 4 DESIGN CRITERIA

Introduction

This section describes the criteria for storm drains and detention basin design and the computational procedures used for the preliminary 15% design.

Design Criteria

The design criteria for hydraulic structures is based upon the guidelines established in the *Drainage Design Manual for Maricopa County, Arizona, Volume II, Hydraulics (DDMII),* January 28, 1996. The following criteria were used in the development of the design alternatives and are to be followed during final design.

Storm Drain

Storm drains were designed for the 100-year discharge. A minimum of 2-feet of cover is required over all storm drains to allow for full pavement structural section over the top of the pipe. The pipes are designed so that construction traffic will not damage the pipes during roadway construction.

Due to the steep slopes along the potential alignments and the desire to keep the velocities in the range of 15 ft/sec, CMP was utilized as the primary pipe material for the conceptual design. In order to allay any concerns as to its durability, the invert of the CMP will be paved with 3-inches of 5000psi concrete (reinforced with welded wire fabric which is welded to the CMP itself) and the pipe will be slurry backfilled to 1' above the crown of the pipe.

Detention Basins

Whenever possible, side slopes of 6:1 are used inside the basin and adjacent to right-of-ways and fill embankment slopes of 4:1 is used outside of the basin. In order to maximize storage volume and minimize land requirements for the basin, it is designed with a minimal bottom slope. The basin is dewatered via gravity flow to a low-flow pipe outlet. The low-flow pipe outfalls into a proposed storm drain system and will dewater the basin within 36 hours.

A 12-foot wide path is provided at the top of the basin to accommodate a maintenance access road around the basin. Provisions have also been made for access to the basin bottom via an access ramp.

The detention basin is designed to limit the embankment fill to ensure that basin is classified as a "non-jurisdictional dam". Embankment fills of six feet or less are classified as non-jurisdictional dams regardless of storage capacity. Embankment fills of less than 25 feet in height are classified as non-jurisdictional if the storage capacity is less than 50 acre-feet. If the storage volume is less than 15 acre-feet, regardless of embankment height, the basin is classified as non-jurisdictional. The dam height for purposes of Arizona Department of Water Resources (ADWR) dam classification is the vertical difference between the lowest point on the downstream toe (at natural ground) and the emergency spillway crest.

The detention basin is designed as an off-line basin. A structure is designed adjacent to the basin with a splitter structure to allow a pre-determined design bypass flow. Once the design bypass flow rate is exceeded, the splitter structure will allow excess flow to enter the basin. A detailed design and analysis of the splitter structure is required at the final design level to ensure proper functioning.

The design of the detention basin also incorporates aesthetic considerations such as terracing and re-vegetation. Multi-use amenities were not considered for this basin site.

100-Year Design Calculations

Proposed storm drains and the detention basin are sized based on projected peak runoff rates under fully developed conditions. The developed condition's hydrology model is updated to reflect the proposed detention basin stage-storage-discharge relationship. Therefore, the effects of the proposed improvements are included in the design discharges.

Storm Drain

Storm drains are sized using standard culvert design methodology. The hydraulic grade line (HGL) was computed according to the procedures outlined in the *Drainage Design Manual for Maricopa County, Arizona, Volume II, Hydraulics* and using the StormCAD® computer program.

Detention Basins

The detention basin is sized by developing a preliminary grading plan that optimizes the volume available at each site based on the design constraints presented in the Design Criteria section of this report and the physical constraints presented at each site.

An off-line basin is used since it allows for more effective use of the available basin volume by conveying low flows around the basin without occupying any storage volume. In this way, the available storage volume is preserved for attenuating the peak flows when they arrive at the basin.

The basin stage-storage relationship is input into the hydrology model and the basin bypass discharge and outlet pipe size are adjusted until the basin volume is used and acceptable peak flow attenuation is achieved.

The side weir spillway is sized to divert the flow in excess of the design bypass flow. Side weir spillways are sized using the broad crested weir equation and the average flow depth over the weir. The stage discharge relationship is determined by inputting the outlet pipe size and invert elevation into the HEC-1 model where the stage-discharge relationship is developed using the orifice equation.

Surface modeling software was used to calculate the cut and fill quantities for the basin earthwork estimates.

PART 5 EXISTING UTILITIES AND PLANNING CONSTRAINTS

Introduction

This section describes the existing utilities within the project limits and constraints that impacted the preliminary design.

Existing Utilities

Utility providers with facilities within the study area were contacted to determine what facilities may be present.

Water and Sanitary Sewer

The City of Mesa provides both water and sewer service to a portion of the study area. The water distribution system consists of water mains constructed on section line roads where section line roads exist. The distribution system will be expanded by the City to include new section line roads as they are constructed. Existing primary water distribution corridors include Power Road, Hawes Road, Ellsworth Road, McDowell Road and Brown Road. Several of these alignments contain multiple water distribution lines ranging in size from 12-inches to 36-inches.

Although many of the subdivisions in the Spook Hill area are on city sewer, a significant portion of the homes in this area are on septic systems.

Natural Gas

The City of Mesa supplies gas service to the portion of the study area that lies within its boundary. The Southwest Gas Corporation provides the remainder of gas service in the study area.

Electric Power

The study area is within the Salt River Project electric power service area. Power in the project area is primarily supplied via an underground distribution grid.

Cable TV

Cable TV Service is provided by Cox Communications. Cable TV lines are shown on the Preliminary Design Plans. Cable TV is not considered a critical utility conflict, but is shown for information purposes.

Telephone

Telephone lines owned by Qwest (formerly US West) are present within the study area. Major duct banks and fiber optic line are considered critical utility conflicts and are shown on the Conceptual Design Plans.

Irrigation

Central Arizona Project's Salt-Gila Aqueduct is immediately downstream and parallel to the Spook Hill FRS. Since this facility is outside of the proposed drainage improvements, there are no conflicts.

Planning Constraints

The development of the design solutions for the site is impacted by existing utilities and certain physical constraints. While the conceptual design accommodates the known existing utilities, the vertical alignment of the proposed storm drains may require adjustment during final design to accommodate new utilities or the identification of existing utilities whose locations were not known at the time of the conceptual design.

PART 6 ENVIRONMENTAL AND PERMIT ISSUES

The firm of CMG Engineering, Inc. was contracted by the District to identify the regulatory washes within the project boundary of the ADMP and this study, entitled *Jurisdictional Boundary Delineation for the Spook Hill ADMP,* was completed on July 9, 2001. The study identified two Section 404 washes that would be impacted by the activities proposed within this supplement. Refer to Figure 2 – *404 Jurisdictional Delineation* for the locations of the two washes. The system proposed within this addendum will maintain low flows to these washes.

Section 404 of the Clean Water Act regulates construction activities within "Waters of the U.S." The U.S. Army Corps of Engineers (USACOE) enforces the Section 404 requirements through the 404 permits program. Prior to undertaking construction activities within waters of the U.S., a 404 permit must be obtained. The purpose of the 404-permit program is to avoid adverse impacts or to offset unavoidable adverse impacts to existing aquatic resources.

The Environmental Protection Agency (EPA) prepared guidelines to be followed in evaluating 404 permit applications. The guidelines, referred to as 404(b)(1) guidelines, require evaluating the alternatives to consider the environmental impacts with the implicit goal of selecting the Least Environmentally Damaging Practicable Alternative (LEDPA). Accordingly, alternatives should be designed to avoid environmental impacts, when practicable. When environmental impacts are unavoidable or impracticable to avoid, then measures must be taken to minimize the impacts and to compensate for the impacts through mitigation. Mitigation consists of restoration, creation, or enhancement of aquatic resources expressly for the purpose of compensating for unavoidable impacts. On-site mitigation is typically preferred by the COE. If on-site mitigation is not feasible, then off-site mitigation or in-lieu fees for the monetary value of the environmental impacts may be options.

The proposed Culver – Hawes detention basin within this study provides an opportunity to mitigate adverse impacts through the establishment of native vegetation and habitat within the basin.

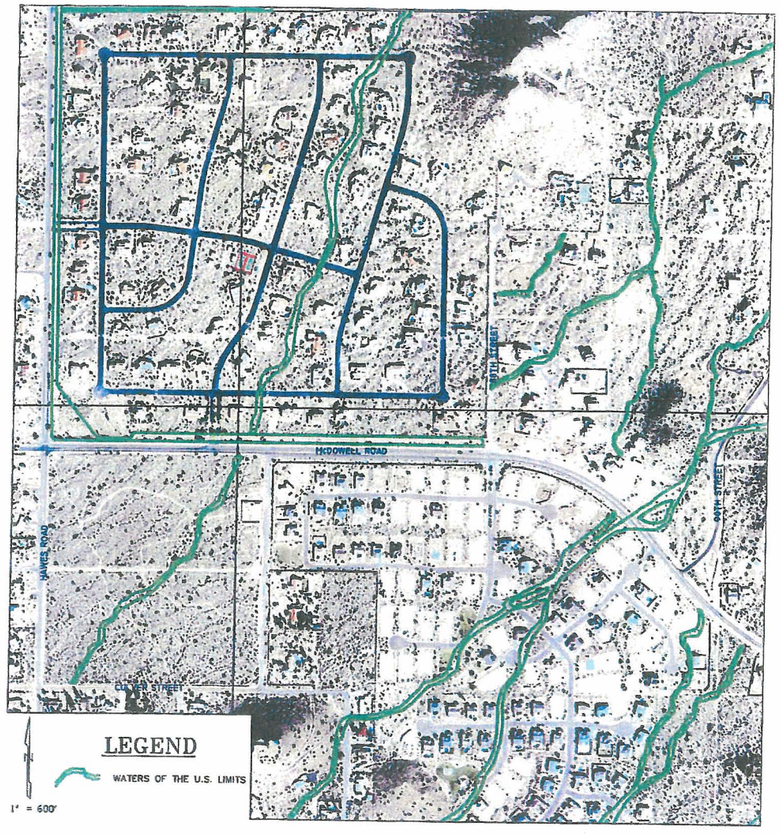


FIGURE 2 – 404 JURISDICTIONAL DELINEATION

PART 7 ALTERNATIVES FORMULATION & ANALYSES

The alternative analysis portion of this project is being developed in three levels: Level I – Alternative Formation/Preliminary Analysis; Level II – Alternative Analysis; and Level III – Preferred Alternative Analysis. The following is a summary of the tasks performed under each level of the study.

Level I Analysis (Alternative Development) & Level II Analysis (Evaluation of Alternatives)

Constraints

Wood/Patel was initially scoped to investigate three alternatives. Based on feedback from the project partners, it was determined that additional alternatives should be modeled. In total, six alternatives were evaluated and then presented to the District. The following information has been provided as a summary of each alternative that was studied.

Each alternative studied was limited by the same boundary constraints. The boundary constraints included flows developed in the ADMP for proposed storm drain systems downstream of Culver Street and Hawes Road. One system begins at the intersection of McDowell Road and Hawes Road. This system drains to the west along McDowell Road to the Spook Hill FRS. The design flow for this system as reported in the ADMP is 783 cfs. The other storm drain system originates along Hawes Road. This system continues along Hawes Road to Hermosa Vista Road where it drains west to the Spook Hill FRS. The design flow as reported in the ADMP is 165 cfs.

Sediment deposition into the Madrid detention basin was also taken into account for each alternative modeled. The overall storage volume of the Madrid detention basin was reduced by 1.0 acre-foot of volume to account for sediment. This was a conservative volume reduction. The watershed contributing to the basin is approximately 0.67 square miles. A 100-year storm event produces an estimated 0.82 ac-ft of sediment per square mile of contributing watershed. Therefore, a 1.0 ac-ft reduction accounts for two potential 100-year storm events occurring within the same year if the basin is maintained annually.

In all the alternatives studied, the Culver - Hawes detention basin was designed as an off-line basin. Low-flows bypass the basin and outlet through the storm drain system along Hawes Road and Hermosa Vista Drive. The basin is also evacuated through the same storm drain system.

The following is a description of each alternative that was studied.

Alternative 1

Alternative one (Figure 3) utilizes the Madrid detention basin. A minor flow of 39 cfs is released through the existing outlet structure into the Madrid subdivision to meet the Section 404 requirements for the wash that continues through the Madrid subdivision. The remainder of the flow produced by the stage-storage routing of the Madrid detention basin is taken west along McDowell Road within a proposed 72-inch storm drain. At Hawes Road, the system turns south and continues within a 78-inch storm drain system along Hawes Road to the proposed Culver - Hawes detention basin.

Alternative 2

Alternative two (Figure 4) utilizes the Madrid detention basin and releases the entire reduced flow produced by the stage-storage routing into the Madrid subdivision. The flow is then collected within the Madrid subdivision in the vicinity of 87th Street and Culver Street. The flow is directed west within 2-66-inch storm drains to the Culver - Hawes detention basin.

Alternative 3

Alternative three (Figure 5) utilizes the Madrid detention basin. Alternative three allows 108 cfs to be released into the Madrid subdivision. The remaining flow produced by the stage-storage routing through the Madrid detention basin is taken west within a 66-inch storm drain along McDowell Road. At Hawes Road, the system turns south and continues along Hawes Road in a 72-inch storm drain to the proposed Culver - Hawes detention basin.

Alternative 4

Alternative four (Figure 6) utilizes the Madrid detention basin. The outflow produced by the stage-storage routing from the basin is taken west along McDowell Road within a 78-inch storm drain system. At Hawes Road, the system turns south and continues along Hawes Road in an 84-inch storm drain to the proposed Culver - Hawes detention basin.

Alternative 5

Alternative five (Figure 7) does not utilize the Madrid detention basin. The entire flow that reaches the basin site is routed west along McDowell Road in 2-78-inch storm drains. The flow continues along Hawes Road in 2-84-inch storm drains to the proposed basin site. This model is intended to determine the overall effect utilizing the Madrid basin has on the volume requirements for the proposed Culver - Hawes detention basin.

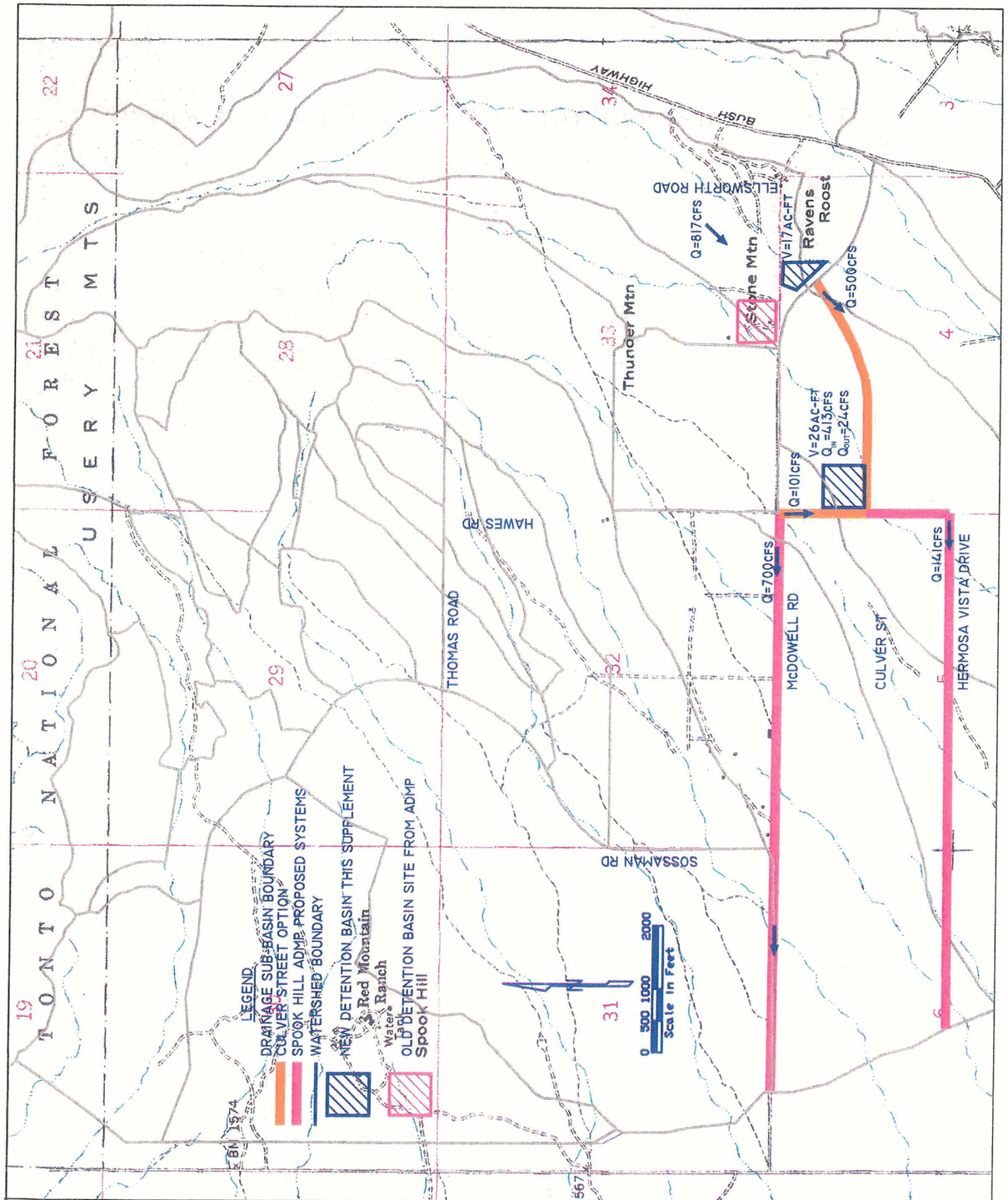
Alternative 6

Alternative six (Figure 8) utilizes the Madrid detention basin. A minor flow of 39 cfs is released through the Madrid subdivision to meet the Section 404 requirements for the wash that continues through the Madrid subdivision. The remainder of the flow produced by the stage-storage routing of the Madrid detention basin is taken west along McDowell Road within a 72-inch storm drain. At Hawes Road, the system turns south and continues along Hawes Road in a 78-inch storm drain to the proposed Culver - Hawes detention basin. In an attempt to provide cost savings to the Hermosa Vista–Hawes Road storm drain system downstream of the basin, this alternative maximizes the size of the Culver - Hawes detention basin.

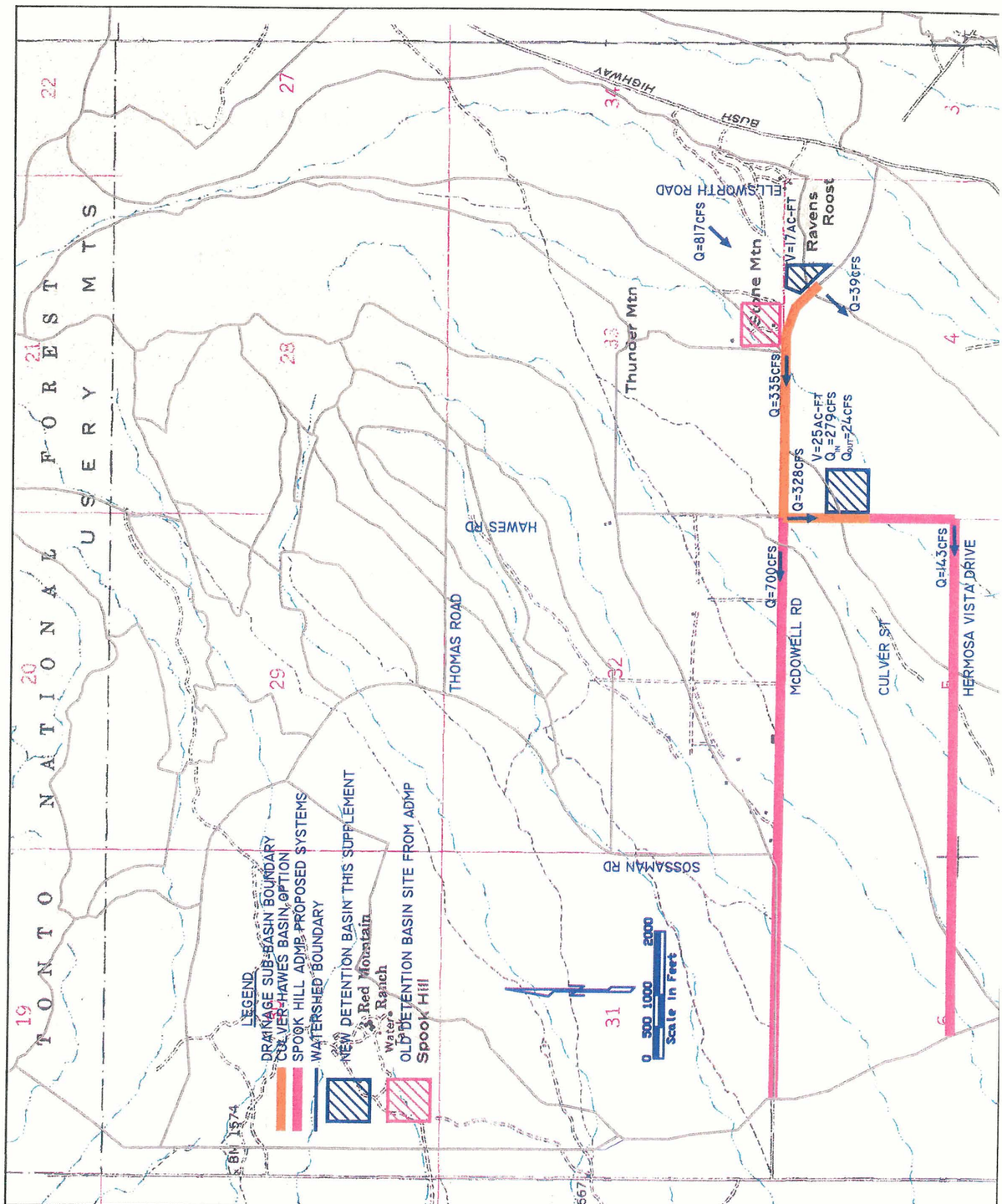
Hydrologic Modeling

The existing condition HEC-1 model was revised to reflect the routing required for each alternative. The channel routing parameters and the sequence of hydrograph routing and combinations were modified to model the effects of each alternative.

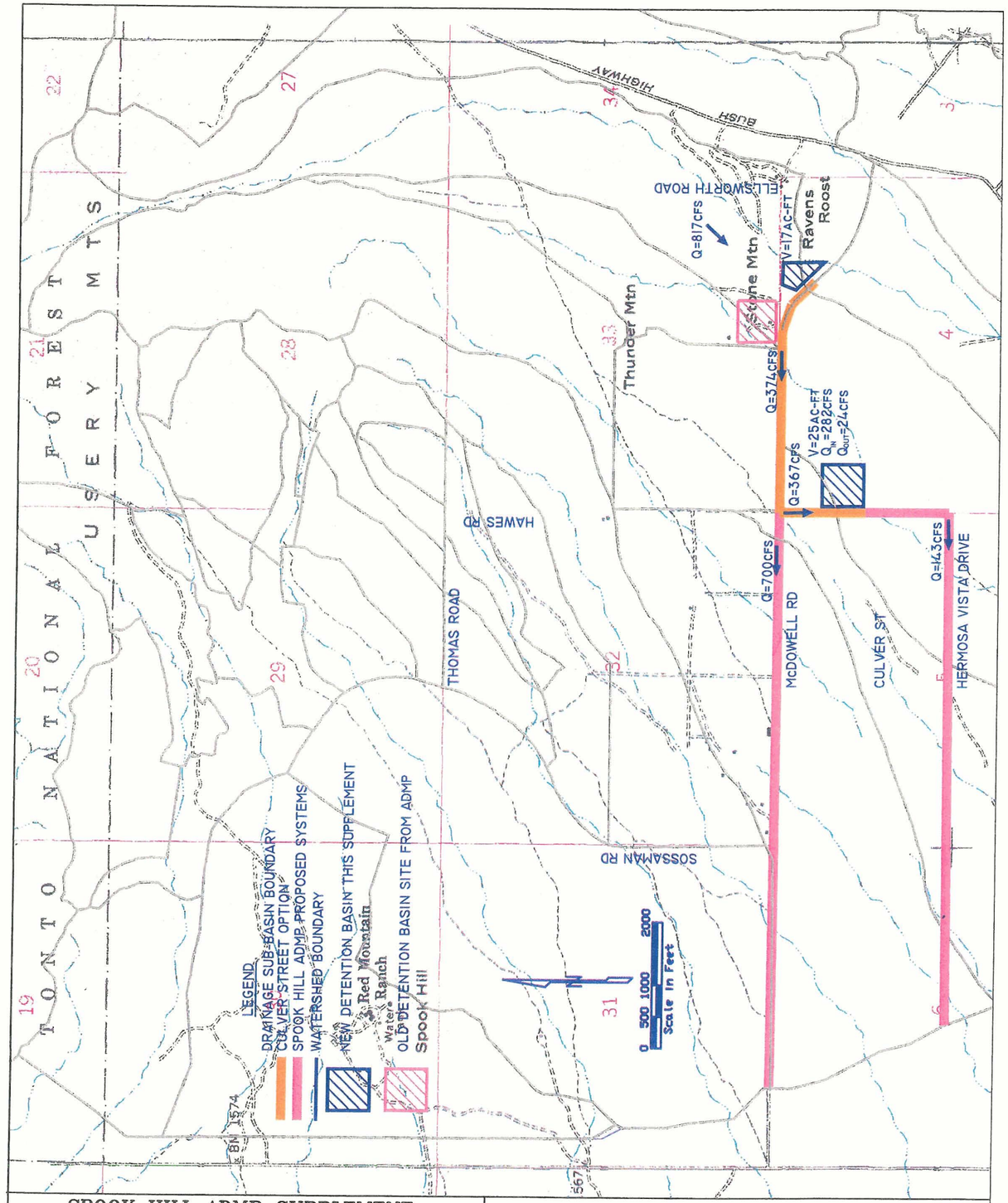
The detention basins and storm drains were then sized based on the 100-year, 24-hour peak discharges. The detention basin was sized to maximize flow attenuation with the land area available using the off-line basin concept. A summary of the flows for each alternative are given in Table 1 on page 11.



