

Waddell Road Drainage Improvements Candidate Assessment Report FINAL

Prepared for:



Flood Control District of Maricopa County

Prepared by:

HDR

3200 East Camelback Road
Phoenix, Arizona 85018

Revised April 10, 2009



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Flood Control District of Maricopa County, Arizona

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Waddell Road CAR

Flood Control District of Maricopa County, Arizona

1.0 Executive Summary

The purpose of this project is to prepare a Candidate Assessment Report (CAR) to update and identify regional drainage solutions within the northwest portion of the study area for the Loop 303/White Tanks Area Drainage Master Plan Update (ADMPU), which was completed in 2002. The CAR is prepared with professional engineering and landscape architectural services to identify regional drainage facilities, associated rights-of-way (ROW), landscape and aesthetics, multi-use opportunities, and cost estimates associated with the recommended drainage improvements along Waddell Road and Lower El Mirage Wash to an ultimate outfall at the Agua Fria River. The study limits are Reems Road to the west, the Agua Fria River to the east, Grand Avenue/Greenway Road to the north and Peoria Avenue to the south.

Eighteen (18) locations within the study area have been identified as areas of flooding hazard. Several locations have been addressed in previous studies, are being addressed in concurrent studies, or will be addressed in the future through development. Two key flooding hazard areas within the project limits were the focus of this project. These areas are the Waddell Road Area and the West Cactus Detention Basin. Four preliminary alternatives (including a “no action” alternative) were developed to address the flood potential. The alternatives were evaluated using a three level method of ranking.

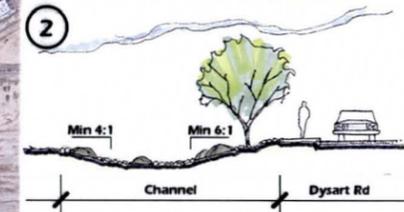
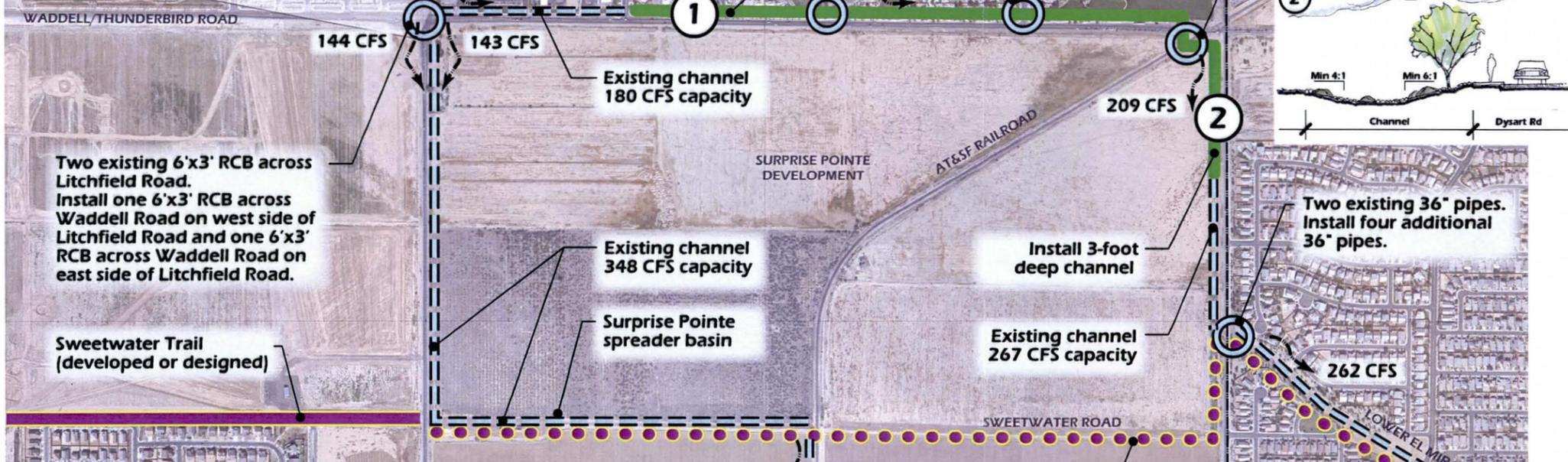
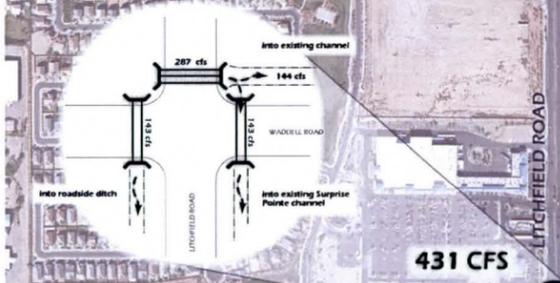
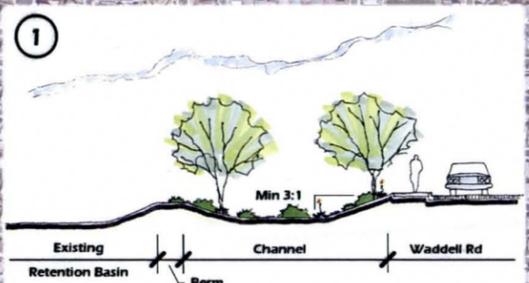
The recommended plan for the Waddell Road Area includes:

- Installing culverts under Waddell Road just west and east of Litchfield Road
- Extending a continuous channel along the north side of Waddell Road from 137th Avenue to Dysart Road in the existing retention basins
- Installing culverts under Waddell Road and Dysart Road to the south
- Installing a channel along the west side of Dysart Road from Waddell Road to the start of Surprise Pointe’s channel
- Adding additional pipes at the Lower El Mirage Wash crossing at Dysart Road
- Facilitate completing the regional drainage outfall for this area
- Landscape improvements that increase viewer appreciation of the roadway

The recommended plan for the West Cactus Detention Basin includes:

- Replacing the existing culverts under Cactus Road with a 20 foot by 10 foot arch culvert
- Raising a portion of Cactus Road approximately 6 feet
- Installing a 33.4 acre-foot (ac-ft) detention basin
- Installing one additional box culvert under El Mirage Road
- Facilitate completing the regional drainage outfall for this area
- Multi-use recreation amenities that serve the surrounding vicinity

- 1 DESERT PARK THEME**
- The existing landscape character along the north side of Waddell Road, from Litchfield Road to Dysart Road, is Desert Park and includes a combination of turf and both Native and desert adapted plants.
 - There is an existing, turf-bottomed retention basin the entire length.
 - The new 3' deep channel needs to fit between the back of curb and the existing retention basin.
 - The proposed landscape theme of the new channel is also Desert Park.
 - Trail opportunities are limited to sidewalk improvements.



- 2 SEMI-NATURAL SONORAN DESERT THEME**
- There is no established landscape character along the west side of Dysart Road. The property is bladed, vacant land with a few volunteer native desert plants.
 - The existing Surprise Point channel is a rip-rap lined channel with 4:1 side slopes on the west bank and 8:1 side slopes on the east bank.
 - The landscape character on the east side of Dysart Road is Semi-Natural Sonoran Desert.
 - The new channel must fit within the right-of-way.
 - The proposed landscape is Semi-Natural Sonoran Desert along the top banks. The channel will be rip-rap with large (2 to 3-foot) boulders interspersed.
 - Trail opportunities are limited to sidewalk improvements.

- Existing channel or channel proposed by others
- Channel
- Culvert or pipe location
- Flow direction
- Municipal trails
- Developed or designed trails

RCB = reinforced concrete box
CFS = cubic feet per second



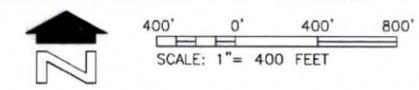
HDR

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WADDELL ROAD CAR
CONTRACT NUMBER: FCD 2007C015
WADDELL ROAD AREA
RECOMMENDED ALTERNATIVE

HDR ENGINEERING, INC.		
3200 East Camelback Road, Suite 350		
PHOENIX, ARIZONA 85018-2311		
(602) 522-7700		
BY	DATE	
DESIGN	JM/LEP	02-05-09
DESIGN CHK.	LAP	02-05-09
PLANS	JM/LEP	02-05-09
PLANS CHK.	LAP	02-05-09





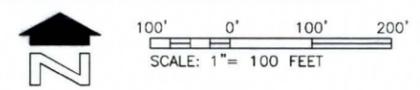
- Area needed for flood control
- Area needed for flood control basin plus 30 percent for landscaping
- Municipal trails

RCB = reinforced concrete box
CFS = cubic feet per second

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NO.	REVISION	BY	DATE
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY WADDELL ROAD CAR CONTRACT NUMBER: FCD 2007C015 WEST CACTUS DETENTION BASIN			

HDR ENGINEERING, INC.		
3200 East Camelback Road, Suite 350 PHOENIX, ARIZONA 85018-2311 (602) 522-7700		
BY	DATE	
DESIGN	JM/LEP	02-12-09
DESIGN CHK.	LAP	02-12-09
PLANS	JM/LEP	02-12-09
PLANS CHK.	LAP	02-12-09





Waddell Road CAR

Flood Control District of Maricopa County, Arizona

2.0 Introduction

2.1 Overview

HDR Engineering has been contracted by the Flood Control District of Maricopa County (FCDMC) to prepare a Candidate Assessment Report (CAR), to update and evaluate regional drainage solutions within the northwest portion of Loop 303/White Tanks ADMPU drainage area. The CAR documents the development of conceptual plans for proposed drainage facilities associated with the Waddell Road Area. The purpose of this project is to prepare a Candidate Assessment Report (CAR) with professional engineering and landscape architectural services and identify regional drainage facilities, associated rights-of-way (ROW), and cost estimates associated with drainage improvements along Waddell Road. The CAR includes the following: a review and update of existing data and facilities; development and analysis of alternative drainage concepts; an assessment of the multi-use recreational potential of the alternatives (specifically, connectivity to planned and existing trail systems); and identification of a recommended plan. The recommended plan will include conceptual design plans, ROW requirements, and cost estimates.

2.2 Purpose and Regional Benefits

The Waddell Study Area Drainage Improvements project was originally proposed as a regional project in the White Tanks/Agua Fria Area Drainage Master Study (ADMS) dated 1994. This project was submitted to the FCDMC Capital Improvement Program in 1999 and was recommended by the FCDMC for inclusion.

The Loop 303/White Tanks Area Drainage Master Plan Update (ADMPU), completed in 2005, re-evaluated and developed solutions to mitigate flooding hazards in the White Tanks drainage area. The ADMPU did not include this project (Waddell CAR) as a recommended regional facility. However, this facility will alleviate flooding on the upstream (west side) of the railroad embankment and reduce overtopping of several arterial roads. The project would provide a positive drainage outfall for the area, and will reduce peak flows in the proposed Atchison, Topeka and Santa Fe Railway (AT&SF) Channel and the existing Dysart Drain.

The purpose of the CAR is to define a 100-year regional solution for flooding in Surprise and El Mirage, specifically in the vicinity of Waddell Road and Dysart Road to an outfall at the Agua Fria River. This study has three primary goals: a) Develop a 100-year regional outfall for the area, utilizing existing facilities when possible; b) Evaluate the relevance of the project features recommended in the 1994 ADMS; and c) Incorporate stakeholder and community expectations regarding aesthetic and multi-use functions of the flood control facilities.

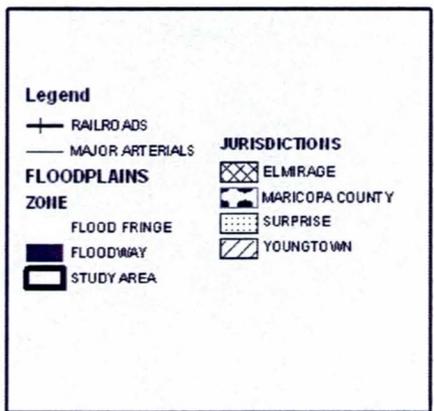
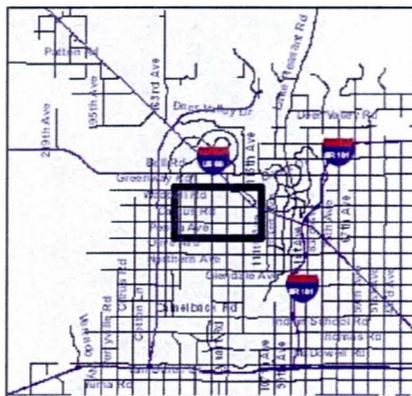
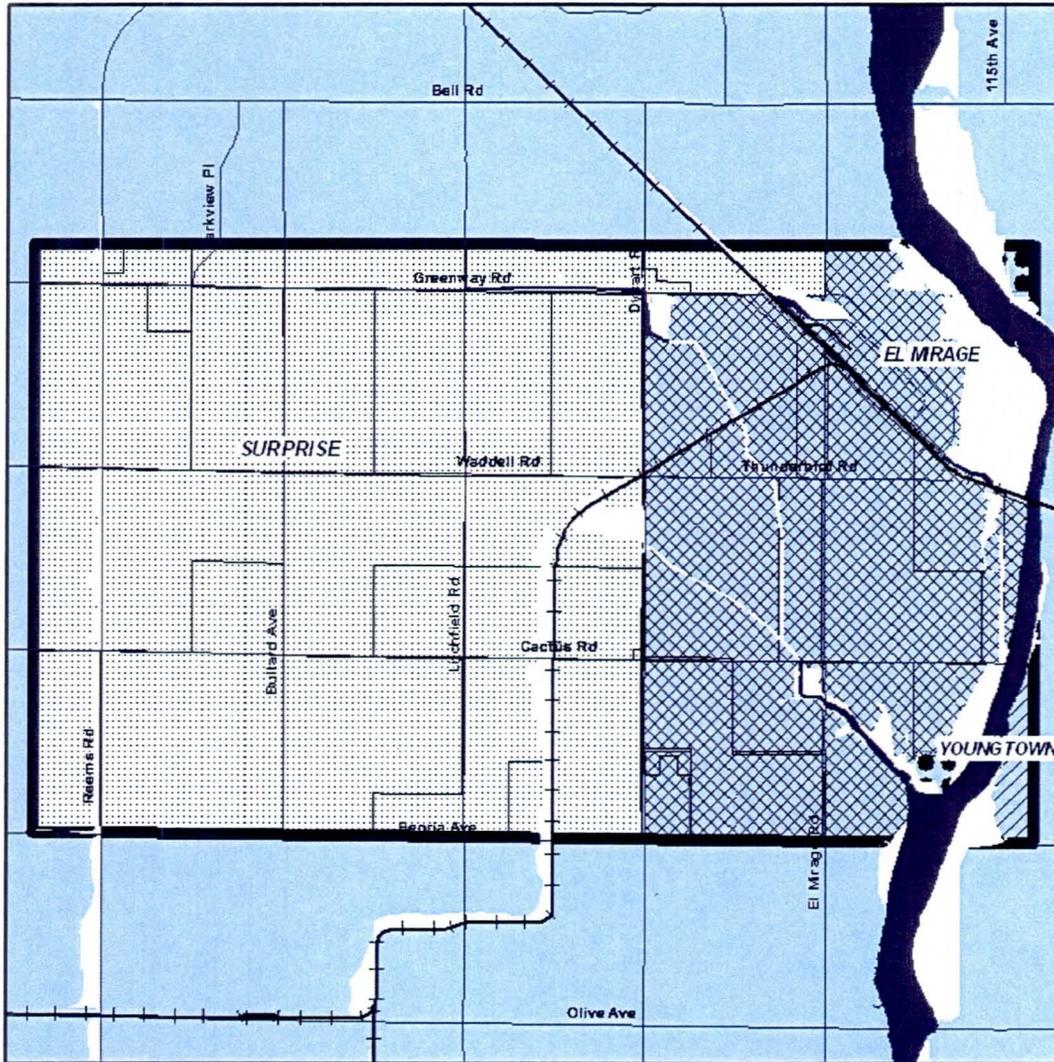
2.3 Location

The study limits are Reems Road to the west, the Agua Fria River to the east, Grand Avenue/Greenway Road to the north and Peoria Avenue to the south, as shown in the vicinity map on the following page.



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Vicinity Map





3.0 Stakeholders and Contact Information

The active stakeholders in this project included the City of El Mirage, City of Surprise and the FCDMC. Table 1 below is a comprehensive list of all the stakeholders involved in this project:

Table 1 – Stakeholder and Contact Information

Name	Agency	Email Address	Phone Number
Debbi Shortal	FCDMC	dls@mail.maricopa.gov	(602) 506-1034
Jennifer Pokorski	FCDMC	jmp@mail.maricopa.gov	(602) 506-4695
Burke Lokey	FCDMC	burkelokey@mail.maricopa.gov	(602) 506-0867
Jon Loxley	FCDMC	jonloxley@mail.maricopa.gov	(602) 506-2956
John Holmes	FCDMC	jwh@mail.maricopa.gov	(602) 506-3320
Jeff Davidson, PE	City of Surprise	Jeff.davidson@surprise.org	(623) 222-3440
Suneel Garg	City of Surprise	Suneel.garg@surprise.com	(623) 222-3424
Hobart Wingard	City of Surprise	Hobart.wingard@surpriseaz.com	(623) 222-3156
Vamshee Kovusu	City of Surprise	Vamshee.Kovusu@surpriseaz.com	(623) 222-3192
Lance Calvert, PE	City of El Mirage	lcalvert@cityofelmirage.org	(623) 876-2971

4.0 Data Collection

Information has been obtained from a variety of sources, including (but not limited to) the FCDMC, City of El Mirage, and City of Surprise. The information collected includes recent and on-going drainage studies, existing topographic mapping and aerial photography, as-built plans for existing structures, Federal Emergency Management Agency (FEMA) Flood Hazard Boundary Maps, Letters of Map Revisions and development plans. See Table 2 for a summary of information collected.

The FCDMC has provided HDR with the Camelback Basins CAR (Camelback CAR) Updated Hydrology Models from the Camelback Basins Candidate Assessment Report by Aspen Consulting Engineers dated 4/25/08 (Reference 1). The updated HEC-1 existing conditions with projects in place hydrologic model was developed for the Camelback CAR from the Loop 303/White Tanks ADMPU and will be used as the primary source of hydrology for this study. It is noted that there was a discrepancy at concentration point (CP) 134 in the Camelback CAR HEC-1 model, where a portion of the flow that concentrates at that point is not accounted for after it is diverted to CP147 and CP135. FCDMC advised that the flow to be used for this study at CP134 will be the simple addition of the flow diverted from CP134 to CP147 (57 cfs) and to CP135 (94 cfs) for a flow of 151 cfs at CP 134. See Exhibit 1 in Appendix A for the locations of the concentration points.

Numerous sources of topographic information exist within the project area. Information provided by FCDMC consists of 2-foot contour interval topography for the project area dated February 15, 1990 (vertical datum NGVD29) and aerial photography for the project area dated October-November 2006. Additionally, as part of the Loop 303/White Tanks ADMPU Area Hydrologic Analysis project, aerial photography was performed for the majority of the project



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area using Airborne GPS methods on March 22, 2008. The area was flown at a 1"=200' mapping scale for a 2-foot contour interval mapping accuracy.

Surprise Pointe is a 287 acre development located south of Waddell Road between Litchfield Road and Dysart Road in the City of Surprise, and is considered a key development in the study area. DEI Professional Services completed a Letter of Map Revision (LOMR) for the Surprise Pointe development (Reference 2). As part of the LOMR, the hydrology for the site and the surrounding area was updated through modifying the HEC-1 model from the Loop 303 White Tanks ADMPU. Notable changes to the model include adding retention for recent developments and changing the direction of flow exiting subbasin 153.

The purpose of the Lower El Mirage Wash Design Concept Report (Reference 3) is to document the evaluation of alternative drainage solutions for all weather crossings at Cactus Road and El Mirage Road. The conclusion of this report stated that "The City indicated that in the next phase of work they would like to develop an alternative with an on-line detention basin with a water feature located south of Cactus Road and incorporate a looped roadway through the site connecting Cactus Road with El Mirage Road."

The purpose of the AT&SF Railroad Channel and Basin Candidate Assessment Report (Reference 4) was to develop a preferred regional drainage collector channel alternative for the AT&SF component of the ADMPU that works with the regional flood protection and existing and proposed drainage structures (some of which are included in the Waddell CAR) including the Northern Parkway Channel, Dysart Drain, and the Loop 303 channel. This report was reviewed as part of the alternatives analysis.

The purpose of the West Cactus Detention Basin and Channels Project Candidate Assessment Report by Stanley Consultants, Inc. dated 11/04 (Reference 5) was to develop improvement alternatives.

A field visit of the project area was performed on June 26, 2008. See Exhibit 3 in Appendix A for photos taken of the project area.



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Table 2 – Data Collection Summary

Source	Item
FCDMC	White Tanks/Agua Fria Area Drainage Master Study
	Loop 303/White Tanks ADMP Level III Update Report (ADMPU)
	Hydrology Model(s)
	Technical Data Notebook
	Landscape Aesthetics Assessment and Multi-Use Opportunities Assessment
	Environmental Overview
	Camelback Basins CAR (Camelback CAR) Updated Hydrology Models
	Digital Aerial Maps, Photography and Topography
	Land Ownership Information
	Landscape Inventory Assessment for Study Area
	Landscape Design Themes
	Structure Type Compatibility
	Flood Protection Methods Compatibility
	Regional Recreation Resource Assessment
	Scenery and Recreation Goals, and Objectives for Planning Studies
	DISTRICT Policy for the Aesthetic Treatment and Landscaping of Flood Control Projects (Policy)
	Aesthetic and Multiple-Use Design Guidelines For Flood Control Structures
	Surprise Pointe Master Drainage Report
	Lower El Mirage Design Concept Report
	Waddell/Lower El Mirage CIP Project Proposal
	Example CAR (Loop 303 Drainage Improvements I-10 to the Gila River)
	Flood Control District Project Proposal from City of El Mirage
	Application for CLOMR for the Lower El Mirage Wash Channelization and Tributary
	Reems Road Project - Flood Control District Project Proposal from the City of Surprise
	Flood Control District Project Proposal from City of El Mirage
	Drainage Report for Channelization of Reems Road Floodplain, Greenway Road to Hearn Road
	Request for Letter of Map Revision - Cotton Lane: Glendale Ave. to Northern Ave.
	Reems Road Channel (unbound book)
	Flood Control District - Floodplain Administration
	CLOMR Application Package for Dysart Drain of White Tanks/Agua Fria ADMS (Vol. 1)
	CLOMR Application Package for Dysart Drain of White Tanks/Agua Fria ADMS (Vol. 2)
	Drainage Report for Litchfield Park Detention Facility
	Dysart Road, Cactus Road to Greenway Road - Final Design Concept Report
	Waddell/Lower El Mirage Wash Project Proposal
	Conditional Letter of Map Revision Reems Road Mountain Vista Ranch Development (Vol 1 of 2)
	Conditional Letter of Map Revision Reems Road Mountain Vista Ranch Development (Vol 2 of 2)
	LOMR Application to FEMA (Reems Road Floodplain, Bell Rd. to Beardsley Rd.)
	Conditional Letter of Map Revision Reems Road Mountain Vista Ranch Development (Vol 1 of 2)
	Conditional Letter of Map Revision Reems Road Mountain Vista Ranch Development (Vol 2 of 2)
	West Cactus Basins Candidate Assessment Report
	AT&SF Railroad Channel and Basin Candidate Assessment Report
Surprise	Master Drainage Report for Surprise Pointe
	Waddell/Lower El Mirage Wash Project, Project Proposal
	LOMR for Surprise Pointe
	Surprise Open Space and Recreation Plan



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Source	Item
	Surprise Community Design Plan
	Surprise Alternative Modes Plan
El Mirage	Letter summarizing Lower El Mirage Wash Design Concept Report
	El Mirage Open Space/Recreation Element
	Agua Fria Watercourse Master Plan

5.0 Hydrology

The following sections summarize the hydrology for the Waddell Study Area.

5.1 Existing Conditions

5.1.1 Land Use

The study area for the Waddell CAR is located within the limits of the City of Surprise and the City of El Mirage, Arizona. Land use in the study area has realized rapid change and development. Land use in the recent past was primarily farms, fields, and other agricultural associated uses. Over the last decade, development has occurred at a rapid rate bringing in both residential and commercial development. While some industrial land use is present, it is not present in large amounts.

5.1.2 Drainage

The watershed slopes in a southeasterly direction toward the Agua Fria River. Stormwater runoff tends to spread out and cause shallow flooding. East of Dysart Road, runoff concentrates in Lower El Mirage Wash and Lower El Mirage Wash Tributary and ultimately discharges into the Agua Fria River. The floodplains associated with both of these flooding sources were delineated as part of the ADMS.

Drainage facilities in the study area are mostly those associated with residential and commercial development. The major provisions for drainage include the detention basin south of Cactus Road and west of El Mirage Road that detains flows from the Lower El Mirage Wash, and the Reems Road Channel. A portion of the Reems Road Channel is complete, starting just north of Greenway Road and ending just north of Waddell Road.

Known areas of flooding hazard within the project limits for the City of Surprise include but are not limited to the northeast corner of Bullard Avenue and Greenway Road, conveyance disconnects along the north side of Greenway Road from Bullard Avenue to Litchfield Road, the channel at the intersection of Waddell Road and Litchfield Road, and the intersection of Waddell Road and Dysart Road.

Known areas of flooding hazard within the project limits for the City of El Mirage include but are not limited to the crossing of the Lower El Mirage Wash at Cactus Road (just west of El Mirage Road) and the intersection of Waddell



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Road and Dysart Road. The City of El Mirage staff has visually observed overtopping of Lower El Mirage Wash at Cactus Road during flood events where vehicles were trapped and emergency services had to respond. Cactus Road is identified by MAG as a major arterial and emergency services route. Overtopping of Cactus Road has resulted in major damage and scour downstream as well.

See Exhibit 1 in Appendix A for the Existing Conditions Hydrology with Projects in Place for the Camelback CAR.

5.1.3 Landscape Character

In the Landscape Inventory and Analysis for Maricopa County dated June 26, 2008 was prepared for this project by the Flood Control District of Maricopa County (Reference 6). The predominant Landscape Character and Physical Setting for the study area is Valley Plains with River Channel along the Agua Fria River and two Valley Washes (the upper and lower El Mirage). The predominant Cultural Setting is Suburban, with lesser amounts of Industrial along the AT&SF and pockets of Rural and Urban along the arterial roads. The area is then subdivided into Landscape Character Units that combine the Physical Settings with the Cultural Settings. Sixty-three (63) percent of the study area is Suburban Valley Plains followed by Industrial Valley Plains at eleven (11) percent.

5.1.4 Recreation Resources

There are several plans that overlap the Waddell CAR study area as follows: Surprise Open Space and Recreation Plan, Surprise Community Design Plan, Surprise Alternative Modes Plan, El Mirage Open Space/Recreation Element, and the Agua Fria Watercourse Master Plan. Notable features include the two major multi-use trails proposed by Surprise to connect the White Tanks on the west to the Agua Fria River on the east. One of these trails trends west to east, halfway between Greenway Road and Waddell Road; the other drops down into the study area at Cactus Road and trends west to east, halfway between Cactus and Peoria roads. This second trail known as Sweetwater Trail has subsequently been developed by Surprise along the half-mile alignment between Waddell Road and Cactus Road (as shown in Exhibit 2- Opportunities and Constraints, and Exhibit 13- Regional Recreation Resource Exhibit).

Most of these plans show the Agua Fria River as a major open space and recreation resource with connecting trails along Lower El Mirage Wash and the east end of Waddell Road. The West Cactus Detention Basin is indicated as a park/open space opportunity in the El Mirage Open Space/Recreation Element (as shown in Exhibit 13- Regional Recreation Resource Exhibit).



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5.2 Future Conditions

5.2.1 Land Use

The project area is being developed into residential and commercial and is the predominant land use. Surprise Pointe (proposed retail, commercial, and light industrial development at the southeast corner of Litchfield Road and Waddell Road) is one example of future development that may impact the existing hydrologic conditions.

5.2.2 Drainage

The completion of the Reems Road Channel will capture and convey flows originating west of the project area from its outfall at the Dysart Drain detention basin at Northern Avenue upstream to just south of Bell Road. Also, proposed channelizing down the west side of the Atchison Topeka and Santa Fe (AT&SF) Railroad is currently in design.

6.0 Opportunities and Constraints

The project area is being developed into predominantly residential and commercial land use. Designing regional drainage facilities at the CAR level allows the best opportunity to integrate the existing and future regional drainage facilities associated with the character of the area. It also provides the opportunity to develop drainage facilities that are multi-functional, as was discussed at the stakeholder/community aesthetic and multi-use meeting in July 2008. At this meeting it was determined that the best structural solutions for this area would be semi-soft methods and landscape character themes would be the more developed types (enhanced desert, desert park or desert oasis).

Opportunities

- Use of the Reems Road Channel (a barrier to flows from the west and a possible outfall for flows from small drainage areas to the east)
- Use of the proposed AT&SF Channel
- Use of the land south of the Cactus Road crossing of Lower El Mirage Channel for retention and multi-use
- Possible use of vacant land on the west side of Dysart Road south of Thunderbird/Waddell Road for drainage improvements
- Multiple stakeholders involved with this project
- Expand regional connections by providing additional paths and recreation opportunities

While the project affords some opportunities for design and development, there are some limitations on the type and locations of regional drainage facilities.

Constraints

- Right-of-way is limited by existing development for drainage facilities along Waddell, Dysart and Litchfield Roads.
- The maximum peak flow for the Lower El Mirage Channel into Roberts Resort is limited to 1,000 cfs by a prior agreement between the City of El Mirage and Roberts Resort.



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- The existing channel through Roberts Resort and the associated culvert under El Mirage Road control both the upstream hydraulic grade and the channel thalweg for the Lower El Mirage Wash.
- There are many utilities in the project area that could be affected by the improvements of this project (example, sanitary sewer).

See Exhibit 2 in Appendix A for a map showing the locations of the opportunities and constraints.

7.0 Preliminary Alternatives

Eighteen (18) specific locations within the study area (Table 3) have been identified as areas of flooding hazard through stakeholder meetings with the City of Surprise, City of El Mirage and FCDMC. Several locations that have been addressed in previous studies are being addressed in concurrent studies, or will be addressed in the future through development. Two key areas of flooding hazard within the project limits have been identified; the Waddell Road Area and the West Cactus Detention Basin Area. Four preliminary alternatives have been developed for these two areas of flooding hazard to address the flood potential, including a “no action” alternative.



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Table 3 – Study Area Locations of Flooding Hazards

#	Location of Drainage Issue	City	Current Issues at Location	How it will be addressed
1	Lower El Mirage Wash crossing at Dysart Rd.	El Mirage/ Surprise	-Culverts undersized -Wash overtops road	This report
2	Lower El Mirage Wash crossing at Cactus Rd.	El Mirage	-Culverts extremely undersized -Wash overtops road	This report
3	Lower El Mirage Wash crossing at El Mirage Rd.	El Mirage	-Water backs up on west side of El Mirage Road -Culverts undersized beneath El Mirage	This report
4	SW corner of El Mirage Rd. and Cactus Rd.	El Mirage	- Flow into Robert's Resort must be <1000 cfs per FCDMC - Extended stagnant water times resulting in potential vector control health risks	This report
5	Lower El Mirage Wash through Robert's Resort	El Mirage	Flooding of homes built in floodway	Not to be addressed in this report
6	AT& SF Channel, Waddell Rd. to Cactus Rd.	Surprise	-Floodplain due to railroad -High flows east of railroad cause flooding	See AT&SF Channel CAR for alternatives to relieve flooding issues
7	AT & SF Channel, Cactus Rd. to Peoria Ave.	Surprise	-Floodplain due to railroad -High flows east of railroad cause flooding	See AT&SF Channel CAR for alternatives to relieve flooding issues
8	AT & SF Channel, Cactus Rd. to Peoria Ave.	Surprise	-Floodplain due to railroad -High flows east of railroad cause flooding	See AT&SF Channel CAR for alternatives to relieve flooding issues
9	Waddell Rd. from Bullard Ave. to Litchfield Rd.	Surprise	Flooding along road, no channel to convey flow	109-193 cfs conveyed in road, not a regional issue, local agency can address with a possible channel
10	Waddell Rd. from Litchfield to Dysart Rd.	Surprise	-Existing Channel from Litchfield to 1/2 mile east of Litchfield -Channel stops and flow enters roadway, causing significant flooding	This report
11	Intersection of Dysart Rd. and Waddell Rd.	Surprise/ El Mirage	Flooding at intersection	This report
12	Intersection of Litchfield Rd and Waddell Rd	Surprise	Flooding at intersection	This report
13	Greenway Rd. between Bullard Ave. and Litchfield Rd.	Surprise	Flooding for 1/2 mile from Litchfield to Surprise Center Blvd.	Being addressed in other study
14	Greenway Rd. between Litchfield Rd. and Dysart Rd.	Surprise	Existing channel on north side of Greenway	Being addressed in other study
15	Intersection of Dysart Rd. and Greenway Rd.	El Mirage	Flooding at intersection Culverts undersized for flow	Being addressed in other study
16	Dysart Rd. south of Greenway Rd.	Surprise/ El Mirage	-Existing channel west of Dysart -Channel is undersized	Being addressed in other study
17	Peoria Ave. from Litchfield to RR	Surprise	Flooding along road	8 cfs is being conveyed in road, not a regional issue, possibly add a storm drain or channel
18	Peoria Ave. at Dysart Rd.	Surprise	Flooding at intersection	Not to be addressed in this report



7.1 Waddell Road Area Preliminary Alternatives

The Waddell Road Area extends from Litchfield Road to Dysart Road along Waddell Road, and from Waddell Road to the beginning of Lower El Mirage Wash along Dysart Road. There are several flooding issues in this area. There is flooding at the intersection of Waddell Road at Litchfield Road due to insufficient capacity of the culverts. There is flooding along Waddell Road from Litchfield Road to Dysart Road due to a channel that stops approximately at 137th Avenue. There is flooding at the intersection of Waddell Road and Dysart Road, due to the lack of culverts and significant flow at this location. There is flooding at Dysart Road at the Lower El Mirage Wash crossing, due to insufficient capacity of the culverts.

7.1.1 Alternative #1: Add Channels and Culverts

Alternative #1 includes installing culverts under Waddell Road at Litchfield Road to the south and southeast to pass 143 cfs in each direction under the intersection to alleviate flooding. There are two existing 6'x3' box culverts under Litchfield Road that will pass 144 cfs to the east. This alternative will maintain the existing three-way split flow pattern at the intersection of Waddell Road and Litchfield Road. This alternative utilizes the Surprise Pointe channel along the east side of Litchfield, that has a capacity of 348 cfs, to convey the 143 cfs south and east along the Sweetwater Road alignment, ultimately reaching the AT&SF Channel. The peak flow that outfalls into the AT&SF Channel will be reduced from the existing condition of 101 cfs to 78 cfs.

This alternative includes extending the channel along the north side of Waddell Road from 137th Avenue to Dysart Road to accommodate 257 cfs. The existing channel ends at 137th Avenue causing the water to pond up and enter the roadway in existing conditions. Five 36" culverts will be installed under Waddell Road and Dysart Road to the south, to alleviate flooding at the intersection. In existing conditions, 203 cfs collects at this intersection and floods across the intersection, as there are no culverts to pass the flow. A channel will be installed along the west side of Dysart Road from Waddell Road to the start of Surprise Pointe's existing channel to accommodate 209 cfs. This channel will eliminate flooding along Dysart Road. Four additional 36" pipes will be installed at the Lower El Mirage Wash crossing at Dysart Road to pass the 262 cfs at that location. The Lower El Mirage Wash has a capacity of 1,768 cfs at this location, so there is sufficient capacity to accommodate the increased flow rate.

See Exhibit 4 in Appendix A for an illustration of the Waddell Road Area Alternative #1.

Benefits:

This alternative will facilitate completing the regional drainage outfall for this area. This alternative will alleviate roadway flooding issues in the following



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locations: Waddell Road and Litchfield Road, along Waddell Road from 137th Avenue to Dysart Road, Waddell Road and Dysart Road, and Dysart Road at the Lower El Mirage Wash crossing. This alternative will also benefit the AT&SF Channel, as the flows are reduced entering the channel.

Constraints:

Sufficient public right-of-way is not available to construct the channels. Easements or acquisition will be required.

Opinion of Probable Cost:

\$2,367,174

(See Appendix D for a detailed cost estimate)

Utility Conflicts:

- The culvert crossings at Waddell Road and Litchfield Road include the following: 4" gas line, fiber optic line, Qwest line and a 16" sewer line.
- The culvert crossing at Waddell Road and Dysart Road includes the following utility conflicts: 16" water line, 12" sewer line and a 4" gas line. A jack and bore operation under the existing BNSF railroad is also required at this location, which will complicate utility clearances.
- The culvert crossing at 133rd Avenue includes a 4" gas line relocation. The culvert crossing at Dysart Road and Lower El Mirage Wash includes a 16" water line and a 4" gas line relocation.

7.1.2 Alternative #2: Add Channels, Culverts and Detention Basin

Alternative #2 includes installing culverts under Waddell Road at Litchfield Road to the south and southeast to pass 143 cfs and 287 cfs respectively, under the intersection to alleviate flooding. There are two existing 6'x3' box culverts under Litchfield Road that will be abandoned and no flow will travel east. This alternative will modify the existing three-way split flow pattern at the intersection of Waddell Road and Litchfield Road to a two-way split going south and southeast. This alternative utilizes the Surprise Pointe channel along the east side of Litchfield, that has a capacity of 348 cfs, to convey the 287 cfs south and east along the Sweetwater Road alignment, ultimately reaching the AT&SF Channel. Due to the increased flow at this location from the existing conditions of 101 cfs to 170 cfs, a 43 acre-foot (ac-ft) capacity detention basin is needed to reduce the flow to 103 cfs before the outfall to the AT&SF Channel.

This alternative includes extending the channel along the north side of Waddell Road from 137th Avenue to Dysart Road to accommodate 154 cfs. The existing channel ends at 137th Avenue causing the water to pond up and enter the roadway in existing conditions. Three 36" culverts will be installed under Waddell Road and Dysart Road to the south, to alleviate flooding at the intersection. In existing



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conditions, 203 cfs collects at this intersection and floods across the intersection, as there are no culverts to pass the flow. A channel will be installed along the west side of Dysart Road from Waddell Road to the start of Surprise Pointe's existing channel to accommodate 125 cfs. This channel will eliminate flooding along Dysart Road. One additional 36" pipe will be installed at the Lower El Mirage Wash crossing at Dysart Road to pass the 173 cfs at that location. The Lower El Mirage Wash has a capacity of 1,768 cfs at this location, so there is sufficient capacity to accommodate the increased flow rate.

See Exhibit 5 in Appendix A for an illustration of the Waddell Road Area Alternative #2.

Benefits:

This alternative will facilitate completing the regional drainage outfall for this area. This alternative will alleviate roadway flooding issues in the following locations: Waddell Road and Litchfield Road, along Waddell Road from 137th Avenue to Dysart Road, Waddell Road and Dysart Road, and Dysart Road at the Lower El Mirage Wash crossing. It will also provide for multi-use, park, and trail connection potential.

Constraints:

Sufficient right-of-way is not available to construct the channels. Easements or acquisition will be required. The land needed for the retention basin is privately owned and would need to be acquired.

Opinion of Probable Cost:

\$5,334,884

(See Appendix D for a detailed cost estimate)

Utility Conflicts:

- The culvert crossing at Waddell Road and Dysart Road includes the following utility conflicts: 16" water line, 12" sewer line and a 4" gas line.
- The culvert crossing at 133rd Avenue includes a 4" gas line relocation. The culvert crossing at Dysart Road and Lower El Mirage Wash includes a 16" water line and a 4" gas line relocation.
- The culvert crossings at Waddell Road and Litchfield Road include the following: 4" gas line, fiber optic line, Qwest line and a 16" sewer line.

7.1.3 Alternative #3: Extend AT&SF Channel North

Alternative #3 includes installing culverts under Waddell Road at Litchfield Road to the south and southeast to pass 143 cfs in each direction under the intersection to alleviate flooding. There are two existing 6'x3' box culverts under Litchfield Road that will pass 144 cfs to the east. This alternative will maintain the existing three-way split flow pattern at the intersection of Waddell



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Road and Litchfield Road. This alternative utilizes the Surprise Pointe channel along the east side of Litchfield, that has a capacity of 348 cfs, to convey the 143 cfs south and east along the Sweetwater Road alignment, ultimately reaching the AT&SF Channel. This alternative includes installing one 8'x4' box culvert under Waddell Road at the AT&SF Channel alignment and extending the AT&SF Channel north to Waddell Road with a capacity of 257 cfs. This alternative eliminates the need for a channel along the north side of Waddell Road, culverts at the Waddell Road and Dysart Road intersection and a channel along the west side of Dysart Road. Due to the increased flow at the AT&SF Channel and Sweetwater alignment location from the existing conditions of 101 cfs to 210 cfs, a 129 acre-foot (ac-ft) capacity detention basin is needed to reduce the flow to 109 cfs before the outfall to the AT&SF Channel.

One additional 36" pipe will be installed at the Lower El Mirage Wash crossing at Dysart Road to pass the 173 cfs at that location. The Lower El Mirage Wash has a capacity of 1,768 cfs at this location, so there is sufficient capacity to accommodate the increased flow rate.

See Exhibit 6 in Appendix A for an illustration of the Waddell Road Area Alternative #3.

Benefits:

This alternative will facilitate completing the regional drainage outfall for this area. This alternative will alleviate roadway flooding issues in the following locations: Waddell Road and Litchfield Road, along Waddell Road from 137th Avenue to Dysart Road, Waddell Road and Dysart Road, and Dysart Road at the Lower El Mirage Wash crossing. It will also provide for a multi-use, park, and trail connection potential.

Constraints:

Sufficient right-of-way is not available to construct the channel which would need to traverse a planned industrial park. Easements or acquisition will be required. The land needed for the retention basin is privately owned and would need to be acquired.

Opinion of Probable Cost:

\$8,500,488

(See Appendix D for a detailed cost estimate)

Utility Conflicts:

- The culvert crossing at Waddell Road and Litchfield Road includes the following utility conflicts: 4" gas line, fiber optic line, Qwest line and a 16" sewer line.



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- The culvert crossing at Waddell Road at the AT&SF Channel alignment includes the following utility conflicts: 16" water line, 4" gas line, Qwest line and a fiber optic line.

7.1.4 Alternative #4: No action

Alternative #4 is the no-action alternative.

Benefits:

No benefits are realized with the no-action alternative. Flooding would continue.

Constraints:

None.

Opinion of Probable Cost:

\$0

Utility Conflicts:

None.

7.2 West Cactus Detention Basin Preliminary Alternatives

The West Cactus Detention Basin Area is located on the southwest corner of Cactus Road and El Mirage Road. There is flooding along Cactus Road at the El Mirage Wash crossing due to insufficient capacity of the existing culverts and sediment and organic material deposition in the culverts. Survey information obtained from the West Cactus Detention Basin and Channels Project Survey Report by Stanley Consultants dated October 2004 (Reference 7), demonstrates that the existing three 24-inch pipes under Cactus Road have an outlet invert that is three feet lower than the existing 2-10'x3' box culvert inlet under El Mirage Road. This results in ponding water in the southwest corner of Cactus Road and El Mirage Road and doesn't allow for positive drainage conveyance, in the existing condition. All three alternatives include raising and replacing the culverts under Cactus Road in order to establish a positive drainage conveyance, which results in approximately 3 feet of ponding in Lower El Mirage Wash just upstream of Cactus Road.

There is also flooding along El Mirage Road at the El Mirage Wash crossing due to insufficient capacity of the existing culverts. Each of the alternatives could be enhanced by building a pedestrian/bicycle underpass under Cactus Road using an arch culvert that would also carry drainage flows. The proposed basins could be developed into detention basin parks with a desert park theme.

7.2.1 Alternative #1: Channel

Alternative #1 includes replacing the existing culverts under Cactus Road with a 20 foot by 10 foot arch culvert, which will reduce the flow under Cactus Road



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from 1,234 cfs to 884 cfs. This will require raising a portion of Cactus Road approximately 6 feet and raising the culvert invert 3 feet higher than the wash invert. A channel will be installed to convey the 884 cfs flow from Cactus Road to El Mirage Road, attenuating the flow to 880 cfs. The existing culverts under El Mirage Road cannot handle 880 cfs without overtopping the road, so two additional 10'x3' box culverts at this location are needed.

See Exhibit 8 in Appendix A for an illustration of the West Cactus Detention Basin Alternative #1.

Benefits:

This alternative will facilitate completing the regional drainage outfall for this area. This alternative will alleviate roadway flooding issues in the following locations: Cactus Road at Lower El Mirage Wash and El Mirage Road at Lower El Mirage Wash. It will also provide for multi-use and park potential. Additionally, this alternative reduces the flows to the Roberts Resort property downstream.

Constraints:

None.

Opinion of Probable Cost:

\$4,985,896

(See Appendix D for a detailed cost estimate)

Utility Conflicts:

- The culvert crossing at El Mirage Road includes the following utility conflicts: Cox fiber optic line and a Cox duct structure.

7.2.2 Alternative #2: Large Detention Basin

Alternative #2 includes replacing the existing culverts under Cactus Road with three 8'x6' box culverts, which will reduce the flow under Cactus Road from 1,230 cfs to 1,005 cfs. This will require raising a portion of Cactus Road approximately 2 feet and raising the culvert invert 3 feet higher than the wash invert. A 30.6 acre-foot (ac-ft) detention basin will be installed to attenuate the flow from 1,005 cfs to 588 cfs from Cactus Road to El Mirage Road. The existing culverts under El Mirage Road cannot handle 588 cfs without overtopping the road, so one additional 10'x3' box culvert at this location is needed.

Benefits:

This alternative will facilitate completing the regional drainage outfall for this area. This alternative will alleviate roadway flooding issues in the following locations: Cactus Road at Lower El Mirage Wash and El Mirage Road at Lower



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El Mirage Wash. It will also provide for multi-use, an active turf play area and park potential. Additionally, this alternative reduces the flows to the Roberts Resort property downstream.

See Exhibit 9 in Appendix A for an illustration of the West Cactus Detention Basin Alternative #2.

Constraints:
None.

Opinion of Probable Cost:
\$2,300,576

(See Appendix D for a detailed cost estimate)

Utility Conflicts:

- The culvert crossing at El Mirage Road includes the following utility conflicts: Cox fiber optic line and a Cox duct structure.

7.2.3 Alternative #3: Linear Detention Basin

Alternative #3 includes replacing the existing culverts under Cactus Road with three 10'x6' box culverts, which will reduce the flow under Cactus Road from 1,198 cfs to 982 cfs. This will require raising a portion of Cactus Road approximately 2 feet and raising the culvert invert 3 feet higher than the wash invert. A 15.6 acre-foot (ac-ft) detention basin will be installed to attenuate the flow from 982 cfs to 838 cfs from Cactus Road to El Mirage Road. The existing culverts under El Mirage Road cannot handle 838 cfs without overtopping the road, so three additional 10'x3' box culverts at this location are needed.

Benefits:

This alternative will facilitate completing the regional drainage outfall for this area. This alternative will alleviate roadway flooding issues in the following locations: Cactus Road at Lower El Mirage Wash and El Mirage Road at Lower El Mirage Wash. It will also provide for multi-use and park potential. Additionally, this alternative reduces the flows to the Roberts Resort property downstream.

See Exhibit 10 in Appendix A for an illustration of the West Cactus Detention Basin Alternative #3.

Constraints:
None.

Opinion of Probable Cost:
\$2,602,088



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(See Appendix D for a detailed cost estimate)

Utility Conflicts:

- The culvert crossing at El Mirage Road includes the following utility conflicts: Cox fiber optic line and a Cox duct structure.

7.2.4 Alternative #4: No Action

Alternative #4 is the no-action alternative.

Benefits:

No benefits are realized with the no-action alternative. Flooding would continue.

Constraints:

None.

Opinion of Probable Cost:

\$0

Utility Conflicts:

None.



8.0 Alternatives Analysis

The alternatives were rated using a three level method of ranking. This method uses colored symbols to represent relative performance. The following is a key to the ratings used.

Safety

-  Improves Safety
-  Neutral/Not Applicable/No Impact
-  Worsens Safety

Downstream Improvements

-  Improves issue
-  Neutral/Not Applicable/No Impact
-  No Improvement

Relative Costs

-  Relatively inexpensive
-  Neutral/Not Applicable/No Impact
-  Expensive

Stakeholder Acceptance

-  Preferred
-  Neutral/Not Applicable/No Impact
-  Not Acceptable

Public Acceptance

-  Public will like it
-  Neutral/Not Applicable/No Impact
-  Not Acceptable

Land Acquisition

-  Not necessary, already public or easement required
-  Neutral/Not Applicable/No Impact
-  May need to pursue, purchase or condemnation

Multi-Use Capabilities

-  Opportunity for multi-use
-  Neutral/Not Applicable/No Impact
-  Prohibits Multi-Use



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Table 4 below shows a summary of the alternative evaluation for all the alternatives. This evaluation was used in the recommended alternative selection process.

Table 4 – Alternatives Evaluation Summary

	Safety	Land Acquisition	Degree of Downstream Improvement	Cost	Multi-Use Capabilities	Public Acceptance	Stakeholder Acceptance
WADDELL ROAD AREA							
Alternative #1 (Add channels and culverts)	●	●	●	●	○	●	
Alternative #2 (Add channels, culverts and detention basin)	●	●	●	●	●	●	
Alternative #3 (Extend AT&SF Channel north)	●	●	●	●	●	●	
Alternative #4 (No Action)	●	●	●	●	●	●	
WEST CACTUS DETENTION BASIN AREA							
Alternative #1 (Channel)	●	●	●	●	●	●	
Alternative #2 (Large Detention Basin)	●	●	●	●	●	●	
Alternative #3 (linear Detention Basin)	●	●	●	●	●	●	
Alternative #4 (No Action)	●	●	●	○	○	●	

9.0 Recommended Plan

As a result of the alternatives evaluation, stakeholder and FCDMC input, and consensus from all parties, a recommended plan was developed by FCDMC, the City of Surprise and the City of El Mirage. The recommended plan contains elements from several proposed alternatives.

Waddell Road Area

The recommended plan for the Waddell Road Area includes installing a 6'x3' box culvert under Waddell Road just to the west of Litchfield Road, to pass 144 cfs under the road without overtopping. This culvert will ultimately connect to a future channel along the west side of Litchfield Road, to be addressed by others. 287 cfs will pass in the existing two 6'x3' box culverts under Litchfield Road just north of Waddell Road. A 6'x3' box culvert will be installed under Waddell Road just to the east of Litchfield Road to pass 143 cfs and alleviate flooding across the intersection. This culvert will outlet into the existing Surprise Pointe channel that transports stormwater south along the east side of Litchfield Road and then along the north side of the Sweetwater Road alignment. Ultimately this flow will outlet into the AT&SF Channel. The described culvert configuration will alleviate flooding at the Waddell Road and Litchfield intersection. This design will require the 287 cfs flow to be split 50/50 just east of Litchfield Road to the east and south, which will be addressed in final design.



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The existing channel on the north side of Waddell Road will be extended to Dysart Road in the existing private retention basin area. A berm will be placed in the existing retention area to separate the off-site flow and on-site flow from the adjacent residential property. The channel will have 3:1 side slopes, be 4 feet deep and require approximately 35 feet of right of way by the City of Surprise. A variance will be required by the City of Surprise to allow a 3:1 side slope along the existing sidewalk on Waddell Road and to allow the adjacent residential property to retain less than the designed retention volume. A weir will be placed to allow for connectivity between the two existing retention basins approximately 2,600 feet east of Litchfield Road. A 10'x4' box culvert will be placed under 133rd Avenue to allow for 257 cfs and to connect the proposed channel along Waddell Road. The landscape design theme along this channel will be Desert Park to complement the landscape in the adjacent retention basin. The retention basin will have a turf bottom and native and desert adapted plants.

Two 6'x3' box culverts will be placed across Waddell Road approximately 200 feet west of Dysart Road to pass 209 cfs, which will alleviate flooding at the Waddell Road and Dysart Road intersection. The City of Surprise requested that these culverts be placed approximately 200 feet west of the intersection to provide an accessible jack and bore location under the AT&SF Railroad. These proposed culverts will outlet to a proposed channel along the west side of Dysart Road that will end at the start of Surprise Pointe's existing channel. The channel will have 6:1 side slopes adjacent to the sidewalk, 4:1 side slopes on the western side, be 3 feet deep and require approximately 40 feet of right of way by the City of Surprise. The landscape design theme along this channel would be Semi-natural Sonoran Desert to complement the landscape that is along the east side of Dysart Road. The existing landscape on the east side includes native and desert adapted plants.

Four additional 36-inch pipes are proposed at the start of the Lower El Mirage Wash at Dysart Road to pass 262 cfs to alleviate overtopping. Lower El Mirage Wash has a capacity of 1,768 cfs at this location.

The recommended plan will have following utility conflicts:

- The culvert crossing at the intersection of Waddell Road and Dysart Road: 16" water line, 12" sewer line and a 4" gas line.
- The culvert crossing at 133rd Avenue near Waddell Road includes a 4" gas line relocation.
- The culvert crossing at Dysart Road and Lower El Mirage Wash includes a 16" water line and a 4" gas line relocation.
- The culvert crossings at the intersection of Waddell Road and Litchfield Road includes a Qwest communications line.

Note: There is an existing culvert that begins at the northwest corner of Waddell and Dysart and ends at the southeast corner. The culvert is partially collapsed and the end is buried. This culvert will be abandoned in the future by the City of El Mirage.

See Exhibit 7 in Appendix A for an illustration of the Waddell Road Area Recommended Plan.



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West Cactus Detention Basin

The recommended plan includes replacing the three existing, plugged 24" pipes under Cactus Road with a 20'x10' arch culvert. The culverts downstream at El Mirage Road are approximately three feet higher than the existing culverts under Cactus Road. Therefore, the invert of the arch culvert will be set approximately 3 feet higher than the existing wash in order to achieve positive drainage through the West Cactus Basin Area. This will create a detention basin upstream of Cactus Road in Lower El Mirage Wash, which will require evacuation methods.

The flow upstream of Cactus Road is 1,234 cfs and is attenuated to 885 cfs as a result of the raised arch culvert invert elevation. The installation of the arch culvert will require a portion of Cactus Road to be raised approximately six feet. A 67.5 acre-foot (ac-ft), 10-foot deep detention basin will be excavated in the southwest area of Cactus Road and El Mirage Road. The detention basin will attenuate the flow from 885 cfs to 794 cfs exiting El Mirage Road and entering Roberts Resort. One additional 10'x3' box culvert is required at the Lower El Mirage Wash and El Mirage Road crossing to pass 794 cfs without overtopping the road. The detention basin will need adequate freeboard according to FCDMC's requirements around the perimeter. It is assumed that El Mirage Road will be raised at least 6 inches in elevation associated with the anticipated MCDOT improvements. Due to the unknown grades on the east side of El Mirage Road, the culverts were designed with a tailwater elevation of half the culvert height.

The landscape design theme proposed for this basin is Desert Park. The bottom of the basin would include turf and be designed large enough to accommodate a small soccer field. The low-flow channel will be a meandering channel with varied width. Decomposed granite multi-use paths would offer park users a variety of routes. One path will connect under Cactus Road into Lower El Mirage Wash to a planned path that will provide additional connectivity to Dysart Road. A second path (14 feet in width), will have a dual purpose of a maintenance road and as a path. A ramada with benches will provide a rest spot along both paths.

The recommended plan will have following utility conflicts:

- The culvert crossing at Lower El Mirage Wash and Cactus Road includes a 12" water line relocation.
- The culvert crossing at Lower El Mirage Wash and El Mirage Road includes: Cox fiber optic line, Cox duct structure, water line, and a 21" sanitary sewer line.

Aesthetic Guidelines

- Basin depth shall not exceed 10 feet.
- Side slopes shall be variable, averaging 6:1. Top and toe of slope should meander, counter to each other, not parallel.
- The low-flow channel shall meander and shall vary in width.
- The landscape palette shall be Semi-natural Sonoran Desert Landscape Design Theme with an appropriate n-value to accommodate mature vegetation within the cross section.
- The basin and channel would occur in a suburban setting so there is likely an expectation for an "instant" landscape. Therefore, containerized plants and an irrigation system would be appropriate rather than seeding.



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- Color and textural aesthetic treatments should be incorporated into visible structural components such as headwalls and path paving.
- The facility setback should be 30 percent of the total top width plus the operations and maintenance road width of 14 feet, but no less than a total of 50 feet (25 feet on each side).
- Overbank treatments should include berming, meandering access route, and landscape planting.

See Exhibit 11 in Appendix A for an illustration of the West Cactus Detention Basin Recommended Plan.

The Camelback CAR model was modified for the recommended plan and is located in Appendix B. Supplemental calculations to determine culvert and channel sizes are also located in Appendix B.

See Exhibit 12 in Appendix A showing the revised hydrology, Appendix C for conceptual plans, Appendix D for cost estimates and Appendix E for utility information.

10.0 Environmental Permits

The environmental permitting that may be required during the design of the Waddell Road and West Cactus Detention Basin areas is indicated in Table 5 below. In particular, the recommended plan will likely require a US Army Corps of Engineers permit in compliance with Section 404 of the Clean Water Act (CWA). This permit would require jurisdictional delineation of Waters of the United States. In addition, cultural resources and biological assessments would need to be conducted. The amount of disturbance within the limits of the identified jurisdictional waters will need to be calculated. An individual CWA 404 permit may be necessary, but it is possible that the flood control improvements could be constructed under a CWA 404 Nationwide Permit. If an individual CWA 404 permit is required by the US Army Corps of Engineers, a CWA Section 401 certification will need to be obtained through the Arizona Department of Environmental Quality (ADEQ).



Table 5 – Potential Environmental Constraints/Permits

Potential Environmental Constraints/Permits	Notes
Clean Water Act Section 404 Permit	For work in Lower El Mirage Wash and/or Lower El Mirage Wash Tributary
Section 401 Water Quality Certification	For work in Lower El Mirage Wash and/or Lower El Mirage Wash Tributary
Arizona Pollutant Discharge Elimination System Permit (AZPDES)	For work in Lower El Mirage Wash and/or Lower El Mirage Wash Tributary, and any proposed channelization
Biological Resources Review	For work in Lower El Mirage Wash and/or Lower El Mirage Wash Tributary
Cultural Resources - Class I overview	For any proposed work on undeveloped areas
Hazardous Materials Site Assessment	For any proposed work on undeveloped areas

* Source: Loop 303/White Tanks ADMPU

11.0 Utility Information

Utility information was gathered from the following sources: Arizona American Water, Southwest Gas, Cox Communications, Arizona Public Service (APS), Qwest, Maricopa Water District, City of Surprise, City of El Mirage and other engineering consultants' reports. There are utility conflicts in almost every proposed improvement location, and include the following utilities: water line, sanitary sewer line, fiber optic line, cable line, telephone line, gas line, electric line. See Appendix E for a list of all the utility conflicts identified.

12.0 Future Design Considerations

Waddell Road Channel

The recommended plan will require a variance from the City of Surprise to allow for a channel with 3:1 side slopes adjacent to a sidewalk (north side of Waddell), and for reducing the existing retention volume in the private retention basin areas where the new channel will encroach.

Other design considerations include:

- Construction of new culverts at Waddell Road and Litchfield Road while maintaining traffic will be a difficult challenge.
- Jack and bore operations under the active BNSF railroad will require multiple permits, approvals and clearances.
- The type, number and size of culvert barrels under Waddell Road near Dysart Road should be evaluated carefully during final design. Selection of the ultimate culvert



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configuration should consider impacts to traffic and utilities, in addition to hydraulic design requirements.

West Cactus Detention Basin Existing Culverts

Survey information obtained from the "West Cactus Detention Basin and Channels Project Survey Report" (by Stanley Consultants dated November 2004 (Reference 7)) demonstrates that the existing three 24-inch pipes under Cactus Road have an outlet invert that is three feet lower than the existing 2-10'x3' box culvert inlet under El Mirage Road. This results in ponding water in the southwest corner of Cactus Road and El Mirage Road, and does not allow for positive drainage conveyance. The recommended plan includes raising and replacing the culverts under Cactus Road in order to accommodate positive drainage conveyance, which will result in approximately 3 feet of ponding in Lower El Mirage Wash just upstream of Cactus Road. The 3 feet of ponding will be stored just upstream of Cactus Road after the storm has passed and will require evacuation methods. The ponding attenuates the flow passing under Cactus Road (through an arch culvert), resulting in a maximum achievable flow rate entering the West Cactus Detention Basin area of 885 cfs. If other options are considered in future design, such as using box culverts instead of the arch culvert, a higher flow rate may be achievable across Cactus Road. Evacuation methods for the upstream portion of the wash above Cactus Road will need to be addressed in final design.

The FCDMC reserves the right to cost-share flood control improvements that allow a maximum flow rate exiting El Mirage Road to be 885 cfs in the future.

West Cactus Detention Basin Right of Way

The West Cactus Detention Basin and Channels Project CAR dated October 2004 by Stanley Consultants (Reference 5) listed right of way acquisition costs as nearly half of the cost of any improvements to the West Cactus Detention Basin with overall project costs that exceed those listed in this report. Since the 2004 study, the City of El Mirage has acquired all the necessary right of way required for the proposed improvements. In future design, consideration should be given for the right of way acquisition effort for future cost share projects.

Lower El Mirage Wash Erosion

During final design, erosion issues in the wash will also need to be addressed. The existing culverts under Cactus Road are full of sediment from the upstream wash. Lining the wash with turf, decomposed granite or other methods should be considered to alleviate erosion and reduce sediment deposition in culverts or areas of the wash. El Mirage has expressed an interest in a multiuse trail and associated landscaping in the Lower El Mirage Wash (Dysart to Cactus Basin section). The cost for this improvement could range between \$150,000 and \$300,000.

Future Commercial Access Road at West Cactus Detention Basin

The City of El Mirage requested commercial road access from El Mirage Road west to the vacant parcel located just west of the West Cactus Detention Basin. At the time of this report, no plans have been developed for the vacant parcel. To accommodate the City of El Mirage's request and the design aspects of this report, the future road alignment is proposed to be located adjacent to Canterbury Drive on the south side of the West Cactus Basin. This alignment will avoid the need for bridge crossings over the detention basin. Future design consideration of the



Waddell Road CAR

Flood Control District of Maricopa County, Arizona

West Cactus Detention Basin will need to accommodate the future commercial access road from El Mirage Road.

Vacant Parcel Adjacent to West Cactus Detention Basin

There are two existing storm drains from adjacent subdivisions that outlet in the vacant parcel adjacent to the West Cactus Detention Basin Area. These storm drains end with a bubble-up structure that allows the flow to pond up in the structure and spill out into the previously excavated area. During final design, these storm drains will need to be addressed.

Topographic Information Available

As part of the Loop 303/White Tanks Area Drainage Master Plan Update Area Hydrologic Analysis (ADMPU AHA) project (FCDMC Contract No. 2007C031), aerial photography was performed for this project area on March 22, 2008 using Airborne GPS methods. The area was flown at a 1"=200' mapping scale for a 2-foot contour interval mapping accuracy. Although the flight performed covered an area which this project is encompassed, it was not the intent of the Loop 303/White Tanks ADMPU AHA to map the entire area flown. Distinct areas were determined during the initial phases of this project for mapping, and did not include the Waddell study area. FCDMC may consider mapping the entire area for the Waddell CAR project and using it for future design.

Loop 303/White Tanks ADMPU AHA Study

At the time of this report, another study (Loop 303/White Tanks ADMPU AHA) was underway in the project area by FCDMC and HDR Engineering that updates the prior ADMPU completed by URS Corporation in June 2004. The purpose of the Loop 303/White Tanks ADMPU AHA is to develop a new hydrologic analysis to account for the development that has occurred in the area since the completion of the original update, include additional areas not covered in the previous work, and use updated mapping. This analysis also utilizes National Oceanic and Atmospheric Administration (NOAA) 14 point rainfall depths and re-analyzes split flow locations.

The Loop 303/White Tanks ADMPU AHA study will change the flows determined in this report that are from the Camelback CAR model dated 4/25/08. It should be noted that the FCDMC directed HDR to use the Camelback CAR model for the Waddell CAR effort. During the future design process, the new hydrology model should be used. The Loop 303/White Tanks ADMPU AHA study is expected to be complete in 2009.

Roberts Resort

The City of El Mirage stated that Roberts Resort contracted with an engineer to design and improve the channel through the development to allow conveyance of 1,000 cfs. The recommended plan accommodates the maximum flow limit of 1,000 cfs. The FCDMC directed HDR to limit the recommended downstream flood control improvements to accommodate a maximum flow limit of 1,000 cfs at the point of discharge from the West Cactus Basin at El Mirage Road. This information was incorporated into the development of the recommended plan and this report. Any improvements by others to the El Mirage Road culverts or the outfall channel through Roberts Resort may significantly impact the design basis of this project and



Waddell Road CAR
Flood Control District of Maricopa County, Arizona

coordination will be critical between FCDMC, MCDOT, the City of El Mirage and Roberts Resort.