SPOOK HILL ADMP SUPPLEMENT FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	HERMOSA VISTA - HAWES ROAD STORM DRAIN AND BASIN	ALTERNATIVE 2
WOOD, PATEL & ASSOCIATES, INC. 2051 WEST NORTHERN, SUITE 100 PHOENIX, ARIZONA (602) 335-8500	BY / DATE / spkh1-culver2.dwg DESIGNED J. McCARTY 04/05 DRAWN J. McCARTY 04/05 CHECKED A. PATEL 04/05	FIGURE 4

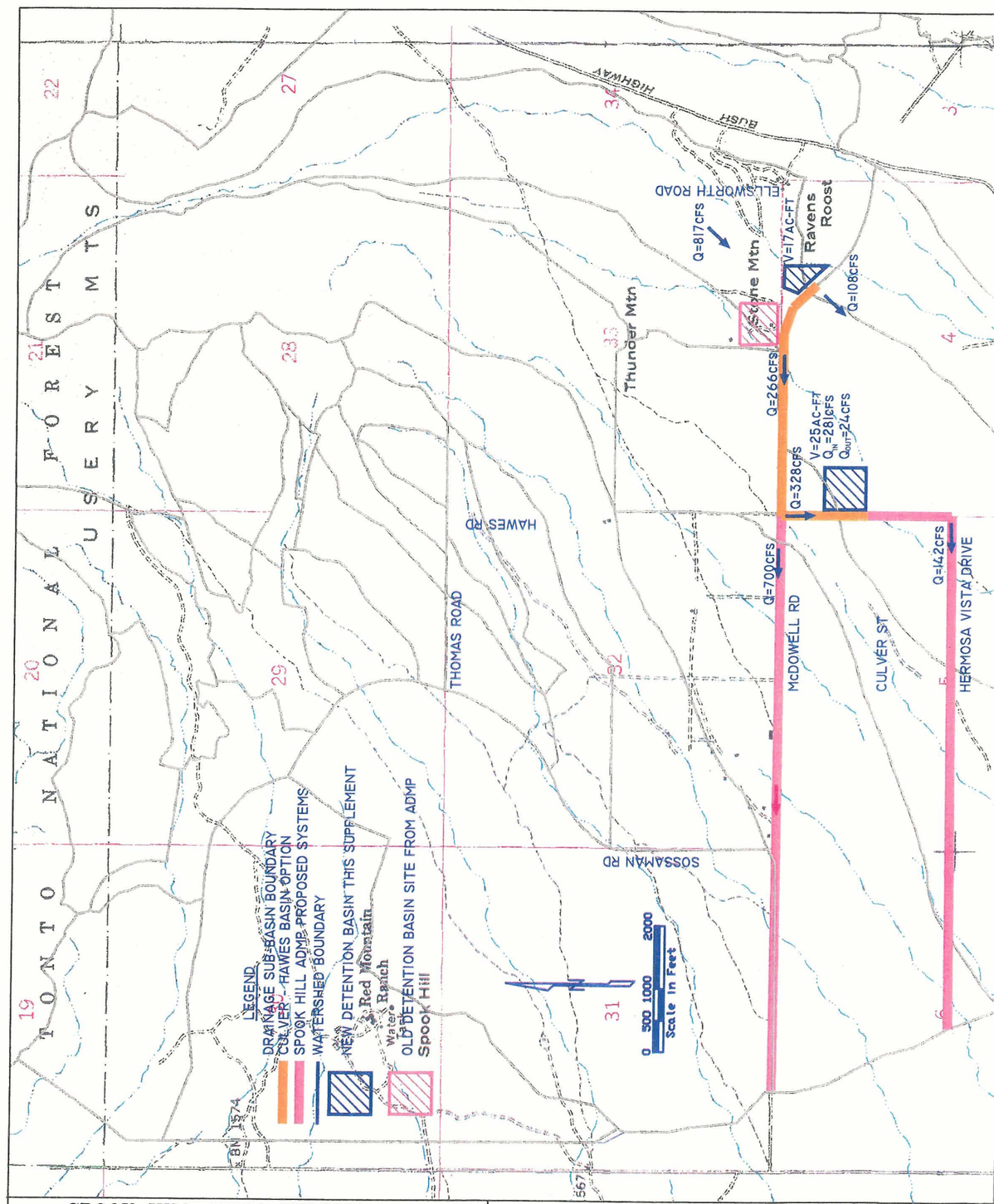


SPOOK HILL ADMP SUPPLEMENT FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	HERMOSA VISTA - HAWES ROAD STORM DRAIN AND BASIN	ALTERNATIVE 1
WOOD, PATEL & ASSOCIATES, INC. 2051 WEST NORTHERN, SUITE 100 PHOENIX, ARIZONA (602) 335-8500	BY / DATE / spkh1-culver1.dwg DESIGNED J. McCARTY 04/05 DRAWN J. McCARTY 04/05 CHECKED A. PATEL 04/05	FIGURE 3



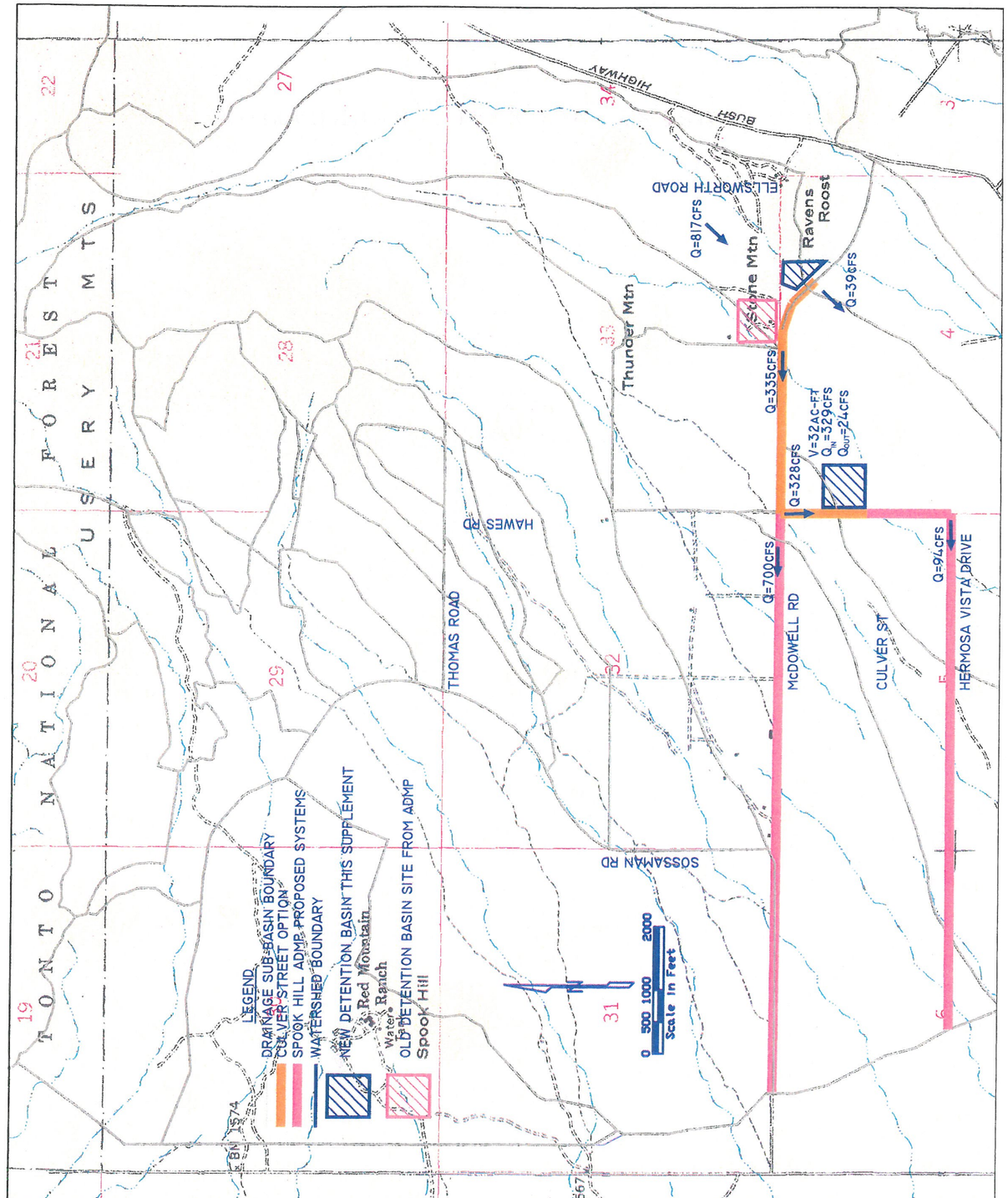
SPOOK HILL ADMP SUPPLEMENT FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	HERMOSA VISTA - HAWES ROAD STORM DRAIN AND BASIN Spook Hill ALTERNATIVE 4
WOOD, PATEL & ASSOCIATES, INC. 2051 WEST NORTHERN, SUITE 100 PHOENIX, ARIZONA (602) 335-8500	

	BY	DATE	
DESIGNED	J. McCARTY	04/05	spkh1-culver4. dwg
DRAWN	J. McCARTY	04/05	FIGURE 6
CHECKED	A. PATEL	04/05	



SPOOK HILL ADMP SUPPLEMENT FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	HERMOSA VISTA - HAWES ROAD STORM DRAIN AND BASIN Spook Hill ALTERNATIVE 3
WOOD, PATEL & ASSOCIATES, INC. 2051 WEST NORTHERN, SUITE 100 PHOENIX, ARIZONA (602) 335-8500	

	BY	DATE	
DESIGNED	J. McCARTY	04/05	spkh1-culver3. dwg
DRAWN	J. McCARTY	04/05	FIGURE 5
CHECKED	A. PATEL	04/05	



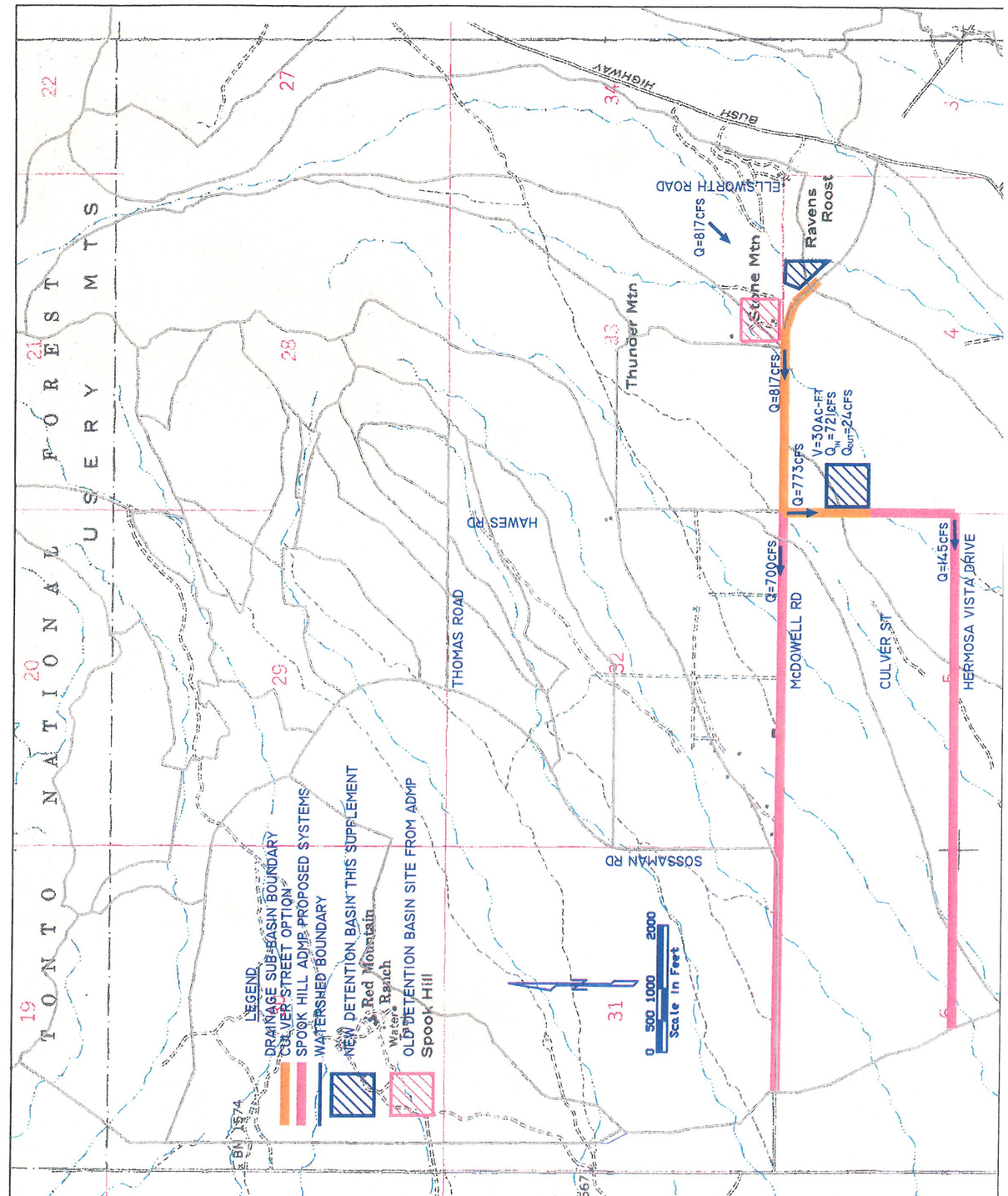
SPOOK HILL ADMP SUPPLEMENT
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

HERMOSA VISTA - HAWES ROAD STORM DRAIN AND BASIN

ALTERNATIVE 6

WOOD, PATEL & ASSOCIATES, INC.
2051 WEST NORTHERN, SUITE 100
PHOENIX, ARIZONA (602) 335-8500

	BY	DATE	spkh1-culver6.dwg
DESIGNED	J. McCARTY	04/05	
DRAWN	J. McCARTY	04/05	FIGURE 8
CHECKED	A. PATEL	04/05	



SPOOK HILL ADMP SUPPLEMENT
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

HERMOSA VISTA - HAWES ROAD STORM DRAIN AND BASIN

ALTERNATIVE 5

WOOD, PATEL & ASSOCIATES, INC.
2051 WEST NORTHERN, SUITE 100
PHOENIX, ARIZONA (602) 335-8500

	BY	DATE	spkh1-culver5.dwg
DESIGNED	J. McCARTY	04/05	
DRAWN	J. McCARTY	04/05	FIGURE 7
CHECKED	A. PATEL	04/05	

Table 1 – Hydrology Summary for Alternatives (cfs)

Major Concentration Point/Location	Hydrograph Name	Alternative						
		Spook Hill model	1	2	3	4	5	6
Flow to West From Madrid Basin along McDowell Rd	D370	175	335	0	266	374	817	335
Flow to Southwest From Madrid Basin Through Madrid	S370	N/A	39	500	108	0	0	39
Flow to West Along McDowell Rd at Hawes Rd	B390W	783	700	700	700	700	700	700
Flow to South Along Hawes Rd at McDowell Rd	C370	N/A	328	101	261	367	773	328
Flow to Culver/Hawes Basin along Culver Street	C38B3b	N/A	N/A	522	N/A	N/A	N/A	N/A
Flow to West at NWC of Hermosa Vista Rd And Hawes Rd	C38B3c	143	143	141	142	143	145	94
Detention Basin Data								
Madrid Basin Peak Volume (ac-ft)		N/A	17	17	17	17	17	17
Culver/Hawes Basin Peak Volume (ac-ft)		N/A	25	26	25	25	30	32

Alternative Refinement

The project team evaluated and discussed the pros and the cons of each alternative selected in the Level I analysis. Cost estimates were prepared which included design, major construction items, rights-of-way, and major utility relocations. Refer to Table 2 below for a summary of costs for each alternative. The costs do not include land acquisition costs for the proposed basin site.

Table 2 – Alternative Preliminary Costs

Alternative	Preliminary Cost
1	$2,513,000
2	$2,618,000
3	$2,374,000
4	$2,671,000
5	$4,384,000
6	$2,698,000

The team evaluated the alternatives in accordance to several criteria in order to objectively identify the preferred alternative. These criteria included the following:

- Capital Cost: The total anticipated cost of the alternative, including engineering, administration, and construction.
- Constructability: The ease with which the alternative could be constructed using current equipment and methodology.
- Implementability: The ease with which the alternative could be implemented given the political, governmental, municipal, and financial constraints which would have to be overcome.
- Aesthetics: The ability of the alternative to blend with the surrounding environment and present an aesthetically pleasing appearance.
- Conformance: A measure of the alternatives conformance with the ADMP's original intent for storm water management within the study area.
- Design Storm: System is to convey runoff from anticipated 100-year, 24-hour storm event.

The team determined that Alternative 2 did not satisfy the criteria of conforming with the intent of the ADMP's plan for the area. This alternative also presented difficulties with implementation due to the modifications that would be required within the Madrid subdivision to capture flows to be conveyed along Culver Street to the proposed basin site. Alternative 3 also did not provide a level of flood protection equivalent to the original plan and therefore was eliminated. Alternative 4 was eliminated due to conformance. The team felt that Alternative 4 would not satisfy Section 404 requirements for the wash that flows through the Madrid subdivision with the elimination of flows from the Madrid detention basin that drain into the subdivision. Alternative 5 was eliminated due to cost considerations. Alternative 6 was eliminated due to cost considerations and aesthetics. The size of the basin site is fixed, therefore, the increase in basin size required to implement Alternative 6 would reduce the ability to vary the shape of the basin.

Upon completion of the analysis of the six alternatives, the team identified Alternative 1 as the preferred alternative. The team felt that Alternative 1 was the closest to meeting all the criteria used in evaluating the alternatives.

Level III Analysis (Recommended Alternative)

The plan elements are identified on the Recommended Drainage Alternative exhibit (Figure 9) and in plan and profile in Appendix A. The segments are identified as items in the alternative component descriptions (i.e. Item A) refer to Figure 9 and not to the preliminary plans. The purpose of this section of the report is to discuss, in further detail, the planned improvements, project costs, and special issues to be considered during final design. Each subsection includes a description of a particular project element, discussions of 404 permit impacts, right-of-way requirements, utility conflicts, and a detailed breakdown of the costs associated with that element.

Note that per the ADMP, corrugated metal pipe is proposed to be used for the design of the storm drain. Therefore, where storm drains are used in the drainage system, the conceptual design and accompanying cost analysis for the Recommended Drainage Alternative are based on the assumption that the storm drains conform to the project design criteria (see detail D-1, Appendix A, for a graphical illustration).

- Aluminized CMP at double the required gage thickness for a 75-yr service life (utilizing ADOT procedures for estimating pipe life), and
- Slurry Backfill to 1' over the top of the pipe, and
- 3-inch thick (minimum) 5000 psi concrete invert paving with welded wire fabric reinforcing welded to the invert of the pipe.

Due to the magnitude of the peak flows being conveyed in the storm drains, they were designed to operate at an optimum velocity of 15 ft/sec in order to minimize the required storm drain size. Lower velocities may make the option of subsurface conveyance unfeasible since the required pipe size will become too large.

The District may, however, choose to utilize Reinforced Concrete Pipe (RGRCP) or other pipe material for the final design based on the design standards applicable at the time of final design as well as input from the partnering community. This will require revisions to the design parameters as well as the pipe profiles and the cost estimate.

Although the costs for a pipe installation of this type are higher than a standard CMP installation, they are still lower than the cost of RGRCP. This is largely due to the fact that the higher roughness factor of CMP allows the designer to eliminate the drop structures at 200 foot intervals required along McDowell Road if RGRCP is used (these drop structures were required with RGRCP in order to keep the velocities within reasonable limits). This may not be required along Hawes Road due to the flatter slopes (< 2.0%).

Madrid Detention Basin & Outlet (Drawing P-4)..... **$106,881**

1. Location: In Maricopa County at the northwest corner of the intersection of McDowell Road and 90th Street (Basin V).
2. Purpose: The existing basin attenuates the peak discharge from the offsite watershed (sub-basin 370 as identified in the future conditions model) before it enters the proposed McDowell Road storm drain.
3. Project Elements: The existing on-line basin has a footprint of 6.5 acres, a total storage volume of 33.7 acre-feet, and is located on a 9.4 acre parcel. The intent of the basin design is that the offsite watershed will flow directly into the basin. The existing outlet structure will need to be modified to limit flows through it to the initial Section 404 low flows required for the downstream wash and flows in excess of the 100-year, 24-hour design event. An inlet structure will be required to allow flows to enter the proposed McDowell Rd. storm drain.
4. Special Considerations: The existing outlet structure will need to be modified. Due to the basin functioning as an on-line structure sediment deposition needs to be accounted for in the design. An

agreement needs to be worked out with the City of Mesa regarding the maintenance requirements for the basin. Grading modifications are required on the upstream side of the basin to direct flows originating from a wash east of 90th Street across 90th Street into the basin. This work to be performed by MCDOT 3-6 months prior to the beginning of construction of this project.

5. 404 Permit: The existing wash that enters the basin along northern edge has been designated as a regulatory wash by the USACOE. Therefore, low flows will be maintained at the existing outlet structure to maintain the 404 wash downstream of the basin.
6. Utility Conflicts: None anticipated.
7. Possible Project Participants: The District, MCDOT, and City.

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
	Madrid Detention Basin Outlet				
1	Modification	$50,000	EA	1	$50,000
2	72" CMP Pipe	$190	LF	115	$21,850
3	72" Inlet Headwall	$5,000	EA	1	$5,000
4	Export	$2.50	CY	240	$600
	SUBTOTAL MAJOR SYSTEM ELEMENTS				$77,450
	CONTINGENCIES:				
	Construction			25%	$19,363
	Engineering			7%	$5,422
	Construction Admin.			6%	$4,647
	TOTAL MAJOR SYSTEM ELEMENTS				**$106,881**

McDowell/Hawes Road Storm Drains (Drawings P-1& P-3) **$1,733,954**

1. Location: In Maricopa County within McDowell Rd and Hawes Rd. right-of-way from approximately 90th Street to Hawes Rd. and within Hawes Rd. from McDowell Road to Culver St. (Segment W).
2. Purpose: The storm drain will convey stormwater from the Madrid subdivision basin to the Culver/Hawes basin.
3. Project Elements: The proposed system consists of a buried storm drain pipe. The 100-year, 24-hour discharge in the storm drain is approximately 335 cfs along McDowell Rd. and 328 cfs along Hawes Road. The storm drain sizes vary from 72 inches to 78 inches.
4. Special Considerations: Modifications are necessary to 88th Street to direct runoff reaching 88th Street into an existing channel along McDowell Road adjacent to the Thunder Mountain subdivision. Costs have been included in this report for a collection channel and box culvert under 88th Street that outlets to the existing channel to capture runoff reaching 88th Street. Additional alternatives to capture flows in this area may need to be investigated during the design phase.
5. 404 Permit: The pipe installation will impact one wash which has been identified by the USACOE as regulatory waters, however, a low or vegetative flow is to be maintained to the downstream wash following construction (this flow is based on the size of the existing downstream wash and may be equivalent to the bank full flow).
6. Right-of-Way: Additional right-of-way may be required along Hawes Road. The current right-of-way is not dedicated east of the ultimate monument line.
7. Utility Conflicts: Care must be exercised when installing the storm drain as there are several water lines within McDowell and Hawes Rd. There are water, sewer, gas, telephone, power, and cable TV lines present along the alignment.
8. Possible Project Participants: The District, the City, and MCDOT.