El Mirage Road Widening

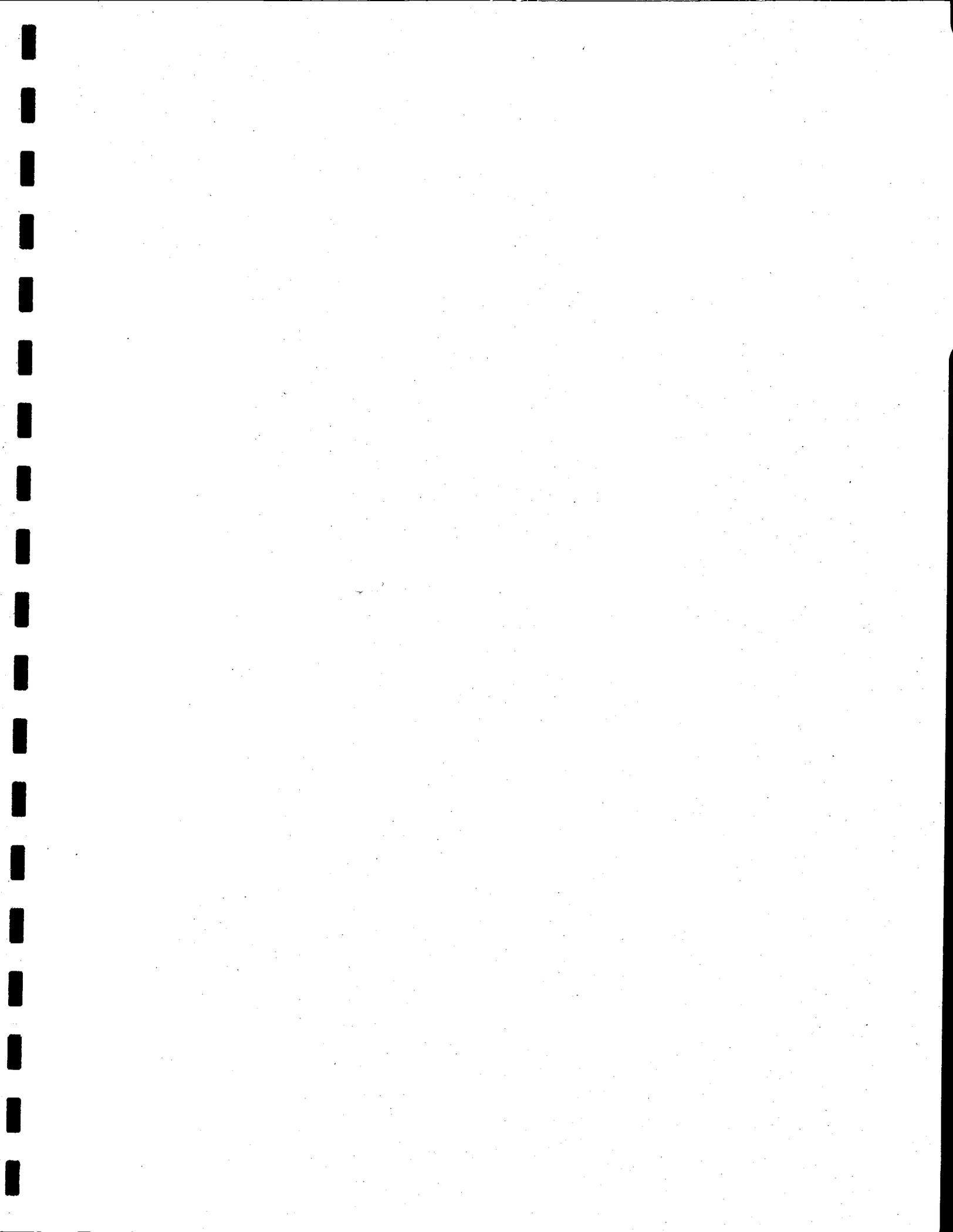
The Maricopa County Department of Transportation (MCDOT) is planning to widen El Mirage Road into a five-lane roadway from Northern Avenue to Bell Road. These improvements are in the area of the West Cactus Basin, and will need to be incorporated into the final design process of this project.

FEMA Floodplain

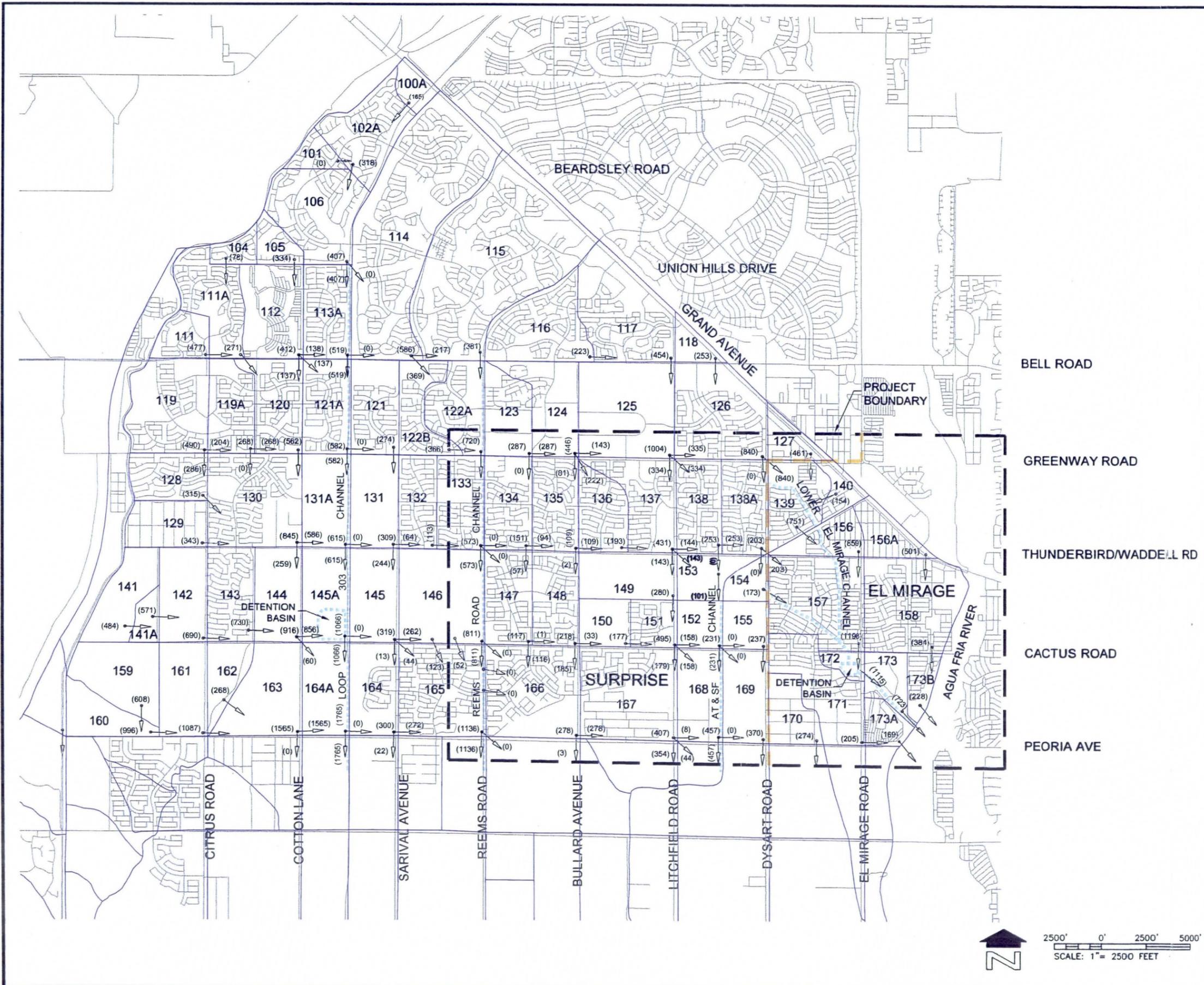
The FCDMC will investigate changes in flow in the floodplain, and will address any revisions that may be needed during final design.

13.0 References

1. Camelback Basins Candidate Assessment Report HEC-1 Model by Aspen Consulting Engineers dated 4/25/08.
2. FEMA Letter of Map Revision (LOMR) Application for Surprise Pointe by DEI Professional Services, LLC dated 6/26/08.
3. Lower El Mirage Wash Design Concept Report by Wood/Patel dated 3/17/08.
4. AT&SF Railroad Channel and Basin Candidate Assessment Report Alternatives Evaluation Report by Hoskin Ryan Consultants, Inc. dated 11/12/08.
5. West Cactus Detention Basin and Channels Project Candidate Assessment Report by Stanley Consultants, Inc. dated 11/04.
6. Landscape Inventory and Analysis for Maricopa County dated June 26, 2008 by the Flood Control District of Maricopa County
7. West Cactus Detention Basin and Channels Project Survey Report by Stanley Consultants, Inc. dated 11/04.



APPENDIX A
Project Exhibits



LEGEND

HYDROLOGIC SUBBASIN BOUNDARY ———

PROJECT BOUNDARY ———

JURISDICTION BOUNDARY ———

DRAINAGE FEATURES PER CAMELBACK CAR MODEL (EXISTING AND PLANNED)

HYDROLOGIC SUBBASIN NAME 126

100-YEAR PEAK FLOW PER CAMELBACK CAR MODEL (CFS) (840)

CONCENTRATION POINT/ FLOW DIRECTION ———>

NOTES

1- ALL PEAK FLOW INFORMATION TAKEN FROM CAMELBACK CAR HEC-1 MODEL ENTITLED "EXISTING CONDITIONS WITH PROJECTS IN PLACE." PRECIPITATION AMOUNTS FOR THE CAMELBACK CAR ARE BASED ON NOAA 2 RAINFALL INFORMATION.



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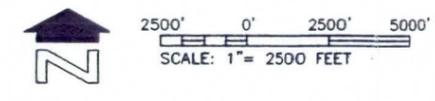
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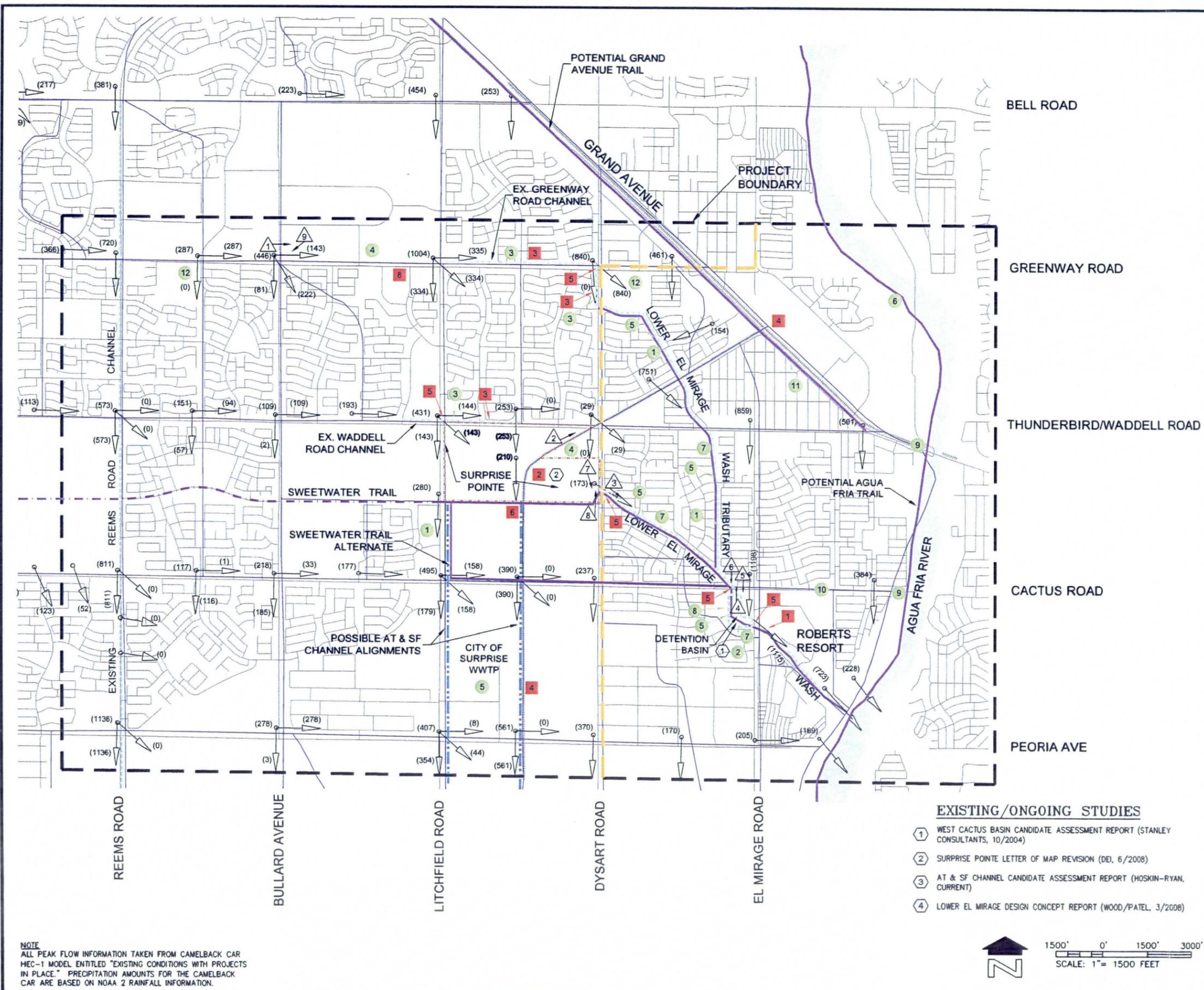
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WADDELL ROAD CAR
CONTRACT NUMBER: FCD 2007C015
EXISTING CONDITIONS HYDROLOGY
WITH PROJECTS IN PLACE

HDR ENGINEERING, INC.		
3200 East Camelback Road, Suite 350 PHOENIX, ARIZONA 85018-2311 (602) 522-7700		
DATE	BY	CHK
10/31/08	JM	LP
10/31/08	LP	LP
10/31/08	JM	LP
10/31/08	LP	LP

EXHIBIT 1





LEGEND

- HYDROLOGIC SUBBASIN BOUNDARY
- PROJECT BOUNDARY
- JURISDICTION BOUNDARY
- EXISTING CHANNEL
- POTENTIAL CHANNEL
- EXISTING TRAIL
- POTENTIAL TRAIL
- DEVELOPMENT BOUNDARY
- 100-YEAR PEAK FLOW PER CAMELBACK CAR MODEL (CFS) (840)
- CONCENTRATION POINT/ FLOW DIRECTION
- PHOTOGRAPH NUMBER/DIRECTION (SEE PHOTO EXHIBIT)

- OPPORTUNITIES**
- 1 PARK
 - 2 WIDER/DEEPER DETENTION BASIN
 - 3 WIDER/DEEPER CHANNEL
 - 4 VACANT LAND
 - 5 LAND OWNED BY MUNICIPALITY OR FCDMC
 - 6 AGUA FRIA RIVER OPEN SPACE & RECREATIONAL CORRIDOR
 - 7 ENHANCED DESERT DESIGN THEMES IN WASHES
 - 8 DESERT PARK DESIGN THEME IN BASIN
 - 9 POSSIBLE CONNECTION POINT OF TRAIL SYSTEM TO AGUA FRIA
 - 10 POSSIBLE ROUTE TO AGUA FRIA FROM EL MIRAGE WASH
 - 11 COVER CONCRETE CHANNEL AND CREATE A LINEAR TRAIL/GREENWAY WITH ENHANCED DESERT DESIGN THEME
 - 12 SCHOOL

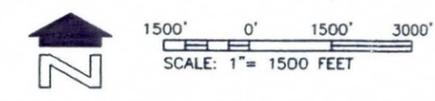
- CONSTRAINTS**
- 1 100-YEAR PEAK FLOW LIMITED TO 1000 CFS ENTERING ROBERTS RESORT
 - 2 PLANNED DEVELOPMENT
 - 3 EXISTING DEVELOPMENT/ RIGHT-OF-WAY CONSTRAINT
 - 4 AT & SF RAILROAD
 - 5 CULVERTS WITH INSUFFICIENT CAPACITY/ AREA OF OVERTOPPING
 - 6 DIFFICULTY CROSSING OF RAILROAD BY THE SWEETWATER TRAIL
 - 7 EL MIRAGE WASH TRAILS STOPPED AT ROBERTS RESORT
 - 8 SIDEWALK ON SOUTH SIDE OF GREENWAY RD. IS NOT CONTIGUOUS



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- EXISTING/ONGOING STUDIES**
- 1 WEST CACTUS BASIN CANDIDATE ASSESSMENT REPORT (STANLEY CONSULTANTS, 10/2004)
 - 2 SURPRISE POINTE LETTER OF MAP REVISION (DEI, 6/2008)
 - 3 AT & SF CHANNEL CANDIDATE ASSESSMENT REPORT (HOSKIN-RYAN, CURRENT)
 - 4 LOWER EL MIRAGE DESIGN CONCEPT REPORT (WOOD/PATEL, 3/2008)

NOTE
ALL PEAK FLOW INFORMATION TAKEN FROM CAMELBACK CAR HEC-1 MODEL ENTITLED "EXISTING CONDITIONS WITH PROJECTS IN PLACE." PRECIPITATION AMOUNTS FOR THE CAMELBACK CAR ARE BASED ON NOAA 2 RAINFALL INFORMATION.



NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WADDELL ROAD CAR CONTRACT NUMBER: FCD 2007C015

OPPORTUNITIES AND CONSTRAINTS

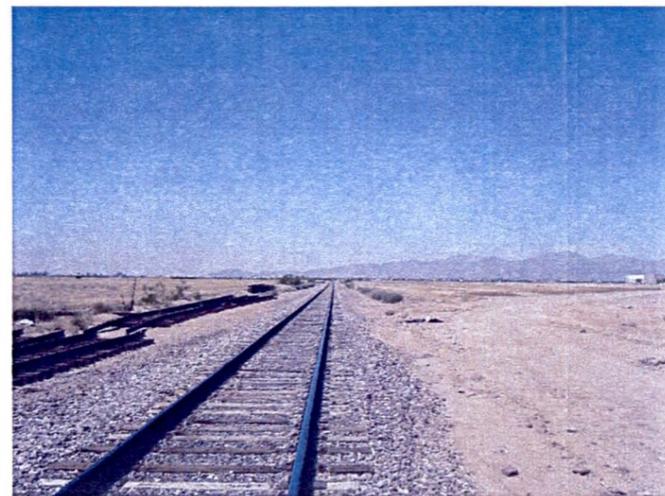
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DESIGN CHK.	SM	8/26/08
PLANS	RR	8/26/08
PLANS CHK.	SM	8/26/08

HDR ENGINEERING, INC.
3200 East Camelback Road, Suite 350
PHOENIX, ARIZONA 85018-2311
(602) 522-7700

EXHIBIT 2



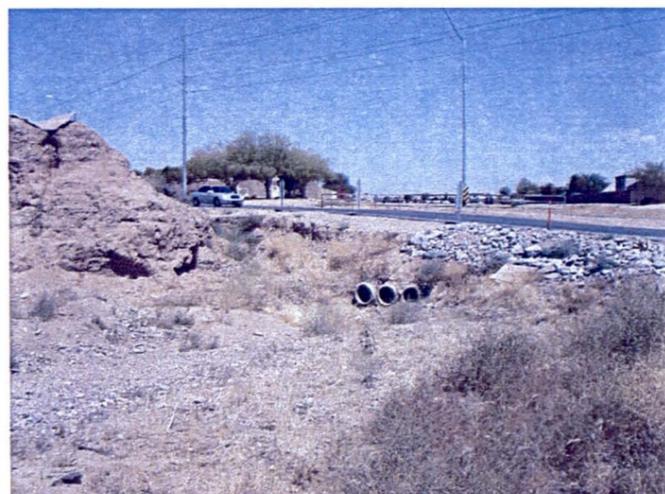
PHOTOGRAPH #1
 AREA OF OPPORTUNITY: VACANT LAND
 LOOKING EAST AT THE INTERSECTION OF BULLARD ROAD AND GREENWAY ROAD ON
 NORTH SIDE OF ROAD



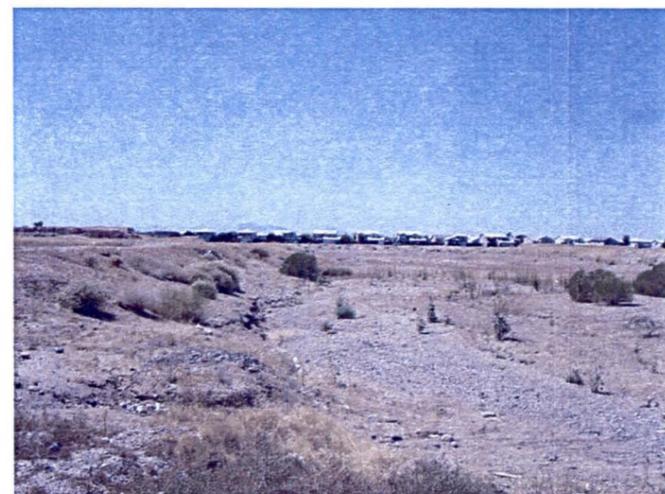
PHOTOGRAPH #2
 AREA OF CONSTRAINT: RAILROAD AND SURPRISE POINTE DEVELOPMENT
 LOOKING WEST ON THE NORTH SIDE OF AT & SF RAILROAD NEAR THE INTERSECTION OF
 WADDELL ROAD AND DYSART ROAD



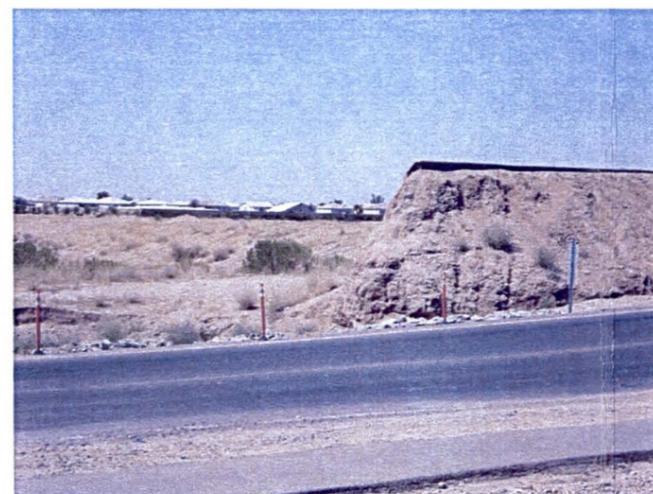
PHOTOGRAPH #3
 AREA OF OPPORTUNITY: MULTI-USE OPPORTUNITY
 LOOKING EAST AT THE INTERSECTION OF DYSART ROAD AND THE LOWER EL MIRAGE WASH



PHOTOGRAPH #4
 PROBLEM AREA DUE TO EROSION, UNDERSIZED CULVERTS
 LOOKING NORTH FROM THE SOUTH SIDE OF CACTUS AT THE INTERSECTION OF CACTUS
 ROAD AND THE LOWER EL MIRAGE WASH



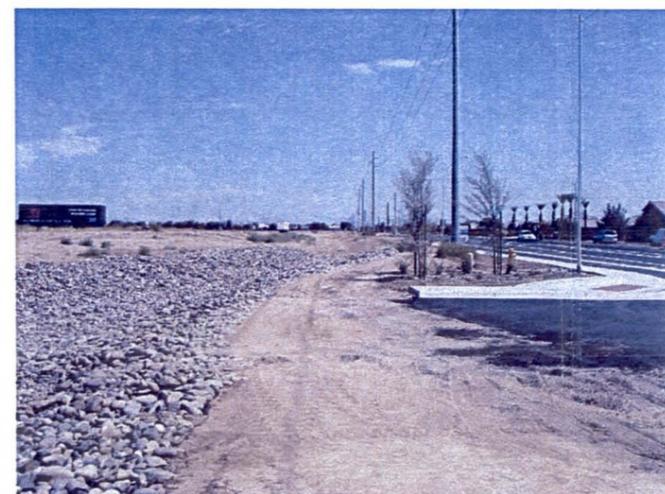
PHOTOGRAPH #5
 AREA OF OPPORTUNITY: WIDER, DEEPER BASIN, MULTI-USE OPPORTUNITY
 LOOKING SOUTH ON THE SOUTH SIDE OF CACTUS ROAD AT LOWER EL MIRAGE WASH



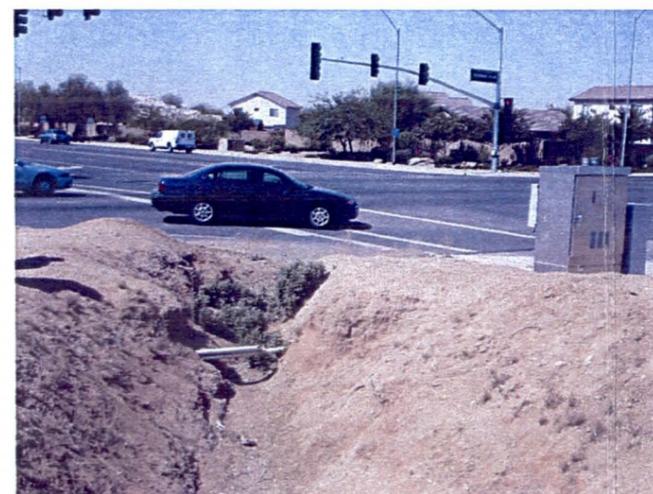
PHOTOGRAPH #6
 AREA OF OPPORTUNITY: WIDER, DEEPER BASIN, MULTI-USE OPPORTUNITY
 LOOKING SOUTHWEST ON THE NORTH SIDE OF CACTUS ROAD AT LOWER EL MIRAGE WASH



PHOTOGRAPH #7
 AREA OF CONSTRAINT: CULVERTS WITH INSUFFICIENT CAPACITY
 LOOKING SOUTH AT THE INTERSECTION OF THE LOWER EL MIRAGE WASH AND DYSART
 ROAD (BEGINNING OF LOWER EL MIRAGE WASH)



PHOTOGRAPH #8
 AREA OF CONSTRAINT: EAST BOUNDARY OF SURPRISE POINTE
 LOOKING NORTH AT THE INTERSECTION OF THE LOWER EL MIRAGE WASH AND DYSART
 ROAD (BEGINNING OF LOWER EL MIRAGE WASH)



PHOTOGRAPH #9
 PROBLEM AREA DUE TO FLOODING, EROSION
 LOOKING SOUTHWEST AT THE NORTHEAST CORNER OF GREENWAY ROAD AND BULLARD AVE.



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 FLOOD CONTROL DISTRICT
 OF MARICOPA COUNTY

WADDELL ROAD CAR
 CONTRACT NUMBER: FCD 2007C015

SITE VISIT PHOTOS

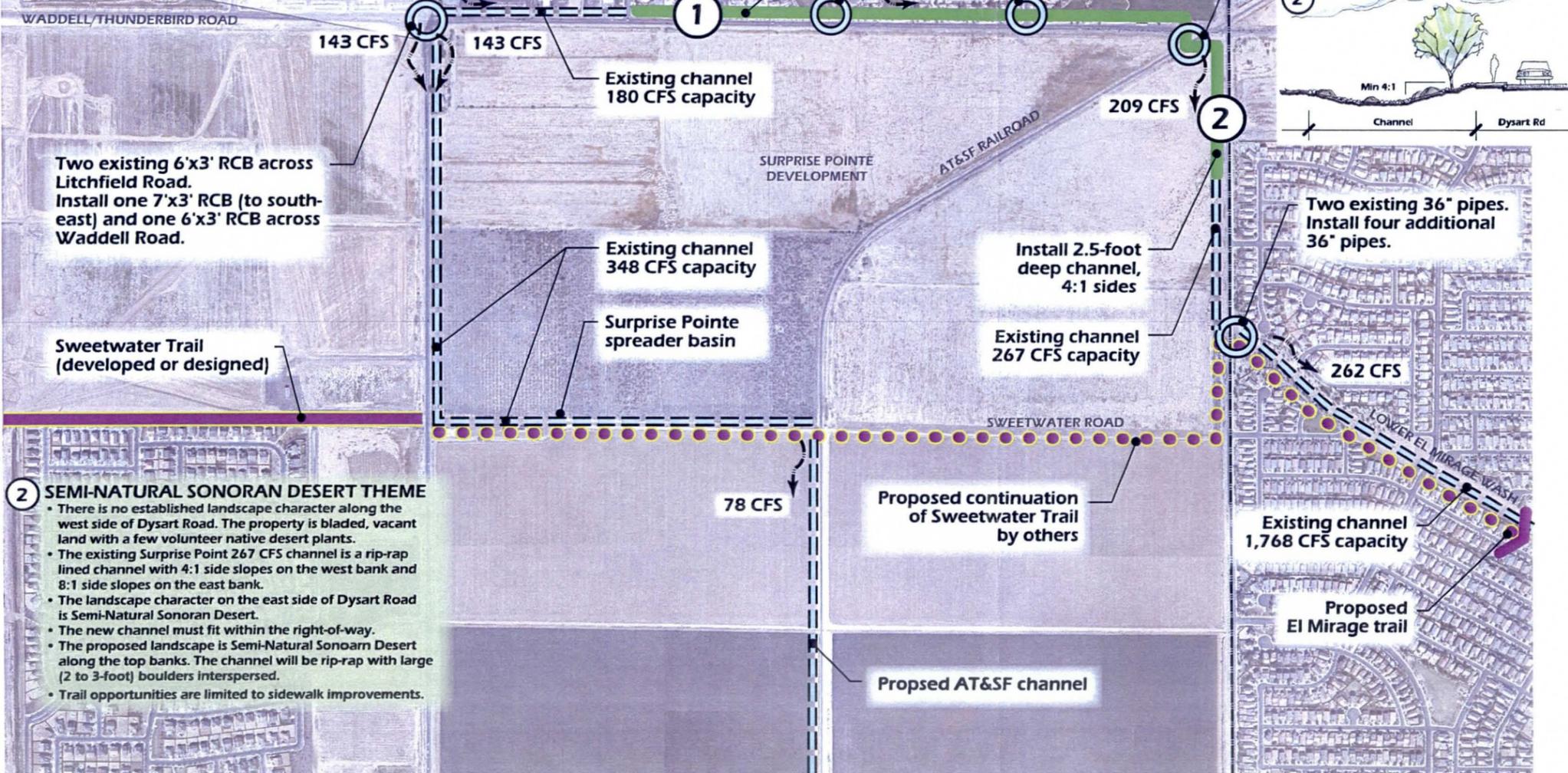
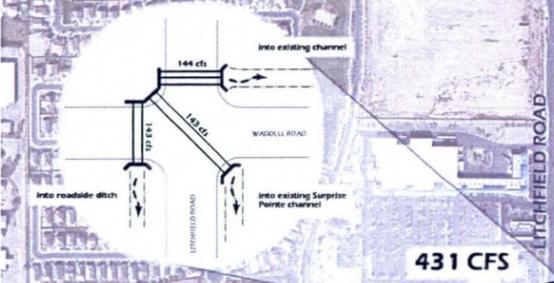
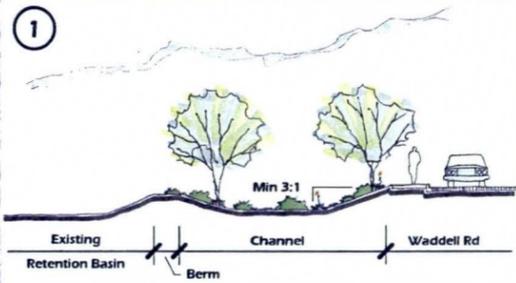
HDR ENGINEERING, INC.		
3200 East Camelback Road, Suite 350 PHOENIX, ARIZONA 85018-2311 (802) 522-7700		
BY	DATE	
DESIGN	RR	8/26/08
DESIGN CHK.	SM	8/26/08
PLANS	RR	8/26/08
PLANS CHK.	SM	8/26/08

EXHIBIT 3

1 DESERT PARK THEME

- The existing landscape character along the north side of Waddell Road, from Litchfield Road to Dysart Road, is Desert Park and includes a combination of turf and both Native and desert adapted plants.
- There is an existing, turf-bottomed retention basin the entire length.
- The new 3' deep channel needs to fit between the back of curb and the existing retention basin.
- The proposed landscape theme of the new channel is also Desert Park.
- Trail opportunities are limited to sidewalk improvements.

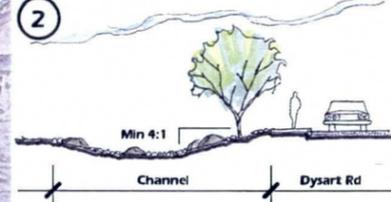
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2 SEMI-NATURAL SONORAN DESERT THEME

- There is no established landscape character along the west side of Dysart Road. The property is bladed, vacant land with a few volunteer native desert plants.
- The existing Surprise Point 267 CFS channel is a rip-rap lined channel with 4:1 side slopes on the west bank and 8:1 side slopes on the east bank.
- The landscape character on the east side of Dysart Road is Semi-Natural Sonoran Desert.
- The new channel must fit within the right-of-way.
- The proposed landscape is Semi-Natural Sonoran Desert along the top banks. The channel will be rip-rap with large (2 to 3-foot) boulders interspersed.
- Trail opportunities are limited to sidewalk improvements.

2



- === Existing channel or channel proposed by others
- Channel
- Culvert or pipe location
- Flow direction
- Recommended trail alignments
- Developed or designed trails

RCB = reinforced concrete box
CFS = cubic feet per second



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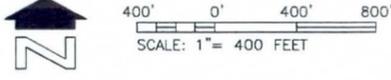
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WADDELL ROAD CAR CONTRACT NUMBER: FCD 2007C015

WADDELL ROAD AREA ALTERNATIVE #1

HDR ENGINEERING, INC.		
3200 East Camelback Road, Suite 350 PHOENIX, ARIZONA 85018-2311 (602) 522-7700		
BY	DATE	
DESIGN	JM	12/18/08
DESIGN CHK.	LP	12/18/08
PLANS	JM	12/18/08
PLANS CHK.	LP	12/18/08

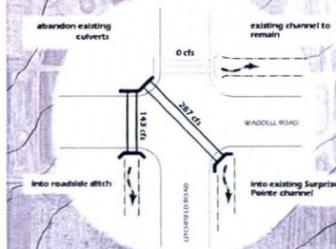
EXHIBIT 4



1 DESERT PARK THEME

- Channel**
- The existing landscape character along the north side of Waddell Road, from Litchfield Road to Dysart Road, is Desert Park and includes a combination of turf and both Native and desert adapted plants.
 - There is an existing, turf-bottomed retention basin the entire length.
 - The new 3' deep channel needs to fit between the back of curb and the existing retention basin.
 - The proposed landscape theme of the new channel is also Desert Park.
 - Trail opportunities are limited to sidewalk improvements.
- Park**
- The new basin would be located in bladed, vacant land with no defined landscape character.
 - The basin provides the opportunity for a basin park that connects the Sweetwater Trail to the AT&SF channel trail and is a rest stop for both trails.
 - The proposed theme is Desert Park, with a passive turf area surrounded by Semi-Natural Sonoran Desert.
 - Vary basin side slopes 4:1 to 8:1 or more if possible.
 - A meandering concrete multi-use path loops around the basin and provides access to a central rest stop of ramadas and play structures.