McDOWELL ROAD/HAWES ROAD MAJOR SYSTEM ELEMENTS

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	72" CMP Pipe	$190	LF	3,435	$652,650
2	78" CMP Pipe	$210	LF	900	$189,000
3	Export	$2.50	CY	9,245	$23,113
4	Manholes	$6,000	EA	13	$78,000
5	48" CMP Pipe	$135	LF	660	$89,100
6	48" RCP Conflict Structure	$5,000	EA	1	$5,000
7	Utility Relocations (W,G,T,C)	$6,000	EA	14	$84,000
8	88th Street Collection System	$123,000	LS	1	$123,000
	SUBTOTAL MAJOR SYSTEM ELEMENTS				$1,243,863
	CONTINGENCIES:				
	Construction			25%	$310,966
	Engineering			7%	$87,070
	Construction Admin.			6%	$74,632
	SUBTOTAL MAJOR SYSTEM ELEMENTS				$1,716,530
9	Collection Channel Land Acquisition	$87,120	AC	0.20	$17,424
	TOTAL MAJOR SYSTEM ELEMENTS				**$1,733,954**

Culver - Hawes Detention Basin & Outfall (Drawing P-2) **$1,808,148**

1. Location: In Maricopa County at the northeast corner of Hawes Rd. and Culver Street (Basin C).
2. Purpose: The basin will serve to attenuate the peak discharge from the McDowell/Hawes Rd. storm drain.
3. Project Elements: The proposed off-line basin has a footprint of 8.6 acres, a peak storage volume of 25 acre-feet, and is located on a 9.6 acre parcel. The diversion of stormwater into the basin is accomplished via an underground splitter structure and an at-grade side-weir which allow more frequent (smaller) flows to pass by unimpeded but diverts less frequent (larger) flows into the basin for temporary storage. The bypass flow is 70 cfs and the peak diversion into the basin during the 100-year, 24-hour event is 265 cfs. A 78-inch storm drain is proposed.
4. Special Considerations: Based on the geotechnical investigations performed for the basin site, no special considerations are anticipated.
5. 404 Permit: One wash, which has been identified by the USACOE as regulatory waters, may be impacted by the construction of this basin and a 404 permit may be required. Low flows will be maintained into the basin.
6. Utility Conflicts: No utility conflicts are anticipated.
7. Possible Project Participants: The District and City.

CULVER/HAWES ROAD BASIN MAJOR SYSTEM ELEMENTS

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
	Culver / Hawes Road Basin Diversion				
1	Structure	$150,000	EA	1	$150,000
2	Basin "D" Excavation	$6	CY	56,000	$336,000
3	78" Outet Headwall	$6,000	EA	1	$6,000
4	Outlet Rip rap	$40	CY	90	$3,600
5	Low Flow Channel Rip rap	$40	CY	150	$6,000
6	Basin Operations and Maintenance Road	$1	SF	24400	$24,400
7	18" Bleed-off Pipe	$45	LF	330	$14,850
8	Landscaping	$0.50	SF	326,700	$163,350
	SUBTOTAL MAJOR SYSTEM ELEMENTS				$704,200
	CONTINGENCIES:				
	Construction			25%	$176,050
	Engineering			7%	$49,294
	Construction Admin.			6%	$42,252
	SUBTOTAL MAJOR SYSTEM ELEMENTS				$971,796
9	Basin Land Acquisition	$87,120	AC	10	$836,352
	TOTAL MAJOR SYSTEM ELEMENTS				**$1,808,148**

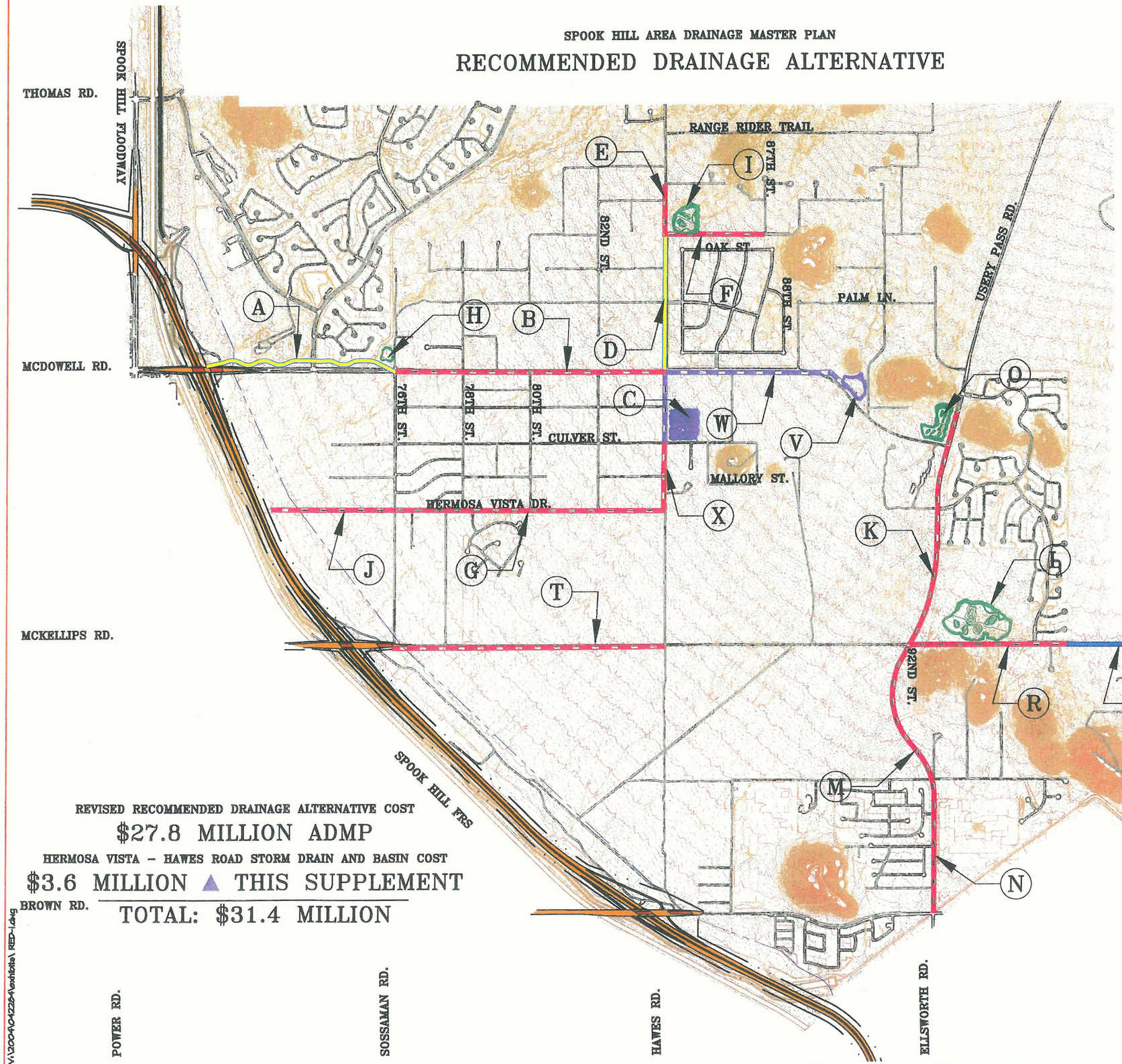
Recommended Alternative Summary

The Preliminary (15%) plans for the Recommended Alternative are located in Appendix A at the end of this report. The engineering calculations for the associated elements (storm drains, detention basins, etc.) are included opposite of the plan sheet depicting those elements. The total cost of the Recommended Alternative is approximately $3.5 Million (see Table 3).

The recommended drainage alternative from the overall ADMP has also been updated to reflect the changes recommended by this supplement. Refer to Figure 9 for an updated overall ADMP plan and Table 3 for the revised costs.

SPOOK HILL AREA DRAINAGE MASTER PLAN

RECOMMENDED DRAINAGE ALTERNATIVE



LEGEND
- RIGHT OF WAY
- FLOODWAY IMPROVEMENTS
- OPEN CHANNEL
- OPEN CHANNEL (EXISTING)
- UNDERGROUND PIPE/BOX
- DETENTION BASIN

ALTERNATIVE COMPONENT DESCRIPTION			
ITEM	DESCRIPTION	ITEM	DESCRIPTION
A	3400′ OF EXISTING OPEN CHANNEL	L	45 AC-FT OFF-LINE DETENTION BASIN ON 32.2 ACRES
B	6700′ OF UNDERGROUND STORM DRAIN	M	2600′ OF UNDERGROUND BOX CULVERT & STORM DRAIN
C	25 AC-FT OFF-LINE DETENTION BASIN ON 9.6 ACRES	N	2590′ OF UNDERGROUND BOX CULVERT & STORM DRAIN
D	2300′ OF EXISTING OPEN CHANNEL	O	18 AC-FT OFF-LINE DETENTION BASIN ON 8.8 ACRES
E	440′ OF UNDERGROUND STORM DRAIN	Q	2640′ OF OPEN CHANNEL WITHIN ROW
F	2630′ OF UNDERGROUND STORM DRAIN	R	2940′ OF UNDERGROUND STORM DRAIN
G	5280′ OF UNDERGROUND STORM DRAIN	T	6050′ OF UNDERGROUND STORM DRAIN
H	4.6 AC-FT OFF-LINE DETENTION BASIN ON 2.6 ACRES	V	20 AC-FT ON-LINE DETENTION BASIN ON 9.4 ACRES
I	32 AC-FT OFF-LINE DETENTION BASIN ON 9.4 ACRES	W	4950′ OF UNDERGROUND STORM DRAIN
J	2740′ OF UNDERGROUND STORM DRAIN	X	1300′ OF UNDERGROUND STORM DRAIN
K	4720′ OF UNDERGROUND STORM DRAIN		

REVISED RECOMMENDED DRAINAGE ALTERNATIVE COST

$27.8 MILLION ADMP

HERMOSA VISTA – HAWES ROAD STORM DRAIN AND BASIN COST

$3.6 MILLION ▲ THIS SUPPLEMENT

TOTAL: $31.4 MILLION

N

0 1000 2000 4000

Scale in Feet

▲ UPDATED THIS SUPPLEMENT

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

RECOMMENDED DRAINAGE ALTERNATIVE

	BY	DATE
DESIGNED	J. MCCARTY	08/05
DRAWN	D. HADGES	08/05
CHECKED	A. PATEL	08/05

WOOD, PATEL & ASSOCIATES, INC.
2051 WEST NORTHERN, SUITE 100
PHOENIX, ARIZONA (602) 335-8500

DRAWING NO. RED-1.DWG

FIGURE 9

SHEET OF 1 1

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Table 3 - Element Cost Breakdown for Recommended Alternative**

ADMP Elements

Element	Description	Raw Cost	Contingencies Const.	Engin.	Const. Admin.	Construction Cost	Land Acquisition	Total Cost		Landscape Cost*
A	*Las Sendas Channel*	$0	$0	$0	$0	$0		**$0**		$0
H	*Sossaman Detention Basin & Outfall*	$391,576	$97,894	$27,410	$23,495	$540,375	**$226,512**	**$766,887**		$201,618
B	*McDowell Rd. Storm Drain & Swale*	$1,998,611	$499,653	$139,903	$119,917	$2,758,083		**$2,758,083**		$139,581
D	*Thunder Mountain West Channel & Storm Drain*	$76,101	$19,025	$5,327	$4,566	$105,019		**$105,019**		$0
E	*Upper Hawes Rd. Storm Drain & Swale*	$106,821	$26,705	$7,477	$6,409	$147,413		**$147,413**		$0
I	*Oak Street Detention Basin & Outlet*	$1,315,102	$328,776	$92,057	$78,906	$1,814,841	**$818,928**	**$2,633,769**		$728,928
F	*Oak Street Storm Drain & Swale*	$424,385	$106,096	$29,707	$25,463	$585,651		**$585,651**		$71,208
G	*Hermosa Vista East Storm Drain*	$1,105,588	$276,397	$77,391	$66,335	$1,525,711		**$1,525,711**		$0
J	*Hermosa Vista West Storm Drain*	$951,981	$237,995	$66,639	$57,119	$1,313,734		**$1,313,734**		$0
X	*Hawes Road Storm Drain & Swale*	$328,752	$82,188	$23,013	$19,725	$453,678		**$453,678**		$47,680
T	*McKellips Road Storm Drain*	$1,338,984	$334,746	$93,729	$80,339	$1,847,798		**$1,847,798**		$0
O	*Ellsworth Detention Basin & Outlet*	$1,248,611	$312,153	$87,403	$74,917	$1,723,083	**$766,656**	**$2,489,739**		$682,400
K	*Upper Ellsworth Storm Drain & Swale*	$1,325,075	$331,269	$92,755	$79,505	$1,828,604		**$1,828,604**		$100,874
L	*School Detention Basin & Outlet*	$3,156,627	$789,157	$220,964	$189,398	$4,356,145	**$2,805,264**	**$7,161,409**		$2,496,965
R	*East McKellips Storm Drain & Swale*	$657,284	$164,321	$46,010	$39,437	$907,052		**$907,052**		$39,627
Q	*East McKellips Open Channel*	$282,773	$70,693	$19,794	$16,966	$390,227		**$390,227**		$164,490
MN	*Lower Ellsworth Storm Drain & Swale*	$2,094,476	$523,619	$146,613	$125,669	$2,890,377		**$2,890,377**		$110,871
		$16,802,747	$4,200,687	$1,176,192	$1,008,165	**$23,187,791**	**$4,617,360**	**$27,805,151**		**$5,632,274**

Hermosa Vista – Hawes Road Storm Drain and Basin Elements, This Supplement **

Element	Description	Raw Cost	Contingencies Const.	Engin.	Const. Admin.	Construction Cost	Land Acquisition	Total Cost		Landscape Cost*
V	*Madrid Detention Basin and Outlet*	$77,450	$19,363	$5,422	$4,647	$106,881		**$106,881**		$0
W	*McDowell Rd. East/Hawes Road South Storm Drain*	$1,243,863	$310,966	$87,070	$74,632	$1,716,530	**$17,424**	**$1,733,954**		$0
C	*Culver – Hawes Detention Basin & Outlet*	$704,200	$176,050	$49,294	$42,252	$971,796	**$836,352**	**$1,808,148**		$225,423
		$2,025,513	$506,378	$141,786	$121,531	**$2,795,207**	**$853,776**	**$3,648,983**		**$225,423**

NOTE: * The landscape cost is already included in the total cost and is only provided here for reference. Land acquisition costs are not included in the landscape costs shown in this table.
**** Costs are based on original ADMP unit prices.**

Culver-Hawes Basin

Landscape Design Theme: to create an organic appearing landform whose shape, side slopes, and bottom surface are undulating and irregular with stepped benches following the existing topography and is revegetated to restore the visual character as close as possible to the original site conditions.

Consider the City on Mesa's *Site Development Design Standards* (Section 11-15-1 through Section 11-15-5) in addition to the design guidelines provided below.

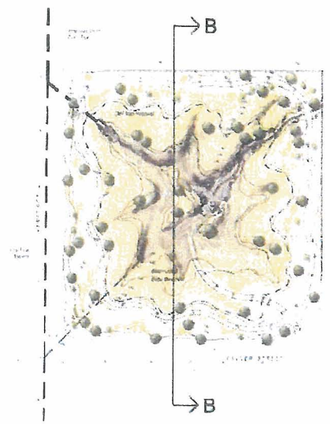
Basin Criteria:

1. Perimeter
   - Provide a 30 to 50-foot landscaped buffer zone around the basin that includes the operation and maintenance (O&M) road.
   - Meander the O&M road to mimic the organic basin configuration.
   - O&M road surface to be of native inert material.
   - Supplement the existing plant material in the buffer zone to increase screening of the basin from Culver Street and Hawes Road as well as from the adjacent residences.
2. Configuration
   - Provide irregular basin bottom slope that follows the existing topography.
   - Create an overall basin form that appears more organic and less geometric.
   - Warp and vary side slope ratios from 3:1 to 8:1 and round top of side slopes.
   - Avoid disturbance to saguaros that cannot be transplanted and mature ironwoods (because of the slow growth).
3. Vegetation
   - Use plant material from the plant list in the City of Mesa's *Uplands Development Standards* (Ordinance 3693), but select specific species to respond to the context of this basin.
   - Place shrubs, ground covers, rocks, and boulders in an irregular pattern along the sides and top of the basin side slopes.
   - Install temporary irrigation system to establish plant material.
   - Restore density and variety of vegetation to the existing site conditions.
   - Salvage and re-establish indigenous vegetation where possible.
   - Consider views from Culver Street, Hawes Road, and adjacent residences to the basin in the placement of plant material.
4. Structural Components
   - Use materials, shapes, and colors that blend in with the surroundings for any side weirs, spillways, dissipaters, and inlets required as determined during final design.
   - Use of boulders native to the vicinity is preferred as a structural component.

Culver-Hawes Basin Location

View of the Culver-Hawes Basin Site

Perspective



Plan

Section B

PART 8 LANDSCAPE AESTHETICS

The District has a Landscape Aesthetics policy for developing their facilities, where feasible, in such a manner that they are aesthetically responsive to or compatible with the character of the existing site and the surrounding area. To meet this objective, among others, the Spook Hill ADMP provides a characterization of the existing corridor, which includes a description of the natural and physical environment that identifies (among other items) the regional and local setting, geology, and ecological and visual resources of the area. Furthermore, the plan identifies environmental and aesthetic considerations, as well as Landscape Design Themes & Aesthetic Design Guidelines to minimize the impacts and enhance the development of the proposed flood control facilities within the Spook Hill ADMP study area.

In order to develop the Culver - Hawes basin to be compatible with the character of its site and surroundings, further assessment of the natural and physical environment of the basin site was conducted. This understanding of the topography, ecology and vegetation, and visual resources and landscape character of the site was then used in the development of the design for the basin. Specifically, the consideration of these resources has assisted in the design of the:

- basin configuration,
- elements to control site lines and views,
- shape of landforms (grading design),
- density and layout of proposed plant material and landscape revegetation.

Landscape Characteristics

This section summarizes the assessments, considerations and recommendations that were followed to address the resources in the conceptual design of the basin.

Topography

The site naturally slopes from the northeast corner to the southwest corner with roughly 26 feet of fall across the site, producing an average slope of 2.7 percent across the entire site with slopes ranging from 1 percent to 4 percent. Large flat areas are dissected by several washes of varying sizes, often braided, which run across the site (Figure 10). These drainages have created a topographic pattern that is generally angular in character with relatively sharp transitions. The site has been characterized into three landform areas based on these topographic and drainage patterns as follows (Figure 11):

Open Flats – Open flat topography with both clearly defined dissected washes and shallow wide washes with sandy bottoms

Central Washes – Heavily dissected area with numerous braided washes and undulating topography

Northeastern Drainages – Gently falling grade with rolling topography and undulating wash corridors

The basin concept has been designed to emulate the existing undulating and angular character of the site's topography and landform by developing a contour-grading plan for the basin that transitions out of and mimics these existing landform patterns where possible (Figures 12 and 13).

Ecology

The ecology of the site is classified as Sonoran Desert Biome, Arizona Upland Subdivision, Sonoran Palo Verde Mixed Cacti, Mixed Shrub Community – Xeroriparian Desert Habitat (Figure 14). In general, these areas may provide suitable habitat for noted species including cactus ferruginous pygmy-owl, lesser long-nosed bat, Sonoran desert tortoise, and American peregrine falcon. Prominent species observed on the site have included Gambel's quail, desert cottontail, and hummingbird.

The ecology of the site will be maintained, to the degree possible, through preservation and reestablishment of this existing vegetation found on the site in similar densities and patterns.

Circulation of wildlife is also an important consideration in protecting wildlife both during construction as well as once construction is completed. A four stranded smooth wire fence will allow wildlife to pass to and from the site. Also, major excavations (trenches) during construction that present hazards to wildlife will be monitored and/or covered during construction.

Vegetation

Several mature trees (primarily palo verde and ironwood), shrubs (bursage and creosote), and cacti (cholla cacti, barrel cacti, and saguaro) make up the dominant vegetation and are dispersed fairly evenly across the site. Interwoven into this foundation are a variety of other species native to the Sonoran Desert. Groupings of cholla occupy large portions of the flat areas of the site, while large and small shrubs are evenly distributed throughout. The northeast corner is relatively open and absent of large species. Several mature saguaros are found across the entire site but primarily concentrated across the center of the site. A small stand of relatively young saguaros is located near the southwest corner of the site. Figure 13 illustrates areas delineated by dominant species the locations of saguaro and large trees. Less dominant vegetation found throughout the site includes jojoba, desert milkweed, ragweed, brittlebush, wolfberry, mariola, desert lupine, and beavertail prickly pear.

The District is proposing to revegetate the Culver - Hawes basin site as shown on the conceptual landscape plan (Figures 15, 16, and 17). Existing vegetation will be preserved where possible. Areas of the site that are disturbed by construction of the basin will be revegetated through the use of hydroseed, tallpot plantings, container material, and/or other similar methods. Additionally, plant material located within disturbance areas that can be successfully and economically salvaged will be reused on the site to help maintain the site's character. It is anticipated that cacti such as cholla and saguaro will be the primary plants salvaged from the site. Plantings will be designed to emulate the existing vegetation in density, location, pattern, and type to the greatest degree possible.

Irrigation

At this time, an automatic irrigation system is not proposed as part of the project. However, a form of irrigation will be provided in order to establish plant material on site. Potential methods being considered for temporary irrigation include the use of DriWater canisters installed at the time the vegetation is planted, watering trucks, and/or a temporary irrigation system.

City of Mesa Uplands Requirements

The site is located within the jurisdiction of Maricopa County. All pertinent zoning and ordinance requirements will be followed. As discussed, the District is committed to developing the basin site in a manner that is consistent with the natural Sonoran Desert and the surrounding character of the site. The design will follow the guidelines identified in the City of Mesa Desert Uplands Development Standards in that the project is designed to minimize disturbance and encourage preservation of the natural character and aesthetic value of the site. This will be achieved through (1) the use of native plant material consistent with the Upper Sonoran Desert community and in accordance with the Preferred and Acceptable Desert Uplands Plant Lists provided in the ordinance, and (2) grading the site to reflect the natural landforms of the surrounding area including varied slopes and berming in and around the basin as opposed to typical retention basins designed with landforms having consistent and straight side slopes.

Visual Resources and Landscape Character Assessment

Landscape Setting

The Culver - Hawes basin site is located in Maricopa County within the Sonoran Desert Landscape Character Type, Mountain Lands Subtype, and Natural Bajada Landscape Unit (Natural and Suburban Bajada Landscape Units surrounding) in an area transitioning to the Tonto Landscape Character Type (Figure 18). The Natural Bajada Landscape Unit is comprised of the characteristics of the Bajada Physical Division and those of the Natural Cultural Setting. Similarly, the Suburban Bajada Landscape Unit is comprised of the characteristics of the Bajada Physical Division and those of the Suburban Cultural Setting (FCDMC, Preliminary Existing Landscape Character Assessment Report, 2003). This area in which the site is located is

characterized by slightly sloping landforms that exhibit braided networks of washes and arroyos with saguaro, palo verde, and mixed cacti vegetation. Cultural modifications in the immediate site vicinity include dispersed rural and suburban residences.

Prominent Views

For the purposes of this study, several existing key views have been identified (Figure 19). These include: (1) views from the intersection of Culver Street and Hawes Road looking north/northeast toward Usery Mountain; (2) views onto the site from residents along Culver Street looking north across the site; (3) views from residents along Hawes Road looking northwest across the site; and (4) multiple viewpoints across the site looking north/northwest towards the transition zone between the Sonoran Desert Landscape Character Type in the middle ground to the Tonto Landscape Character Type in the background. Additionally, development proposed to the north and east of the site creates the potential for future views looking south and east onto and across the site.