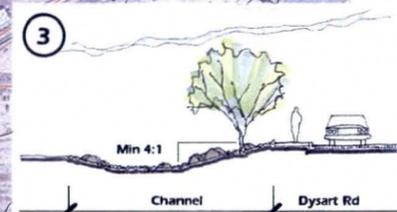
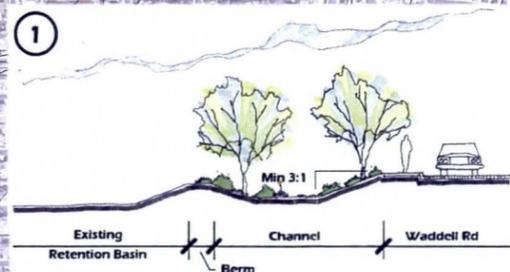
Plug existing culverts across Litchfield Road. Install two 7'x3' RCB (to south-east) and one 6'x3' RCB across Waddell Road.



Sweetwater Trail (developed or designed)

3 SEMI-NATURAL SONORAN DESERT THEME

- There is no established landscape character along the west side of Dysart Road. The property is bladed, vacant land with a few volunteer native desert plants.
- The existing Surprise Point 267 CFS channel is a rip-rap lined channel with 4:1 side slopes on the west bank and 8:1 side slopes on the east bank.
- The landscape character on the east side of Dysart Road is Semi-Natural Sonoran Desert.
- The new channel must fit within the right-of-way.
- The proposed landscape is Semi-Natural Sonoran Desert along the top banks. The channel will be rip-rap with large (2 to 3-foot) boulders interspersed.
- Trail opportunities are limited to sidewalk improvements.



- Existing channel or channel proposed by others
- Channel
- Culvert or pipe location
- Flow direction
- Recommended trail alignments
- Developed or designed trails

RCB = reinforced concrete box
CFS = cubic feet per second



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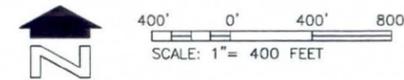
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WADDELL ROAD CAR
CONTRACT NUMBER: FCD 2007C015

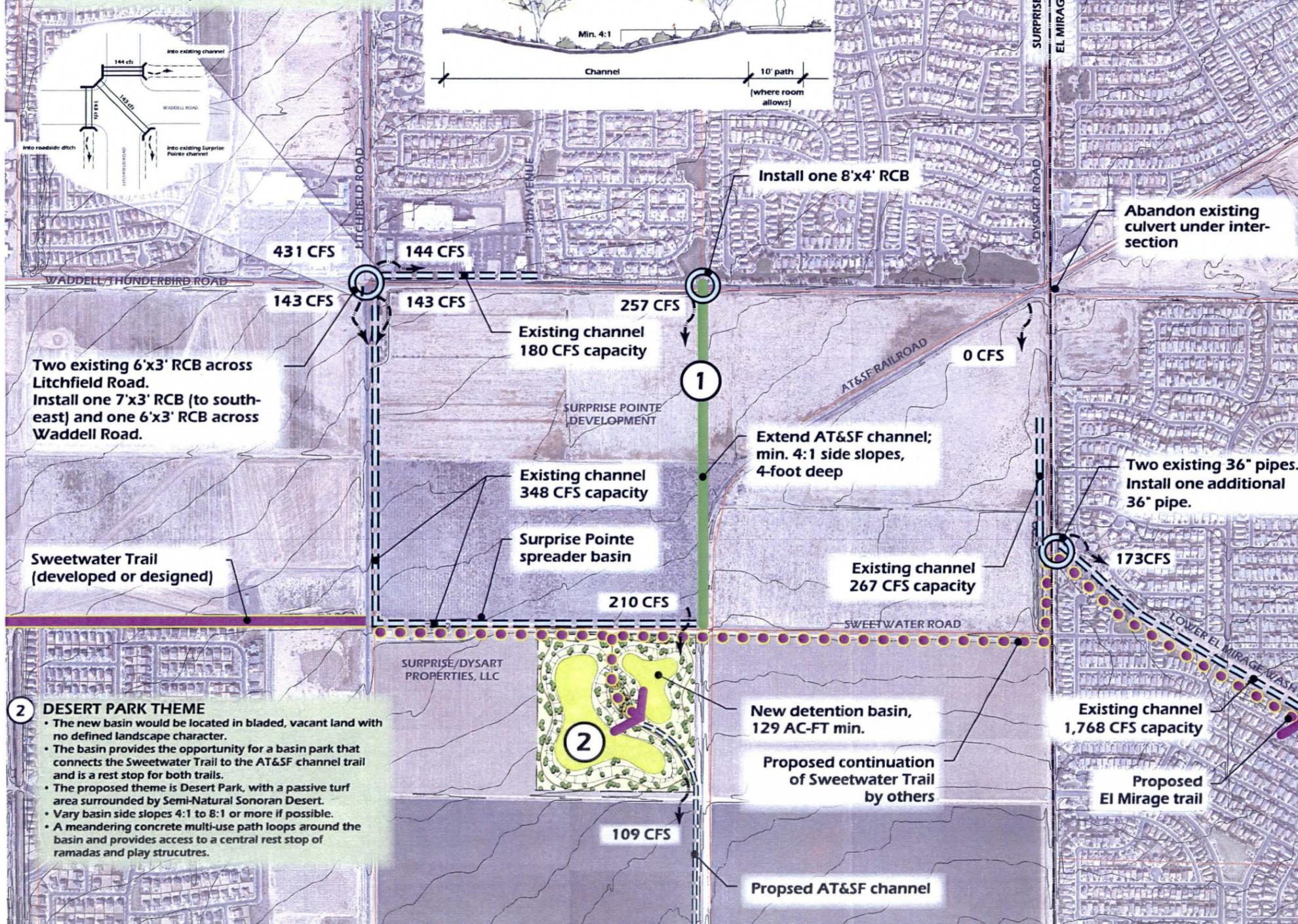
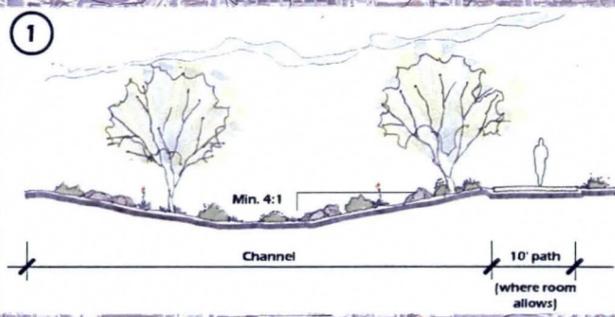
WADDELL ROAD AREA
ALTERNATIVE #2

HDR ENGINEERING, INC.		
3200 East Camelback Road, Suite 350 PHOENIX, ARIZONA 85018-2311 (602) 522-7700		
BY	DATE	
DESIGN	JM	12/18/08
DESIGN CHK.	LP	12/18/08
PLANS	JM	12/18/08
PLANS CHK.	LP	12/18/08

EXHIBIT 5



- 1 SEMI-NATURAL SONORAN DESERT THEME**
- The new channel would cross bladed, vacant land with no defined landscape character.
 - Min. channel top width is 40'.
 - Recommended easement width for channel is 80', allowing for a top bank of 10' on one side and 30' on the opposite side, to include a 10-foot path.



- 2 DESERT PARK THEME**
- The new basin would be located in bladed, vacant land with no defined landscape character.
 - The basin provides the opportunity for a basin park that connects the Sweetwater Trail to the AT&SF channel trail and is a rest stop for both trails.
 - The proposed theme is Desert Park, with a passive turf area surrounded by Semi-Natural Sonoran Desert.
 - Vary basin side slopes 4:1 to 8:1 or more if possible.
 - A meandering concrete multi-use path loops around the basin and provides access to a central rest stop of ramadas and play structures.

- Existing channel or channel proposed by others
- Channel
- Culvert or pipe location
- Flow direction
- Recommended trail alignments
- Developed or designed trails

RCB = reinforced concrete box
CFS = cubic feet per second



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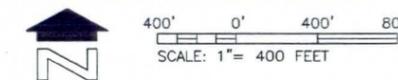
FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

WADDELL ROAD CAR
CONTRACT NUMBER: FCD 2007C015

WADDELL ROAD AREA
ALTERNATIVE #3

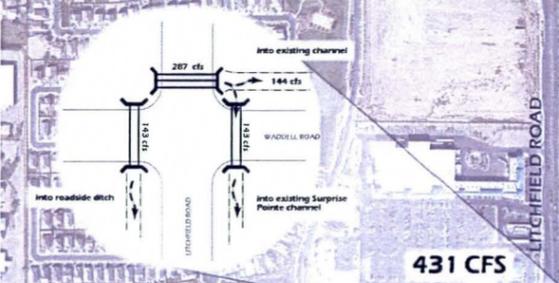
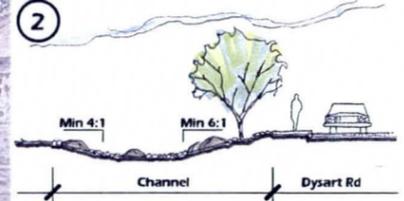
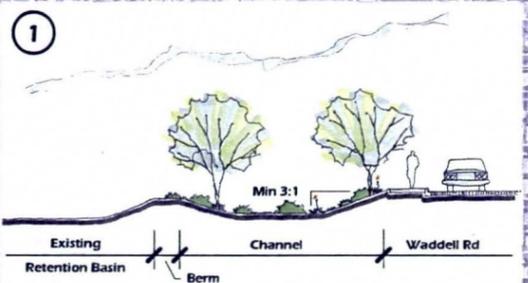
HDR ENGINEERING, INC. 3200 East Camelback Road, Suite 350 PHOENIX, ARIZONA 85018-2311 (602) 522-7700		
BY	JM	DATE
DESIGN	JM	12/18/08
DESIGN CHK.	LP	12/18/08
PLANS	JM	12/18/08
PLANS CHK.	LP	12/18/08

EXHIBIT 6



Waddell Manor Rose View

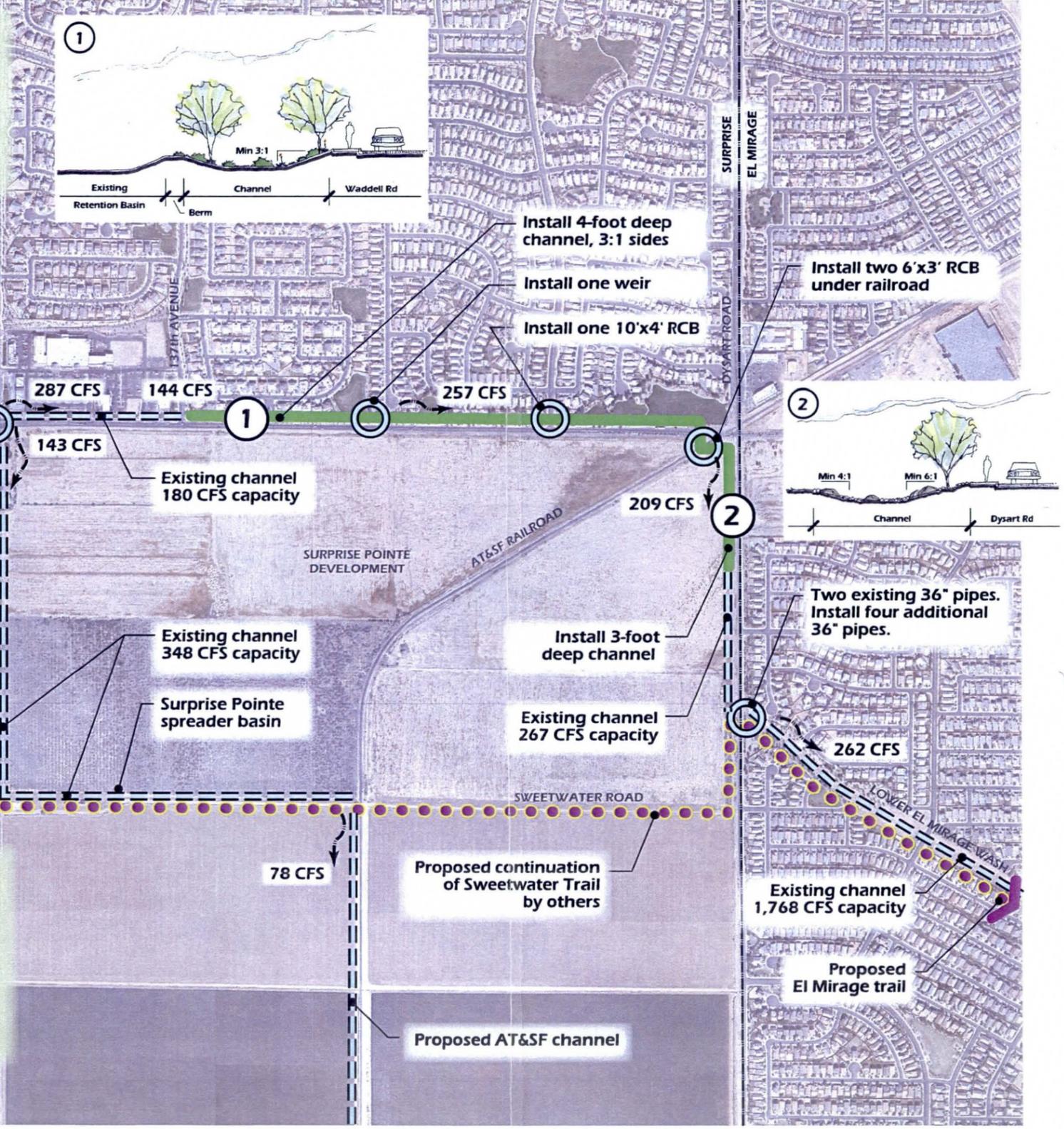
- 1 DESERT PARK THEME**
- The existing landscape character along the north side of Waddell Road, from Litchfield Road to Dysart Road, is Desert Park and includes a combination of turf and both Native and desert adapted plants.
 - There is an existing, turf-bottomed retention basin the entire length.
 - The new 3' deep channel needs to fit between the back of curb and the existing retention basin.
 - The proposed landscape theme of the new channel is also Desert Park.
 - Trail opportunities are limited to sidewalk improvements.



Two existing 6'x3' RCB across Litchfield Road. Install one 6'x3' RCB across Waddell Road on west side of Litchfield Road and one 6'x3' RCB across Waddell Road on east side of Litchfield Road.

Sweetwater Trail (developed or designed)

- 2 SEMI-NATURAL SONORAN DESERT THEME**
- There is no established landscape character along the west side of Dysart Road. The property is bladed, vacant land with a few volunteer native desert plants.
 - The existing Surprise Point channel is a rip-rap lined channel with 4:1 side slopes on the west bank and 8:1 side slopes on the east bank.
 - The landscape character on the east side of Dysart Road is Semi-Natural Sonoran Desert.
 - The new channel must fit within the right-of-way.
 - The proposed landscape is Semi-Natural Sonoran Desert along the top banks. The channel will be rip-rap with large (2 to 3-foot) boulders interspersed.
 - Trail opportunities are limited to sidewalk improvements.



- Existing channel or channel proposed by others
- Channel
- Culvert or pipe location
- Flow direction
- Municipal trails
- Developed or designed trails

RCB = reinforced concrete box
CFS = cubic feet per second



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NO.	REVISION	BY	DATE

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
WADDELL ROAD CAR CONTRACT NUMBER: FCD 2007C015
WADDELL ROAD AREA RECOMMENDED ALTERNATIVE

HDR ENGINEERING, INC.		
3200 East Camelback Road, Suite 350 PHOENIX, ARIZONA 85018-2311 (602) 522-7700		
BY	DATE	
DESIGN	JM/LEP	02-05-09
DESIGN CHK.	LAP	02-05-09
PLANS	JM/LEP	02-05-09
PLANS CHK.	LAP	02-05-09

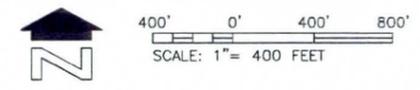
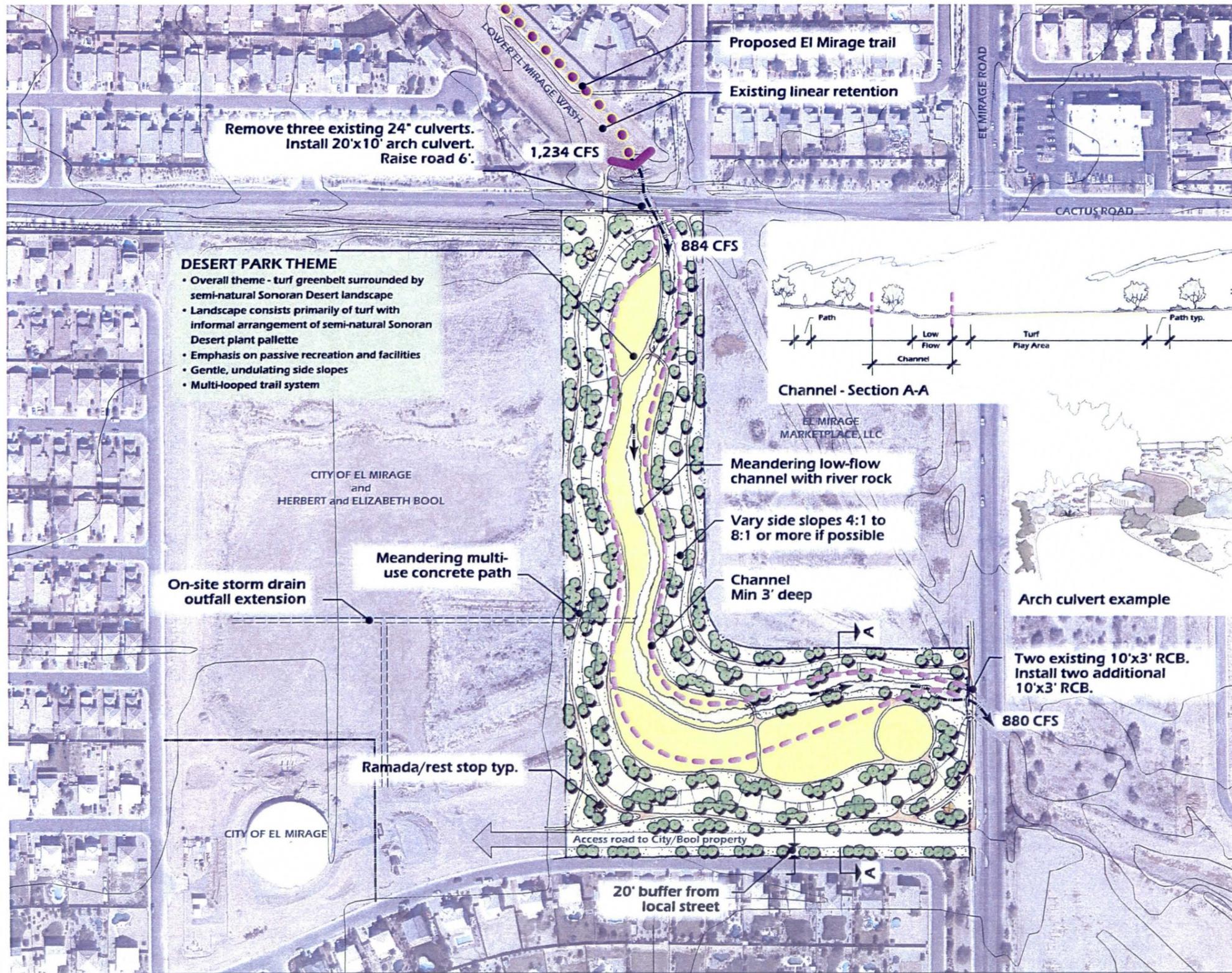


EXHIBIT 7



- Area needed for flood control channel
- Municipal trails

RCB = reinforced concrete box
CFS = cubic feet per second



HDR

ONE COMPANY | Many Solutions™

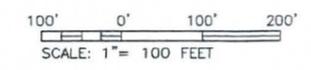
REVISION BY DATE

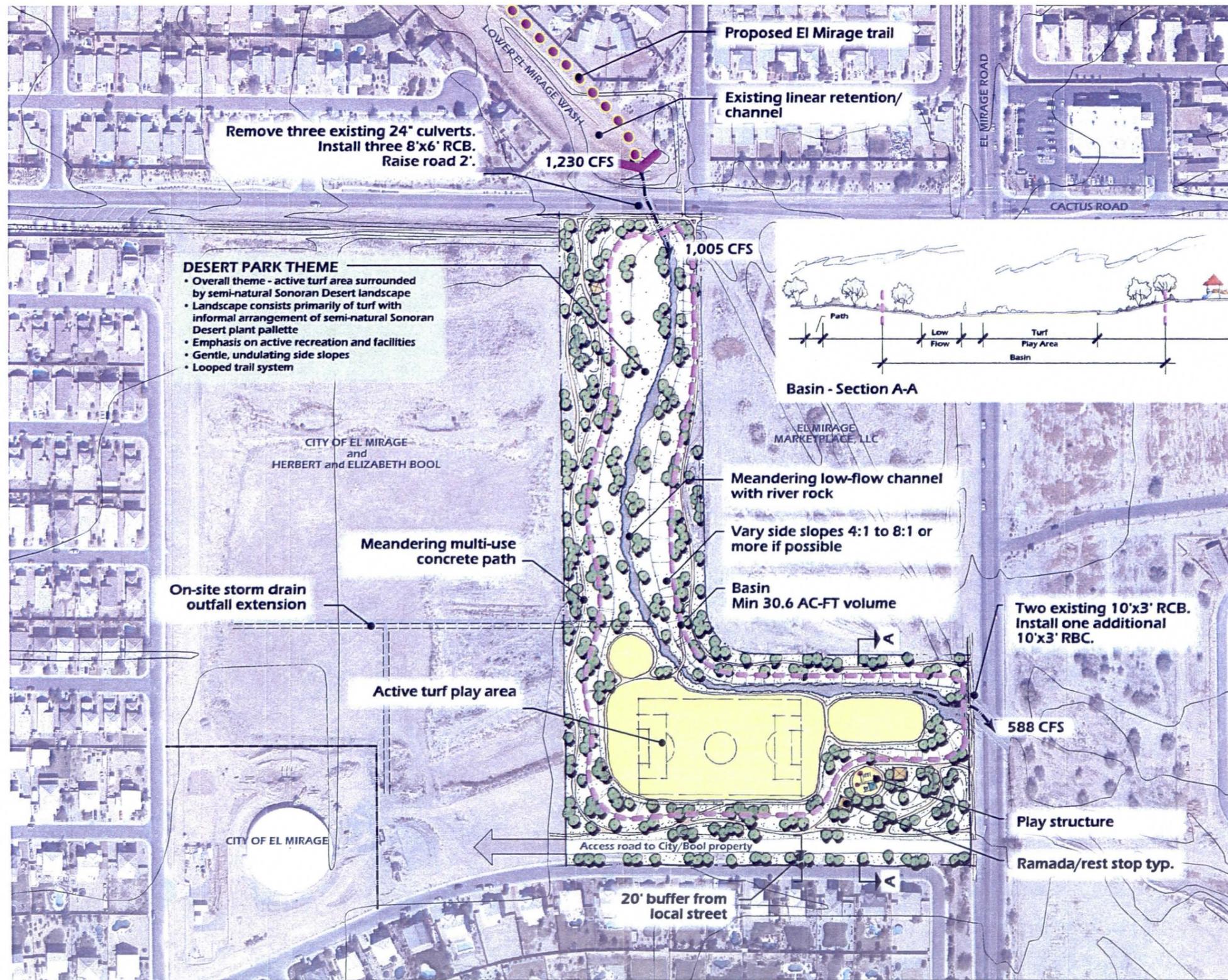
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WADDELL ROAD CAR
CONTRACT NUMBER: FCD 2007C015
WEST CACTUS DETENTION BASIN
ALTERNATIVE #1

HDR ENGINEERING, INC.		
3200 East Camelback Road, Suite 350 PHOENIX, ARIZONA 85018-2311 (602) 522-7700		
BY	DATE	
DESIGN	JM	12/18/08
DESIGN CHR.	LP	12/18/08
PLANS	JM	12/18/08
PLANS CHK.	LP	12/18/08

EXHIBIT 8

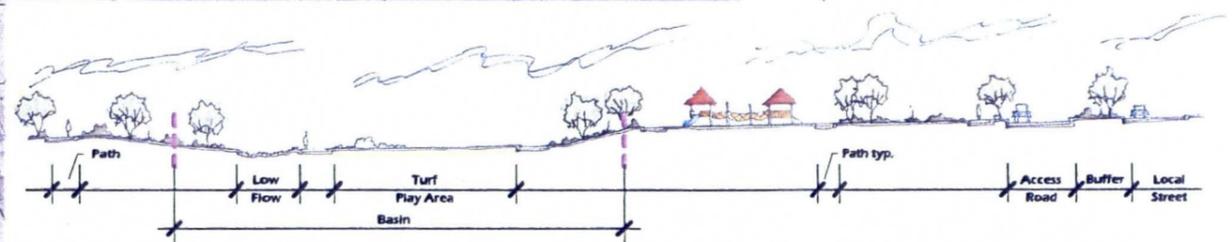




DESERT PARK THEME

- Overall theme - active turf area surrounded by semi-natural Sonoran Desert landscape
- Landscape consists primarily of turf with informal arrangement of semi-natural Sonoran Desert plant palette
- Emphasis on active recreation and facilities
- Gentle, undulating side slopes
- Looped trail system

Basin - Section A-A



--- Area needed for flood control basin
 ●●● Municipal trails

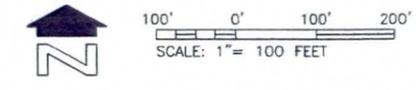
RCB = reinforced concrete box
 CFS = cubic feet per second

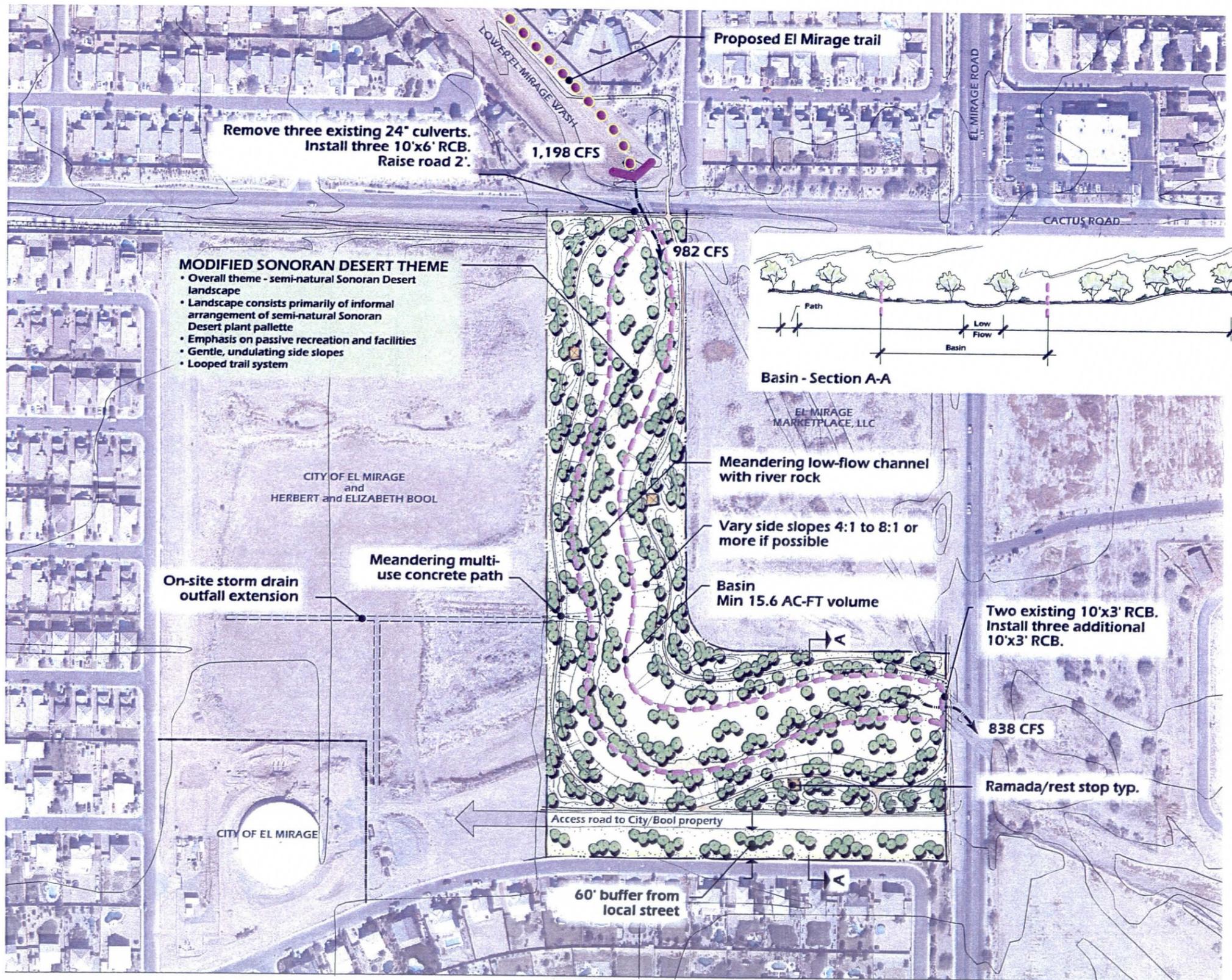


HDR
 ONE COMPANY | Many Solutions™

REVISION BY DATE
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
 WADDELL ROAD CAR
 CONTRACT NUMBER: FCD 2007C015
 WEST CACTUS DETENTION BASIN
 ALTERNATIVE #2

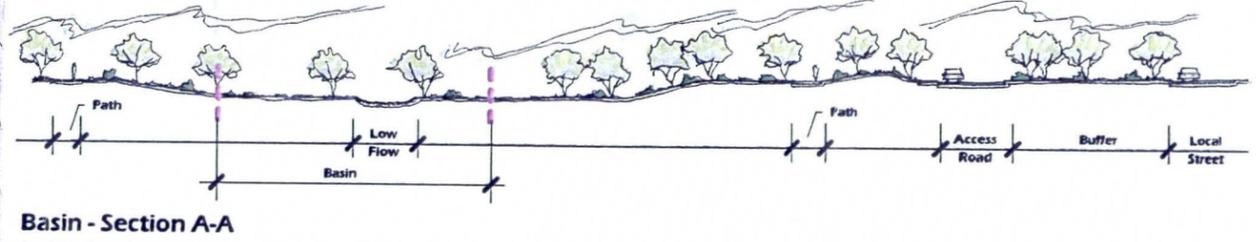
HDR ENGINEERING, INC. 3200 East Camelback Road, Suite 350 PHOENIX, ARIZONA 85018-2311 (602) 522-7700		
DESIGN	JM	12/18/08
DESIGN CHK.	LF	12/18/08
PLANS	JM	12/18/08
PLANS CHK.	LF	12/18/08
EXHIBIT 9		





MODIFIED SONORAN DESERT THEME

- Overall theme - semi-natural Sonoran Desert landscape
- Landscape consists primarily of informal arrangement of semi-natural Sonoran Desert plant palette
- Emphasis on passive recreation and facilities
- Gentle, undulating side slopes
- Looped trail system