Designing the basin to emulate the landform (topography) and vegetative patterns and densities found on the site and the adjacent parcels will help to maintain the visual character of the site. The grading design has been developed to preserve and enhance the key views into and across the site. Landform and vegetation have also been used to screen undesirable elements such as rooftops and structures and frame focal points such as distant views like that of Usery Mountain (Figures 20 and 21).

Multi-Use Opportunities

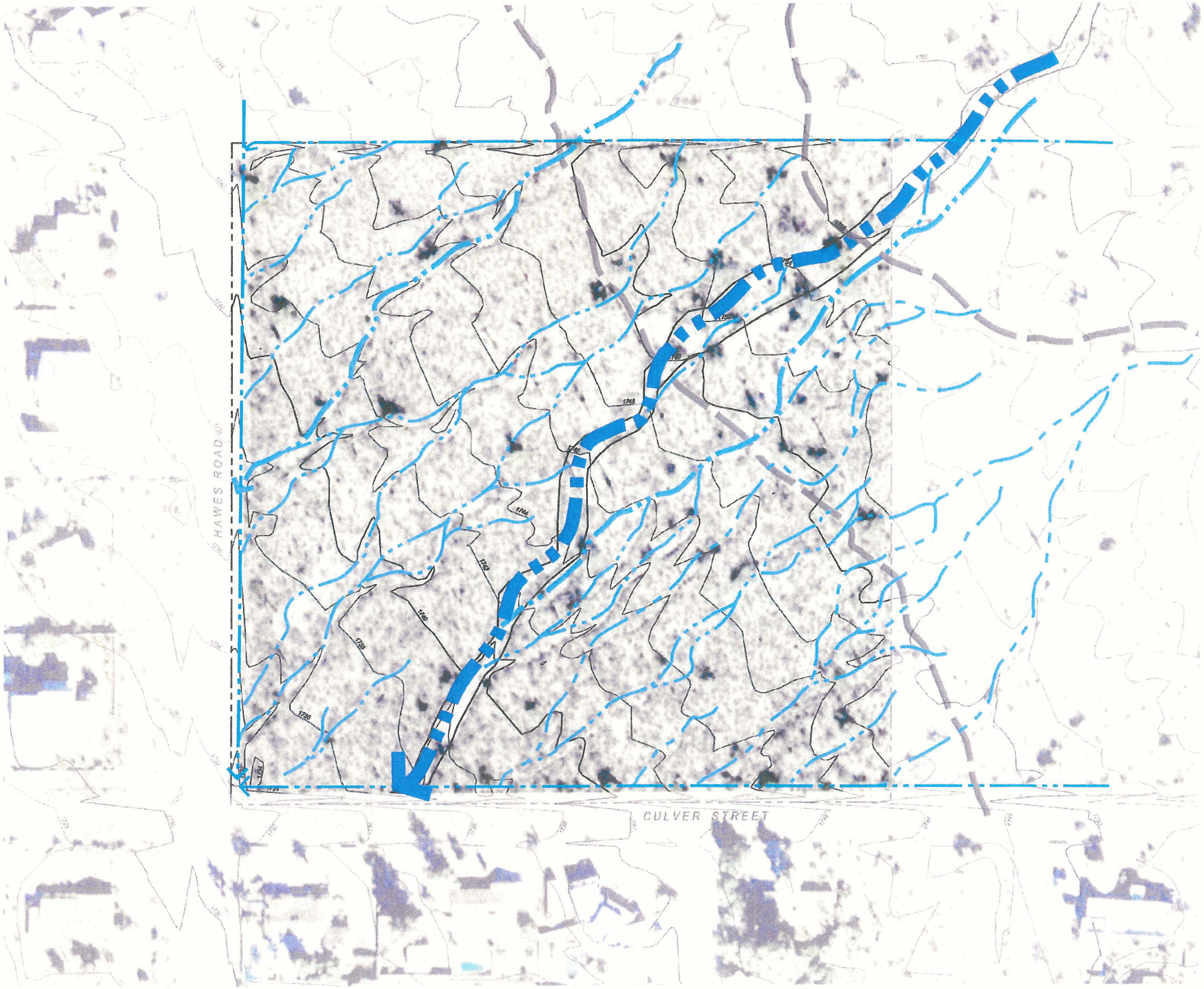
The Culver - Hawes basin site is currently undeveloped and appears to have no multi-use functions. The conceptual basin design does not propose a multi-use component at this time, however, there is the potential for the City of Mesa to utilize the proposed maintenance roads for trails and develop seating nodes along the upper portions of the basin.

Cultural Environment

A Class I cultural resource study based on results of an archaeological inventory and site records review from various federal, state, and local agencies was conducted as a part of the Spook Hill ADMP. The study identifies several Hohokam archaeological sites and numerous historic sites located in the Spook Hill study area; however, the cultural resources identified in the ADMP are not associated with the Culver - Hawes basin site, and therefore consideration of cultural resources was not addressed in detail in this study. The completion of a Class III intensive cultural resource survey is recommended in the Spook Hill ADMP for those sites that are relatively undisturbed, such as the Culver - Hawes basin site. If cultural resources were encountered during construction, work would stop at that location and the District would contact the respective agencies to arrange for the proper assessment or treatment of those resources.

Culver Hawes Basin

Site Analysis - Hydrology



The Culver-Hawes Basin site drains from the northeast to the southwest. The 404 wash divides the site while smaller drainages are braided throughout, adding diversity to the topography. The 404 wash and small drainages south of the 404 wash primarily flow into the existing drainage channel along Culver Street. Small washes north of the 404 wash enter the existing channel parallel to Hawes Road along the western edge of the site.

Water (Washes and Drainages)

Site Area

Flood Control District of Maricopa County

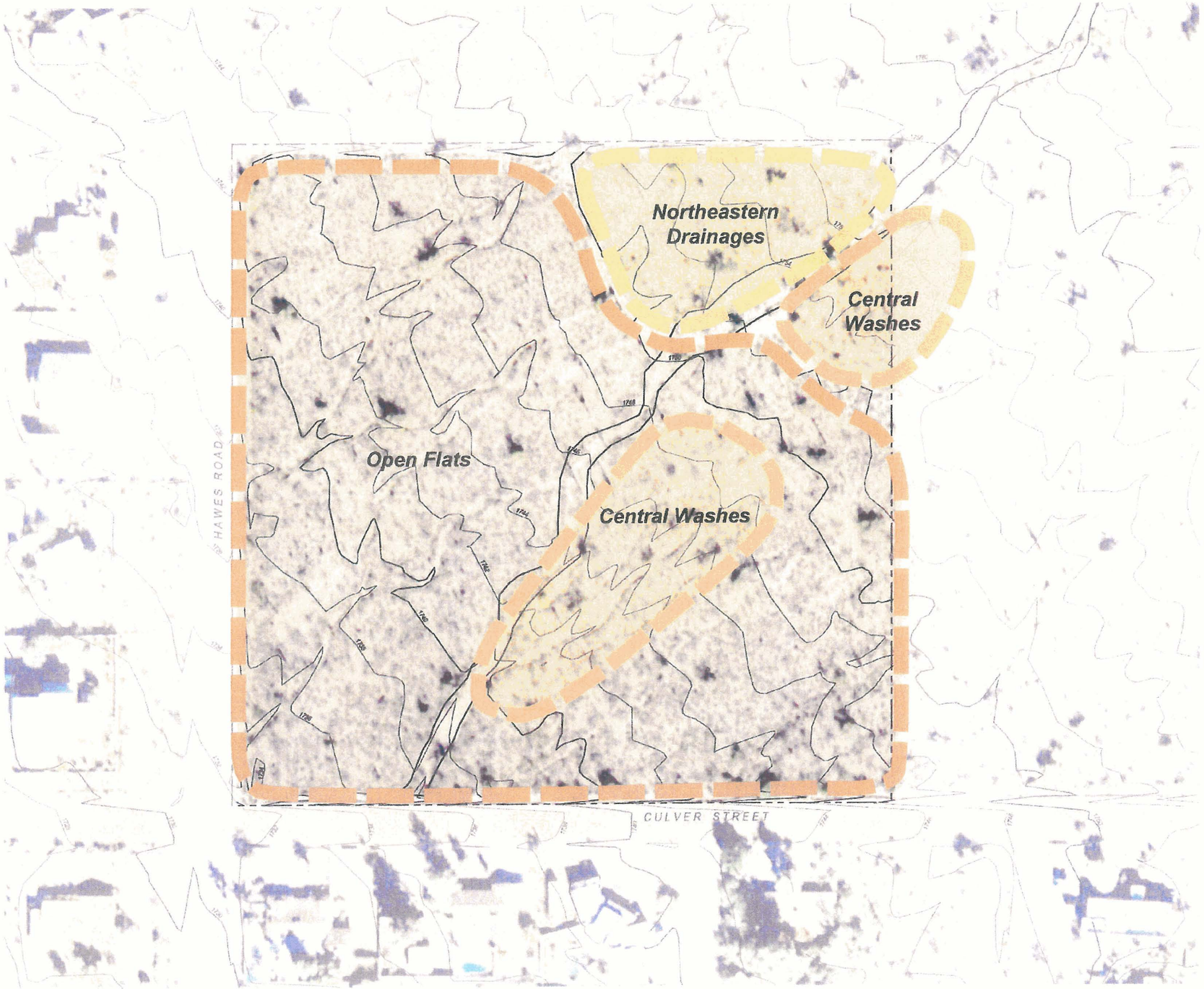
epg

March 2005

Figure 10

Culver Hawes Basin

Site Analysis - Landform



Site Area

Open Flats

Open flat topography with both clearly defined disected washes and shallow wide washes with sandy bottoms

Central Washes

Heavily disected area with numerous braided washes and undulating topography

Northeastern Drainages

Gently falling grade with rolling topography and undulating wash corridors

Topography:

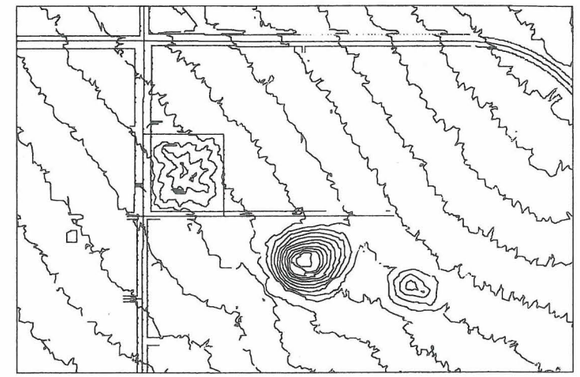
Drainages running across the site have created a topographic patternt that is generally angular in character with sharp transitions in form. Large flat areas are dissected by numerous washes, often braided, that cross the site. There is roughly 26 feet of fall across the site from the northeast corner to the southwest corner producing an average slope of 2.7 percent across the site with slopes ranging from 1 percent to 4 percent.

March 2006

Figure 11

Culver Hawes Basin

Conceptual Design



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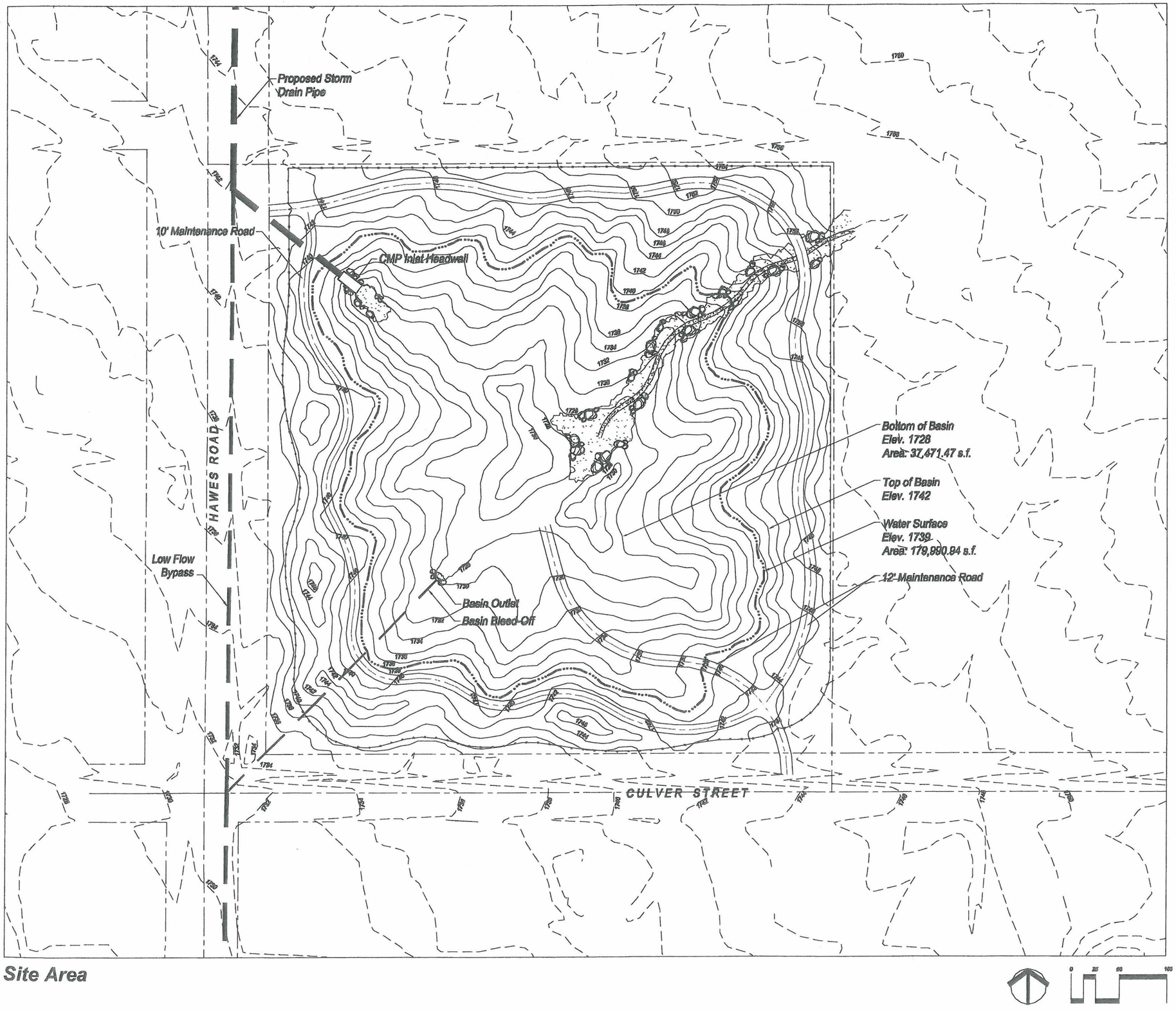


Site Area

0 30 60 120

Legend

- Water Surface Elevation
- Proposed Index Contour
- Proposed Intermediate Contour
- Existing Index Contour
- Existing Intermediate Contour
- Jurisdictional Wash
- Property Line
- Right-of-Way
- Centerline of Street
- Proposed Smooth Wire Fence

Flood Control District of Maricopa County

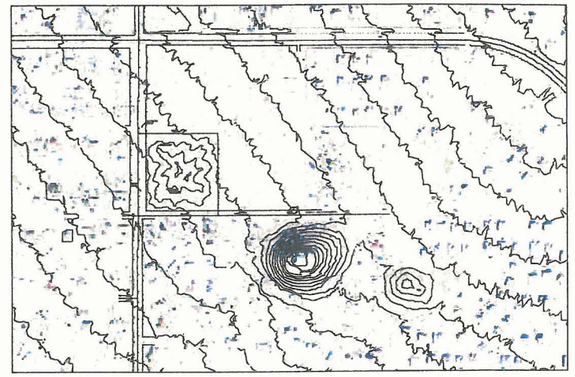
epg

April 2005

Figure 12

Culver Hawes Basin

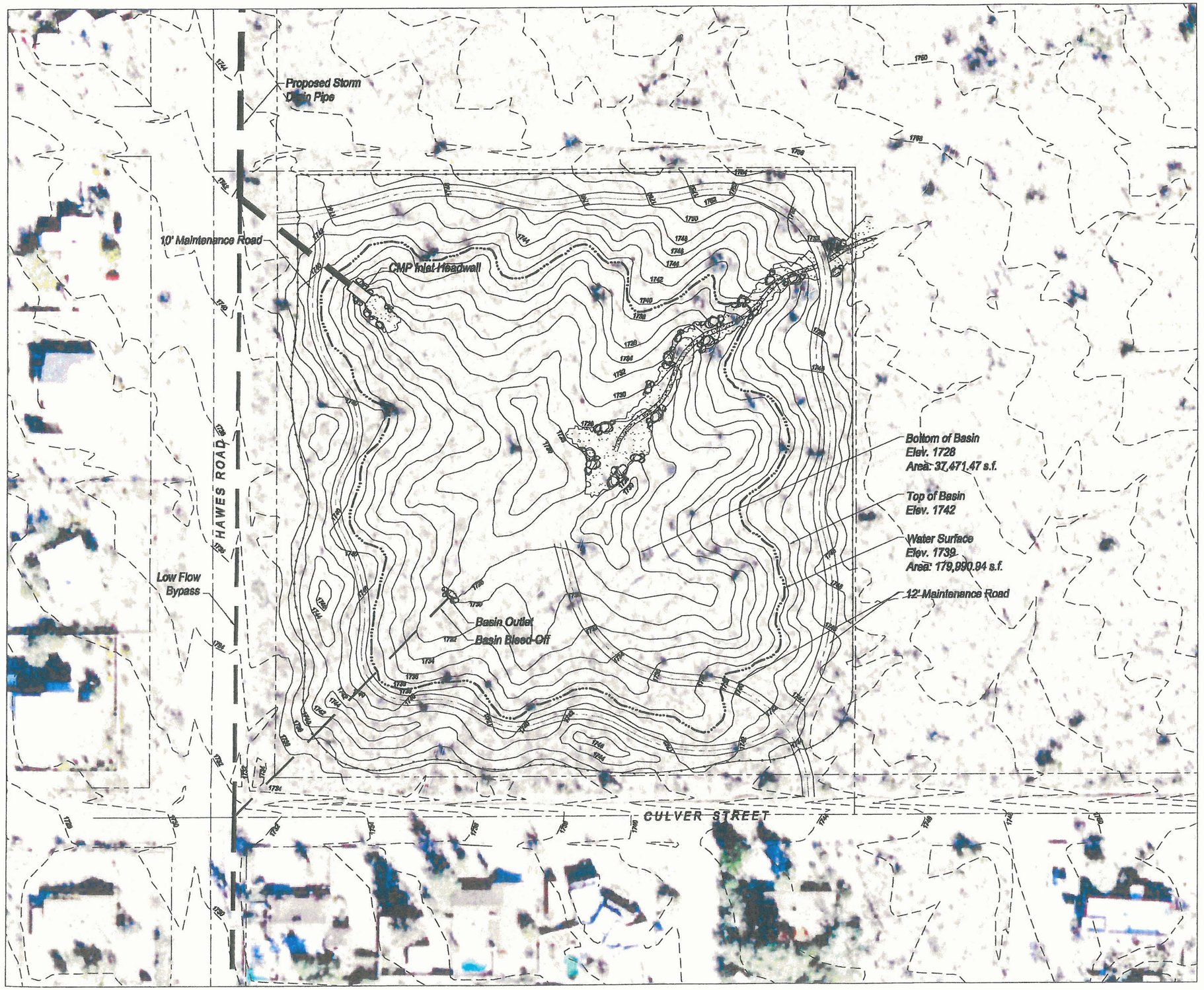
Conceptual Design



Local Area Scale: 1" = 600'-0"

Legend

- Water Surface Elevation
- Proposed Index Contour
- Proposed Intermediate Contour
- Existing Index Contour
- Existing Intermediate Contour
- Jurisdictional Wash
- Property Line
- Right-of-Way
- Centerline of Street
- Proposed Smooth Wire Fence



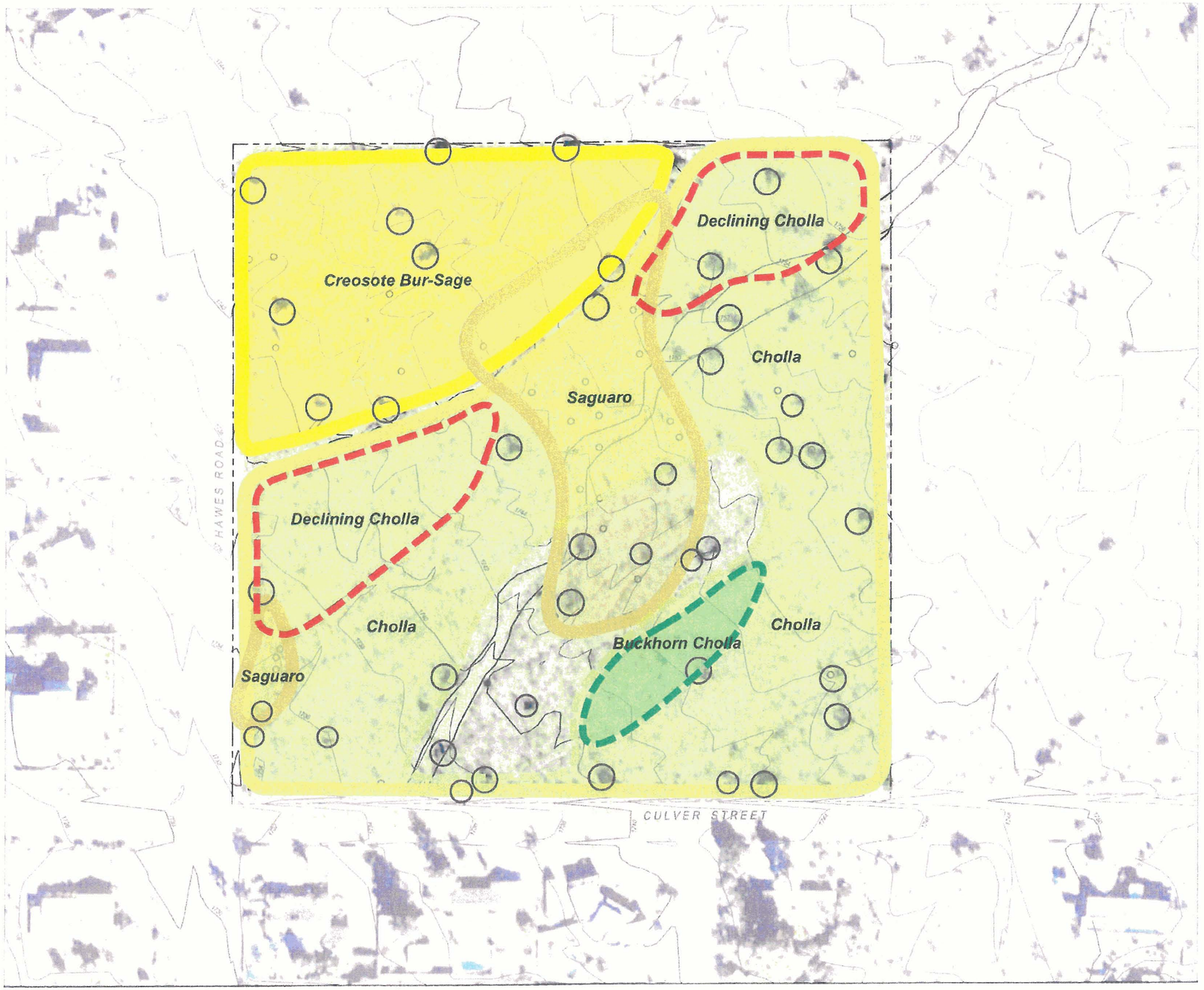
Site Area

April 2005

Figure 13

Culver Hawes Basin

Site Analysis - Vegetation



Site Area

Creosote Bur-Sage

Dominant Vegetation:
Creosote Bush
Triangleleaf Bur-sage

Secondary Vegetation:
Palo Verde
Brittlebush
Barrel Species
Desert Lupine
Mariola

Cholla

Dominant Vegetation
Chainfruit Cholla

Secondary Vegetation

Palo Verde
Ironwood
Creosote Bush
Triangleleaf Bur-sage
Desert Milkweed
Ragweed
Desert Broom
Brittlebush
Barrel Species
Desert Lupine
Wolfberry
Mariola
Beavertail Prickly-pear
Tree Cholla

Saguaro

Dominant Vegetation
Saguaro

Secondary Vegetation

Palo Verde
Ironwood
Chainfruit Cholla
Creosote Bush
Triangleleaf Bur-sage
Desert Milkweed
Ragweed
Desert Broom
Brittlebush
Barrel Species
Desert Lupine
Wolfberry
Mariola
Beavertail Prickly-pear
Tree Cholla

Buckhorn Cholla

Declining Cholla

Ecology

Sonoran Desert biome
Arizona Upland Subdivision
Sonoran Palo Verde Mixed Cacti - Mixed Shrub Community
Xeroriparian Desert Habitat

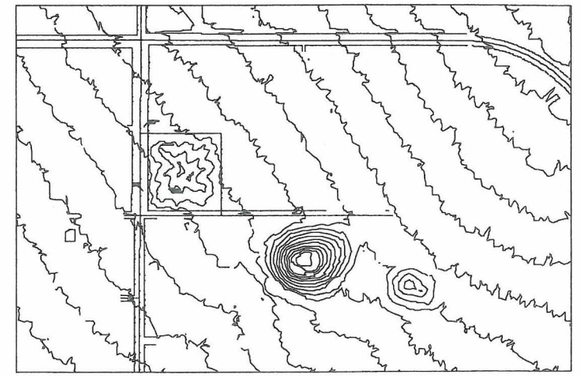
Suitable Habitat for noted species
cactus ferruginous pygmy-owl
lesser long-nosed bat
Sonoran desert tortoise
American peregrine falcon

Prominant species observed on site
Gambel's quail
desert cottontail
hummingbird

Figure 14

Culver Hawes Basin

Conceptual Planting



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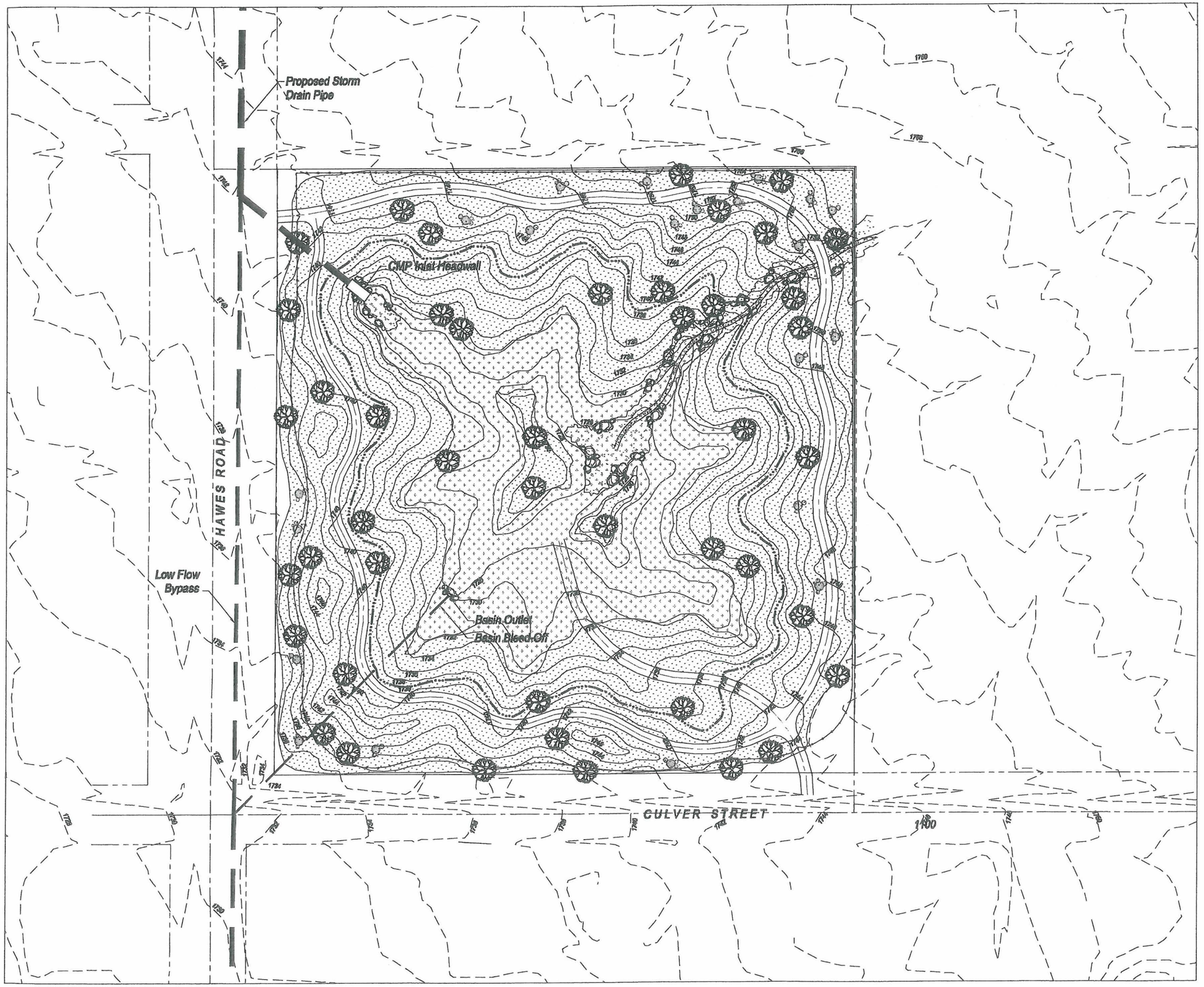


Site Area

Basin Hydroseed

	Grass Hydroseed Mix	1.76 acres
	Shrub Hydroseed Mix	5.80 acres
	Salvaged Saguaro	21
	Tall Pot Tree (Palo Verde, Mesquite, or Ironwood)	45

Legend

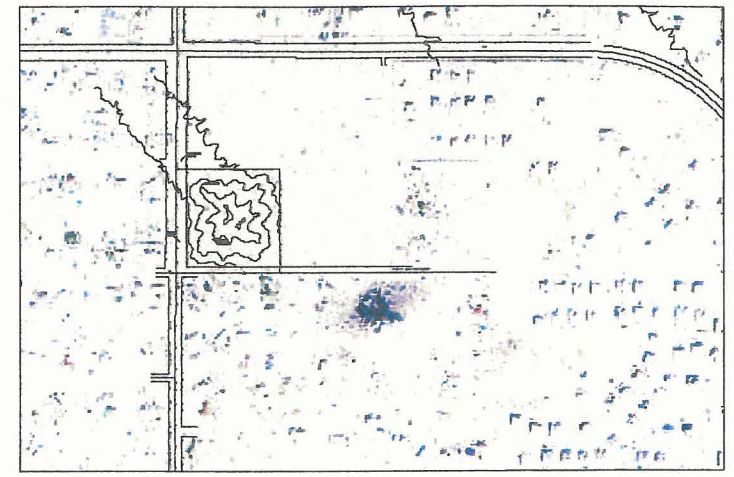
- Water Surface Elevation
- Proposed Index Contour
- Proposed Intermediate Contour
- Existing Index Contour
- Existing Intermediate Contour
- Jurisdictional Wash
- Property Line
- Right-of-Way
- Centerline of Street
- Proposed Straight Wire Fence

April 2005

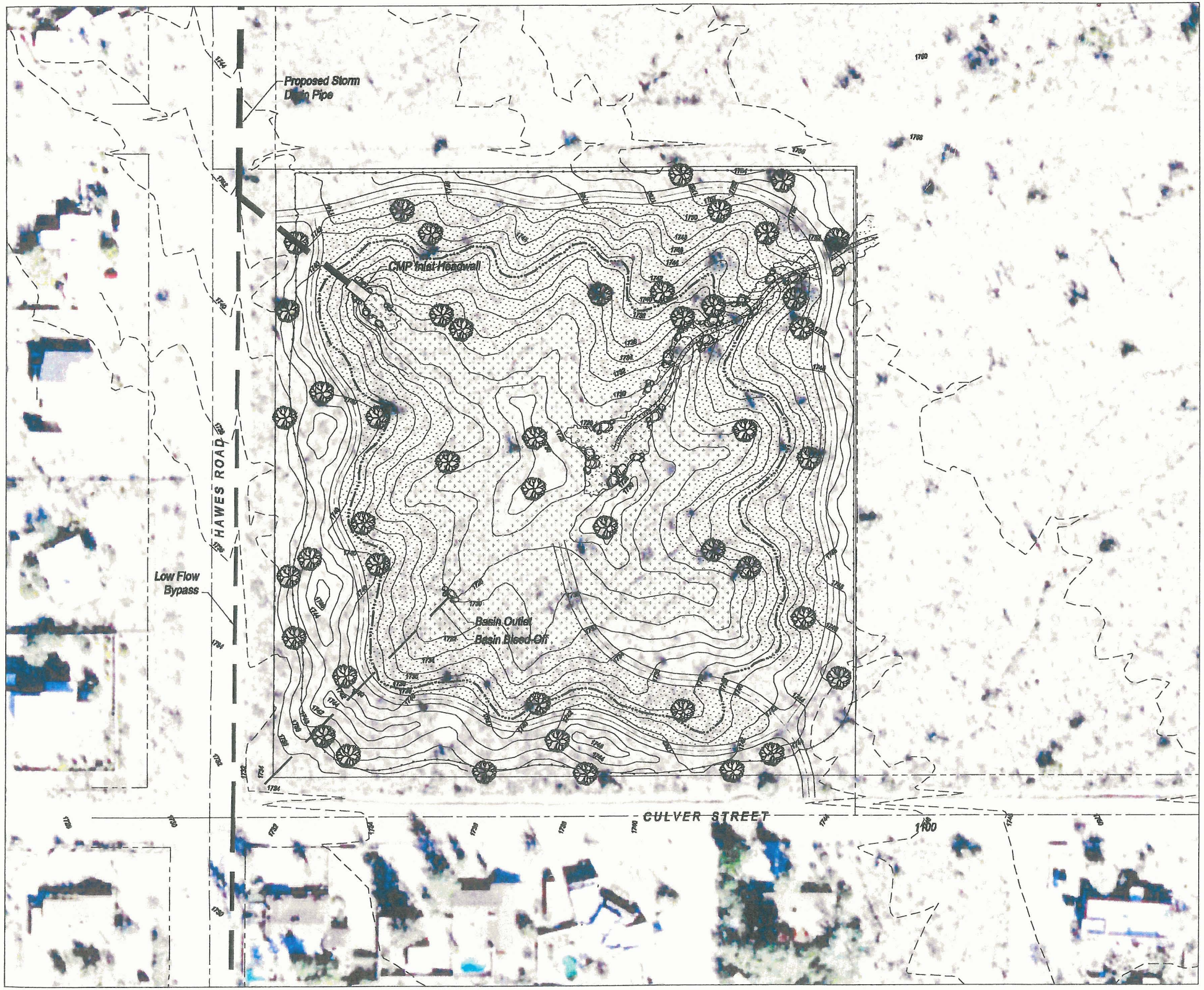
Figure 15

Culver Hawes Basin

Conceptual Planting



Local Area *Scale: 1" = 600'-0"*



Site Area

Basin Hydroseed

	Grass Hydroseed Mix	*1.76 acres*
	Shrub Hydroseed Mix	*5.80 acres*
	Salvaged Saguaro	*21*
	Tall Pot Tree (Palo Verde, Mesquite, or Ironwood)	*45*

Legend

- *Water Surface Elevation*
- *Proposed Index Contour*
- *Proposed Intermediate Contour*
- *Existing Index Contour*
- *Existing Intermediate Contour*
- *Jurisdictional Wash*
- *Property Line*
- *Right-of-Way*
- *Centerline of Street*
- *Proposed Straight Wire Fence*

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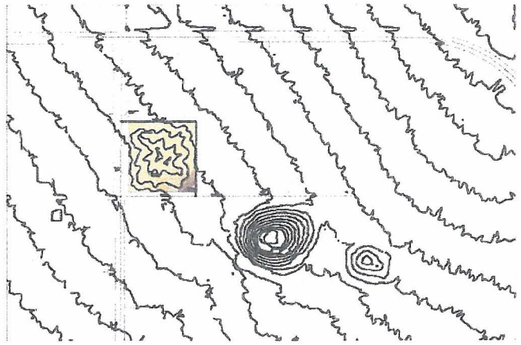
Figure 16

Culver Hawes Basin

Conceptual Planting



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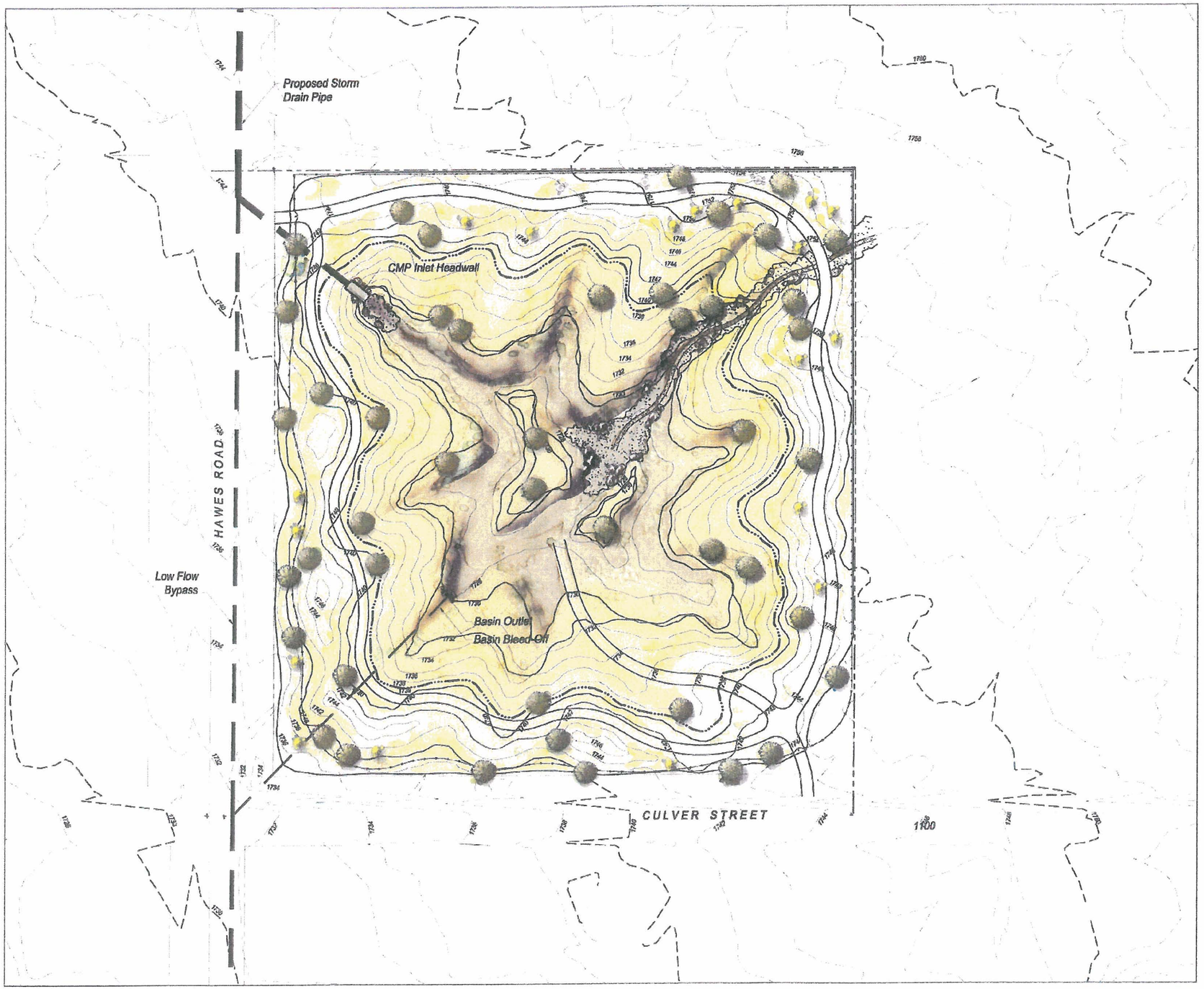

Site Area

Basin Hydroseed

	Grass Hydroseed Mix	1.76 acres
	Shrub Hydroseed Mix	5.80 acres
	Salvaged Saguaro	21
	Tall Pot Tree (Palo Verde, Mesquite, or Ironwood)	45

Legend

- Water Surface Elevation
- Proposed Index Contour
- Proposed Intermediate Contour
- Existing Index Contour
- Existing Intermediate Contour
- Jurisdictional Wash
- Property Line
- Right of Way
- Centerline of Street
- Proposed Straight Wire Fence

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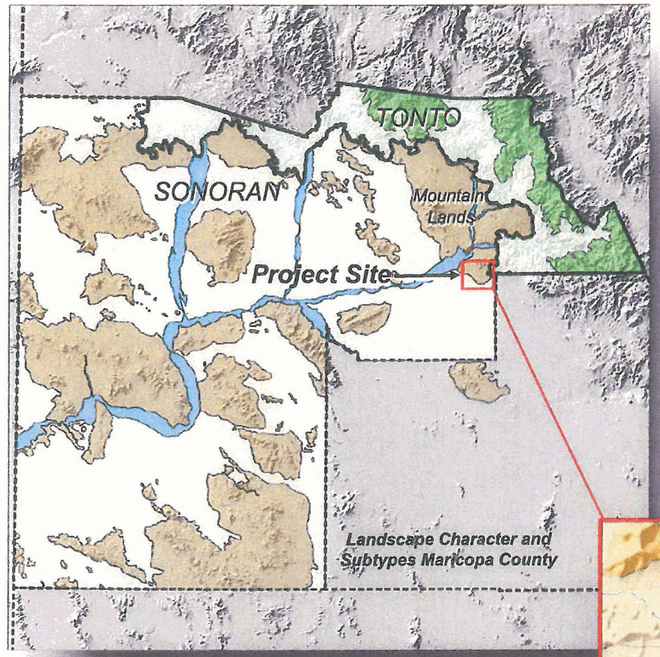
Figure 17

Character Type: Sonoran Desert
Character Subtype: Mountain Lands



Mountain Lands: Visual Character

Line – The dominant lines of this subtype include soft, slightly sloping straight lines of the lower portion of the mountains (bajadas) abutting the very angular, jagged, and bold lines associated with the upper slopes and peaks of the mountains. Subordinate lines are those of the foothills that are intermediate between the lower and upper portions of the unit.

Form – Essentially, three forms occur in this subtype—slightly sloping plains (bajada), rounded to slightly jagged foothills, and the prominent, rough, and concave form of the mountains.

Color – The colors associated with this subtype tend to be subtle grays, blacks, reds, and purples depending on sun position. The vegetation adds a general gray-green to the lower portions of this subtype but is subordinate to the striking bold colors of the exposed rock with desert varnish.

Texture – At this scale, the texture is attributed to the variation of form close to the surface of the mountains. These variations cause shadow, which give the mountain lands a general fine to course texture. Towards the upper half of the mountain units where rock outcroppings exists the texture is course. At the lower elevations, the saguaro forests associated with the bajadas result in a fine texture.

Scale – The scale of the mountain lands varies, from a few hundred acres to several thousand acres.

Composition – The mountains lands are of a feature landscape composing because of their vertical nature and visual presence in the landscape.

Bajada: Visual Character

Form – Flat predominately fan-shaped rectilinear form.

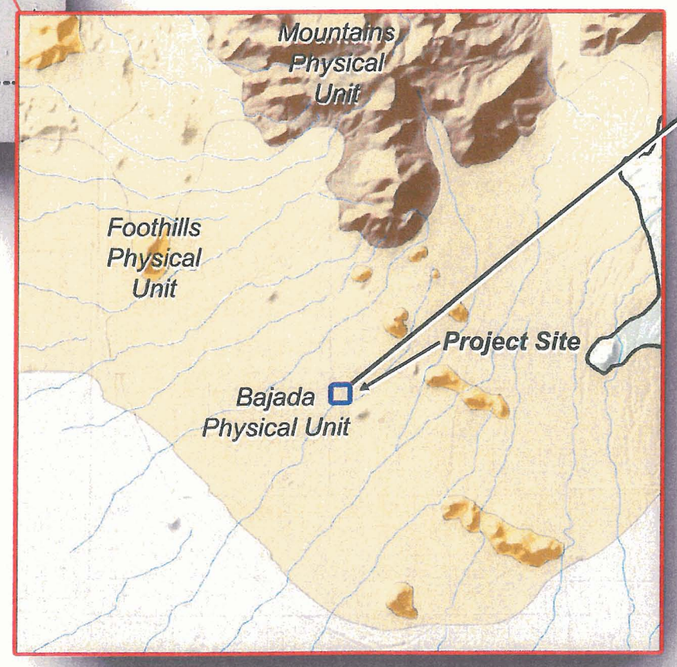
Line – Curvilinear line covers the surface of the bajada dominating the horizontal line of the horizon.

Color – Grey greens are typical of the bajada and associated with the native desert vegetation. Grays to blacks occur where bare rock exists sometimes with green lichen.

Texture – The medium to course texture of this physical unit is caused by the saguaro cactus poking out of the mass of tree and shrubs that typically blanket the land.

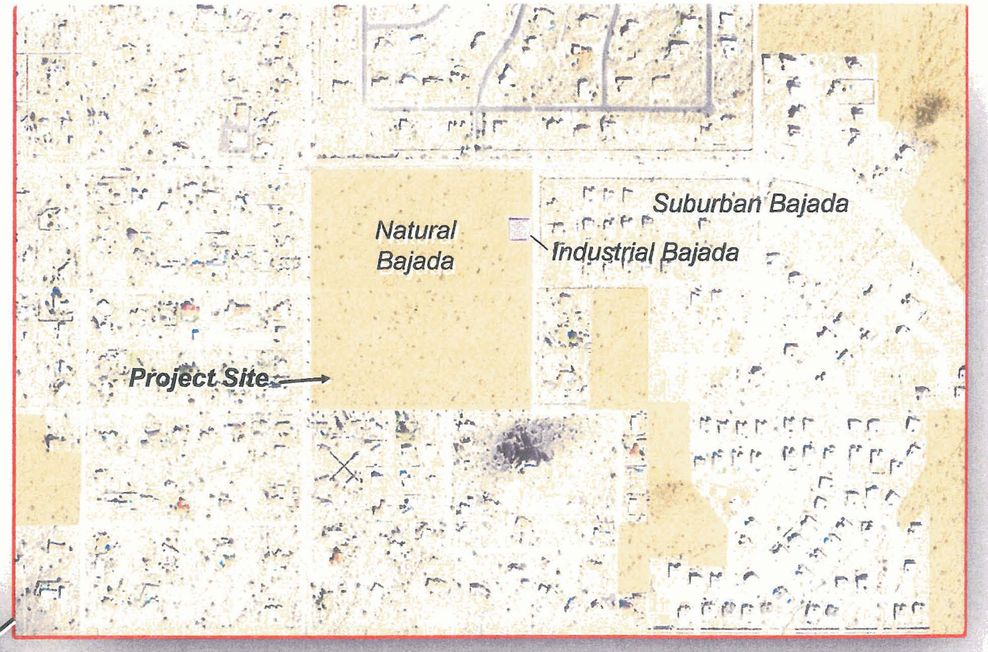
Scale – Scale is not articulated in this landscape because the dominant element is vegetation.

Composition – The sloping nature of the bajada and associated wide open views are typical of a panoramic landscape.



Physical Division: Bajada

Site Specific Landscape Unit: Natural Bajada



Natural Bajada: Landscape Character Description

The Bajada physical unit occupies approximately 5 percent of Maricopa County. The Bajada is a slightly sloping landform exhibiting a braided network of u-shaped shallow arroyos and shallow drainages. Typically, this physical unit begins at the base of a mountain and extends downward to the valley plains. The soil, composed of primarily detritus (eroded rock, sand, and silt) originating from the mountain slopes and peaks, is extremely fertile and provides excel lent drainage. These soil conditions allow Sonoran vegetation to flourish, especially the saguaro, which typically requires excellent drainage for its small root system to function properly. The resulting dense saguaro forests characterize the Sonoran Desert more than any other physical unit.

Landscape Elements

Landform – Slightly downward sloping landform with surface undulations.

Vegetation – Saguaro forests mixed with characteristic dense mixed Sonoran vegetation including, palo verde, ocotillo, ironwood, and cactus.

Water form – Non-existent except for arroyos that occur within the area and occasionally flow for very short durations because of summertime monsoon storms.