--- Area needed for flood control basin
 ●●● Municipal trails

RCB = reinforced concrete box
 CFS = cubic feet per second



HDR

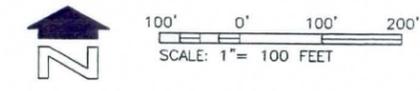
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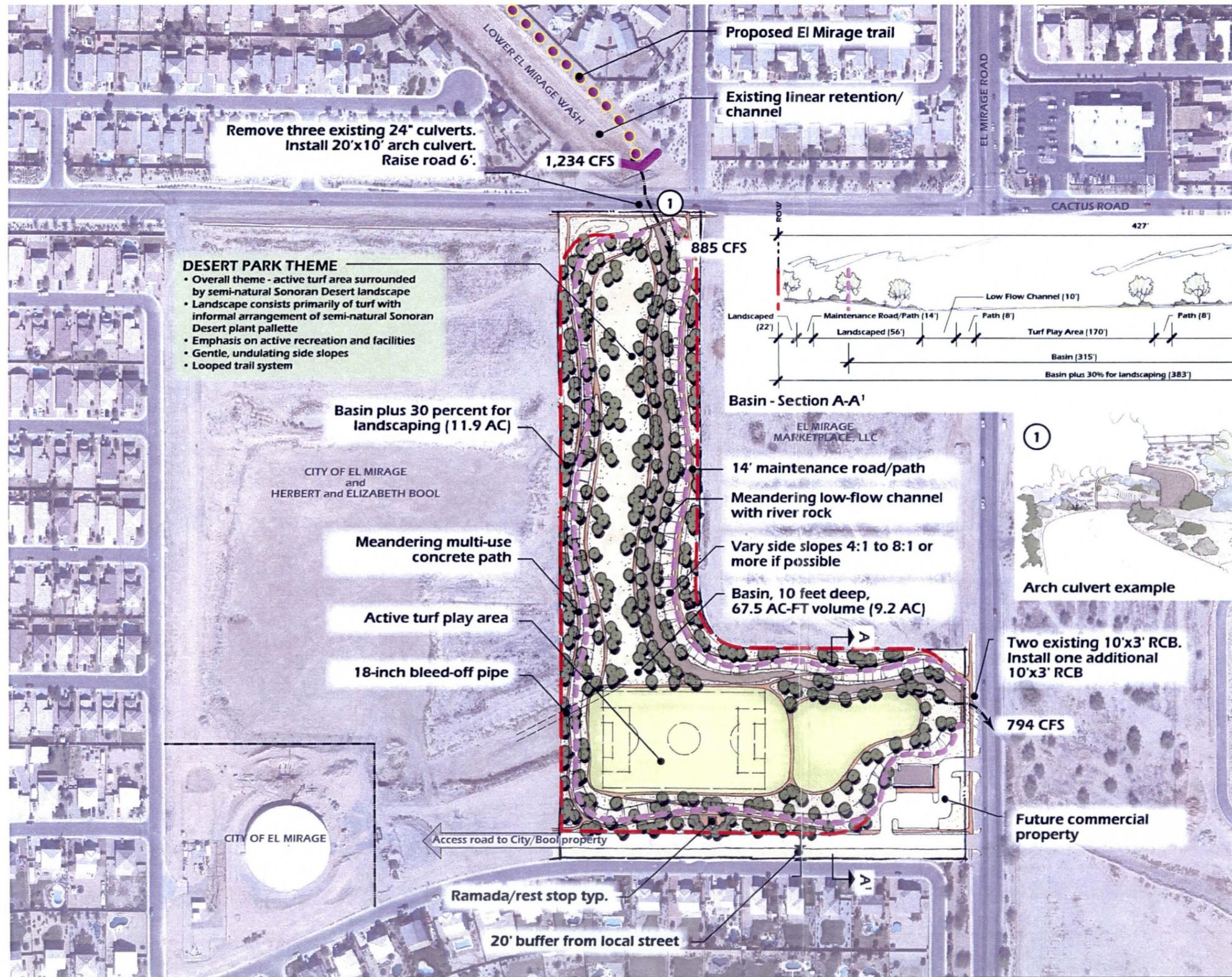
REVISION BY DATE
 FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WADDELL ROAD CAR
 CONTRACT NUMBER: FCD 2007C015
 WEST CACTUS DETENTION BASIN ALTERNATIVE #3

HDR ENGINEERING, INC.	
3200 East Camelback Road, Suite 350 PHOENIX, ARIZONA 85018-2311 (602) 522-7700	
BY	DATE
DESIGN: JM	12/18/08
DESIGN CHK: LP	12/18/08
PLANS: JM	12/18/08
PLANS CHK: LP	12/18/08

EXHIBIT 10





- Area needed for flood control
- Area needed for flood control basin plus 30 percent for landscaping
- Municipal trails

RCB = reinforced concrete box
CFS = cubic feet per second



HDR

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REVISION BY DATE

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

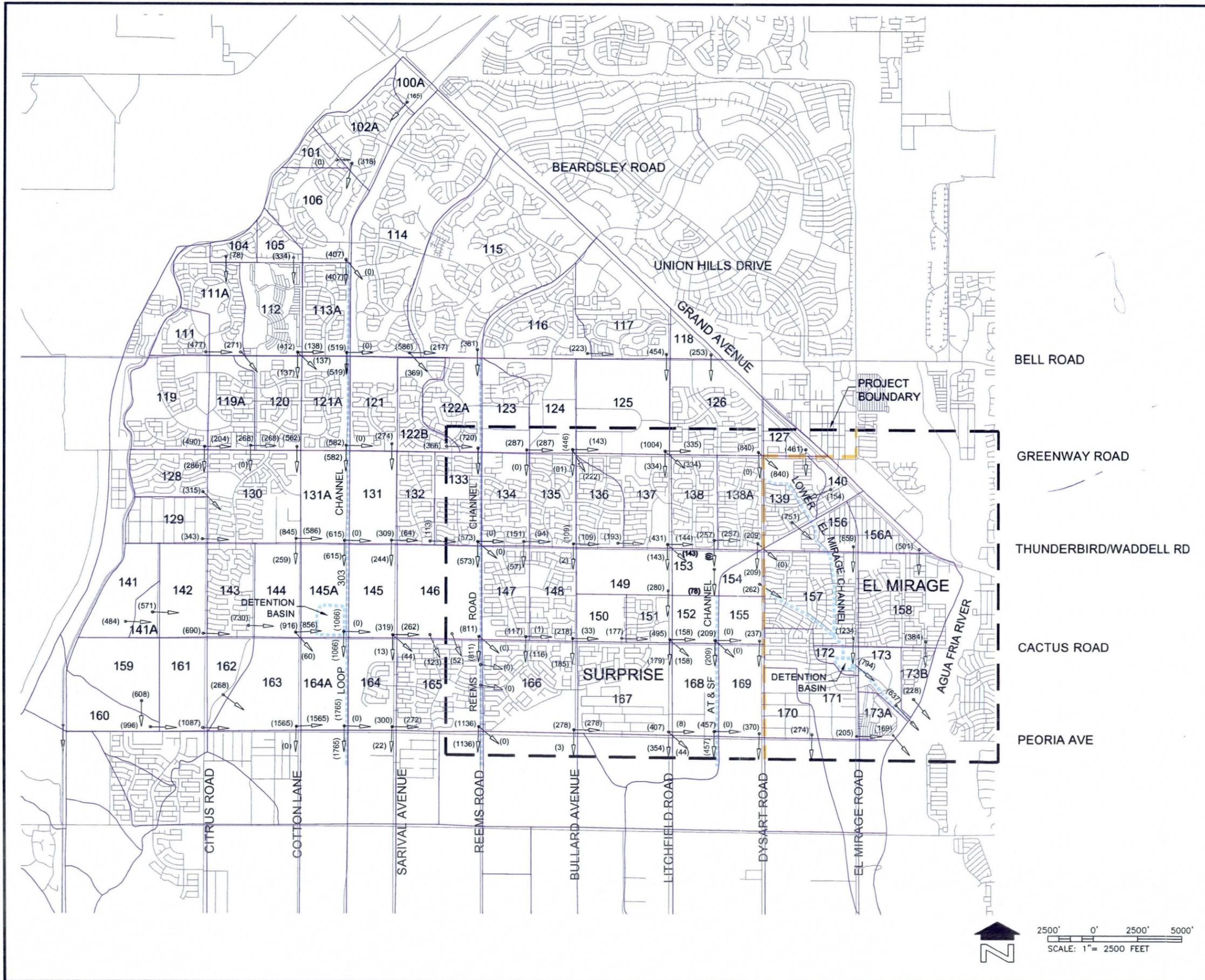
WADDELL ROAD CAR
CONTRACT NUMBER: FCD 2007C015
WEST CACTUS DETENTION BASIN
RECOMMENDED ALTERNATIVE

HDR ENGINEERING, INC. 3200 East Camelback Road, Suite 350 PHOENIX, ARIZONA 85018-2311 (602) 522-7700		
BY	DATE	
DESIGN	JM/LEP	02-12-09
DESIGN CHK.	LAP	02-12-09
PLANS	JM/LEP	02-12-09
PLANS CHK.	LAP	02-12-09

EXHIBIT 11



100' 0' 100' 200'
SCALE: 1" = 100 FEET



LEGEND

- HYDROLOGIC SUBBASIN BOUNDARY
- PROJECT BOUNDARY
- JURISDICTION BOUNDARY
- DRAINAGE FEATURES PER CAMELBACK CAR MODEL (EXISTING AND PLANNED)
- HYDROLOGIC SUBBASIN NAME 126
- 100-YEAR PEAK FLOW (840)
- CONCENTRATION POINT/ FLOW DIRECTION

NOTES

1- ALL PEAK FLOW INFORMATION TAKEN FROM CAMELBACK CAR HEC-1 MODEL ENTITLED "EXISTING CONDITIONS WITH PROJECTS IN PLACE." PRECIPITATION AMOUNTS FOR THE CAMELBACK CAR ARE BASED ON NOAA 2 RAINFALL INFORMATION.



ONE COMPANY | Many Solutions™

NO.	REVISION	BY	DATE

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

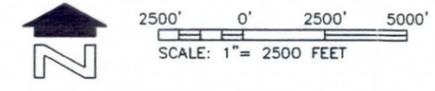
WADDELL ROAD CAR
CONTRACT NUMBER: FCD 2007C015

REVISED HYDROLOGY
WITH PROJECTS IN PLACE

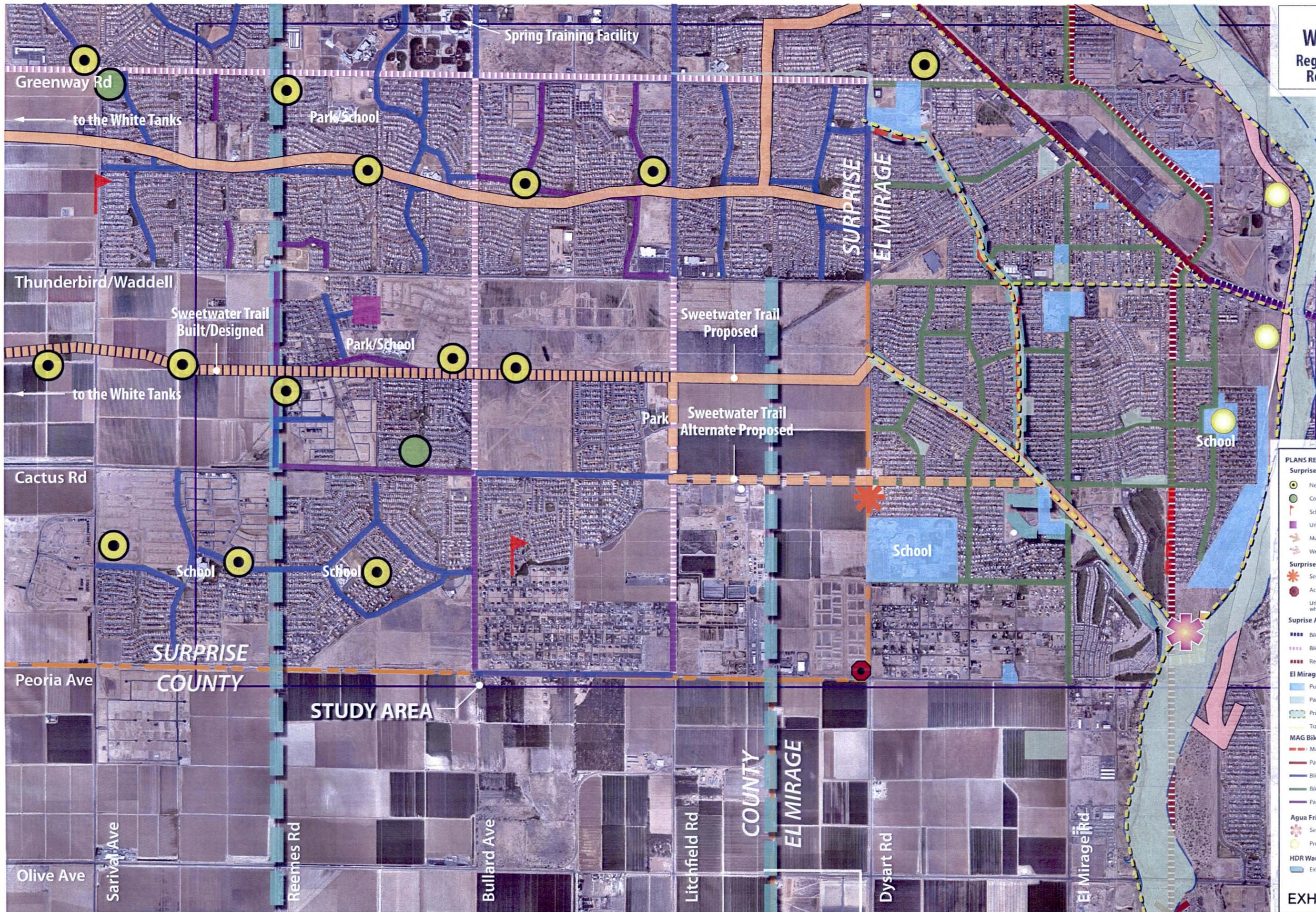
HDR ENGINEERING, INC.
3200 East Camelback Road, Suite 350
PHOENIX, ARIZONA 85018-2311
(602) 522-7700

BY	DATE
DESIGN	JM 4/9/09
DESIGN CHK.	LP 4/9/09
PLANS	JM 4/9/09
PLANS CHK.	LP 4/9/09

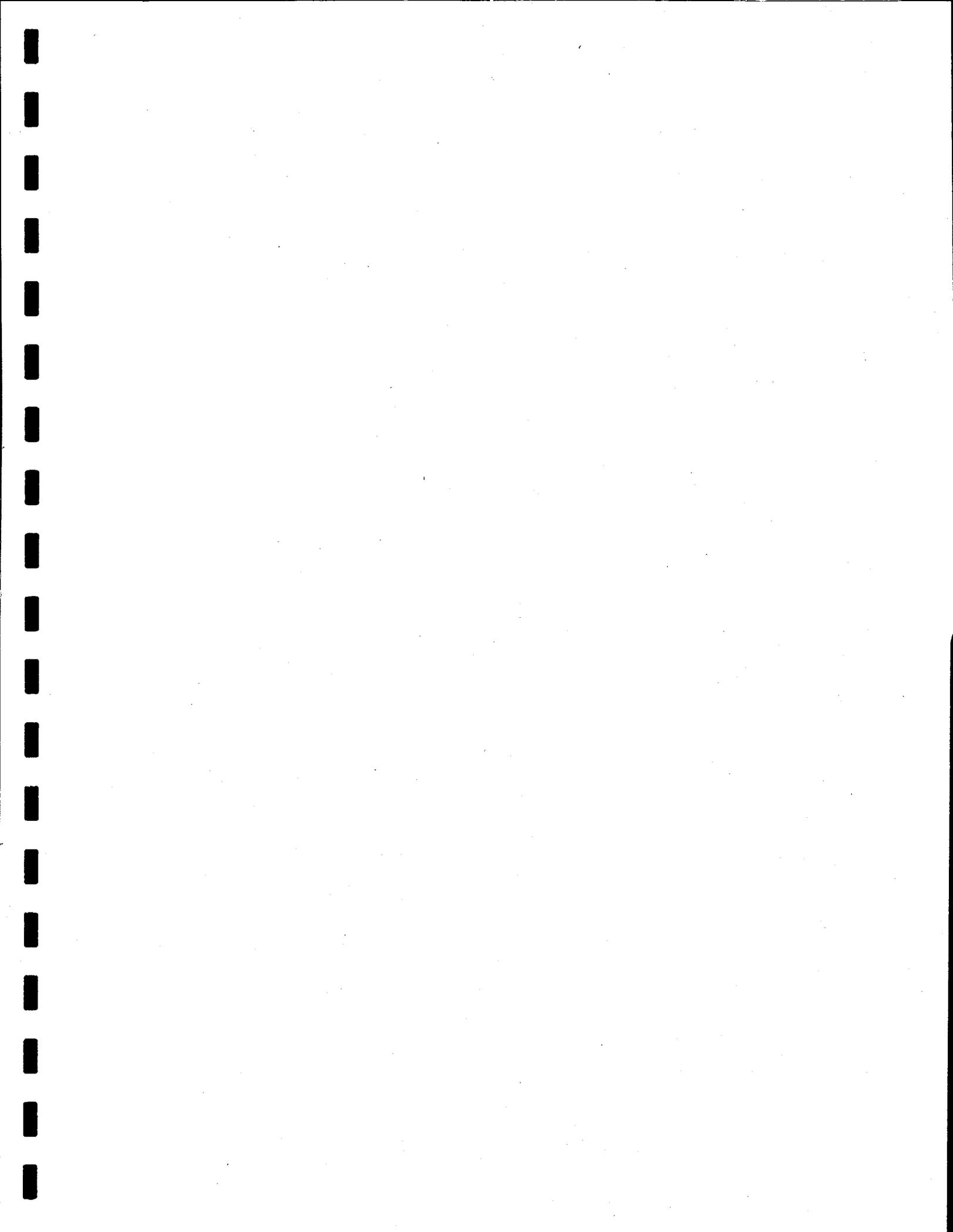
EXHIBIT 12



Waddell CAR Regional Recreation Resource Exhibit



- PLANS REPRESENTED**
- Surprise Open Space and Recreation Plan**
 - Neighborhood Park (proposed)
 - Community Park (proposed)
 - School Park (proposed)
 - Urban Park (proposed)
 - Multi-use Trail System (proposed)
 - West Valley Recreation Corridor (proposed)
 - Surprise Community Design Plan**
 - Secondary Gateway Character
 - Activity Node
 - Urban Community Character (encompasses whole study area; not shown)
 - Surprise Alternative Modes Plan**
 - Bike Route
 - Bike Lane
 - Regional Trail
 - El Mirage Open Space/Recreation Element**
 - Public/Semi-Public (schools)
 - Parks/Open Space
 - Proposed Park
 - Trails
 - MAG Bikeways**
 - Multi-use Trail (unpaved)
 - Paved Multi-use Path
 - Bike Lanes
 - Bike Routes
 - Paved Shoulders
 - Agua Fria Watercourse Master Plan**
 - Secondary Trailhead
 - Proposed and Existing Parks
 - HDR Waddell Road CAR**
 - Existing and Proposed Drainage Features



APPENDIX B

HEC-1 Model and Calculations

Culvert Calculator Report

ALT1-Litchfield and Waddell Proposed Culvert S

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	1,161.00 ft	Headwater Depth/Height	1.48
Computed Headwater Elev.	1,160.94 ft	Discharge	143.00 cfs
Inlet Control HW Elev.	1,160.94 ft	Tailwater Elevation	1,157.50 ft
Outlet Control HW Elev.	1,160.74 ft	Control Type	Inlet Control

Grades			
Upstream Invert	1,156.50 ft	Downstream Invert	1,156.00 ft
Length	175.00 ft	Constructed Slope	0.002857 ft/ft

Hydraulic Profile			
Profile	CompositeM2PressureProfile	Depth, Downstream	2.60 ft
Slope Type	Mild	Normal Depth	N/A ft
Flow Regime	Subcritical	Critical Depth	2.60 ft
Velocity Downstream	9.15 ft/s	Critical Slope	0.004118 ft/ft

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	6.00 ft
Section Size	6 x 3 ft	Rise	3.00 ft
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	1,160.74 ft	Upstream Velocity Head	0.98 ft
Ke	0.20	Entrance Loss	0.20 ft

Inlet Control Properties			
Inlet Control HW Elev.	1,160.94 ft	Flow Control	N/A
Inlet Type	90° headwall w 45° bevels	Area Full	18.0 ft²
K	0.49500	HDS 5 Chart	10
M	0.66700	HDS 5 Scale	2
C	0.03140	Equation Form	2
Y	0.82000		

*Note: Elevations are based on 1990 topo.
They are estimates.*

Culvert Calculator Report

ALT1-Waddell and 133rd Ave Proposed Culvert

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	105.00 ft	Headwater Depth/Height	1.20
Computed Headwater Elev.	104.79 ft	Discharge	257.00 cfs
Inlet Control HW Elev.	104.23 ft	Tailwater Elevation	99.50 ft
Outlet Control HW Elev.	104.79 ft	Control Type	Entrance Control

Grades			
Upstream Invert	100.00 ft	Downstream Invert	99.50 ft
Length	120.00 ft	Constructed Slope	0.004167 ft/ft

Hydraulic Profile			
Profile	S2	Depth, Downstream	2.50 ft
Flow Type	Steep	Normal Depth	2.48 ft
Flow Regime	Supercritical	Critical Depth	2.74 ft
Velocity Downstream	10.28 ft/s	Critical Slope	0.003151 ft/ft

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	10.00 ft
Section Size	10 x 4 ft	Rise	4.00 ft
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	104.79 ft	Upstream Velocity Head	1.37 ft
Ke	0.50	Entrance Loss	0.68 ft

Inlet Control Properties			
Inlet Control HW Elev.	104.23 ft	Flow Control	N/A
Inlet Type	3.7° wingwall flare, d=0.0830	Area Full	40.0 ft²
K	0.48600	HDS 5 Chart	9
M	0.66700	HDS 5 Scale	2
C	0.02490	Equation Form	2
Y	0.83000		

*Note: Elevations are based on 1990 topo.
They are estimates.*

Culvert Calculator Report

RECPLAN-Waddell and Dysart Proposed Culvert

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	1,150.50 ft	Headwater Depth/Height	1.13
Computed Headwater Elev.	1,150.38 ft	Discharge	209.00 cfs
Inlet Control HW Elev.	1,150.33 ft	Tailwater Elevation	1,148.00 ft
Outlet Control HW Elev.	1,150.38 ft	Control Type	Outlet Control

Grades			
Upstream Invert	1,147.00 ft	Downstream Invert	1,146.50 ft
Length	176.00 ft	Constructed Slope	0.002841 ft/ft

Hydraulic Profile			
Profile	M2	Depth, Downstream	2.11 ft
Slope Type	Mild	Normal Depth	2.37 ft
Flow Regime	Subcritical	Critical Depth	2.11 ft
Velocity Downstream	8.24 ft/s	Critical Slope	0.003907 ft/ft

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	6.00 ft
Section Size	6 x 3 ft	Rise	3.00 ft
Number Sections	2		

Outlet Control Properties			
Outlet Control HW Elev.	1,150.38 ft	Upstream Velocity Head	0.85 ft
Ke	0.20	Entrance Loss	0.17 ft

Inlet Control Properties			
Inlet Control HW Elev.	1,150.33 ft	Flow Control	N/A
Inlet Type	90° headwall w 45° bevels	Area Full	36.0 ft ²
K	0.49500	HDS 5 Chart	10
M	0.66700	HDS 5 Scale	2
C	0.03140	Equation Form	2
Y	0.82000		

*Note: Elevations are based on 1990-top o
They are estimates.*

Culvert Calculator Report

ALT1-Lower El Mirage Wash and Dysart Proposed Culvert

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	105.50 ft	Headwater Depth/Height	1.47
Computed Headwater Elev.	104.91 ft	Discharge	376.00 cfs
Inlet Control HW Elev.	104.89 ft	Tailwater Elevation	100.00 ft
Outlet Control HW Elev.	104.91 ft	Control Type	Outlet Control

Grades			
Upstream Invert	100.50 ft	Downstream Invert	100.00 ft
Length	80.00 ft	Constructed Slope	0.008250 ft/ft

Hydraulic Profile			
Profile	M2	Depth, Downstream	2.55 ft
Slope Type	Mild	Normal Depth	N/A ft
Flow Regime	Subcritical	Critical Depth	2.55 ft
Velocity Downstream	9.79 ft/s	Critical Slope	0.008325 ft/ft

Section			
Section Shape	Circular	Mannings Coefficient	0.013
Section Material	Concrete	Span	3.00 ft
Section Size	36 inch	Rise	3.00 ft
Number Sections	6		

Outlet Control Properties			
Outlet Control HW Elev.	104.91 ft	Upstream Velocity Head	1.24 ft
Ke	0.20	Entrance Loss	0.25 ft

Inlet Control Properties			
Inlet Control HW Elev.	104.89 ft	Flow Control	N/A
Inlet Type	Beveled ring, 33.7° bevels	Area Full	42.4 ft ²
K	0.00180	HDS 5 Chart	3
M	2.50000	HDS 5 Scale	B
C	0.02430	Equation Form	1
Y	0.83000		

*Note: Elevations are based on 1990 topo.
They are estimates.*

Cross Section for RECPLAN-Waddell Road Channel

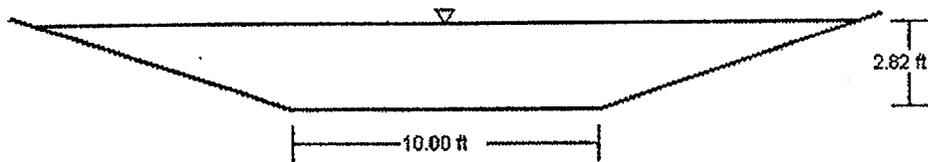
Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Roughness Coefficient	0.025	← Earth w/ grass
Channel Slope	0.00300	ft/ft
Normal Depth	2.82	ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	10.00	ft
Discharge	257.00	ft ³ /s

Cross Section Image



$$FB = 0.25 \left(2.82' + \frac{4.94^2}{2(32.2)} \right) = 0.80' = 7 \text{ 1'}$$

v:1 H:1

Worksheet for RECPLAN-Waddell Road Channel

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Roughness Coefficient	0.025	
Channel Slope	0.00300	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	10.00	ft
Discharge	257.00	ft ³ /s

Results

Normal Depth	2.82	ft
Flow Area	52.02	ft ²
Wetted Perimeter	27.83	ft
Top Width	26.91	ft
Critical Depth	2.19	ft
Critical Slope	0.00816	ft/ft
Velocity	4.94	ft/s
Velocity Head	0.38	ft
Specific Energy	3.20	ft
Froude Number	0.63	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	2.82	ft
Critical Depth	2.19	ft
Channel Slope	0.00300	ft/ft
Critical Slope	0.00816	ft/ft

Cross Section for RECPLAN-Dysart Road Channel

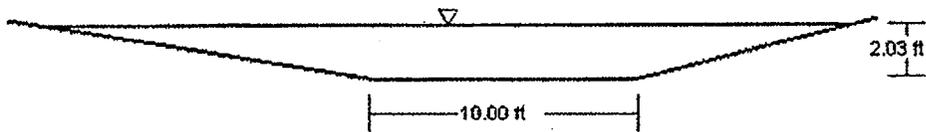
Project Description

Friction Method Manning Formula
 Solve For Normal Depth

Input Data

Roughness Coefficient	0.025
Channel Slope	0.00500 ft/ft
Normal Depth	2.03 ft
Left Side Slope	6.00 ft/ft (H:V)
Right Side Slope	4.00 ft/ft (H:V)
Bottom Width	10.00 ft
Discharge	209.00 ft ³ /s

Cross Section Image



$$FB = 0.25 \left(2.03' + \frac{5.092}{2(32.2)} \right) = 0.161 \Rightarrow 7' 1''$$

V: 1
 H: 1

Worksheet for RECPLAN-Dysart Road Channel

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Roughness Coefficient	0.025	
Channel Slope	0.00500	ft/ft
Left Side Slope	6.00	ft/ft (H:V)
Right Side Slope	4.00	ft/ft (H:V)
Bottom Width	10.00	ft
Discharge	209.00	ft ³ /s

Results

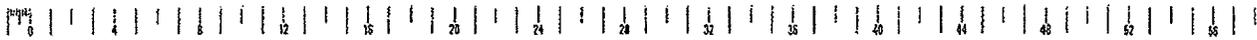
Normal Depth	2.03	ft
Flow Area	41.03	ft ²
Wetted Perimeter	30.76	ft
Top Width	30.34	ft
Critical Depth	1.78	ft
Critical Slope	0.00870	ft/ft
Velocity	5.09	ft/s
Velocity Head	0.40	ft
Specific Energy	2.44	ft
Froude Number	0.77	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

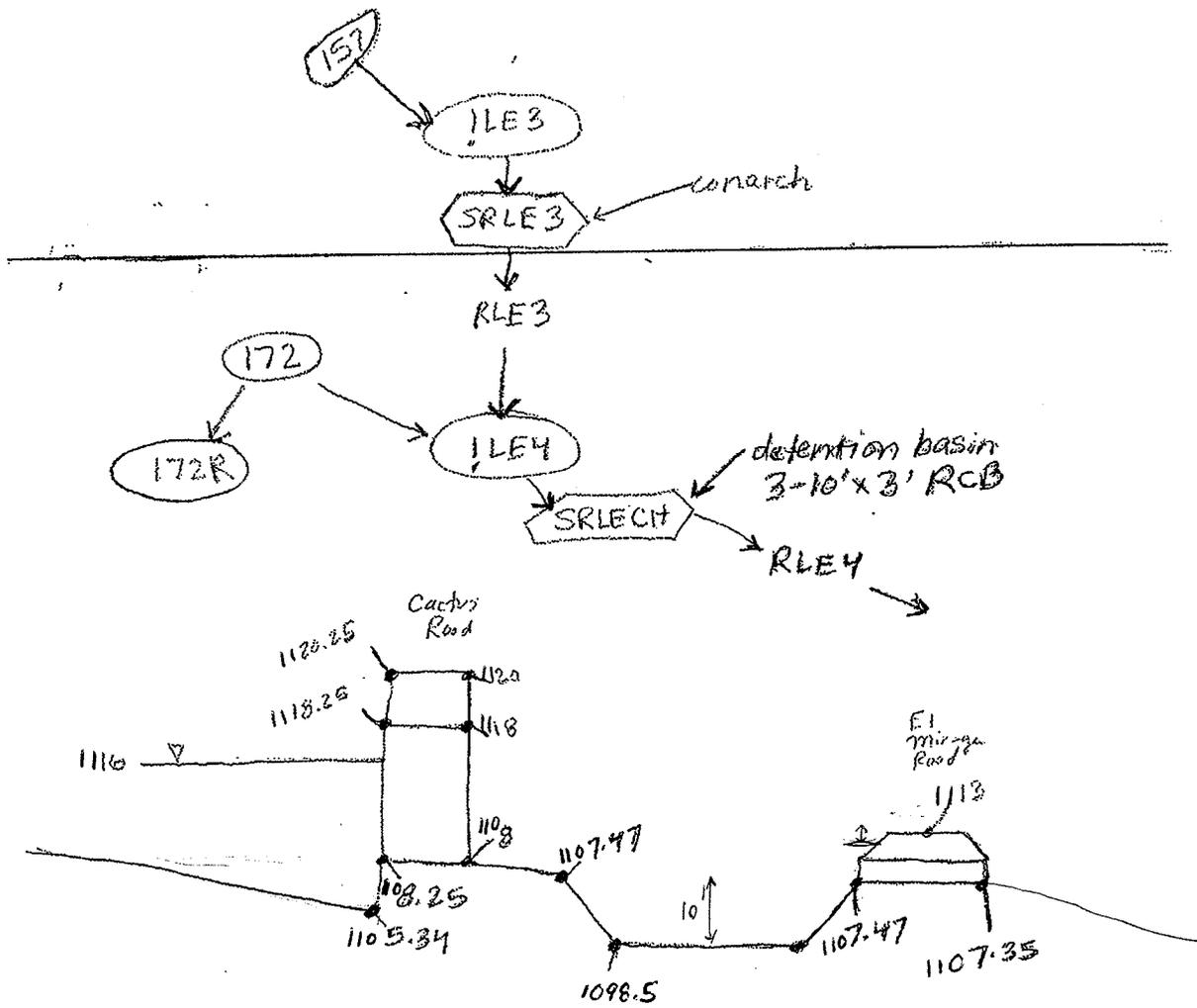
GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	2.03	ft
Critical Depth	1.78	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.00870	ft/ft



Project: Waddell CAR Computed: JM Date: 3/24/09
Subject: Recommended Plan Checked: EC Date: 3/24/09
Task: Revised HEC-1 Schematic Page: 1 of: 1
Job #: _____ No: _____

West Cactus Detention Basin Area



RECOMMENDED PLAN

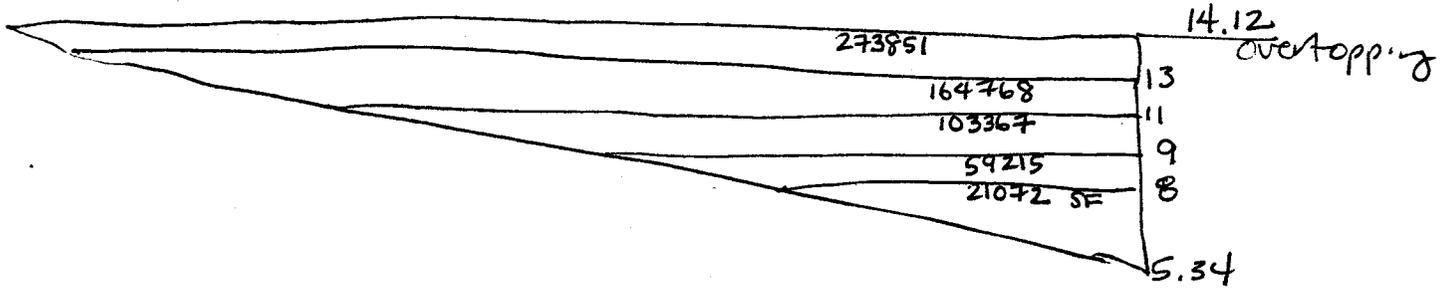
SRLE3

SV	0.00	0.64	4.60	17.30	27.60	56.00
SQ	0	0	139	426	827	1295
SE	1105.34	1108	1110	1112	1114	1116

SRLECH

SV	5.72	11.59	18.17	24.91	32.01	39.46	67.53	67.53	67.53
SQ	0	0	0	0	0	0	0	329	890
SE	1098.5	1099.47	1100.5	1101.5	1102.5	1103.5	1107.5	1110	1113

Rating curve, storage behind Cactus
@ Lower El Mirage Wash



SV = volume in ac-ft

@ elev. 8, vol = $\frac{1}{2} (2.66') (21072 \text{ sf})$
 = 28026 cuft = 0.64 ac-ft

@ elev 9, vol = $\frac{1}{2} (3.66 \text{ ft}) (59215 \text{ sq ft})$
 = 108363 cuft = 2.49 ac-ft

@ elev 11, vol = $\frac{1}{2} (5.66 \text{ ft}) (103367 \text{ sf})$
 = 292529 cuft = 6.7 ac-ft

@ elev 13, vol = $\frac{1}{2} (7.66 \text{ ft}) (164768 \text{ sf})$
 = 631061 cuft = 14.5 ac-ft