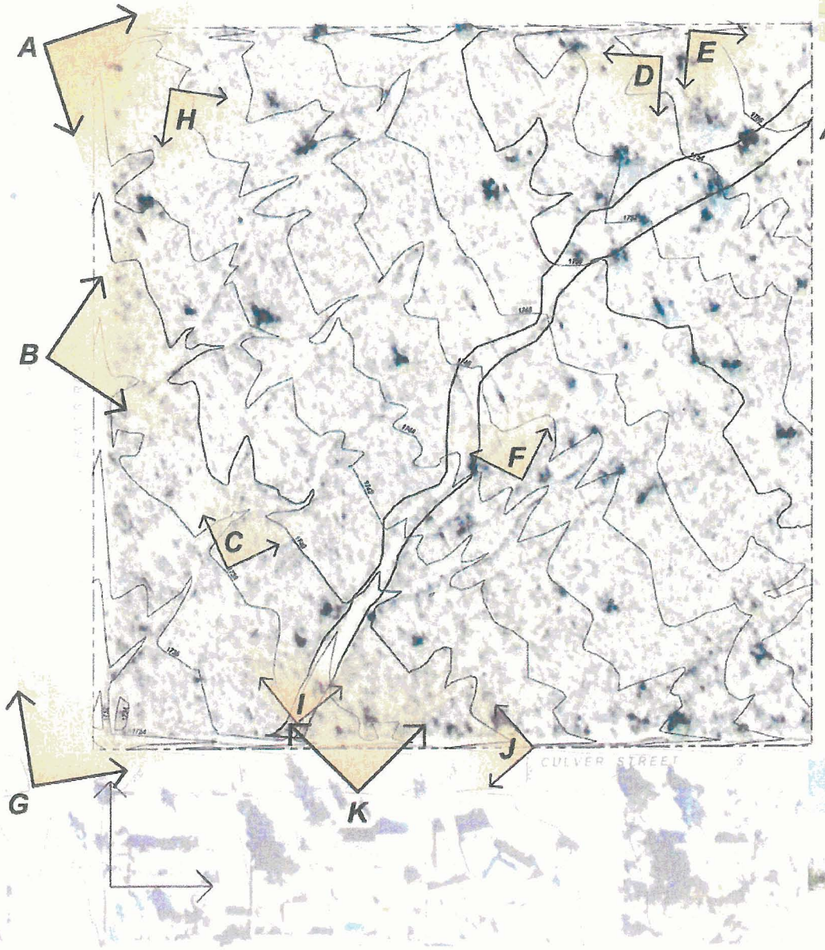
Rock form – Occasionally rock cockcrows occur that are void of vegetation.

Adjacent Landscape Units:
Suburban Bajada
Natural Foothills
Suburban Foothills

Figure 18

Culver Hawes Basin

Site Analysis - Key Viewpoints and Visual Character



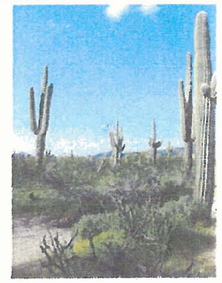
A *View from northwest corner of site looking southeast*

B *View from Culver Road looking east across site*

C *View of cholla looking north*

D *Northeast corner of site looking southwest*

E *Unpaved road at northeast corner of site*



F *View of Saguaro in central section of site*

G *Corner of Culver Street and Hawes Road looking north*

H *View towards southeast from northeastern section of site*

I *View of 404 wash looking north*

J *Drainage channel along Culver Street looking west*

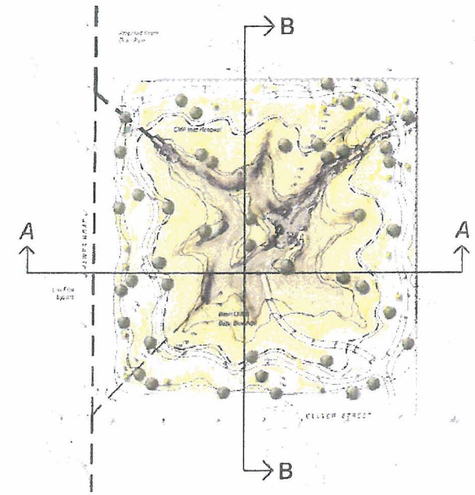
K *View along Culver Street looking north*

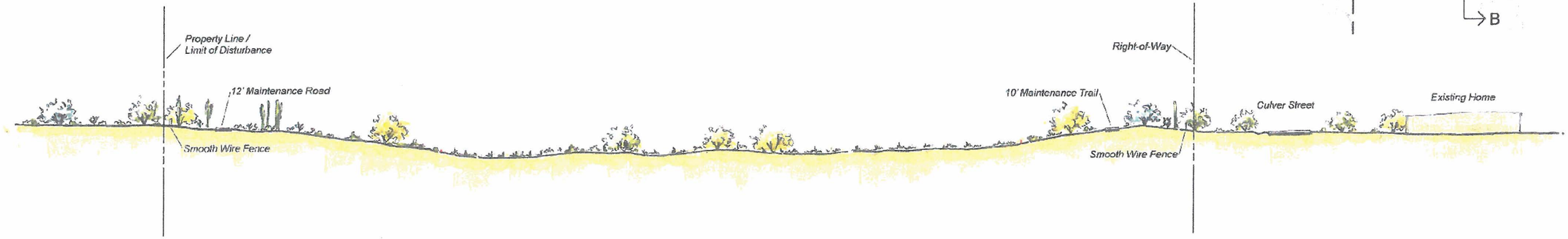
Figure 19

Culver Hawes Basin

Conceptual Basin Sections

Section A





Section B

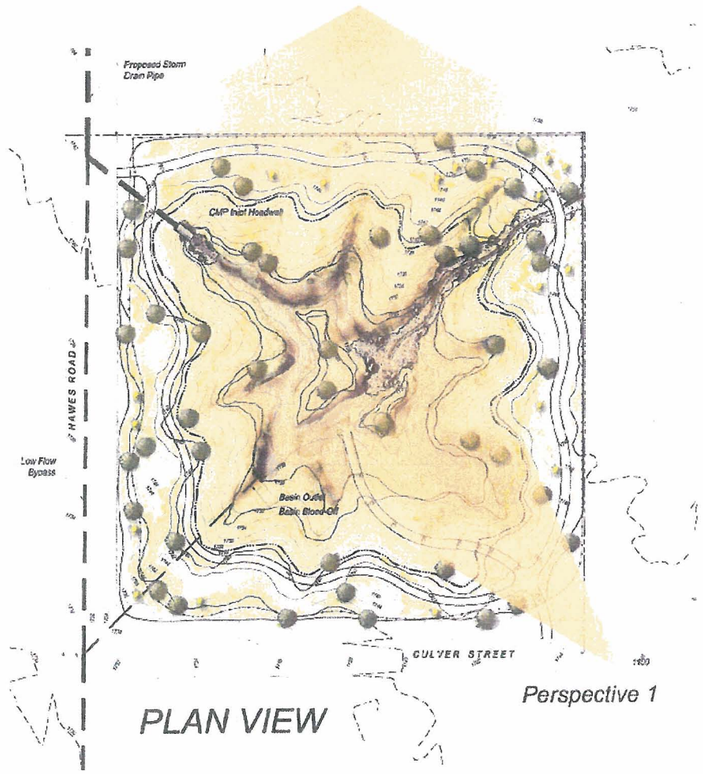
Figure 20

Culver Hawes Basin

Conceptual Basin Perspectives

Perspective 1

Perspective 2



Perspective 1

Perspective2

Figure 21

PART 9 BIBLIOGRAPHY

The following bibliographical list of data was utilized for this supplemental document.

Table 30 - Bibliography Reference Key	
DD	Drainage Design Reports
SD	Subdivision Drainage Reports
UM	Utility Maps
FM	Flood Insurance Rate Maps
QM	Quadrangle Maps
GIS	Geographic Information System
ST	Sediment Transport

1. DRAINAGE/DESIGN REPORTS:

DD-1 Spook Hill Area Drainage Master Plan, prepared by Wood, Patel & Associates, Inc., September 2002.

2. SUBDIVISION DRAINAGE REPORTS:

SD-1 Revised Drainage Report for Madrid, prepared by JMI & Associates, Inc., June 6, 2004.

3. UTILITY MAPS:

UM-1 City of Mesa ¼ Section Maps for Water, Sewer, Gas, & Storm Drain Locations (See Table 1)

UM-2 US West ¼ Section Maps for Telephone & Fiber Optic Facility Locations (See Table 2)

UM-3 Southwest Gas ¼ Section Maps for Gas Facility Locations (See Table 3)

4. FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) FLOOD INSURANCE RATE MAPS:

FM-1 04013C2210 D - Panel 2210 of 4350, Maricopa County, Arizona and Unincorporated Areas, Effective April 15, 1988

FM-2 04013C2220 D - Panel 2220 of 4350, Maricopa County, Arizona and Unincorporated Areas, Effective April 15, 1988

FM-3 04013C02230 D - Panel 2230 of 4350, Maricopa County, Arizona and Unincorporated Areas, Effective April 15, 1988

5. UNITED STATES GEOLOGICAL SURVEY (USGS) QUADRANGLE MAPS:

QM-1 Buckhorn, Ariz. (N3322.5-W11137.5/7.5), C.I. 10 feet, 1956 (photo revised 1982).

QM-2 Apache Junction, Ariz. (N3322.5-W11130/7.5), C.I. 10 feet, 1956 (photo revised 1982).

QM-3 Goldfield, Ariz. (33111-D4-TF-024), C.I. 20 feet, 1956 (photo revised 1981).

QM-4 Granite Reef Dam, Ariz. (N3330-W11137.5/7.5), C.I. 20 feet, 1964 (photo revised 1974)

6. GEOGRAPHIC INFORMATION SYSTEM (GIS) DATA:

GIS-1 Seamless USGS Quad Maps (TIFF Format)

GIS-2 NRCS Soils Data

GIS-3 FEMA Floodplain Data

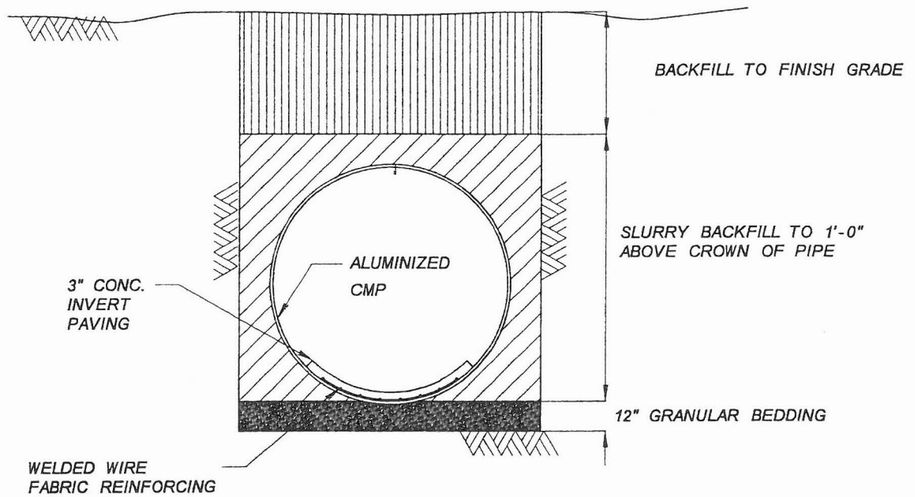
GIS-4 Mesa City Limits

7. SEDIMENT TRANSPORT ANALYSES/REPORTS:

ST-1 JE Fuller/Hydrology & Geomorphology, Inc. (JEF), 2000, Spook Hill Area Drainage Master Plan Update - Existing Conditions Sedimentation Analysis, report prepared for Wood/Patel for the Flood Control District of Maricopa County under FCD 99-43, March 2000.

APPENDIX A

15% Design Plans



DETAIL D-1

CMP INSTALLATION DETAIL
N.T.S.

NOTE:
THESE PLANS ARE PRELIMINARY AND ARE PROVIDED FOR PLANNING PURPOSES ONLY. THE LOCATIONS OF ALL STRUCTURES, UTILITIES AND RIGHT-OF-WAY ARE APPROXIMATE AND ARE BASED UPON RECORD DOCUMENTS. AERIAL TOPOGRAPHY WAS PRODUCED AT A SCALE OF 1 INCH = 200 FEET WITH A 2 FOOT CONTOUR INTERVAL. MAPPING WAS PREPARED BY KENNEY AERIAL MAPPING AND WAS PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY.

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

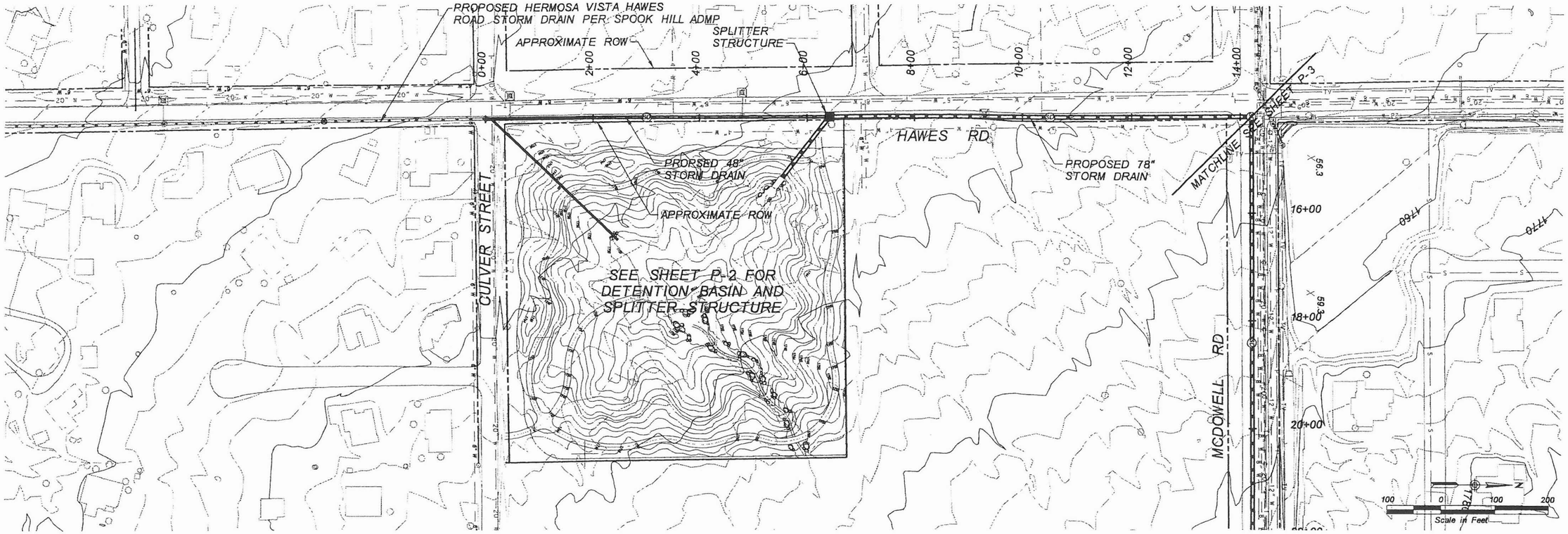
	NAME	DATE
DESIGNED	J. McCARTY	07/05
DRAWN	C. FOWLER	07/05
CHECKED	A. PATEL	07/05

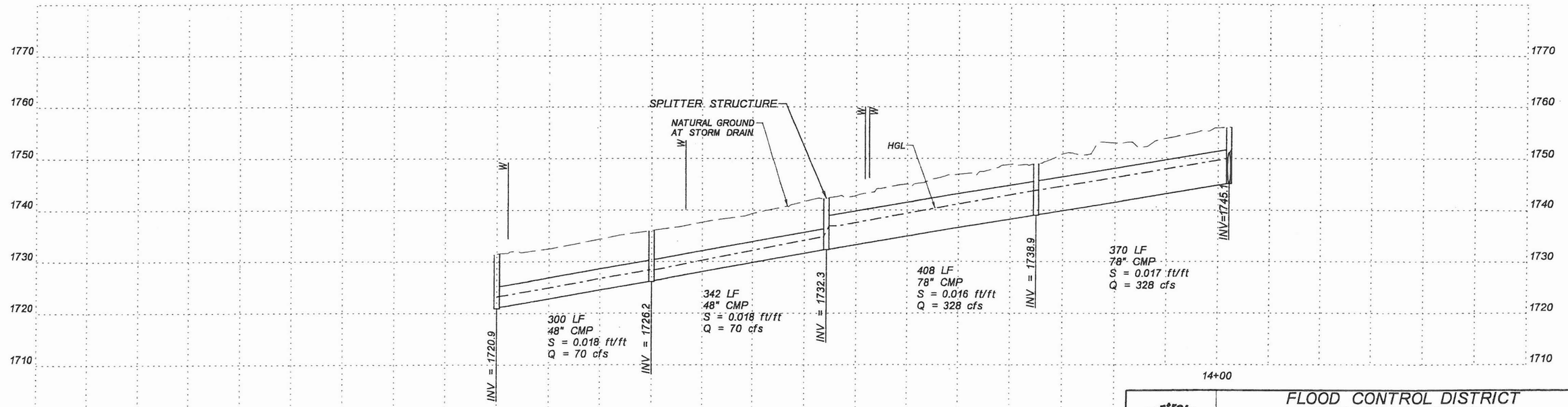
WOOD, PATEL & ASSOCIATES, INC.
2051 WEST NORTHERN, SUITE 100
PHOENIX, ARIZONA (602) 335-8500

STANDARD DETAILS

SHEET
DWG. D-1

FIGURE:





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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

	NAME	DATE
DESIGNED	J. McCARTY	07/05
DRAWN	C. FOWLER	07/05
CHECKED	A. PATEL	07/05

WOOD, PATEL & ASSOCIATES, INC.
2051 WEST NORTHERN, SUITE 100
PHOENIX, ARIZONA (602) 335-8500

STORM DRAIN

FIGURE: HAWES ROAD ALIGNMENT

SHEET DWG. P-1

PROPOSED HERMOSA VISTA HAWES ROAD STORM DRAIN PER SPOOK HILL ADMP

APPROXIMATE ROW

0+00 2+00 4+00 6+00 8+00 10+00

SPLITTER STRUCTURE

WILLETTA STREET

HAWES RD

SD

BASIN BLEED-OFF PIPE

PROPOSED 48" STORM DRAIN

APPROXIMATE ROW

PROPOSED GATE

PROPOSED 78" STORM DRAIN

PROPOSED 78" STORM DRAIN

PROPOSED PERIMETER FENCE

UN-SUBDIVIDED

PROPOSED BASIN BOUNDARY LIMITS

CULVER STREET

PROPOSED GATE

PROPOSED MAINTENANCE ROAD

N

100 0 100 200

Scale in Feet

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

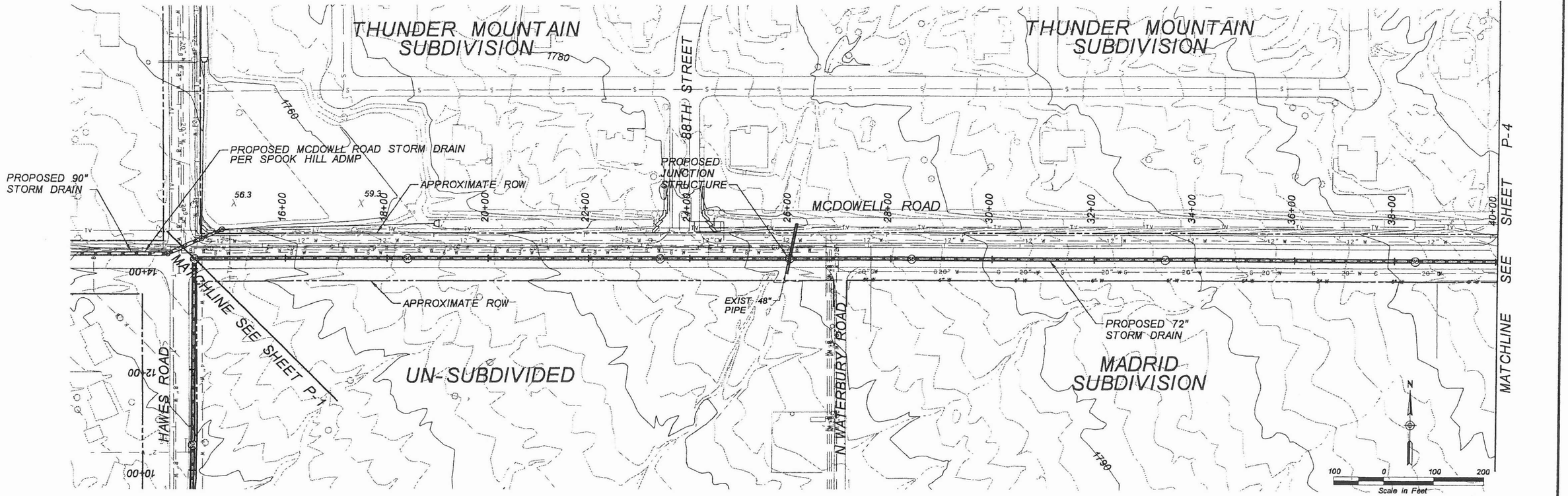
	NAME	DATE
DESIGNED	J. McCARTY	07/05
DRAWN	C. FOWLER	07/05
CHECKED	A. PATEL	07/05

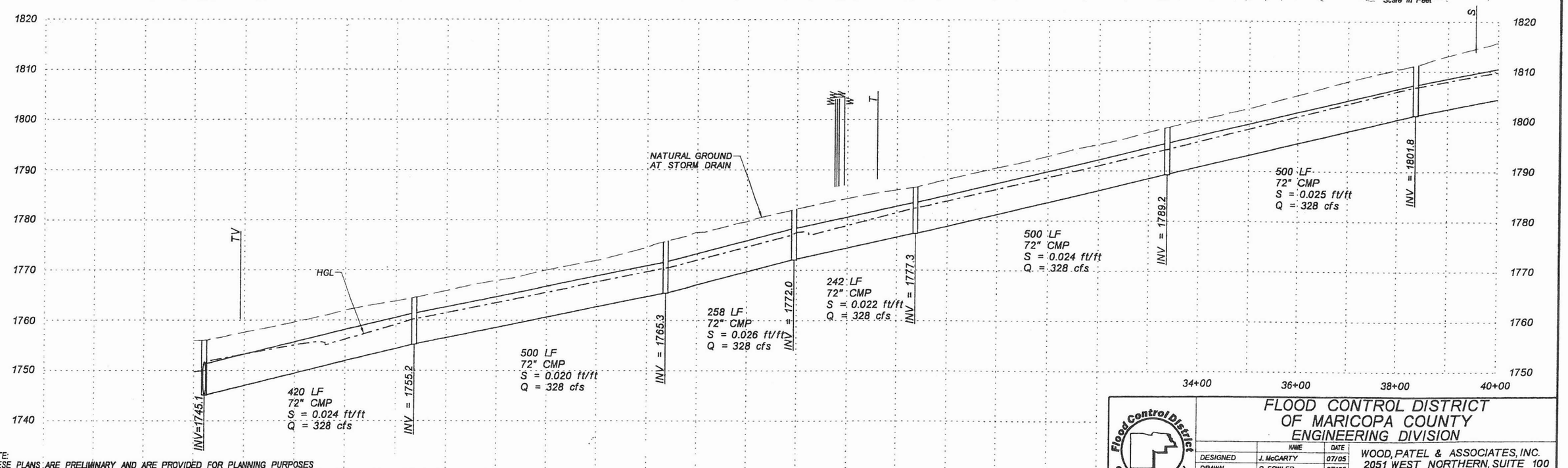
WOOD, PATEL & ASSOCIATES, INC.
2051 WEST NORTHERN, SUITE 100
PHOENIX, ARIZONA (602) 335-8500

BASIN PLAN

FIGURE: HAWES ROAD ALIGNMENT

SHEET DWG. P-2





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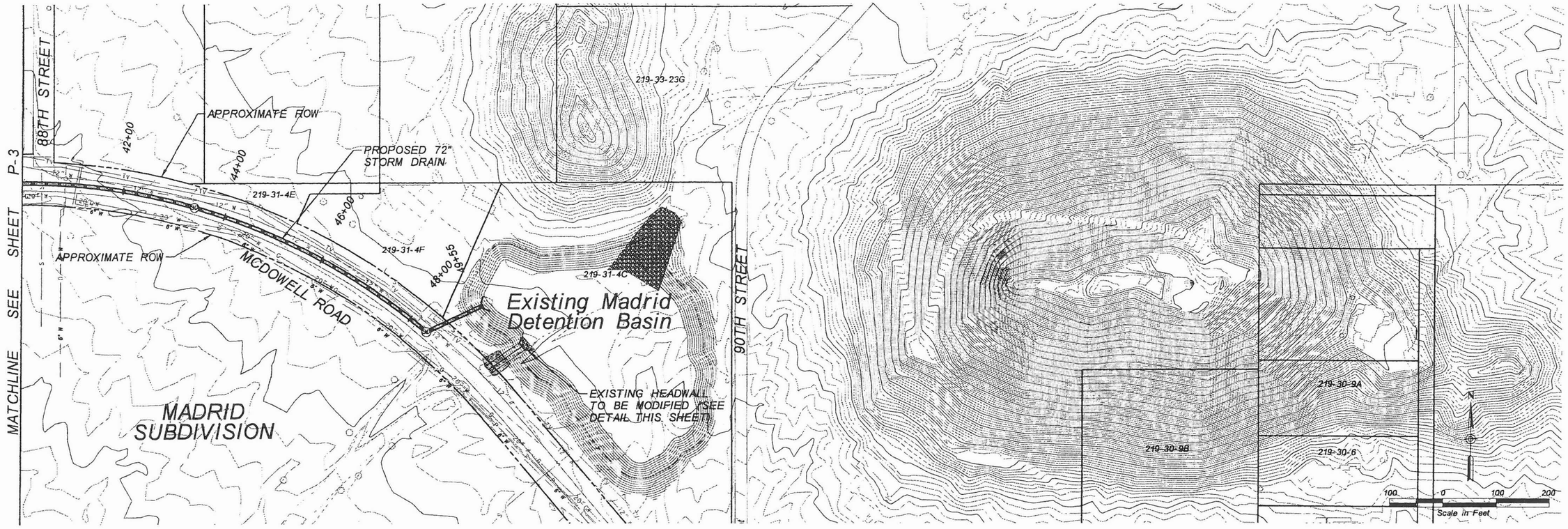
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

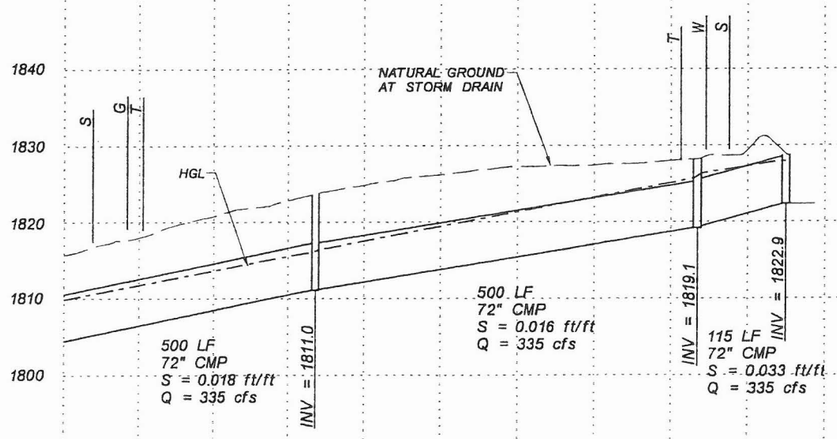
	NAME	DATE
DESIGNED	J. McCARTY	07/05
DRAWN	C. FOWLER	07/05
CHECKED	A. PATEL	07/05

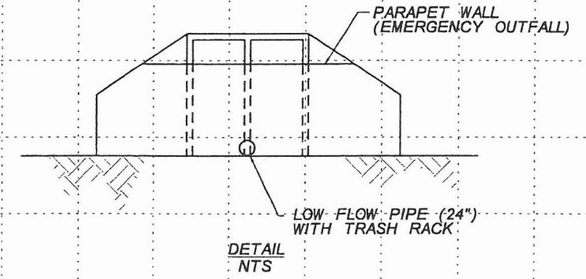
WOOD, PATEL & ASSOCIATES, INC.
2051 WEST NORTHERN, SUITE 100
PHOENIX, ARIZONA (602) 335-8500

FIGURE: STORM DRAIN McDOWELL ROAD ALIGNMENT

SHEET DWG. P-3







DETAIL
NTS

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

	NAME	DATE
DESIGNED	J. McCARTY	07/05
DRAWN	C. FOWLER	07/05
CHECKED	A. PATEL	07/05

WOOD, PATEL & ASSOCIATES, INC.
2051 WEST NORTHERN, SUITE 100
PHOENIX, ARIZONA (602) 335-8500

FIGURE: STORM DRAIN
McDOWELL ROAD ALIGNMENT

SHEET
DWG. P-4

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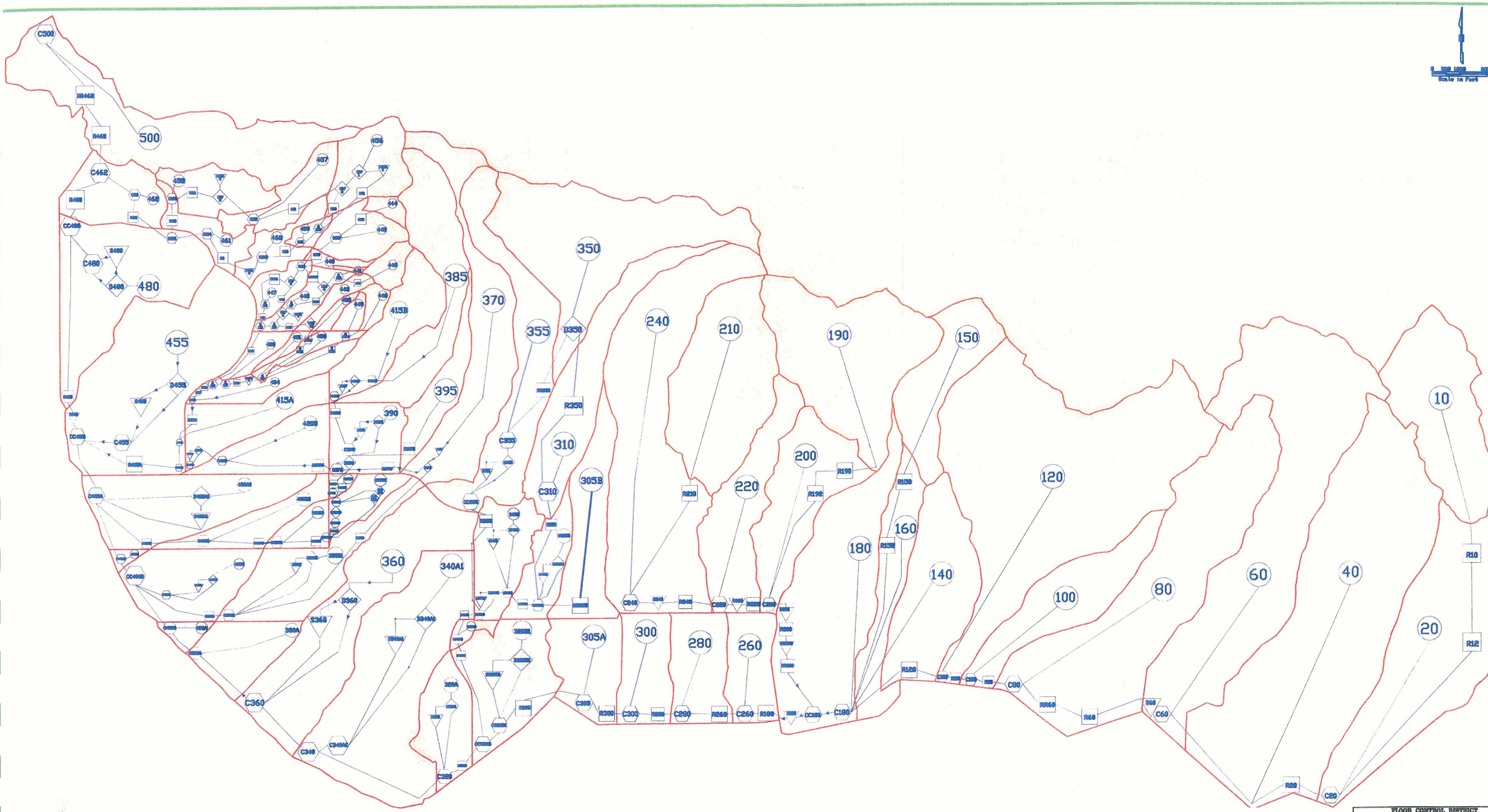
APPENDIX B

Hydrologic Analysis



FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
ENGINEERING DIVISION

RECOMENDED ALTERNATIVE

	BY	DATE
DESIGNED	L. McCARTY	06/05
DRAWN	L. McCARTY	06/05
CHECKED	A. PATEL	06/05

WOOD, PATEL & ASSOCIATES, INC.
8501 WEST NORTHERN, SUITE 100
PHOENIX, ARIZONA (602) 335-8500

DRAWING NO. REC_FC24.DWG

REC-FC24.OUT
Future Conditions Land Use

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	10	972.	12.27	119.	33.	12.	.69	
+	ROUTED TO	R10	903.	12.40	119.	33.	12.	.69	
+	ROUTED TO	R12	845.	12.60	118.	33.	12.	.69	
+	HYDROGRAPH AT	20	1103.	12.23	165.	45.	16.	1.17	
+	DIVERSION TO	BS20	1103.	12.23	92.	24.	9.	1.17	
+	HYDROGRAPH AT	D20	839.	12.50	79.	21.	8.	1.17	
+	HYDROGRAPH AT	RT20	1103.	12.23	92.	24.	9.	1.17	
+	ROUTED TO	S20	16.	12.50	15.	12.	7.	1.17	
+	3 COMBINED AT	C20	1554.	12.57	207.	63.	26.	1.86	
+	ROUTED TO	R20	1554.	12.57	207.	63.	26.	1.86	
+	HYDROGRAPH AT	40	2753.	12.30	286.	79.	28.	2.23	
+	DIVERSION TO	BS40	1789.	12.13	72.	20.	7.	2.23	
+	HYDROGRAPH AT	D40	2753.	12.30	227.	59.	21.	2.23	
+	HYDROGRAPH AT	RT40	1789.	12.13	72.	20.	7.	2.23	
+	ROUTED TO	S40	13.	12.20	12.	10.	6.	2.23	
+	3 COMBINED AT	C40	3088.	12.33	437.	129.	52.	4.08	
+	HYDROGRAPH AT	60	1654.	12.40	244.	66.	24.	1.75	
+	DIVERSION TO	BS60	11.	9.17	7.	2.	1.	1.75	
+	HYDROGRAPH AT	D60	1654.	12.40	244.	64.	23.	1.75	
+	HYDROGRAPH AT	RT60	11.	9.17	7.	2.	1.	1.75	
+	ROUTED TO	SB60	2.	9.33	2.	1.	1.	1.75	
+	3 COMBINED AT	C60	4599.	12.33	665.	190.	75.	5.84	
+	ROUTED TO	S60	101.	14.73	101.	98.	54.	5.84	
+	ROUTED TO	R60	101.	14.83	101.	98.	54.	5.84	
+	ROUTED TO	RR60	101.	14.87	101.	98.	54.	5.84	
+	HYDROGRAPH AT	80	1951.	12.13	199.	53.	19.	1.49	
+	DIVERSION TO	BS80	945.	11.93	35.	10.	3.	1.49	
+	HYDROGRAPH AT	D80	1951.	12.13	170.	43.	16.	1.49	
+	HYDROGRAPH AT	RT80	945.	11.93	35.	10.	3.	1.49	
+	ROUTED TO	S80	7.	12.00	6.	5.	3.	1.49	
+	2 COMBINED AT	C80	1958.	12.13	176.	48.	19.	1.49	
+	2 COMBINED AT	CC80	1958.	12.13	264.	144.	75.	1.49	
+	ROUTED TO	R80	1950.	12.17	264.	144.	75.	1.49	
+	HYDROGRAPH AT	100	453.	12.20	66.	18.	6.	.49	
+	DIVERSION TO	BS100	422.	12.13	19.	5.	2.	.49	
+	HYDROGRAPH AT	D100	453.	12.20	50.	13.	5.	.49	
+	HYDROGRAPH AT	RT100	422.	12.13	19.	5.	2.	.49	
+	ROUTED TO	S100	4.	12.20	3.	3.	2.	.49	
+	3 COMBINED AT	C100	2352.	12.20	314.	158.	81.	1.98	
+	ROUTED TO	R100	2303.	12.23	313.	158.	81.	1.98	
+	HYDROGRAPH AT	120	3345.	12.27	342.	93.	34.	2.20	
+	DIVERSION TO	BS120	13.	7.50	10.	3.	1.	2.20	
+	HYDROGRAPH AT	D120	3345.	12.27	342.	90.	33.	2.20	
+	HYDROGRAPH AT	RT120	13.	7.50	10.	3.	1.	2.20	
+	ROUTED TO	S120	2.	8.00	2.	2.	1.	2.20	
+	3 COMBINED AT	C120	5561.	12.23	633.	242.	112.	4.18	
+	ROUTED TO	R120	5512.	12.27	633.	242.	112.	4.18	

	HYDROGRAPH AT						
+		140	665.	12.13	67.	18.	6.	.60
	DIVERSION TO						
+		BS140	369.	11.97	11.	3.	1.	.60
	HYDROGRAPH AT						
+		D140	665.	12.13	58.	15.	5.	.60
	HYDROGRAPH AT						
+		RT140	369.	11.97	11.	3.	1.	.60
	ROUTED TO						
+		S140	2.	12.03	2.	2.	1.	.60
	3 COMBINED AT						
+		C140	6028.	12.27	687.	257.	118.	4.78
	HYDROGRAPH AT						
+		150	593.	12.17	51.	14.	5.	.41
	ROUTED TO						
+		R150	567.	12.23	51.	14.	5.	.41
	ROUTED TO						
+		R152	513.	12.33	51.	14.	5.	.41
	HYDROGRAPH AT						
+		160	224.	12.40	36.	9.	3.	.37
	DIVERSION TO						
+		BS160	82.	12.13	2.	1.	0.	.37
	HYDROGRAPH AT						
+		D160	224.	12.40	34.	9.	3.	.37
	HYDROGRAPH AT						
+		RT160	82.	12.13	2.	1.	0.	.37
	ROUTED TO						
+		S160	1.	12.20	1.	1.	0.	.37
	3 COMBINED AT						
+		C160	732.	12.37	86.	23.	8.	.77
	HYDROGRAPH AT						
+		180	851.	12.37	98.	25.	9.	1.01
	3 COMBINED AT						
+		C180	7186.	12.27	850.	298.	132.	6.56
	HYDROGRAPH AT						
+		210	1322.	12.17	111.	29.	10.	.79
	ROUTED TO						
+		R210	1246.	12.23	111.	29.	10.	.79
	HYDROGRAPH AT						
+		240	1513.	12.30	167.	42.	15.	1.41
	2 COMBINED AT						
+		C240	2684.	12.27	273.	70.	25.	2.20
	ROUTED TO						
+		S240	799.	12.70	226.	59.	21.	2.20
	ROUTED TO						
+		R240	795.	12.77	225.	59.	21.	2.20
	HYDROGRAPH AT						
+		220	676.	12.20	68.	18.	6.	.47
	2 COMBINED AT						
+		C220	955.	12.60	288.	75.	27.	2.67
	ROUTED TO						
+		SW220	895.	12.80	280.	73.	26.	2.67
	ROUTED TO						
+		R220	893.	12.87	280.	73.	26.	2.67
	HYDROGRAPH AT						
+		190	1471.	12.17	123.	33.	12.	.92
	ROUTED TO						
+		R190	1415.	12.23	123.	33.	12.	.92
	ROUTED TO						
+		R192	1359.	12.30	123.	33.	12.	.92
	HYDROGRAPH AT						
+		200	831.	12.17	72.	20.	7.	.53
	3 COMBINED AT						
+		C200	2264.	12.30	459.	122.	44.	4.12
	ROUTED TO						
+		SW200	2144.	12.37	454.	119.	43.	4.12
	ROUTED TO						
+		R200	2135.	12.37	454.	119.	43.	4.12
	ROUTED TO						
+		SS200	1364.	12.73	333.	88.	32.	4.12
	ROUTED TO						
+		RR200	1343.	12.83	331.	88.	32.	4.12
	2 COMBINED AT						
+		CC180	7186.	12.27	1160.	382.	162.	10.68
	ROUTED TO						
+		S180	124.	24.37	124.	123.	89.	10.68
	ROUTED TO						
+		R180	124.	24.40	124.	123.	89.	10.68
	HYDROGRAPH AT						
+		260	427.	12.10	42.	11.	4.	.26
	2 COMBINED AT						
+		C260	428.	12.10	140.	130.	102.	.26
	ROUTED TO						
+		R260	411.	12.20	140.	130.	102.	.26
	HYDROGRAPH AT						
+		280	527.	12.10	46.	13.	5.	.32
	2 COMBINED AT						
+		C280	893.	12.13	181.	141.	107.	.58
	ROUTED TO						
+		R280	870.	12.20	180.	141.	106.	.58
	HYDROGRAPH AT						
+		300	428.	12.10	37.	11.	4.	.29
	2 COMBINED AT						
+		C300	1235.	12.17	214.	149.	110.	.87
	ROUTED TO						
+		R300	1189.	12.23	213.	149.	110.	.87
	HYDROGRAPH AT						
+		305A	394.	12.13	41.	11.	4.	.32
	2 COMBINED AT						
+		C305	1534.	12.20	250.	159.	113.	1.19
	ROUTED TO						
+		R305	1520.	12.23	250.	158.	113.	1.19

+	HYDROGRAPH AT 320B1	659.	12.13	66.	19.	7.	.45
+	DIVERSION TO B320B1	364.	11.93	16.	5.	2.	.45
+	HYDROGRAPH AT D320B1	659.	12.13	54.	14.	5.	.45
+	HYDROGRAPH AT T320B1	364.	11.93	16.	5.	2.	.45
+	ROUTED TO S320B1	4.	12.00	3.	3.	2.	.45
+	3 COMBINED AT C320B1	2042.	12.20	304.	174.	119.	1.64
+	HYDROGRAPH AT 350	1315.	12.20	112.	29.	11.	1.00
+	DIVERSION TO SF350	658.	12.20	56.	15.	5.	1.00
+	HYDROGRAPH AT D350	658.	12.20	56.	15.	5.	1.00
+	ROUTED TO R350	593.	12.40	56.	15.	5.	1.00
+	HYDROGRAPH AT 310	381.	12.33	50.	13.	5.	.54
+	2 COMBINED AT C310	950.	12.37	106.	27.	10.	1.04
+	ROUTED TO R310	865.	12.67	106.	27.	10.	1.04
+	HYDROGRAPH AT 305B	333.	12.33	40.	10.	4.	.39
+	ROUTED TO R305B	317.	12.43	40.	10.	4.	.39
+	HYDROGRAPH AT 320B2	251.	12.13	27.	7.	3.	.22
+	DIVERSION TO B320B2	177.	12.00	6.	2.	1.	.22
+	HYDROGRAPH AT D320B2	251.	12.13	22.	6.	2.	.22
+	HYDROGRAPH AT T320B2	177.	12.00	6.	2.	1.	.22
+	ROUTED TO S320B2	1.	12.03	1.	1.	1.	.22
+	4 COMBINED AT C320B2	1150.	12.63	167.	43.	16.	1.65
+	ROUTED TO R320B2	1144.	12.67	167.	43.	16.	1.65
+	HYDROGRAPH AT 340B	497.	12.07	41.	12.	4.	.29
+	DIVERSION TO BS340B	497.	12.07	29.	8.	3.	.29
+	HYDROGRAPH AT D340B	286.	12.20	15.	4.	2.	.29
+	HYDROGRAPH AT RT340B	497.	12.07	29.	8.	3.	.29
+	ROUTED TO S340B	5.	12.20	5.	4.	3.	.29
+	3 COMBINED AT C340B	1166.	12.67	185.	50.	20.	1.94
+	DIVERSION TO BS340	966.	12.67	113.	28.	10.	1.94
+	HYDROGRAPH AT DD340B	200.	12.10	71.	22.	10.	1.94
+	HYDROGRAPH AT RT340	966.	12.67	113.	28.	10.	1.94
+	ROUTED TO SS340B	48.	13.40	41.	24.	10.	1.94
+	2 COMBINED AT CD340B	248.	13.40	109.	46.	20.	1.94
+	HYDROGRAPH AT RT350	658.	12.20	56.	15.	5.	1.00
+	ROUTED TO RR350	570.	12.43	56.	15.	5.	1.00
+	HYDROGRAPH AT 355	546.	12.33	75.	19.	7.	.68
+	2 COMBINED AT C355	1061.	12.40	130.	34.	12.	1.17
+	DIVERSION TO BS355	611.	12.40	40.	10.	4.	1.17
+	HYDROGRAPH AT D355	450.	12.13	90.	24.	9.	1.17
+	HYDROGRAPH AT RT355	611.	12.40	40.	10.	4.	1.17
+	ROUTED TO S355	40.	12.77	26.	10.	4.	1.17
+	2 COMBINED AT CC355	490.	12.77	115.	34.	12.	1.17
+	ROUTED TO R355	478.	12.77	115.	34.	12.	1.17
+	2 COMBINED AT CC340B	707.	12.77	220.	78.	31.	3.11
+	ROUTED TO R340B	703.	12.80	219.	78.	31.	3.11
+	HYDROGRAPH AT 340A2	72.	12.03	8.	3.	1.	.04
+	DIVERSION TO B340A2	64.	11.97	4.	1.	0.	.04
+	HYDROGRAPH AT D340A2	72.	12.03	5.	1.	1.	.04
+	HYDROGRAPH AT T340A2	64.	11.97	4.	1.	0.	.04
+	ROUTED TO S340A2	1.	12.03	1.	1.	0.	.04
+	3 COMBINED AT C340A2	710.	12.80	225.	80.	32.	3.15
	ROUTED TO						

+	R340A2	703.	12.93	225.	80.	32.	3.15
	2 COMBINED AT						
+	CC320B	2211.	12.23	517.	251.	148.	4.79
	ROUTED TO						
+	R320B	2204.	12.23	517.	251.	148.	4.79
	HYDROGRAPH AT						
+	320A	315.	12.13	40.	12.	4.	.27
	DIVERSION TO						
+	BS320A	315.	12.13	22.	6.	2.	.27
	HYDROGRAPH AT						
+	D320A	267.	12.27	22.	6.	2.	.27
	HYDROGRAPH AT						
+	RT320A	315.	12.13	22.	6.	2.	.27
	ROUTED TO						
+	S320A	4.	12.27	3.	3.	2.	.27
	3 COMBINED AT						
+	C320	2378.	12.30	539.	259.	151.	5.06
	HYDROGRAPH AT						
+	340A1	1254.	12.17	154.	46.	17.	1.09
	DIVERSION TO						
+	B340A1	1254.	12.17	154.	46.	17.	1.09
	HYDROGRAPH AT						
+	D340A1	0.	.00	0.	0.	0.	1.09
	HYDROGRAPH AT						
+	T340A1	1254.	12.17	154.	46.	17.	1.09
	ROUTED TO						
+	S340A1	18.	15.30	18.	16.	12.	1.09
	2 COMBINED AT						
+	C340A1	18.	15.30	18.	16.	12.	1.09
	2 COMBINED AT						
+	C340	2378.	12.30	553.	273.	162.	6.15
	HYDROGRAPH AT						
+	360	840.	12.20	122.	36.	13.	.88
	DIVERSION TO						
+	BS360	840.	12.20	93.	25.	9.	.88
	HYDROGRAPH AT						
+	D360	366.	12.67	40.	12.	4.	.88
	HYDROGRAPH AT						
+	RT360	840.	12.20	93.	25.	9.	.88
	ROUTED TO						
+	S360	15.	12.67	15.	12.	8.	.88
	3 COMBINED AT						
+	C360	2378.	12.30	597.	294.	172.	7.03
	HYDROGRAPH AT						
+	380A	322.	12.27	33.	10.	4.	.26
	2 COMBINED AT						
+	C380A	2639.	12.30	619.	300.	174.	7.29
	HYDROGRAPH AT						
+	400A	56.	12.20	4.	1.	0.	.05
	2 COMBINED AT						
+	C400A	2676.	12.30	622.	300.	174.	7.34
	HYDROGRAPH AT						
+	370	817.	12.23	83.	22.	8.	.67
	ROUTED TO						
+	S370	374.	12.53	83.	22.	8.	.67
	DIVERSION TO						
+	B370W	335.	12.53	74.	20.	7.	.67
	HYDROGRAPH AT						
+	D370	39.	12.53	8.	2.	1.	.67
	ROUTED TO						
+	R370S	38.	12.90	8.	2.	1.	.67
	HYDROGRAPH AT						
+	380B1	329.	12.20	47.	14.	5.	.37
	DIVERSION TO						
+	B380B1	329.	12.20	19.	5.	2.	.37
	HYDROGRAPH AT						
+	D380B1	312.	12.27	31.	8.	3.	.37
	HYDROGRAPH AT						
+	T380B1	329.	12.20	19.	5.	2.	.37
	ROUTED TO						
+	S380B1	3.	12.27	3.	3.	2.	.37
	3 COMBINED AT						
+	C380B1	315.	12.27	42.	13.	6.	1.04
	ROUTED TO						
+	R380B1	287.	12.43	42.	13.	6.	1.04
	HYDROGRAPH AT						
+	400B1	440.	12.13	45.	13.	5.	.38
	DIVERSION TO						
+	B400B1	239.	11.97	10.	3.	1.	.38
	HYDROGRAPH AT						
+	D400B1	440.	12.13	37.	10.	3.	.38
	HYDROGRAPH AT						
+	T400B1	239.	11.97	10.	3.	1.	.38
	ROUTED TO						
+	S400B1	2.	12.03	2.	2.	1.	.38
	2 COMBINED AT						
+	C400B1	442.	12.13	39.	11.	5.	.38
	3 COMBINED AT						
+	CC400B	2957.	12.30	685.	319.	181.	8.76
	HYDROGRAPH AT						
+	420A2	31.	12.07	2.	1.	0.	.02
	2 COMBINED AT						
+	C400A2	2967.	12.30	687.	320.	181.	8.78
	HYDROGRAPH AT						
+	395	236.	12.13	29.	8.	3.	.20
	ROUTED TO						
+	R395	230.	12.20	29.	8.	3.	.20
	HYDROGRAPH AT						
+	385	613.	12.23	74.	20.	7.	.53
	HYDROGRAPH AT						
+	415B	449.	12.10	49.	14.	5.	.33
	2 COMBINED AT						
+	C415B	979.	12.20	123.	35.	12.	.86