@ elev 14.12, vol = $\frac{1}{2} (8.78) (273851)$
 = 1202206 cuft = 27.6 ac-ft

SV	0	0.64	2.49	6.7	14.5	27.6	56.0
SE	1105.34	1108	1109	1111	1113	1114.12	1116

(SRLE3)

Cross Section for ALT1-Cactus Conarch

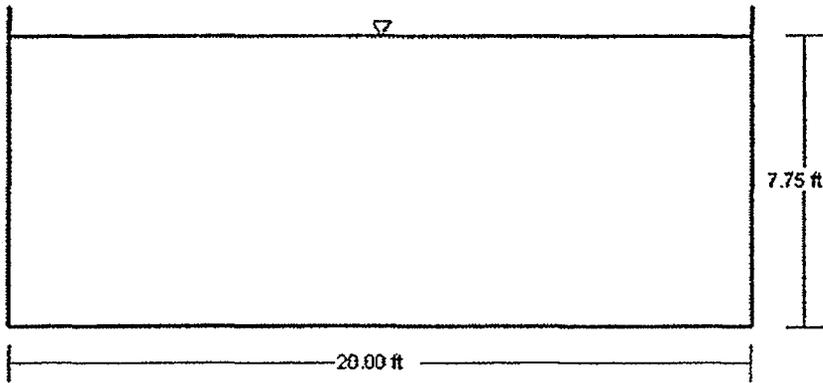
Project Description

Solve For Discharge

Input Data

Discharge	1294.51	ft ³ /s
Headwater Elevation	1116.00	ft
Crest Elevation	1108.25	ft
Weir Coefficient	3.00	US
Crest Length	20.00	ft

Cross Section Image



V:1
H:1

(SRLE3)

Rating Table for ALT1-Cactus Conarch

Project Description

Solve For Discharge

Input Data

Headwater Elevation 1116.00 ft
Crest Elevation 1108.25 ft
Weir Coefficient 3.00 US
Crest Length 20.00 ft

Headwater Elevation (ft) Discharge (ft³/s) Velocity (ft/s)

1108.00		
1110.00	138.90	3.97
1112.00	435.71	5.81
1114.00	827.28	7.19
1116.00	1294.51	8.35

Culvert Calculator Report RECPLAN-EI Mirage Road Culvert

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	1,113.00 ft	Headwater Depth/Height	1.63
Computed Headwater Elev.	1,112.37 ft	Discharge	794.00 cfs
Inlet Control HW Elev.	1,112.37 ft	Tailwater Elevation	1,108.85 ft
Outlet Control HW Elev.	1,112.32 ft	Control Type	Inlet Control

Grades			
Upstream Invert	1,107.47 ft	Downstream Invert	1,107.35 ft
Length	113.00 ft	Constructed Slope	0.001062 ft/ft

Hydraulic Profile			
Profile	CompositeM2PressureProfile	Depth, Downstream	2.79 ft
Slope Type	Mild	Normal Depth	N/A ft
Flow Regime	Subcritical	Critical Depth	2.79 ft
Velocity Downstream	9.48 ft/s	Critical Slope	0.003160 ft/ft

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	10.00 ft
Section Size	10 x 3 ft	Rise	3.00 ft
Number Sections	3		

Outlet Control Properties			
Outlet Control HW Elev.	1,112.32 ft	Upstream Velocity Head	1.21 ft
Ke	0.20	Entrance Loss	0.24 ft

Inlet Control Properties			
Inlet Control HW Elev.	1,112.37 ft	Flow Control	Submerged
Inlet Type	90° headwall w 45° bevels	Area Full	90.0 ft ²
K	0.49500	HDS 5 Chart	10
M	0.66700	HDS 5 Scale	2
C	0.03140	Equation Form	2
Y	0.82000		

Rating Table Report

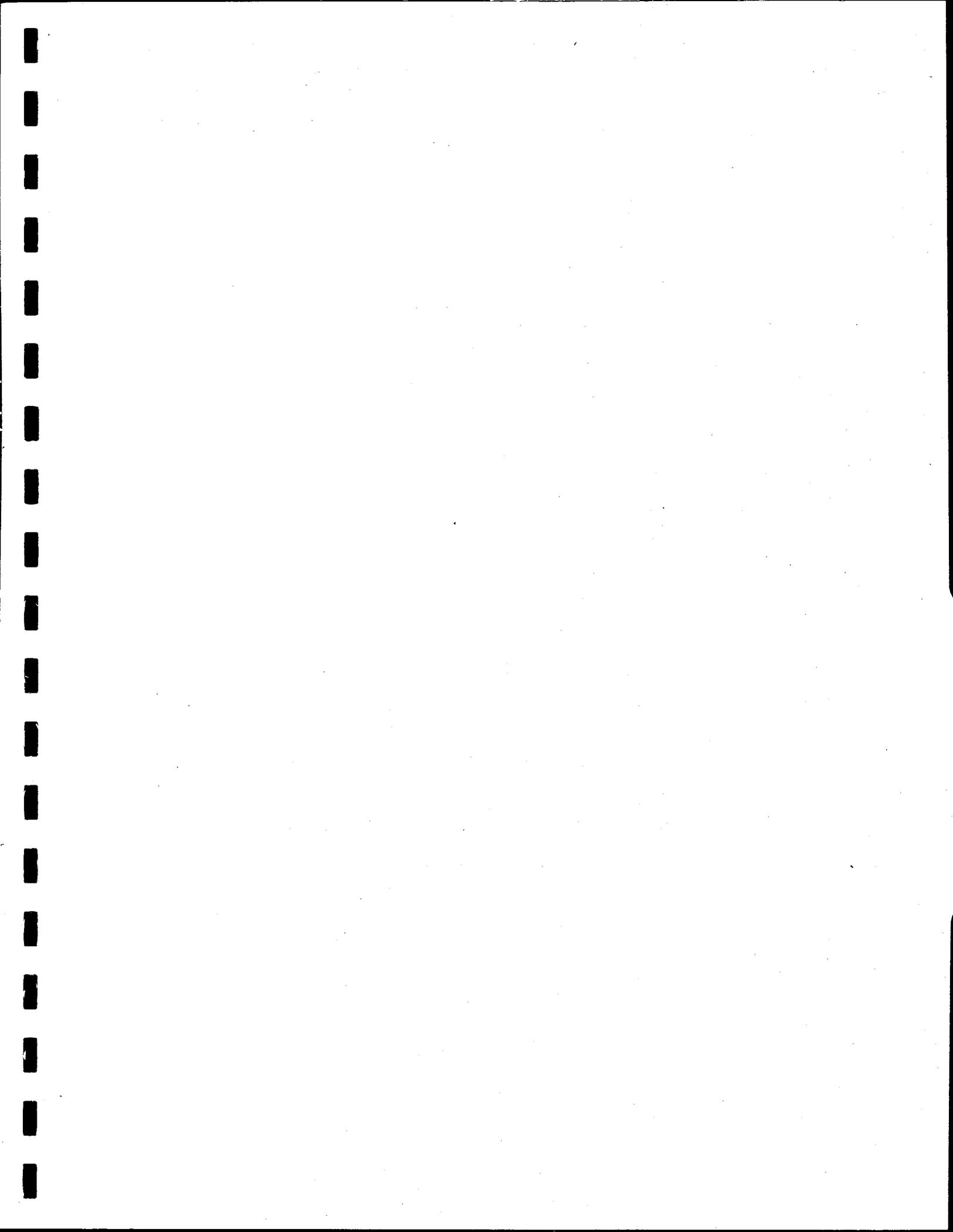
RECPLAN-EI Mirage Road Culvert

Range Data:			
	Minimum	Maximum	Increment
Allowable HW E	1,098.50	1,113.00	0.50 ft

HW Elev. (ft)	Discharge (cfs)
1,098.50	0.00
1,099.00	0.00
1,099.50	0.00
1,100.00	0.00
1,100.50	0.00
1,101.00	0.00
1,101.50	0.00
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1,112.00	731.02
1,112.50	814.48
1,113.00	890.14

RECOMMENDED PLAN
 STORAGE IN WEST CACTUS BASIN
 STORAGE ROUTE SRLECH

Elev	Depth	Top. Area	Bot. Area	Total
	D	Atop	Abot	Vpro
	(ft)	(sq.ft.)	(sq.ft.)	(acre-ft)
1098.5	1.0	256251	241708	5.72
1099.5	2.0	270956	241708	11.59
1100.5	3.0	285822	241708	18.17
1101.5	4.0	300,831	241708	24.91
1102.5	5.0	315,973	241708	32.01
1103.5	6.0	331,224	241708	39.46
1107.5	10.0	346,584	241708	67.53
1110	12.5		241708	67.53
1111	13.5		241708	67.53
1112	14.5		241708	67.53



APPENDIX C

Conceptual Plans for Recommended Plan



WADDELL ROAD CANDIDATE ASSESSMENT REPORT

CONTRACT NUMBER: FCD 2007C015

CONCEPTUAL LEVEL PLANS

FOR RECOMMENDED PLAN

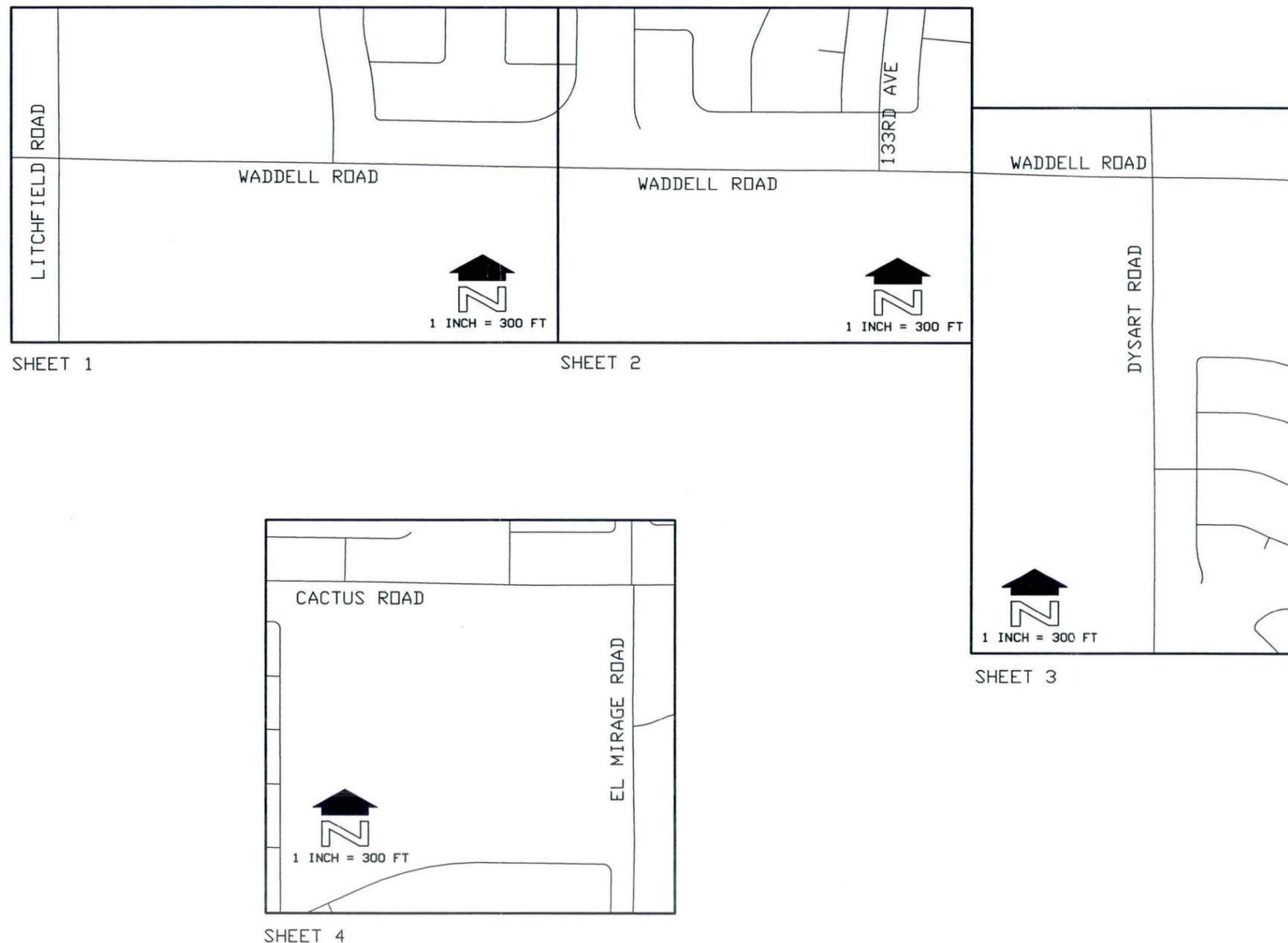
3/27/2009

AUTHORITY FOR STUDY

THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY (FCDMC) HAS CONTRACTED HDR TO PREPARE THIS STUDY UNDER THE CONTRACT NUMBER 2007C015

SHEET INDEX

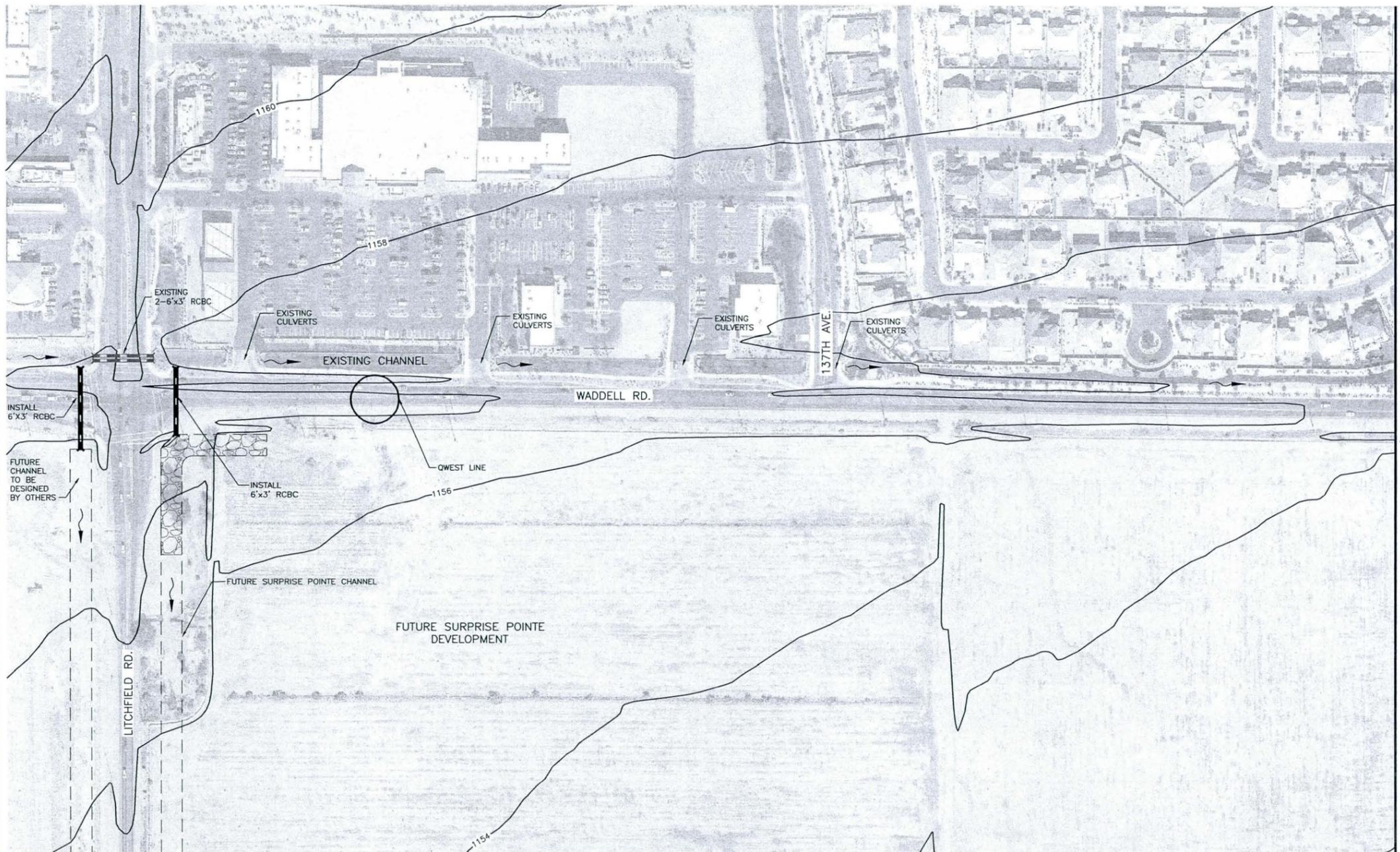
COVER
SHEET 1 - WADDELL ROAD
SHEET 2 - WADDELL ROAD
SHEET 3 - DYSART ROAD
SHEET 4 - WEST CACTUS BASIN



PRELIMINARY
NOT FOR CONSTRUCTION



HDR ENGINEERING, INC.
3200 East Camelback Road, Suite 350
PHOENIX, ARIZONA 85018-2311
(602) 522-7700



MATCH LINE SEE SHEET 2

LEGEND

-  EXISTING CULVERT
-  PROPOSED CULVERT
-  RIP-RAP
-  STORMWATER FLOW DIRECTION
-  1154 CONTOUR ELEVATION AMSL
-  UNDERGROUND UTILITY LOCATION IN ROADWAY

NOTES

SURVEY INFORMATION:
 PROJECT NO. FCD 89-50
 PROJECT NAME: WHITE TANKS-AGUA FRIA ADMS
 TOPOGRAPHIC MAP DATE: 2/15/1990
 VERTICAL DATUM: NGVD29
 HORIZONTAL DATUM: NAD27
 CONTOUR INTERVAL = 2 FEET

ABBREVIATIONS:
 RCBC = REINFORCED CONCRETE BOX CULVERT
 AMSL = ABOVE MEAN SEA LEVEL

NO.	REVISION	BY	DATE
2			
1			

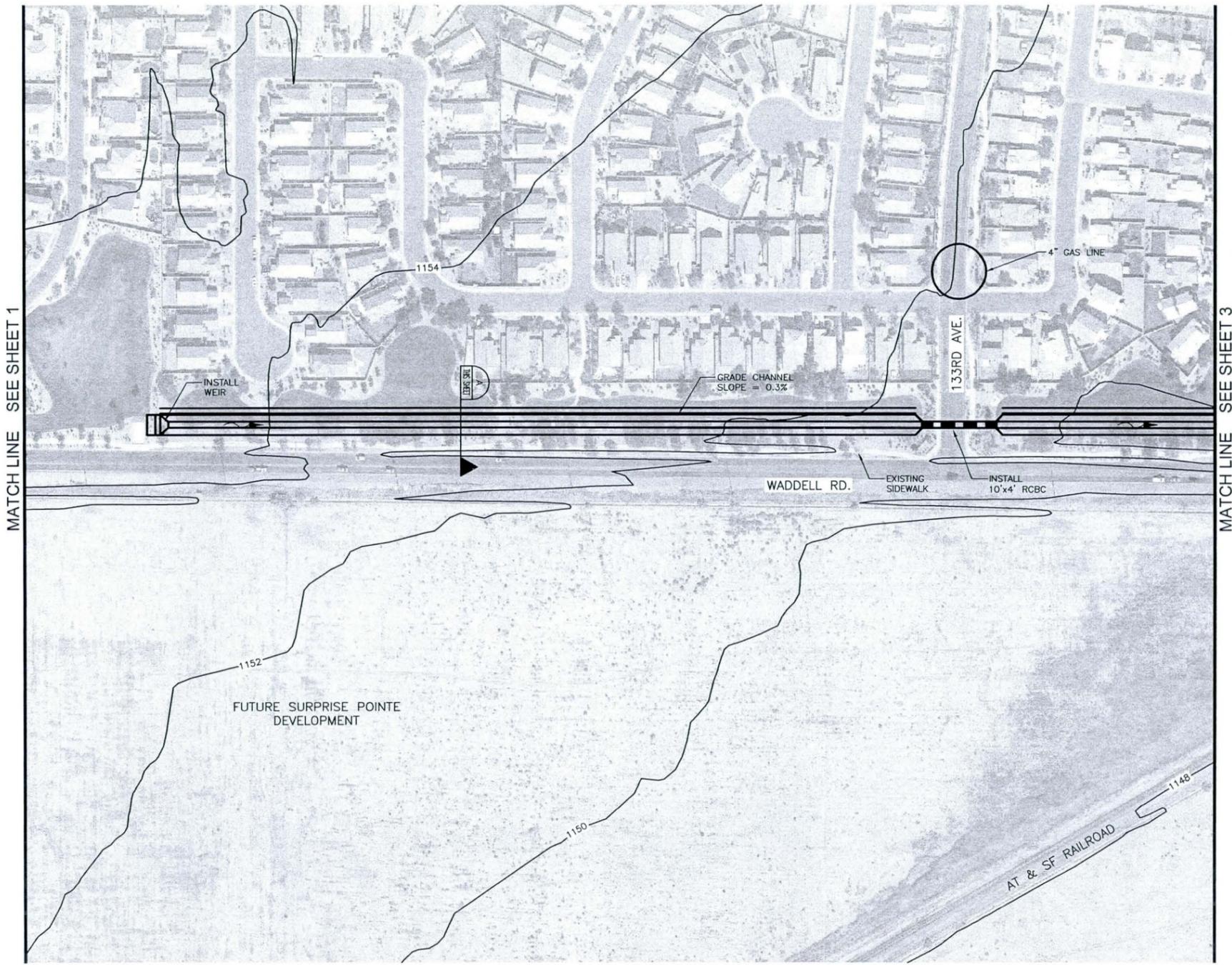
 FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WADDELL ROAD CAR
 CONTRACT NUMBER: FCD 2007C015
 CONCEPTUAL LEVEL PLANS
 WADDELL ROAD

 HDR ENGINEERING, INC.
 3200 East Camelback Road, Suite 350
 PHOENIX, ARIZONA 85018-2311
 (602) 522-7700

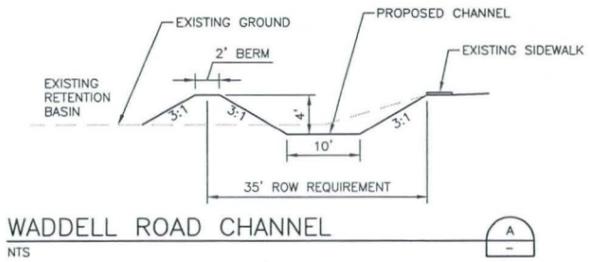
PRELIMINARY
 NOT FOR
 CONSTRUCTION

	BY	DATE
DESIGN	JM	03-27-09
DESIGN CHK.	LP/SM	03-27-09
PLANS	JM/DC	03-27-09
PLANS CHK.	LP/SM	03-27-09



MATCH LINE SEE SHEET 1

MATCH LINE SEE SHEET 3



LEGEND

- EXISTING CULVERT
- PROPOSED CULVERT
- RIP-RAP
- STORMWATER FLOW DIRECTION
- 1154 CONTOUR ELEVATION AMSL
- UNDERGROUND UTILITY LOCATION IN ROADWAY

NOTES

SURVEY INFORMATION:
 PROJECT NO. FCD 89-50
 PROJECT NAME: WHITE TANKS-AGUA FRIA ADMS
 TOPOGRAPHIC MAP DATE: 2/15/1990
 VERTICAL DATUM: NGVD29
 HORIZONTAL DATUM: NAD27
 CONTOUR INTERVAL = 2 FEET

ABBREVIATIONS:
 RCBC = REINFORCED CONCRETE BOX CULVERT
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NO.	REVISION	BY	DATE
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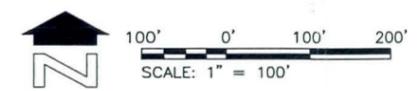
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

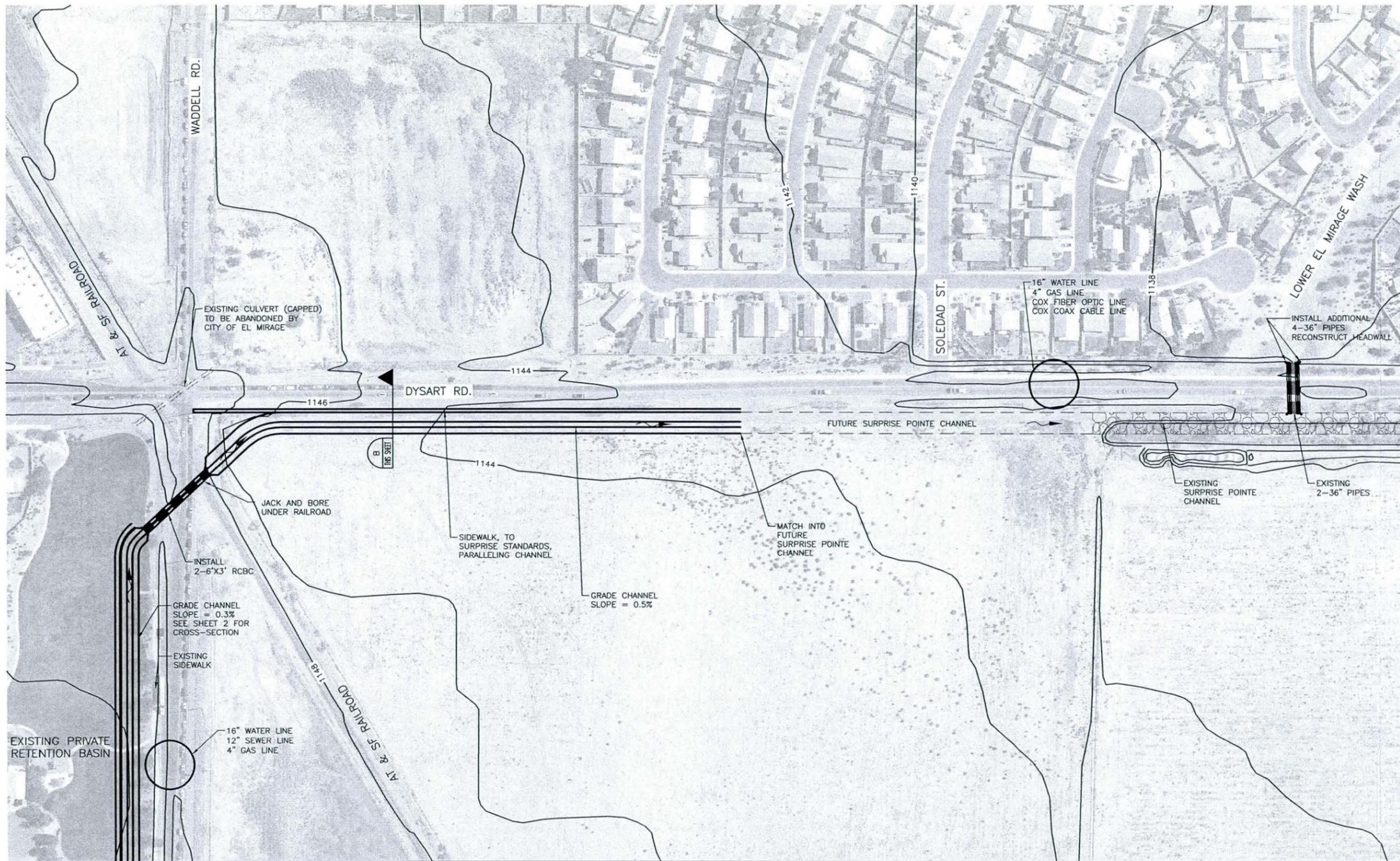
WADDELL ROAD CAR
 CONTRACT NUMBER: FCD 2007C015
 CONCEPTUAL LEVEL PLANS
 WADDELL ROAD

HDR ENGINEERING, INC.
 3200 East Camelback Road, Suite 350
 PHOENIX, ARIZONA 85018-2311
 (602) 522-7700

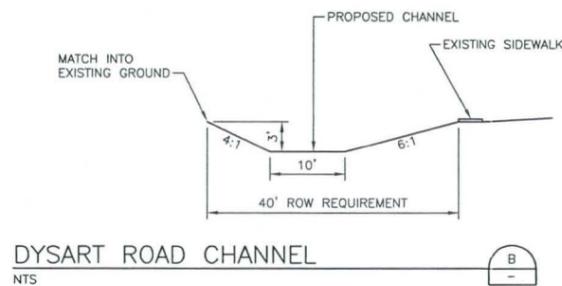
PRELIMINARY
 NOT FOR
 CONSTRUCTION

	BY	DATE
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DESIGN CHK.	LP/SM	03-27-09
PLANS	JM/DC	03-27-09
PLANS CHK.	LP/SM	03-27-09





MATCH LINE SEE SHEET 2



DYSART ROAD CHANNEL
NTS

LEGEND

- EXISTING CULVERT
- PROPOSED CULVERT
- RIP-RAP
- STORMWATER FLOW DIRECTION
- 1154 CONTOUR ELEVATION AMSL
- UNDERGROUND UTILITY LOCATION IN ROADWAY

NOTES

SURVEY INFORMATION:
 PROJECT NO. FCD 89-50
 PROJECT NAME: WHITE TANKS-AGUA FRIA ADMS
 TOPOGRAPHIC MAP DATE: 2/15/1990
 VERTICAL DATUM: NGVD29
 HORIZONTAL DATUM: NAD27
 CONTOUR INTERVAL = 2 FEET

ABBREVIATIONS:
 RCBC = REINFORCED CONCRETE BOX CULVERT
 AMSL = ABOVE MEAN SEA LEVEL

NO.	REVISION	BY	DATE
2			
1			

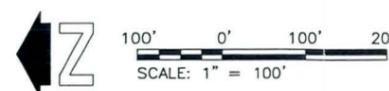
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

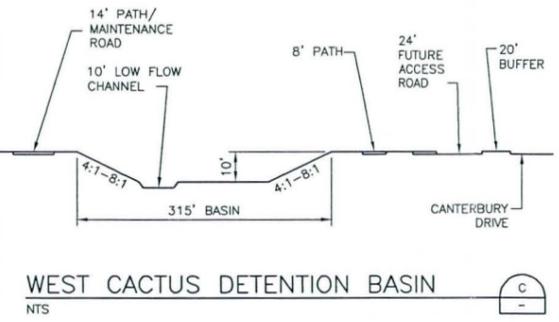
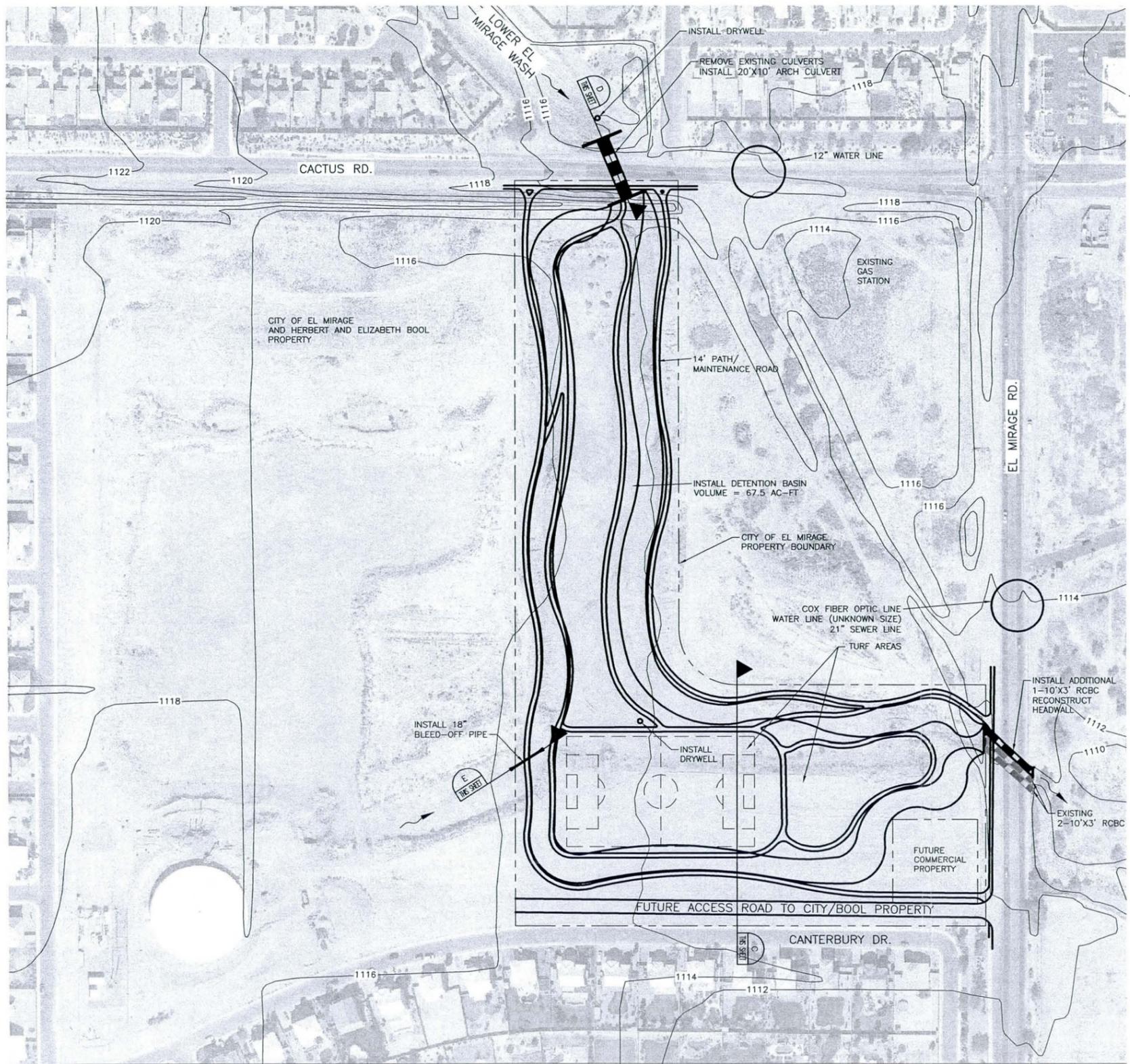
WADDELL ROAD CAR
 CONTRACT NUMBER: FCD 2007C015
 CONCEPTUAL LEVEL PLANS
 DYSART ROAD