+	DIVERSION TO	BS415B	829.	12.20	72.	18.	7.	.86
+	HYDROGRAPH AT	D415B	150.	11.80	50.	16.	6.	.86
+	HYDROGRAPH AT	RT415B	829.	12.20	72.	18.	7.	.86
+	ROUTED TO	S415B	51.	12.83	39.	18.	7.	.86
+	2 COMBINED AT	CC415B	201.	12.83	85.	33.	12.	.86
+	ROUTED TO	R415B	201.	12.90	84.	33.	12.	.86
+	HYDROGRAPH AT	390	486.	12.03	35.	10.	4.	.25
+	DIVERSION TO	BS390	103.	11.73	6.	2.	1.	.25
+	HYDROGRAPH AT	D390	486.	12.03	32.	8.	3.	.25
+	HYDROGRAPH AT	RT390	103.	11.73	6.	2.	1.	.25
+	ROUTED TO	S390	1.	11.80	1.	1.	1.	.25
+	4 COMBINED AT	C390	801.	12.07	144.	50.	19.	1.30
+	DIVERSION TO	B390W	700.	12.00	142.	49.	19.	1.30
+	HYDROGRAPH AT	D390S	101.	12.07	2.	0.	0.	1.30
+	HYDROGRAPH AT	T370W	335.	12.53	74.	20.	7.	.67
+	ROUTED TO	R370W	331.	12.73	74.	20.	7.	.67
+	2 COMBINED AT	C370	330.	12.73	75.	20.	7.	1.30
+	ROUTED TO	R390S	329.	12.80	75.	20.	7.	1.30
+	HYDROGRAPH AT	400B3	39.	12.03	3.	1.	0.	.02
+	DIVERSION TO	B400B3	39.	12.03	3.	1.	0.	.02
+	HYDROGRAPH AT	D400B3	0.	.00	0.	0.	0.	.02
+	HYDROGRAPH AT	T400B3	39.	12.03	3.	1.	0.	.02
+	ROUTED TO	S400B3	1.	11.67	1.	1.	0.	.02
+	2 COMBINED AT	C400B3	1.	11.67	1.	1.	0.	.02
+	2 COMBINED AT	C390S	330.	12.80	76.	21.	8.	1.33
+	HYDROGRAPH AT	380B3	171.	12.10	16.	5.	2.	.12
+	DIVERSION TO	B380B3	170.	12.07	7.	2.	1.	.12
+	HYDROGRAPH AT	D380B3	162.	12.13	10.	3.	1.	.12
+	HYDROGRAPH AT	T380B3	170.	12.07	7.	2.	1.	.12
+	ROUTED TO	S380B3	2.	12.13	2.	1.	1.	.12
+	2 COMBINED AT	C380B3	164.	12.13	11.	4.	2.	.12
+	DIVERSION TO	380B3c	44.	12.13	3.	1.	0.	.12
+	HYDROGRAPH AT	D380B3	120.	12.13	8.	3.	1.	.12
+	DIVERSION TO	380B3a	62.	12.13	4.	1.	1.	.12
+	HYDROGRAPH AT	380B3b	57.	12.13	4.	1.	1.	.12
+	2 COMBINED AT	C380BB	335.	12.77	80.	22.	8.	1.45
+	DIVERSION TO	B38B3b	265.	12.77	51.	13.	5.	1.45
+	HYDROGRAPH AT	D380B	70.	12.07	29.	9.	3.	1.45
+	HYDROGRAPH AT	RT380B	265.	12.77	51.	13.	5.	1.45
+	ROUTED TO	S380B	22.	13.80	20.	12.	5.	1.45
+	2 COMBINED AT	CC380B	92.	13.80	47.	21.	8.	1.45
+	ROUTED TO	R38B3b	92.	13.83	47.	21.	8.	1.45
+	HYDROGRAPH AT	T38B3a	62.	12.13	4.	1.	1.	.12
+	ROUTED TO	R38B3a	50.	12.23	4.	1.	1.	.12
+	HYDROGRAPH AT	T38B3c	44.	12.13	3.	1.	0.	.12
+	3 COMBINED AT	C38B3c	154.	12.23	54.	23.	9.	1.45
+	ROUTED TO	R380B3	149.	12.33	54.	23.	9.	1.45
+	HYDROGRAPH AT	380B2	140.	12.07	12.	3.	1.	.10
+	2 COMBINED AT	C380B2	205.	12.27	64.	26.	10.	1.55
+	ROUTED TO	R380B2	202.	12.40	64.	26.	10.	1.55
+	HYDROGRAPH AT	400B2	205.	12.13	19.	5.	2.	.19

	2 COMBINED AT						
+	C400B2	336.	12.17	82.	31.	12.	1.74
	ROUTED TO						
+	R400B2	323.	12.33	82.	31.	12.	1.74
	HYDROGRAPH AT						
+	420A1	759.	12.13	74.	21.	8.	.57
	DIVERSION TO						
+	B420A1	477.	11.97	20.	6.	2.	.57
	HYDROGRAPH AT						
+	D420A1	759.	12.13	60.	16.	6.	.57
	HYDROGRAPH AT						
+	T420A1	477.	11.97	20.	6.	2.	.57
	ROUTED TO						
+	S420A1	4.	12.03	3.	3.	2.	.57
	4 COMBINED AT						
+	C420A	3670.	12.23	806.	360.	196.	11.09
	HYDROGRAPH AT						
+	T390W	700.	12.00	142.	49.	19.	1.30
	ROUTED TO						
+	R390W	672.	12.27	142.	49.	19.	1.30
	HYDROGRAPH AT						
+	420B	356.	12.10	34.	10.	4.	.28
	2 COMBINED AT						
+	C420B	940.	12.20	176.	59.	22.	.28
	HYDROGRAPH AT						
+	440	184.	12.03	12.	3.	1.	.08
	ROUTED TO						
+	R70	181.	12.07	12.	3.	1.	.08
	HYDROGRAPH AT						
+	441	16.	12.03	1.	0.	0.	.01
	2 COMBINED AT						
+	C108	197.	12.07	14.	4.	1.	.09
	DIVERSION TO						
+	SPLIT	98.	12.07	7.	2.	1.	.09
	HYDROGRAPH AT						
+	D4	98.	12.07	7.	2.	1.	.09
	ROUTED TO						
+	R108	92.	12.13	7.	2.	1.	.09
	HYDROGRAPH AT						
+	442	105.	12.10	9.	2.	1.	.10
	2 COMBINED AT						
+	C67	195.	12.10	16.	4.	2.	.19
	DIVERSION TO						
+	BASIN4	121.	12.10	6.	2.	1.	.19
	HYDROGRAPH AT						
+	D6	74.	12.10	10.	3.	1.	.19
	HYDROGRAPH AT						
+	RTD6	121.	12.10	6.	2.	1.	.19
	ROUTED TO						
+	SD6	1.	12.47	1.	1.	0.	.19
	2 COMBINED AT						
+	CD6	74.	12.10	10.	3.	1.	.19
	HYDROGRAPH AT						
+	443	151.	12.07	15.	4.	1.	.08
	DIVERSION TO						
+	WSH66	78.	11.87	12.	3.	1.	.08
	HYDROGRAPH AT						
+	D66	73.	12.07	3.	1.	0.	.08
	ROUTED TO						
+	R113	71.	12.07	3.	1.	0.	.08
	2 COMBINED AT						
+	C114	144.	12.07	13.	4.	2.	.27
	HYDROGRAPH AT						
+	444	83.	12.03	5.	1.	0.	.04
	ROUTED TO						
+	R58	79.	12.07	5.	1.	0.	.04
	HYDROGRAPH AT						
+	445	307.	12.03	19.	5.	2.	.19
	2 COMBINED AT						
+	C107	382.	12.03	23.	6.	2.	.23
	ROUTED TO						
+	R107	382.	12.07	23.	6.	2.	.23
	HYDROGRAPH AT						
+	RTB2	98.	12.07	7.	2.	1.	.09
	ROUTED TO						
+	RSPLIT	98.	12.07	7.	2.	1.	.09
	HYDROGRAPH AT						
+	446	66.	12.03	6.	2.	1.	.04
	3 COMBINED AT						
+	C109	545.	12.07	36.	10.	3.	.27
	DIVERSION TO						
+	WSH404	35.	11.70	8.	2.	1.	.27
	HYDROGRAPH AT						
+	D5	510.	12.07	28.	7.	3.	.27
	ROUTED TO						
+	R109	493.	12.10	28.	7.	3.	.27
	HYDROGRAPH AT						
+	447	141.	12.07	12.	4.	1.	.09
	HYDROGRAPH AT						
+	RT404	35.	11.70	8.	2.	1.	.27
	ROUTED TO						
+	R404	35.	11.83	8.	2.	1.	.27
	3 COMBINED AT						
+	C110	666.	12.07	48.	13.	5.	.36
	ROUTED TO						
+	R110	663.	12.10	48.	13.	5.	.36
	2 COMBINED AT						
+	C115	805.	12.07	61.	17.	7.	.63
	ROUTED TO						
+	R115	799.	12.10	61.	17.	7.	.63
	HYDROGRAPH AT						
+	448	89.	12.03	6.	2.	1.	.05
	HYDROGRAPH AT						

+	449	81.	12.03	5.	1.	0.	.05
	2 COMBINED AT						
+	C6364	170.	12.03	11.	3.	1.	.09
	ROUTED TO						
+	R6364	145.	12.17	11.	3.	1.	.09
	HYDROGRAPH AT						
+	450	63.	12.20	7.	2.	1.	.07
	HYDROGRAPH AT						
+	451	18.	12.17	2.	1.	0.	.03
	2 COMBINED AT						
+	C451	80.	12.20	9.	2.	1.	.09
	HYDROGRAPH AT						
+	RT66	78.	11.87	12.	3.	1.	.08
	HYDROGRAPH AT						
+	452	63.	12.03	5.	1.	0.	.04
	2 COMBINED AT						
+	C6465	141.	12.03	17.	4.	2.	.04
	ROUTED TO						
+	R6566	137.	12.10	17.	4.	2.	.04
	3 COMBINED AT						
+	C116	357.	12.17	36.	10.	3.	.23
	ROUTED TO						
+	BASIN5	159.	12.47	36.	10.	3.	.23
	ROUTED TO						
+	R116	157.	12.53	36.	10.	3.	.23
	HYDROGRAPH AT						
+	453	63.	12.10	7.	2.	1.	.06
	2 COMBINED AT						
+	C117	177.	12.47	43.	12.	4.	.29
	2 COMBINED AT						
+	C118	892.	12.10	104.	29.	11.	.92
	ROUTED TO						
+	R118	887.	12.13	104.	29.	11.	.92
	DIVERSION TO						
+	BASIN6	248.	12.13	7.	2.	1.	.92
	HYDROGRAPH AT						
+	D7	639.	12.13	97.	27.	10.	.92
	HYDROGRAPH AT						
+	RTD7	248.	12.13	7.	2.	1.	.92
	ROUTED TO						
+	SD7	1.	12.67	1.	1.	1.	.92
	2 COMBINED AT						
+	CD7	640.	12.13	97.	28.	11.	.92
	HYDROGRAPH AT						
+	454	162.	12.13	21.	6.	2.	.18
	2 COMBINED AT						
+	C454	801.	12.13	118.	34.	13.	1.10
	ROUTED TO						
+	R454	793.	12.23	118.	34.	13.	1.10
	HYDROGRAPH AT						
+	415A	267.	12.17	32.	9.	3.	.28
	2 COMBINED AT						
+	C415A	1046.	12.20	149.	43.	16.	1.38
	2 COMBINED AT						
+	CC415A	1975.	12.20	321.	100.	38.	1.66
	DIVERSION TO						
+	BS420B	475.	12.20	17.	4.	2.	1.66
	HYDROGRAPH AT						
+	D420B	1500.	12.10	304.	96.	37.	1.66
	HYDROGRAPH AT						
+	RT420B	475.	12.20	17.	4.	2.	1.66
	ROUTED TO						
+	S420B	29.	12.40	14.	4.	2.	1.66
	2 COMBINED AT						
+	CC420B	1529.	12.37	318.	100.	38.	1.66
	ROUTED TO						
+	R415A	1527.	12.40	318.	100.	38.	1.66
	HYDROGRAPH AT						
+	455	1418.	12.13	150.	45.	16.	1.11
	DIVERSION TO						
+	BS455	1418.	12.13	139.	37.	13.	1.11
	HYDROGRAPH AT						
+	D455	145.	12.80	24.	8.	3.	1.11
	HYDROGRAPH AT						
+	RT455	1418.	12.13	139.	37.	13.	1.11
	ROUTED TO						
+	S455	23.	12.80	22.	18.	11.	1.11
	2 COMBINED AT						
+	C455	169.	12.80	46.	26.	14.	1.11
	3 COMBINED AT						
+	CC455	5133.	12.23	1112.	465.	240.	13.86
	ROUTED TO						
+	S440	300.	22.00	299.	271.	175.	13.86
	ROUTED TO						
+	R455	300.	22.77	299.	271.	172.	13.86
	HYDROGRAPH AT						
+	480	1102.	12.10	100.	31.	11.	.73
	DIVERSION TO						
+	BS480	487.	11.90	27.	8.	3.	.73
	HYDROGRAPH AT						
+	D480	1102.	12.10	83.	23.	8.	.73
	HYDROGRAPH AT						
+	RT480	487.	11.90	27.	8.	3.	.73
	ROUTED TO						
+	S480	5.	11.97	5.	4.	3.	.73
	2 COMBINED AT						
+	C480	1107.	12.10	88.	27.	11.	.73
	2 COMBINED AT						
+	CC480	1107.	12.10	359.	318.	207.	.73
	ROUTED TO						
+	R480	907.	12.33	359.	318.	205.	.73
	HYDROGRAPH AT						
+	456	483.	12.07	37.	10.	4.	.26

	DIVERSION TO						
+	BASIN1	193.	12.07	8.	2.	1.	.26
	HYDROGRAPH AT						
+	D1	290.	12.07	29.	8.	3.	.26
	DIVERSION TO						
+	WA30	59.	12.07	10.	3.	1.	.26
	HYDROGRAPH AT						
+	CD2	231.	12.07	19.	5.	2.	.26
	ROUTED TO						
+	R456	218.	12.13	19.	5.	2.	.26
	HYDROGRAPH AT						
+	457	273.	12.07	21.	6.	2.	.19
	2 COMBINED AT						
+	C101	480.	12.10	40.	10.	4.	.45
	DIVERSION TO						
+	BASIN2	177.	12.10	8.	2.	1.	.45
	HYDROGRAPH AT						
+	D3	303.	12.10	32.	8.	3.	.45
	HYDROGRAPH AT						
+	RTD3	177.	12.10	8.	2.	1.	.45
	ROUTED TO						
+	SD3	1.	12.40	1.	1.	1.	.45
	2 COMBINED AT						
+	CD3	304.	12.10	33.	9.	4.	.45
	ROUTED TO						
+	R101	302.	12.10	33.	9.	4.	.45
	HYDROGRAPH AT						
+	458	366.	12.03	26.	7.	2.	.19
	2 COMBINED AT						
+	C103	655.	12.07	59.	16.	6.	.64
	ROUTED TO						
+	R103	651.	12.07	59.	16.	6.	.64
	HYDROGRAPH AT						
+	RT30	59.	12.07	10.	3.	1.	.26
	ROUTED TO						
+	R30	58.	12.10	10.	3.	1.	.26
	HYDROGRAPH AT						
+	RTB1	193.	12.07	8.	2.	1.	.26
	ROUTED TO						
+	B1	35.	12.20	8.	2.	1.	.26
	ROUTED TO						
+	RB1	35.	12.27	8.	2.	1.	.26
	2 COMBINED AT						
+	CDIV	87.	12.20	18.	5.	2.	.12
	HYDROGRAPH AT						
+	459	45.	12.03	3.	1.	0.	.03
	2 COMBINED AT						
+	C52	117.	12.10	21.	6.	2.	.15
	ROUTED TO						
+	R52	116.	12.17	21.	6.	2.	.15
	HYDROGRAPH AT						
+	460	221.	12.07	20.	6.	2.	.14
	2 COMBINED AT						
+	C102	323.	12.07	40.	12.	4.	.29
	ROUTED TO						
+	BASIN3	71.	12.63	40.	12.	4.	.29
	ROUTED TO						
+	R3	71.	12.77	40.	12.	4.	.29
	HYDROGRAPH AT						
+	461	165.	12.10	17.	5.	2.	.12
	2 COMBINED AT						
+	C104	220.	12.10	57.	17.	6.	.41
	2 COMBINED AT						
+	C106	866.	12.07	115.	33.	12.	1.05
	ROUTED TO						
+	R106	828.	12.13	115.	33.	12.	1.05
	HYDROGRAPH AT						
+	462	557.	12.07	42.	12.	4.	.30
	2 COMBINED AT						
+	C56	1306.	12.10	156.	44.	16.	1.35
	2 COMBINED AT						
+	C462	1633.	12.30	398.	341.	217.	2.09
	ROUTED TO						
+	R462	1600.	12.33	397.	341.	217.	2.09
	ROUTED TO						
+	RR462	1563.	12.40	396.	340.	217.	2.09
	HYDROGRAPH AT						
+	500	1126.	12.27	128.	35.	12.	.93
	2 COMBINED AT						
+	C500	2472.	12.33	507.	367.	226.	3.02

*** NORMAL END OF HEC-1 ***

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APPENDIX C

Public Meeting

Flood Control District of Maricopa County
Hermosa Vista – Hawes Road Storm Drain and Basin
August 18, 2005 Public Open House Summary

INTRODUCTION

A public open house was held for the Flood Control District of Maricopa County Hermosa Vista – Hawes Road Storm Drain and Basin on Thursday, August 18, 2005 at the Desert Hills Baptist Church on 8326 East McDowell Road, Mesa, Arizona. The meeting was conducted in an open house format from 6:00 p.m. to 8:00 p.m., allowing residents to attend at their convenience to review project displays and speak with project team members. The purpose of the meeting was to introduce the project to the community, provide information regarding the update to the Spook Hill Area Drainage Master Plan (ADMP), illustrate the proposed basin design, and gather input from the surrounding residents.

The following project team members attended the meeting:

- Emili Kolevski, Principal Project Manager, FCDMC
- Dennis Holcomb, Landscape Architect Manager, FCDMC
- Doug Hauth, Public Information Officer, FCDMC
- Fred Rustam, City of Mesa
- Raul Varela, City of Mesa
- Ashok Patel, Wood, Patel and Associates, Inc.
- Joel McCarty, Wood, Patel and Associates, Inc.
- Scott Peters, EPG
- Sarah Homuth, EPG
- Judie Talbot, EPG
- Christina White, EPG

PUBLIC NOTIFICATION AND ATTENDANCE

The public was notified of the open house through a newsletter mailed by the District to approximately 520 households. Twenty-six people attended the open house.

COMMENT SUMMARY

Comment forms were provided to everyone who attended the open house, requesting their input on the information presented at the open house. Three comment forms were returned to project team members. A summary of the comments from the comment forms is provided on the next page.

Concern was expressed by one resident that the size and design of the basin and storm drain would not be adequate for large storm events, and damage to adjacent residents may result. No details on the basis of this concern were given. Residents responded that the project information was presented in an understandable manner and the overall knowledge and helpfulness of the project team was good to very good. People reported that they heard about the open house through the postcard in the mail or through a friend/neighbor. The facility was rated very good by all respondents.

Name	Address	Telephone	Email
Archer, Ken	9205 E. Omega	480-986-5610	
Barnby, Dorothy	2618 N. Hawes Rd.	480-986-5642	
Barnby, John P.	2618 N. Hawes Rd	480-986-5642	
Baxter, Greg	8343 East Mowson	480-985-8712	
Bell, Bob	8914 E. Norwood Cir	480-837-1496	
Bell, Patricia	8914 E. Norwood Cir	480-837-1496	
Branvard, Rodger	2439 N. Keesha	480-985-4372	
Branvard, Roy	2439 N. Keesha	480-985-4372	
Conan, Lee	2717 N. 82nd St	480-441-2618	
Curran, Tim	8333 E. Culversti	480-213-9817	tplaz@worldnet.att.net
Cutlip, David	8336 E Hermosa Vista	480-380-6135	
Deshong, Butch	2758 N. Estrada	480-396-0486	
Elliott, Fred	2634 N. Hawes Rd	480-986-9952	elliottfw@cox.net
Fletcher, Kelly and Sharon	8301 E. McDowell	480-380-7415	Kgts00kr@aol.com
Furlanetto, Ernest	2734 N. Estrada	480-664-2174	erffre@excite.com
Jansen, Annette	8135 E. Culver	480-373-9030	
Jenkins, John J.	8336 E. Manson Rd	480-986-9359	
Root, Sonya	3129 N. 82nd St	480-380-5309	
Sacks, Neal	2415 N. Keesha	480-986-2424	
Seeman, J.S.	3714 N. Hawes Rd	480-380-9535	Eeckogulach3@netscape.net
Singleton, Chuck	8863 E. Norwood St	480-649-9652	
Singleton, Debbie	8863 E. Norwood St	480-649-9652	
Smith, Catherine	8540 E. McDowell Rd. #7	480-380-3459	
Smith, Tom	8540 E. McDowell Rd. #7	480-380-3459	
Thomas, Lance	2651 N. Keesha	480-891-7465	

Flood Control District of Maricopa County
Hermosa Vista – Hawes Road Storm Drain and Basin
Comment Tracking Form
Public Open House
August 18, 2005

Date	CommentNumber	Name	Address	Method	Issues, Comments, and Concerns
08/18/05	1	Curran, Tim	8333 E. Culver St	In Person	Has lived in the Desert Uplands for 16 years. Has concerns about the "100 year floods" that could cause serious damage to the residents southwest of the proposed basin. Project information presented in an understandable manner and rated facility as "very good." Heard about the meeting through a postcard in the mail.
08/18/05	2	Les, Sawdy	8335 E. Culver St	In Person	Has lived in Spook Hill – Desert Uplands for 20 years. No good, mother nature will run water and overpower the basin design. Project information presented in an understandable manner and rated facility as "good." Heard about the meeting through a friend/neighbor.
08/18/05	3	Furlanetto, Ernest	2734 N. Estrada	In Person	Has lived in Madrid for two years. Found information helpful to know about the area. The map of the Loop 202 and its proximity with this project was also helpful. Project information presented in an understandable manner and rated facility as "very good." Heard about the meeting through a postcard in the mail.