HDR ENGINEERING, INC.
 3200 East Camelback Road, Suite 350
 PHOENIX, ARIZONA 85018-2311
 (602) 522-7700

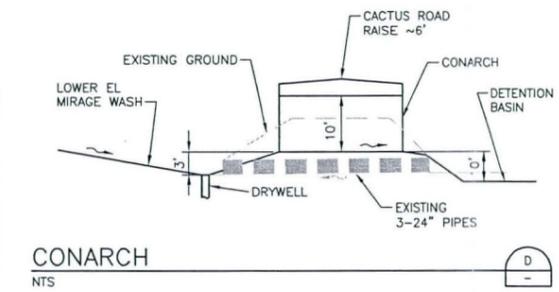
PRELIMINARY
 NOT FOR
 CONSTRUCTION

DESIGN	BY	DATE
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DESIGN CHK.	LP/SM	03-27-09
PLANS	JM/DC	03-27-09
PLANS CHK.	LP/SM	03-27-09

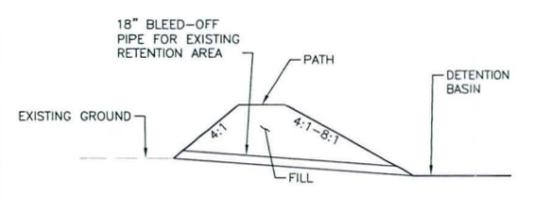




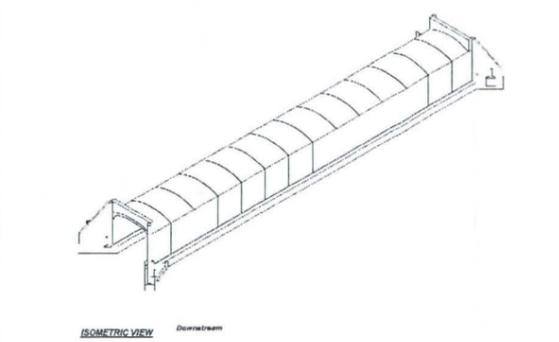
WEST CACTUS DETENTION BASIN
NTS



CONARCH
NTS



BLEED-OFF PIPE
NTS



CONARCH

- LEGEND**
- EXISTING CULVERT
 - PROPOSED CULVERT
 - RIP-RAP
 - STORMWATER FLOW DIRECTION
 - 1154 CONTOUR ELEVATION AMSL
 - UNDERGROUND UTILITY LOCATION IN ROADWAY

NOTES

SURVEY INFORMATION:
 PROJECT NO. FCD 89-50
 PROJECT NAME: WHITE TANKS-AGUA FRIA ADMS
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 VERTICAL DATUM: NGVD29
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 CONTOUR INTERVAL = 2 FEET

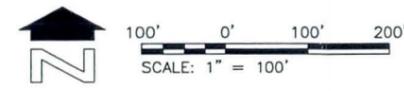
ABBREVIATIONS:
 RCBC = REINFORCED CONCRETE BOX CULVERT
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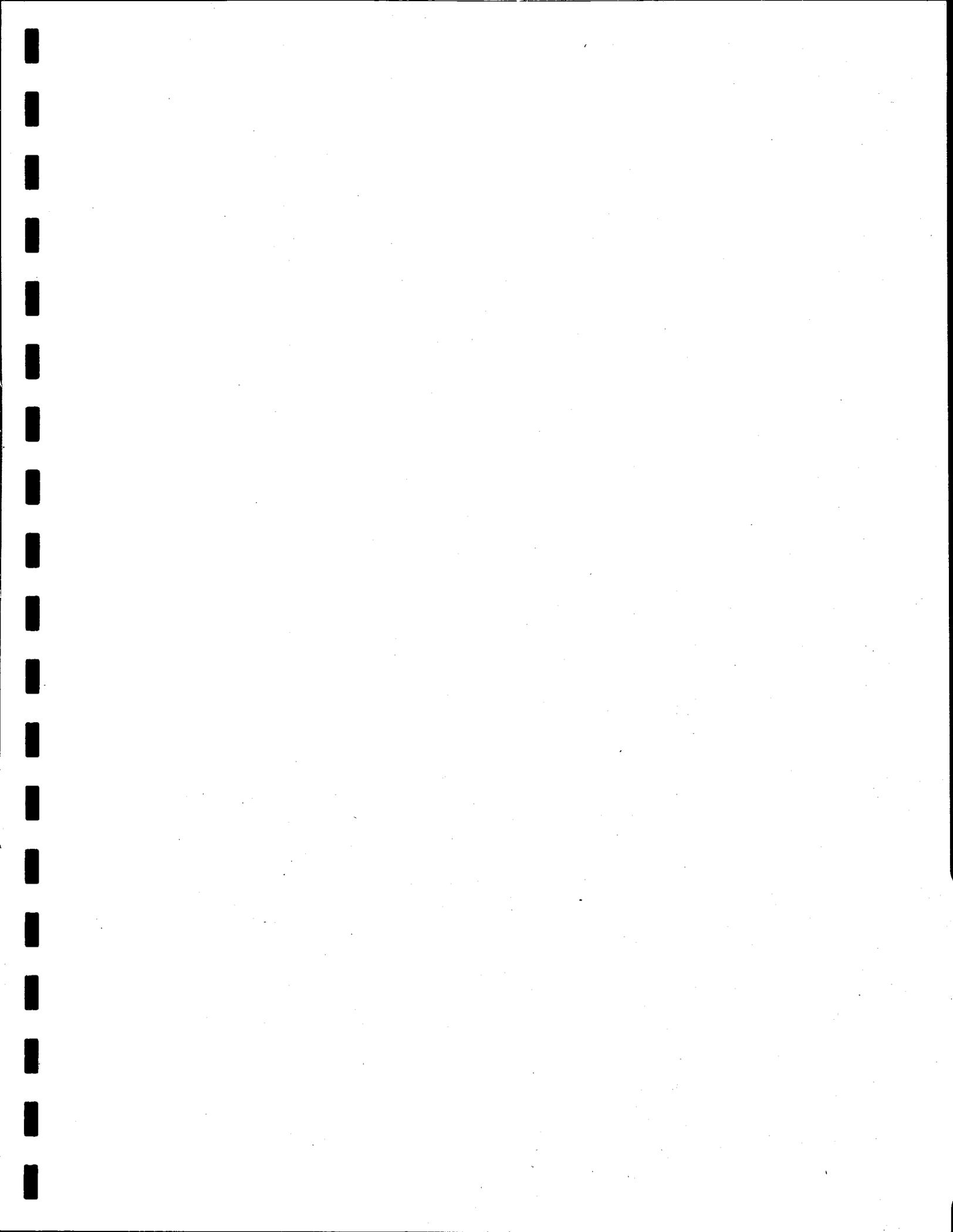
NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WADDELL ROAD CAR
CONTRACT NUMBER: FCD 2007C015
CONCEPTUAL LEVEL PLANS
WEST CACTUS BASIN

PRELIMINARY NOT FOR CONSTRUCTION	HDR ENGINEERING, INC. 3200 East Camelback Road, Suite 350 PHOENIX, ARIZONA 85018-2311 (602) 522-7700	
	BY	DATE
	DESIGN	JM 03-27-09
	DESIGN CHK.	LP/SM 03-27-09
	PLANS	JM/DC 03-27-09
PLANS CHK.	LP/SM 03-27-09	





APPENDIX D

Cost Estimates

Waddell Road CAR

Flood Control District of Maricopa County, Arizona

WADDELL ROAD AREA RECOMMENDED PLAN

Item	Quantity	Unit	Unit Cost	Total Cost
FLOOD CONTROL FUNCTION				
6'x3' RCBC at Waddell and Litchfield Road	126	L.F.	\$500	\$63,000
Pavement Replacement for 6'x3' Box Culvert	190	S.Y.	\$30	\$5,700
6'x3' RCBC at Waddell and Litchfield Road	150	L.F.	\$430	\$64,500
Pavement Replacement for 6'x3' Box Culvert	190	S.Y.	\$30	\$5,700
Excavation for Waddell channel	2,128	C.Y.	\$5	\$10,640
Fill for Waddell channel berm	2,650	C.Y.	\$5	\$13,250
10'x4' RCBC at 133rd Ave	125	L.F.	\$750	\$93,750
Pavement Replacement at 133rd Ave	72	S.Y.	\$30	\$2,160
6'x3' RCBC (160 L.F. x 2 culverts) at Waddell and Dysart	320	L.F.	\$430	\$137,600
Pavement Replacement for 2-6'x3' RCBC	90	S.Y.	\$30	\$2,700
Headwall	20	EA	\$6,500	\$130,000
Jack & Bore under railroad (50' x 2 culverts)	100	L.F.	\$783	\$78,300
Excavation for Dysart channel	2,830	C.Y.	\$5	\$14,150
Land Acquisition (land owned by Pierce Hardy LP)	1	AC	\$200,000	\$200,000
4-36" Pipe Culverts (92 L.F. x 4 = 368 L.F.) Dysart and Wash	368	L.F.	\$155	\$57,040
Pavement Replacement for 4-36" Pipe Culverts	193	S.Y.	\$30	\$5,790
Utility Relocations	-	-	-	\$200,000
Subtotal				\$1,084,280
Engineering Design (10%)				\$108,428
Contingency (20%)				\$216,856
2009 Escalation (6%)				\$65,057
Total				\$1,474,621

LANDSCAPING/MULTI-USE*

Landscape (suburban channel)	2.6	AC	\$76,000	\$197,600
Subtotal				\$197,600
Engineering Design (10%)				\$19,760
Contingency (20%)				\$39,520
2009 Escalation (6%)				\$11,856
Total				\$268,736

TOTAL OPINION OF PROBABLE COST				\$1,743,357
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Note: All costs are 2008 and include labor and materials.

* The 1992 Policy for the Aesthetic Treatment and Landscaping of Flood Control Projects caps the cost of a Suburban Channel at \$40,000 per acre. The landscaping cost ceiling based on the 1992 policy is estimated at \$104,000 (2.6 acres) for the purpose of cost share analysis.

WEST CACTUS DETENTION BASIN RECOMMENDED PLAN

Item	Quantity	Unit	Unit Cost	Total Cost
FLOOD CONTROL FUNCTION				
20'X10' Conarch under Cactus Road	110	L.F.	\$3,000.00	\$330,000
Pavement Replacement for Conarch	762	S.Y.	\$30	\$22,860
Fill for raising Cactus Road	1,523	C.Y.	\$5	\$7,615
10'x3' RCBC under El Mirage Road (112 L.F. x 2 culvert)	224	L.F.	\$700	\$156,800
Headwall	2	EA	\$6,500	\$13,000
Pavement Replacement for 10'x3' RCBC	284	S.Y.	\$30	\$8,520
18" Bleed-off Concrete Pipe	144	L.F.	\$135	\$19,440
18" Flared End Section	2	EA	\$450	\$900
Drywell	2	EA	\$15,000	\$30,000
Excavation for basin	130,000	C.Y.	\$5	\$650,000
Utility Relocations	-	-	-	\$200,000
14' concrete maintenance road	20,482	S.F.	\$4	\$81,928
Subtotal				\$1,521,063
Engineering Design (10%)				\$152,106
Contingency (20%)				\$304,213
2009 Escalation (6%)				\$91,264
Total				\$2,068,646

LANDSCAPING/MULTI-USE*

Landscape (suburban basin)	7.8	AC	\$76,000	\$592,800
Multiuse (paths)	54,952	S.F.	\$4	\$219,808
Multiuse-aesthetics (arch culvert veneer)	400	S.F.	\$12	\$4,800
Multiuse-aesthetics (colored concrete paths and maint. road)	75,434	S.F.	\$1	\$75,434
Multiuse-amenities (ramadas)	2	EA	\$40,000	\$80,000
Subtotal				\$972,842
Engineering Design (10%)				\$97,284
Contingency (20%)				\$194,568
2009 Escalation (6%)				\$58,371
Total				\$1,323,065

TOTAL OPINION OF PROBABLE COST				\$3,391,711
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Note: All costs are 2008 and include labor and materials.

* The 1992 Policy for the Aesthetic Treatment and Landscaping of Flood Control Projects caps the cost of a Suburban Channel at \$40,000 per acre. The landscaping cost ceiling based on the 1992 policy is estimated at \$312,000 (7.8 acres) for the purpose of cost share analysis.

Waddell Road CAR

Flood Control District of Maricopa County, Arizona

WADDELL ROAD AREA ALTERNATIVE #1

Item	Quantity	Unit	Unit Cost	Total Cost
7'x3' Box Culvert	220	L.F.	\$500.00	\$110,000
Pavement Removal and Replacement	320	S.Y.	\$30.00	\$9,600
6'x3' Box Culvert	170	L.F.	\$430.00	\$73,100
Pavement Removal and Replacement	190	S.Y.	\$30.00	\$5,700
Excavation for channel from 137th Street to Dysart	8,815	C.Y.	\$8.00	\$70,519
Pavement Removal and Replacement	70	S.Y.	\$30.00	\$2,100
10'x4' RBC	120	L.F.	\$750.00	\$90,000
10'x4' RBC	120	L.F.	\$750.00	\$90,000
Multi-use/Landscape	2.9	AC	\$217,500	\$217,500
4-36" Culverts (460 L.F. x 4 = 1840 L.F.)	1,840	L.F.	\$155.00	\$285,200
Pavement Removal and Replacement	170	S.Y.	\$30.00	\$5,100
36" Jack & Bore under railroad (50' x 5-36" pipes)	250	L.F.	\$783.00	\$195,750
Excavation for Dysart channel	3,000	C.Y.	\$8.00	\$24,000
Land Acquisition (land owned by Pierce Hardy LP)	1	AC	\$50,000.00	\$50,000
Multi-use/Landscape	0.8	AC	\$60,000	\$60,000
Additional 4-36" Culverts (80 L.F. x 4 = 320 L.F.)	320	L.F.	\$155.00	\$49,600
Pavement Removal and Replacement	80	S.Y.	\$30.00	\$2,400
Utility Relocations	-	-	-	\$400,000
Subtotal				\$1,740,569
Engineering Design (10%)				\$174,057
Contingency (20%)				\$348,114
2009 Escalation (6%)				\$104,434
TOTAL OPINION OF PROBABLE COST				\$2,367,174

Note: All costs are 2008 and include labor and materials.

Waddell Road CAR

Flood Control District of Maricopa County, Arizona

WADDELL ROAD AREA ALTERNATIVE #2

Item	Quantity	Unit	Unit Cost	Total Cost
2-7'x3' Box Culvert SE (220 L.F. x 2 = 440 L.F.)	440	L.F.	\$500.00	\$220,000
Pavement Replacement	460	S.Y.	\$30.00	\$13,800
6'x3' Box Culvert	170	L.F.	\$430.00	\$73,100
Pavement Removal and Replacement	190	S.Y.	\$30.00	\$5,700
Excavation for channel from 137th Street to Dysart	5,963	C.Y.	\$8.00	\$47,704
8-36" Culverts (120 L.F. x 3 = 960 L.F.)	960	L.F.	\$155.00	\$148,800
Pavement Removal and Replacement	105	S.Y.	\$30.00	\$3,150
Multi-use/Landscape	2.9	AC	\$75,000.00	\$217,500
3-36" Culverts (460 L.F. x 5 = 2300 L.F.)	2,300	L.F.	\$155.00	\$356,500
Pavement Removal and Replacement	120	S.Y.	\$30.00	\$3,600
36" Jack & Bore under railroad (50' x 3-36" pipes)	150	L.F.	\$783.00	\$117,450
Excavation for Dysart channel	2,500	C.Y.	\$8.00	\$20,000
Land Acquisition (land owned by Pierce Hardy LP)	1	AC	\$50,000.00	\$50,000
Multi-use/Landscape	0.8	AC	\$75,000.00	\$60,000
Additional -36" Culvert (80 L.F.)	80	L.F.	\$155.00	\$12,400
Pavement Removal and Replacement	38	S.Y.	\$30.00	\$1,140
Land Acquisition (owned by Surprise/Dysart Properties, LLC)	11.3	AC	\$50,000.00	\$565,000
Detention Basin Excavation	69,373	C.Y.	\$5.00	\$346,865
Basin Park Improvements	10.5	A.C.	\$120,000	\$1,260,000
Utility Relocations	-	-	-	\$400,000
Subtotal				\$3,922,709
Engineering Design (10%)				\$392,271
Contingency (20%)				\$784,542
2009 Escalation (6%)				\$235,363
TOTAL OPINION OF PROBABLE COST				\$5,334,884

Note: All costs are 2008 and include labor and materials.

Waddell Road CAR

Flood Control District of Maricopa County, Arizona

WADDELL ROAD AREA ALTERNATIVE #3

Item	Quantity	Unit	Unit Cost	Total Cost
7'x3' Box Culvert	220	L.F.	\$500.00	\$110,000
Pavement Removal and Replacement	320	S.Y.	\$30.00	\$9,600
6'x3' Box Culvert	170	L.F.	\$430.00	\$73,100
Pavement Removal and Replacement	190	S.Y.	\$30.00	\$5,700
Extend AT & SF Channel to Dysart	9,630	C.Y.	\$8.00	\$77,040
Multi-use/Landscape	4.8	AC	\$65,000	\$312,000
AT&SF Channel Acquisition (owned by Surprise Pointe)	3	AC	\$50,000.00	\$149,219
8'x4' RBC	120	L.F.	\$620.00	\$74,400
Pavement Removal and Replacement	70	S.Y.	\$30.00	\$2,100
Additional 1-36" Culvert	80	L.F.	\$155.00	\$12,400
Pavement Removal and Replacement	40	S.Y.	\$30.00	\$1,200
Land Acquisition (owned by Surprise/Dysart Properties, LLC)	33.1	AC	\$50,000.00	\$1,655,000
Detention Basin Excavation	208,120	C.Y.	\$5.00	\$1,040,600
Basin Park Improvements	32	A.C.	\$79,000.00	\$2,528,000
Utility Relocations	-	-	-	\$200,000
Subtotal				\$6,250,359
Engineering Design (10%)				\$625,036
Contingency (20%)				\$1,250,072
2009 Escalation (6%)				\$375,022
TOTAL OPINION OF PROBABLE COST				\$8,500,488

Note: All costs are 2008 and include labor and materials.

Waddell Road CAR

Flood Control District of Maricopa County, Arizona

WEST CACTUS DETENTION BASIN ALTERNATIVE #1

Item	Quantity	Unit	Unit Cost	Total Cost
20'X10' Conarch under Cactus Road	80	L.F.	\$3,000.00	\$240,000
Pavement Removal and Replacement	500	S.Y.	\$30.00	\$15,000
10'x3' Box Culverts under El Mirage Road (120 L.F. x 2 culverts)	240	L.F.	\$700.00	\$168,000
Pavement Removal and Replacement	750	S.Y.	\$30.00	\$22,500
Onsite Storm Drain Outfall Extension (estimated 36" pipe)	1,140	L.F.	\$155.00	\$176,700
Cactus Road Drywell	1	EA	\$15,000.00	\$15,000
Manhole	1	EA	\$6,500.00	\$6,500
Imported Fill*	241,300.0	C.Y.	\$8.00	\$1,930,400
Multiuse/Landscape	14.0	AC	\$78,000.00	\$1,092,000
Subtotal				\$3,666,100
Engineering Design (10%)				\$366,610
Contingency (20%)				\$733,220
2009 Escalation (6%)				\$219,966
TOTAL OPINION OF PROBABLE COST				\$4,985,896

Note: All costs are 2008 and include labor and materials.

Waddell Road CAR

Flood Control District of Maricopa County, Arizona

WEST CACTUS DETENTION BASIN ALTERNATIVE #2

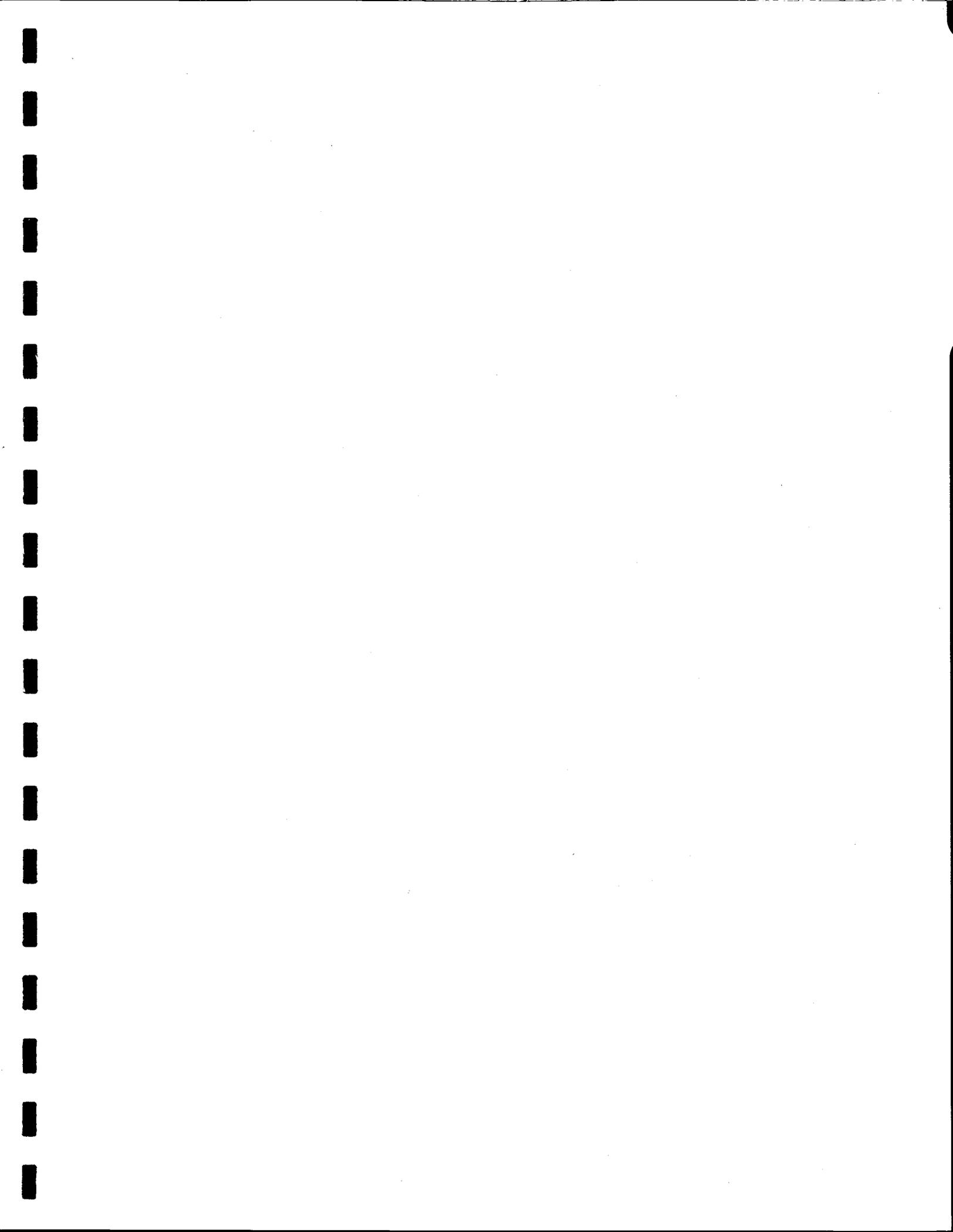
Item	Quantity	Unit	Unit Cost	Total Cost
10'x6' Box Culverts under Cactus Road (110 L.F. x 3 culverts)	330	L.F.	\$850	\$280,500
Pavement Removal and Replacement	500	S.Y.	\$30	\$15,000
10'x3' Box Culverts under El Mirage Road (120 L.F. x 12 culvert)	120	L.F.	\$700	\$84,000
Pavement Removal and Replacement	230	S.Y.	\$30	\$6,900
Onsite Storm Drain Outfall Extension (estimated 36" pipe)	1,140	L.F.	\$155	\$176,700
Cactus Road Drywell	2	EA	\$15,000	\$30,000
Manhole	1	EA	\$6,500	\$6,500
Multi-use/Landscape	14	AC	\$78,000	\$1,092,000
Subtotal				\$1,691,600
Engineering Design (10%)				\$169,160
Contingency (20%)				\$338,320
2009 Escalation (6%)				\$101,496
TOTAL OPINION OF PROBABLE COST				\$2,300,576

Note: All costs are 2008 and include labor and materials.

WEST CACTUS DETENTION BASIN ALTERNATIVE #3

Item	Quantity	Unit	Unit Cost	Total Cost
10'x6' Box Culverts under Cactus Road (110 L.F. x 3 culverts)	330	L.F.	\$850	\$280,500
Pavement Removal and Replacement	500	S.Y.	\$30	\$15,000
10'x3' Box Culverts under El Mirage Road (120 L.F. x 3 culverts)	360	L.F.	\$700	\$252,000
Pavement Removal and Replacement	620	S.Y.	\$30	\$18,600
Onsite Storm Drain Outfall Extension (estimated 36" pipe)	1,140	L.F.	\$155	\$176,700
Cactus Road Drywell	2	EA	\$15,000	\$30,000
Manhole	1	EA	\$6,500	\$6,500
Multi-use/Landscape	14	AC	\$81,000	\$1,134,000
Subtotal				\$1,913,300
Engineering Design (10%)				\$191,330
Contingency (20%)				\$382,660
2009 Escalation (6%)				\$114,798
TOTAL OPINION OF PROBABLE COST				\$2,602,088

Note: All costs are 2008 and include labor and materials.



APPENDIX E

Utility Information

UTILITY CONFLICTS

WADDELL ROAD AREA ALTERNATIVE #1

Culvert crossing at Waddell near Dysart

- 1) 16" water line to be relocated
- 2) 12" sewer line to be relocated
- 3) 4" gas line to be relocated
- 4) Cox vacant duct structure to be relocated

Culvert crossing at 133rd Avenue

- 1) 4" gas line to be relocated

Culvert crossing at Dysart at Lower El Mirage Wash

- 1) 16" water line to be dipped
- 2) 4" gas line to be relocated
- 3) Cox fiber optic to be relocated (don't know how deep)
- 4) Cox coax cable to be relocated (don't know how deep)

Culvert Crossings at Waddell and Litchfield

- 1) 4" gas line to be relocated
- 2) Cox coax cable to be relocated (don't know how deep)
- 3) Qwest lines to be relocated
- 4) 16" sewer line to be dipped

WADDELL ROAD AREA ALTERNATIVE #2

Culvert crossing at Waddell near Dysart

- 1) 16" water line to be relocated
- 2) 12" sewer line to be relocated
- 3) 4" gas line to be relocated
- 4) Cox vacant duct structure to be relocated

Culvert crossing at 133rd Avenue

- 1) 4" gas line to be relocated

Culvert crossing at Dysart at Lower El Mirage Wash

- 1) 16" water line to be dipped
- 2) 4" gas line to be relocated
- 3) Cox fiber optic to be relocated (don't know how deep)
- 4) Cox coax cable to be relocated (don't know how deep)

Culvert Crossings at Waddell and Litchfield

- 1) 4" gas line to be relocated
- 2) Cox coax cable to be relocated (don't know how deep)
- 3) Qwest lines to be relocated
- 4) 16" sewer line to be dipped

Waddell Road CAR

Flood Control District of Maricopa County, Arizona

WADDELL ROAD AREA ALTERNATIVE #3

Culvert Crossings at Waddell and Litchfield

- 1) 4" gas line to be relocated
- 2) Cox coax cable to be relocated
- 3) Qwest lines to be relocated
- 4) 16" sewer line to be dipped

Culvert crossing at Waddell for AT&SF Channel Extension

- 1) 16" water line to be dipped
- 2) 4" gas line to be relocated
- 3) Qwest line to be relocated
- 4) Cox vacant duct structure to be relocated

Culvert crossing at Dysart at Lower El Mirage Wash

- 1) 16" water line to be dipped
- 2) 4" gas line to be relocated
- 3) Cox fiber optic to be relocated (don't know how deep)
- 4) Cox coax cable to be relocated (don't know how deep)

WEST CACTUS DETENTION BASIN ALTERNATIVE #1

Culvert crossing at El Mirage Road

- 1) Cox fiber optic to be relocated
- 2) Cox duct structure to be relocated

WEST CACTUS DETENTION BASIN ALTERNATIVE #2

Culvert crossing at El Mirage Road

- 1) Cox fiber optic to be relocated
- 2) Cox duct structure to be relocated

WEST CACTUS DETENTION BASIN ALTERNATIVE #3

Culvert crossing at El Mirage Road

- 1) Cox fiber optic to be relocated
- 2) Cox duct structure to be relocated

Waddell Road CAR

Flood Control District of Maricopa County, Arizona

WADDELL ROAD AREA RECOMMENDED PLAN

Culvert crossing at Waddell near Dysart

- 1) 16" water line to be relocated
- 2) 12" sewer line to be relocated
- 3) 4" gas line to be relocated
- 4) Cox vacant duct structure to be relocated

Culvert crossing at 133rd Avenue

- 1) 4" gas line to be relocated

Culvert crossing at Dysart at Lower El Mirage Wash

- 1) 16" water line to be dipped
- 2) 4" gas line to be relocated
- 3) Cox fiber optic to be relocated (don't know how deep)
- 4) Cox coax cable to be relocated (don't know how deep)

Culvert Crossings at Waddell and Litchfield

- 1) 4" gas line to be relocated
- 2) Cox coax cable to be relocated (don't know how deep)
- 3) Qwest lines to be relocated
- 4) 16" sewer line to be dipped

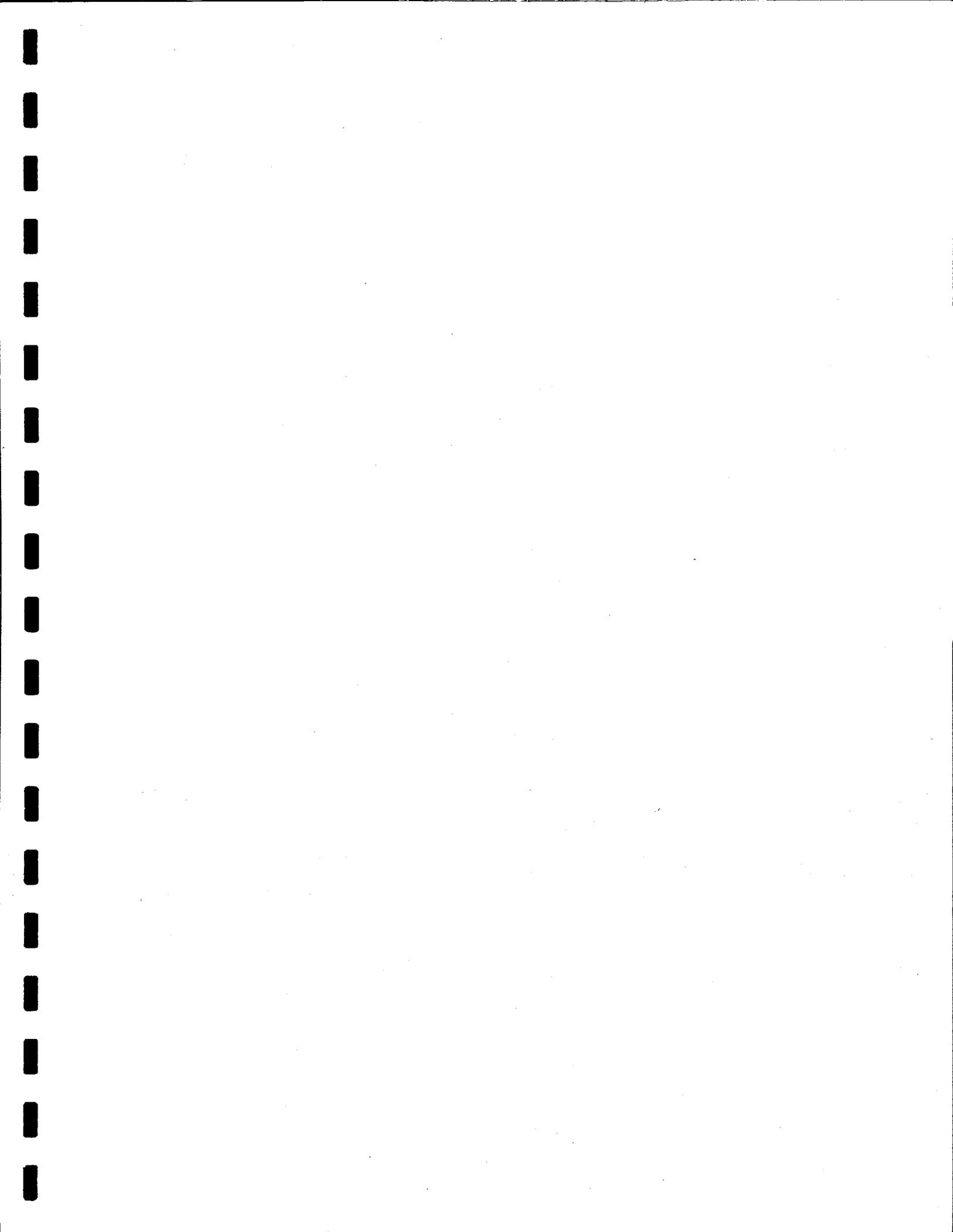
WEST CACTUS DETENTION BASIN RECOMMENDED PLAN

Culvert crossing at El Mirage Road

- 1) Cox fiber optic to be relocated
- 2) Cox duct structure to be relocated
- 3) water line to be dipped
- 4) 21" sewer to be relocated

Culvert crossing at Cactus Road

- 1) 12" water line to be dipped



APPENDIX F

Meeting Agendas and Minutes



Waddell CAR

FCDMC Project No. 2007C015
HDR Project No. TBD

Meeting Location: City of Surprise

Kick-off Meeting Agenda

June 27, 2008 (8am – 9am)

- I. Introductions
- II. Project Goals & Project Partner Expectations
- III. Project Scope of Work
 - Location
 - Hydrology
 - Alternative Alignments
 - Landscape Design
 - Time frame – six (6) months
- IV. Schedule and Subsequent Meetings and Site Visits
 - Surprise request for two additional site visits discussion (scheduling)
- V. Data Collection Needs
- VI. Other special Attention Items and Issues
 - Utility Conflicts
 - Stakeholder/Public Concerns
 - On-going Development
 - Multi-use expectations
- VII. Administrative Items
 - Invoicing
 - Communication Protocols
- VIII. Action Items

Flood Control District of Maricopa County (FCDMC)
Waddell CAR
Contract FCD 2007C015
HDR Project No. 86345

MEETING NOTES

Meeting: Project Kick-off Meeting
Location: City of Surprise
Date: June 27, 2008
Time: 8:00 am – 9:00 am

Prepared by: Scott Mars

Project Discussion

1. Lance Calvert mentioned El Mirage is moving forward with NOAA 14
 - a. Wood Patel Study of the Waddell Wash Crossing at Cactus (constraint of 1,000 cfs allowed to discharge into the Roberts Development)
 - b. El Mirage has a consultant (Wood/Patel) working on the intersection of El Mirage and Cactus and the Lower El Mirage Wash crossing using the NOAA 14 hydrology.
2. Road Project at Dysart Road/Thunderbird Intersection (change the configuration from 1-1 to 3-2-3 possibly) begin construction before year end
3. Burke is the FCDMC project manager for the ATRR project
4. Suneel (City of Surprise) is the project manager for the Reems Road Channel Project. Suneel is not sure if this project is in the model. Jennifer asked Suneel to confirm. Suneel noted that the design of the Reems channel is for 1500 to 2000 cfs at Cactus Rd. John (FCDMC) believes the actual Q peak is 1640 cfs.
5. Discussion of NOAA 14 vs NOAA 2 use for CAR: the White Tanks/Agua Fria ADMP Hydrology uses NOAA 2. It was decided on that the Waddell CAR will use NOAA 2 data for Hydrology and then when the project goes into pre-design, they may take into consideration the ADMP Update (which will use NOAA 14).
6. Reems Road Channel- working on project now- starts between Bell and Greenway, and continues south to Peoria
 - a. Not believed to be in the HEC-1 Model now for existing conditions, believed to be updated in 2007
 - b. There is a CLOMR for the Reems Road Channel- Lynn Thomas at Flood Control should be able to provide
 - c. Cactus to Peoria channel is now in place
 - d. Starting construction of culverts at Cactus
 - e. Basin south of Peoria- discussion of the basin size differing from that of the plans
 - f. Between Cactus and Waddell/Thunderbird not yet constructed (complete within next 2 years)
 - g. The Reems Road project is not in the model right now. If it were, it might show decreased flows. Channel construction will be complete in 2-3 years (the portion

from Cactus to Waddell). South of Cactus is built. The channel begins south of Bell.

7. Lance Calvert (El Mirage):
 - a. Mentioned Cactus Road crossing is known bad condition
 - b. The Roberts Development has long history of sensitive issues with El Mirage and the FCDMC – we can not increase the flow to this area (which have been calculated to be 1,000 cfs by the Cactus/El Mirage Study conducted by Wood Patel)
 - c. Want effective multi-use trail and Linear facility
 - d. Ditches/basins in southwest corner of Cactus/El Mirage not city owned
 - e. Basins developed in Wood Patel Study could reduce flows into the Robert's Development
 - f. Stated that the goal of El Mirage is to be a good partner, but not incur additional adverse conditions.
 - g. Noted the Roberts Development litigation associated with drainage history
 - h. The Roberts Development is planning on no more than 1000 cfs entering their project. A temporary online basin and pond have been built at the southwest corner of Cactus and El Mirage Road.
8. El Mirage concerns:
 - a. As the downstream recipient, that more water is/could be directed at El Mirage
 - b. El Mirage facilities can still be usable for multiuse
 - c. The Roberts development is not impacted
9. City of Surprise
 - a. Questions how a channel would be constructed west of Litchfield Road along Waddell, not believed to be enough space
 - b. City of Surprise goals include constructability associated with other proposed channels
 - c. There is potential for channelizing along the railroad
 - d. New development in area:
 1. Surprise Point (south side of Waddell Road) under construction- will be an area of concern
 2. Summit Business Park (Northwest Dysart/Cactus intersection) near construction start
 - e. City of Surprise (Jeff) mentioned areas of concern along Greenway Road, areas of disconnect from Bullard Ave to Litchfield Road (when Greenway/Litchfield intersection floods, water backs up about ½ mile on Greenway west of Litchfield). All along Greenway Road there are disconnects in the flow. There are locations where drainage just ends.
 - f. Possibility of looking to the areas West of Dysart in the industrial areas for areas of improvements/basins
 - g. Very important to avoid impacts to existing facilities
 - h. Surprise is concerned about constructability. How can channels be built where development has severely constricted the available space? Example, the west side of Dysart Rd. has more space than the east.
10. Other Waddell Study Area projects include:
 - a. Box culvert under Dysart

- b. Dysart and Thunderbird intersection improvements; this project was pushed forward in order to solve trail access issues
 - c. Linear park improvements on Lower El Mirage Wash
 - d. Thunderbird/Waddell and Dysart intersection- improvement design by Wood Patel in progress
11. The Loop 303 study is scheduled for completion in January 2009. Can it be accelerated? The base hydrology study should be ready by the end of the summer.
12. Jeff would rather oversize the boxes now, in concept. If it's determined later they can be smaller, that's OK. They can be scaled back during pre-design.
13. El Mirage can provide data from the Wood/Patel project. However, their work is only within the city boundaries; none of it is upstream.
14. Multi-use Issues
- a. Both existing washes are planned park/trail facilities (believed to tie into the Northern Parkway Regional Trail system- has regional trails planned from the Loop 303 to the Agua Fria)
 - b. Review the Surprise Trails Master Plan prepared by EDAW.
 - c. In El Mirage, both washes are planned as multiuse.
 - d. El Mirage Wash is owned by El Mirage
 - e. El Mirage is in the process of updating their General Plan. The parks elements could impact what is desired for this project. Currently, they have a trail planned on Grand Ave., trails along the Agua Fria, and a pedestrian crossing at Grand Ave.
 - f. FCDMC would like HDR team to meet with the parks/trails staff of both cities.
 - g. Linear Park improvements along El Mirage (Multi-use trails), and proposed trail under Cactus Road
15. Lance Calvert noted that there are some abandoned irrigation conveyance pipes under an intersection (Waddell-Dysart) that are going to be shown in Wood-Patel Study as "being filled/abandoned." Lance Calvert noted that Thurman is the contact at Wood-Patel

House Keeping

16. Draft Schedule handed out to all stakeholders. Jennifer asked that comments be sent to her as soon as possible.
17. Multi-use meeting is being considered for week of July 20th. Jennifer will send out some possible dates via e-mail to the stakeholders.
18. City of Surprise request for two additional meeting: decision was made to make these meetings "as -needed".
19. Lance Calvert will be contact for any information regarding El Mirage Channel (he prefers e-mail)
20. Jeff will be main contact at Surprise. Jeff believes that HDR has most of the needed data.
21. Lynn Thomas (FCDMC) will be contact for CLOMR at Surprise Point
22. Jennifer discussed what the group was planning on looking at in the field today, and invited all attendees to join the group.

23. Next stakeholder and team meeting in August
24. Preliminary Alternatives to be presented in September
25. Deliverables should be on CD to Surprise and El Mirage. Possibility of using upload to FTP site was discussed.
26. Linda Potter noted that the general area was flown for topo mapping 2' contours in March 2008 for the Loop 303 project (Linda Potter)
27. Notices to landowners:
 - a. El Mirage:
 1. Robert's Development
 2. Since the city owns the channel, no notice needed for that area
 - b. Surprise:
 1. Surprise Point
 2. Summit Business Park
 3. Jeff Davidson will provide the Flood Control with a list of others to notify
28. HDR work completed in June – invoices need to be submitted by July 3rd (FCDMC close out July 7th)
29. Jennifer will be main point of contact for stakeholders to be sure everything remains within Scope of Work
30. Provide stakeholders with meeting minutes and action items



Waddell CAR Kick-Off Meeting Sign-in Sheet

Meeting Location

City of Surprise
12425 W. Bell Road, Bldg. B Lobby Conference Room

Meeting Date

Friday June 27, 2008

INITIAL HERE	NO.	NAME	COMPANY/ AFFILIATION	ADDRESS	PHONE/FAX	E-MAIL
<i>JP</i>	1.	Jen Pokorski	Flood Control District of Maricopa County (FCDMC)	2801 West Durango Street Phoenix, AZ 85009	602-506-4695 Direct 602-372-0617 Office 602-506-2903 Fax	jmp@mail.maricopa.gov
<i>SM</i>	2.	Scott Mars, P.E.	HDR Engineering	3200 E. Camelback Road Suite 350 Phoenix, AZ 85018-2311	602-522-4347 Direct 602-522-7700 Office 602-522-7707 Fax	scott.mars@hdrinc.com
<i>LAP</i>	3.	Linda Potter, P.E.	HDR Engineering	3200 E. Camelback Road Suite 350 Phoenix, AZ 85018-2311	602-522-7738 Direct 602-522-7700 Office 602-522-7707 Fax	linda.potter@hdrinc.com
<i>JG</i>	4.	Jennifer Gagnon	HDR Engineering	3200 E. Camelback Road Suite 350 Phoenix, AZ 85018-2311	602-474-3974 Direct 602-522-7700 Office 602-522-7707 Fax	jennifer.gagnon@hdrinc.com
<i>LP</i>	5.	Laura Paty	HDR Engineering	101 N. 1 st Ave. Suite 1950/1300 Phoenix, AZ 85003	602-792-8836 Direct 602-792-8800 Office 602-385-1620 Fax	laura.paty@hdrinc.com
	6.	<i>John Holmes</i>	<i>FCDMC</i>	<i>2801 W. Durango Phx. AZ 85009</i>	<i>602.506.3320</i>	<i>jwh@mail.maricopa.gov</i>
	7.	<i>Burke Lokey</i>	<i>FCDMC</i>	<i>"</i>	<i>602.506.0867</i>	<i>BurkeLokey@maricopa.gov</i>
	8.	<i>JEFF DAVIDSON</i>	<i>COS</i>		<i>623.222.3440</i>	<i>JEFF.DAVIDSON@SurpriseCity</i>
	9.	<i>LANCE CALVERT</i>	<i>EL MIRAGE</i>		<i>(603) 876-2971</i>	<i>lcalvert@cityofelmirage.org</i>
	10.	<i>Suneel Corp</i>	<i>COS</i>		<i>623-222-3424</i>	<i>Suneel.garg@SurpriseAZ.com</i>



Waddell Road CAR

FCDMC Project No. 2007C015
HDR Project No. 86345

Meeting Location: City of Surprise

Multi-Use Expectations Meeting Agenda

July 23, 2008 (1:30pm – 2:30pm)

- II. Introductions
- III. Project Goals & Background
 - i. Waddell Road CAR
 - ii. AT&SF CAR
- IV. FCD Context Sensitive Design
 - i. Background & Goals
 - ii. Recommendations
 - iii. Funding
- V. Surprise & El Mirage Multi-use Expectations
 - i. Plans/vision
 - ii. Existing Facilities
 - iii. Stakeholder/Public Needs & Concerns
 - iv. Other Agency Concerns
- VI. Data Collection Needs
 - i. Regional Recreation Assessment
- VII. Other
 - i. Hydrology
- VIII. Action Items

Flood Control District of Maricopa County (FCDMC)
Waddell CAR
Contract FCD 2007C015
HDR Project No. 86345

MEETING NOTES

Meeting: Multi-Use Expectations Meeting
Location: City of Surprise
Date: July 23, 2008
Time: 1:30 pm – 2:30 pm

Prepared by: Scott Mars (HDR)

Action Items

- Surprise to provide Jon from FCDMC with guidelines regarding landscaping
- HDR to obtain Surprise General Plan, and copy of Surprise Park Master Plan after it is adopted on Sept. 11.
- HDR will make the appropriate changes to the regional recreation resource map and re-distribute to the group for final review.
- Send any additional comments on the regional recreation resource map to Jen by 7/31.

Project Discussion

Jon Loxley from FCDMC:

- Based on study performed by FCDMC, they suggest a semi-soft structural method for flood mitigation
 - This could be an earthen channel/basin, free form/organic shapes
- Due to constraints of ROW, this is not always possible
 - Alternative is a hard structural method with aesthetic treatment and create neighborhood element out of any structural feature
- Design Themes: Enhanced Desert, Desert Park, or Desert Oasis
 - Theme depends on what the cities have planned
 - If there are any natural areas, the theme should be natural desert or natural riparian
- Noted that aesthetic improvements are a cost share item between FCDMC and municipality, and that municipality will take over O&M responsibility after construction
- Noted that the FCDMC has cost caps on landscape

Jennifer Pokorski from FCDMC:

- Discussed basis for CARs: 1) Footprint, 2) costs, 3) overall aesthetics
- CAR forms basis for agreements
- Asked that N-values be checked to make sure capacity is sufficient

Russell MacDonald from Hoskin Ryan:

- Possible channel location/ trail location of AT&SF channel is west on Cactus and south on Litchfield
- AT&SF crossing (trail) is a constraint (AT&SF will not allow Surprise a trail crossing). Will focus on crossing options at controlled points (will also avoid tunnels).
- Orange grove set back around Surprise water campus- may run connection around water campus to allow for channel and bike lane if water (existing?) line could be moved. Will consider soft-structural or semi-soft structural measures.
- The use of reclaimed water for a demonstration garden is being considered for the water campus
- They had to consider the 75 DB noise levels (from Luke AFB) associated with parks and recreation areas. Gathering places must be located outside the 75DB noise contour.

Lance Calvert from El Mirage:

- Need to establish multiuse character along entire wash corridor. This would not only address recreational use needs but also various erosion control and dust control problems.
- On the corner of Cactus and El Mirage, the city only owns 'L' shaped piece of land
- Opportunities south side of Cactus along Agua Fria
- Updating Open Space Plan
- El Mirage has water conservation guidelines that should be considered.
- Discussed the large commercial parcel on the SW corner of El Mirage Road and Cactus Road. This is the subject parcel in the Wood-Patel study:
 - El Mirage has this zoned as commercial
 - El Mirage owns an "L" shaped portion of the parcel. It is only this portion where a drainage and multi-use opportunity exists.
 - El Mirage owns the land in El Mirage wash.
 - El Mirage is working with ADOT to get the open ditch along Grand Avenue covered to allow for a multi-use opportunity (i.e. path or trail)
 - Discussed a new park under construction that will use reclaimed water for landscape irrigation
 - It is a goal to tie into the trail system outlined in the Agua Fria WCMP
 - Any trail connection to the Aqua Fria River will have to go north of Roberts Resort (will not be allowed to go through Roberts)
- The following items should be identified/corrected on the recreational resource assessment map:
 - The drainage channel along Grand Ave as a proposed Trail to connect to Agua Fria.
 - Need to relocate Gateway at Agua Fria to the north closer to Cactus Road.
 - Relocate proposed park away from south side of Peoria Ave near Dysart to one quarter mile south of Peoria along El Mirage Road.

Burke Lokey from FCDMC:

- AT & SF channel can possibly be a bleed off for areas of the Waddell CAR
- Northern Parkway Plan- will tie into Dysart Channel and AT&SF
- Possible trail connection into AT&SF (Agua Fria River to White Tanks Regional Park)
- Noted that the Surprise WWTP will pose space constraints for drainage

Hobart Wingard from City of Surprise

- Surprise to provide Jon from FCDMC with guidelines regarding landscaping
- Discussed Sweetwater Trail and park. Sweetwater trail under construction
- Prefer turf only for active recreation areas, and water conservation will be key
- General plan is being updated. Need to obtain copy for this study.
- Surprise is due to adopt their park master plan on September 11.

House Keeping

1. Draft copies of the hydrology map and the regional recreation resource map were provided to Surprise and El Mirage at the meeting.
2. One copy of the regional recreation resource map was “marked up” with notes and comments. HDR will take map and make appropriate changes.
3. Jennifer noted that the model summary report will be sent to stakeholders next month (August).
4. Jennifer noted that some meetings and presentations may be moved out due to some data issues with the Camelback CAR.



Waddell CAR Multi-Use Expectations Meeting Sign-in Sheet

Meeting Location

City of Surprise
12425 W. Bell Road, Bldg. D (Green Room)

Meeting Date

Thursday July 23, 2008

INITIAL HERE	NO.	NAME	COMPANY/ AFFILIATION	ADDRESS	PHONE/FAX	E-MAIL
JP	1.	Jen Pokorski	Flood Control District of Maricopa County (FCDMC)	2801 West Durango Street Phoenix, AZ 85009	602-506-4695 Direct 602-372-0617 Office 602-506-2903 Fax	jmp@mail.maricopa.gov
SM	2.	Scott Mars, P.E.	HDR Engineering	3200 E. Camelback Road Suite 350 Phoenix, AZ 85018-2311	602-522-4347 Direct 602-522-7700 Office 602-522-7707 Fax	scott.mars@hdrinc.com
	3.	Linda Potter, P.E.	HDR Engineering	3200 E. Camelback Road Suite 350 Phoenix, AZ 85018-2311	602-522-7738 Direct 602-522-7700 Office 602-522-7707 Fax	linda.potter@hdrinc.com
	4.	Jennifer Gagnon	HDR Engineering	3200 E. Camelback Road Suite 350 Phoenix, AZ 85018-2311	602-474-3974 Direct 602-522-7700 Office 602-522-7707 Fax	jennifer.gagnon@hdrinc.com
LP	5.	Laura Paty	HDR Engineering	101 N. 1 st Ave. Suite 1950/1300 Phoenix, AZ 85003	602-792-8836 Direct 602-792-8800 Office 602-385-1620 Fax	laura.paty@hdrinc.com
	6.	John Holmes	Flood Control District of Maricopa County (FCDMC)	2801 West Durango Street Phoenix, AZ 85009	602-506-3320 Direct 602-372-0617 Office 602-506-2903 Fax	jwh@mail.maricopa.gov
BL	7.	Burke Lokey	Flood Control District of Maricopa County (FCDMC)	2801 West Durango Street Phoenix, AZ 85009	602-506-0867 Direct 602-372-0617 Office 602-506-2903 Fax	burkelokey@mail.maricopa.gov
LC	8.	Lance Calvert	El Mirage		623-816-2971	lcalvert@cityofelmirgae.org
	9.	Suneel Garg	City of Surprise		623-222-3424	Suneel.garg@surprise.com

INITIAL HERE	NO.	NAME	COMPANY/ AFFILIATION	ADDRESS	PHONE/FAX	E-MAIL
	10.	Jeff Davidson	City of Surprise		623-222-3440	Jeff.davidson@surprise.org
JH	11.	Jon LOXLEY	FED MC		602.506.2956	jonloxley@mail.maricopa.gov
RMD	12.	Russell McDonald	Hoskin Ryan			
HW	13.	Hebert Wingard	CITY OF SURPRISE		623.222.3156	HEBERT.WINGARD@SURPRISEAZ.COM
KLR	14.	Ryan Riggs	HDR			
	15.					
	16.					
	17.					
	18.					
	19.					
	20.					
	21.					
	22.					



Waddell Road CAR

FCDMC Project No. 2007C015
HDR Project No. 86345

Meeting Location: City of Surprise

Opportunities & Constraints Meeting Agenda

August 26, 2008 (10:00am – 11:30am)

- 1) Introductions
- 2) Data Collection
 - a) Key data and reports used
 - b) Needed data (utility information)
- 3) Opportunities and Constraints discussion
 - a) Exhibits (3)
 - b) Stakeholder comments
 - c) Flooding issues table
 - d) Multi-use opportunities
- 4) Monthly coordination update
 - a) Project status
 - b) Hydrology findings
 - c) Multiple concurrent projects and studies
 - d) Schedule
- 5) Other
- 6) Action Items

Flood Control District of Maricopa County (FCDMC)
Waddell CAR
Contract FCD 2007C015
HDR Project No. 86345

MEETING NOTES

Meeting: Opportunities and Constraints, and Data Presentation Meeting
Location: City of Surprise
Date: August 26, 2008
Time: 10:00am – 11:30am

Prepared by: Scott Mars (HDR)

Project Discussion

Utility conflict information discussion points:

- HDR still needs major utilities from Surprise
- Contact Ron Godell at APS for electric info (Surprise and El Mirage)
- Need to be cautious dealing with Bluestake- they have not been staking fiber optic lines (Surprise and El Mirage)
- Fiber optic tends to be buried very shallow.
- Contact Todd Gillum at the City of Surprise for water utility information
- El Mirage stated that their waterlines are deep and should not be a problem
- El Mirage noted that a 270kV overhead power line in the study area may need to be relocated associated with another project
- What is considered 'major'?
- Water and sewer services are in-house at the City of Surprise
- Utilities for planned developments were discussed

Data Collection:

- Waddell/Dysart intersection- The off-site drainage may not have been accounted for adequately.
- El Mirage Road DCR only at 15% completion.
- Roberts Resort: Development started in the 1970s; The old FEMA maps stated there was 300 cfs coming through the resort. Today FEMA states 1,500 cfs.
- Jeff Davidson said that CMX is working on plans for the area between Bullard Ave. and Litchfield Rd. north of Greenway. HDR will follow up with Jeff to see if he can provide the plans.
- Surprise Pointe LOMR has been approved. The HEC-1 model is being updated as part of the AT & SF channel project.

- HDR asked to determine if 1' contours were obtained for the Dysart/Cactus intersection as part of the Loop 303/WT ADMPU.
- HDR is to follow up with Jeff Davidson regarding the intersection plans for Dysart and Cactus roads.
- Surprise suggested that HDR contact Ben Bowles at Hoskin-Ryan regarding information for the WWTP pipelines along Waddell Road west of Litchfield Road.

Opportunities and Constraints

- A 10-foot sidewalk is the preferred minimum width. Installing a 10' sidewalk to serve as a bike lane and sidewalk at the SE corner of Cactus/El Mirage was discussed (as opposed to having a bike lane in the road in that area).
- Fixing the crossing at Cactus Road and the Lower El Mirage Wash is a priority
- On Waddell Road, between Litchfield and Dysart, some flows may need to be routed south to the AT&SF channels.
- In the final CAR, El Mirage requested that the lawsuit associated with Roberts Resort not be discussed. The only discussion point regarding Roberts Resort is that there is a limitation that the flow at El Mirage Road be less than 1000 cfs.
- Jennifer asked that a major utilities table be included in the CAR
- There are several undersized culverts in the study area that have back up or road over topping problems.
- Greenway Road flooding was discussed by Jeff Davidson: Basins north of Greenway Road (near Litchfield Road) will be temporary and sized for 50-year event. Permanent basins will be constructed at some time in the future when all the basins can be connected. Jeff will look into providing HDR with the Draft CMX basin design report.
- Landscaping:
 1. consider road crossing with signage, road flashers, etc. Jennifer suggested this be considered in the alternatives phase of the project.
 2. Sweetwater Trail- Use Cactus Road to connect to Agua Fria River if Cactus Road drainage improvements are planned. Lance Calvert noted that there is a 30% plan developed to connect Sweetwater Trail to the Agua Fria.
 3. Discontinuous trails- Reems Road trail, Greenway Road trail
- Scott Mars discussed the potential environmental constraints.

Schedule

- Project may get pushed back 5 to 6 weeks due to split flow analysis being finished by Hoskin-Ryan; Jennifer noted that the Waddell CAR is estimated to be complete by the end of January.
- The revised report from Hoskins/Ryan should be available in about 2 weeks.

House Keeping

1. HDR asked for feedback regarding using the exhibits with inset photos in subsequent phases of the study (alternatives and CAR). The stakeholders and the FCDMC agreed to use this method.
2. Next Waddell CAR stakeholder meeting to be held at El Mirage (date TBD)

Action Items

1. Surprise to provide HDR with the drainage plans for the area north of Greenway Road (CMX work).
2. Burke Lokey noted that the Hoskin-Ryan report will need to be reviewed internally before being provided to HDR. This is expected to take two weeks.
3. The Thursday (8-28-08) AT&SF meeting will result in four alternatives which Jennifer will then provide to HDR.



Waddell CAR Opportunities & Constraints Meeting Sign-in Sheet

Meeting Location
City of Surprise
12425 W. Bell Road, Bldg. D (Lobby Conference Room)

Meeting Date

Tuesday August 26, 2008

INITIAL HERE	NO.	NAME	COMPANY/ AFFILIATION	ADDRESS	PHONE/FAX	E-MAIL
Jmp	1.	Jen Pokorski	Flood Control District of Maricopa County (FCDMC)	2801 West Durango Street Phoenix, AZ 85009	602-506-4695 Direct 602-372-0617 Office 602-506-2903 Fax	jmp@mail.maricopa.gov
ScM	2.	Scott Mars, P.E.	HDR Engineering	3200 E. Camelback Road Suite 350 Phoenix, AZ 85018-2311	602-522-4347 Direct 602-522-7700 Office 602-522-7707 Fax	scott.mars@hdrinc.com
	3.	Linda Potter, P.E.	HDR Engineering	3200 E. Camelback Road Suite 350 Phoenix, AZ 85018-2311	602-522-7738 Direct 602-522-7700 Office 602-522-7707 Fax	linda.potter@hdrinc.com
	4.	Jennifer Gagnon	HDR Engineering	3200 E. Camelback Road Suite 350 Phoenix, AZ 85018-2311	602-474-3974 Direct 602-522-7700 Office 602-522-7707 Fax	jennifer.gagnon@hdrinc.com
LOP	5.	Laura Paty	HDR Engineering	101 N. 1 st Ave. Suite 1950/1300 Phoenix, AZ 85003	602-792-8836 Direct 602-792-8800 Office 602-385-1620 Fax	laura.paty@hdrinc.com
RLR	6.	Ryan Riggs	HDR Engineering	3200 E. Camelback Road Suite 350 Phoenix, AZ 85018-2311	602-522-7779 Direct 602-522-7700 Office 602-522-7707 Fax	ryan.riggs@hdrinc.com
JWH	7.	John Holmes	Flood Control District of Maricopa County (FCDMC)	2801 West Durango Street Phoenix, AZ 85009	602-506-3320 Direct 602-372-0617 Office 602-506-2903 Fax	jwh@mail.maricopa.gov
BL	8.	Burke Lokey	Flood Control District of Maricopa County (FCDMC)	2801 West Durango Street Phoenix, AZ 85009	602-506-0867 Direct 602-372-0617 Office 602-506-2903 Fax	burkelokey@mail.maricopa.gov
LC	9.	Lance Calvert	El Mirage		623-816-2971	lcalvert@cityofelmirgae.org

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	10.	Suneel Garg	City of Surprise		623-222-3424	Suneel.garg@surpriseaz.com
JSD	11.	Jeff Davidson	City of Surprise		623-222-3440	Jeff.davidson@surpriseaz.org
H/W	12.	Hobart Wingard	City of Surprise		623-222-3156	Hobart.wingard@surpriseaz.com
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Waddell Road CAR

FCDMC Project No. 2007C015
HDR Project No. 86345

Meeting Location: Waddell Study Area (City of El Mirage)

Alternatives Field Meeting Agenda

November 26, 2008 (1:00pm – 3:00pm)

- 1) Introductions
- 2) Preliminary Alternative Options
 - a) Figures
 - b) Relative costs
- 3) Visit to Key Area -1: Waddell Road Area
 - a) Discussion of alternatives
- 4) Visit to Key Area -2: West Cactus Detention Basin Area
 - a) Discussion of alternatives
- 5) Project Schedule Update
- 6) Action Items

Flood Control District of Maricopa County (FCDMC)
Waddell CAR
Contract FCD 2007C015
HDR Project No. 86345

MEETING NOTES

Meeting: Preliminary Alternatives Field Meeting
Location: City of El Mirage
Date: November 26, 2008
Time 1:00pm – 3:00pm

Prepared by: Scott Mars (HDR)

Project Discussion

The meeting started at the El Mirage City Hall where HDR led a discussion regarding the preliminary alternatives. An agenda, figures, and ConArch information were distributed and discussed. The meeting attendees then loaded into two vehicles and headed into the field where specific alternatives were discussed.

Preliminary Alternatives discussion points:

- Burke Lokey noted that the AT&SF channel is planned to end at the south side of the Surprise Point development adjacent to the AT&SF railroad
- HDR needs to add Sweetwater Road notation to the figures
- Lance Calvert and Jeff Davidson noted they do want some drainage under the Waddell/Dysart/AT&SF intersection to relieve upstream (of the AT&SF RR) flooding.
- Lance Calvert noted that the property on the SE corner of Waddell/Dysart is contaminated (soil from APS transformer).
- Jeff Davidson stated that (regarding preliminary alternative #3) it will not be acceptable to Surprise Point to extend the AT & SF Channel from Sweetwater to Waddell Road through Surprise Pointe.
- HDR should include Sweetwater trail on Figures.
- Alternative to install ConArch under Dysart at El Mirage Wash is not desired due to projected lack of use and safety considerations.
- Lance Calvert noted that Wood Patel is looking at West Cactus Basin area based upon new hydrology.

Field Visit Discussion:

- Waddell/Dysart/AT&SF intersection (SW portion)- new rail bed was installed last week. Lance Calvert and Burke Lokey noted that any recommended culverts will need to cross under the rail line as follows:
 1. South of the new Waddell Road ROW

2. Consider adjacent (E and W of rail line) land ownership and easements: 84
Lumber and Surprise Point

- El Mirage noted that a 270kV overhead power line (APS) on the south side of Waddell will be relocated in the fall of 2009 associated with the roadway widening and improvement project.
- Jeff noted that any detention structures in the Surprise Point area will require a detention easement from Surprise and will be maintained by future HOAs.
- At Dysart and Lower El Mirage Wash- Lance Calvert noted that the City is planning to replace the east side of Dysart in the near future, but may put project on hold to accommodate any drainage improvements (i.e. more culverts under roadway into El Mirage Wash) from the Waddell CAR.
- El Mirage Road DCR includes design recommendation for additional culverts the El Mirage wash crossing into Roberts Resort.
- Lance Calvert noted that the maximum flow at El Mirage Road and Roberts Resort is 1,000 cfs (based on NOAA 14). Lance noted that the existing box culverts under El Mirage Road can only handle 400cfs. Lance would like to see a recommendation to have more capacity under El Mirage Road. Lance stated that it was critical that future overtopping of El Mirage Road not occur.
- Lance noted that a future east-west ingress/egress from El Mirage Road into West Cactus Basin will be needed for future commercial access. Debbi Shortal noted that this access road will need to be clear of 100-year floodplain.
- Lance stated that multi-use of West Cactus Basis is desired by the City to the extend practical after stormwater flow and detention considerations.
- A discussion of in-line basins vs. off-line basins and detention basis was conducted as it related to the West Cactus Basin ROW issues.
- Lance stated that no parking will be needed associated with ant West Cactus basin multi-use opportunities.
- At Cactus Road and El Mirage Wash- Lance noted that the future design of Cactus Road will be "2-1-2." In Addition, Lance thought this crossing may be a good opportunity to install the ConArch under cactus Road for future multi-use opportunity (trail). A low flow channel will need to be considered associated with the ConArch design.

Schedule:

- Scott Mars discussed the revised schedule. He noted that the formal alternatives presentation is scheduled for December 18th, and the selected alternative presentation is scheduled for January 13th. The draft Waddell CAR is scheduled to be submitted to the FCDMC on February 12th, and the final Waddell CAR is scheduled to be submitted on March 13th.

House Keeping

1. Next Waddell CAR stakeholder meeting will be the formal alternatives presentation on December 18, 2008 (time and location TBD)
2. Burke Lokey provided HDR with the draft Hoskins/Ryan AT&SF CAR (on CD).

Action Items

1. City of El Mirage and Surprise to provide HDR feedback regarding preliminary alternatives
2. FCDMC to set time and location for December 18, 2008 alternatives presentation/meeting
3. Lance Calvert stated that Carnell Thurman at Wood Patel be contacted to obtain CAD files associated with Waddell Roadway design.



Waddell CAR Preliminary Alternatives Field Meeting Sign-in Sheet

Meeting Location

City of El Mirage (El Mirage City Hall, 12145 NW Grand Ave) - Waddell Study Area
Field Visit to Follow

Meeting Date

November 26, 2008

INITIAL HERE	NO.	NAME	COMPANY/ AFFILIATION	ADDRESS	PHONE/FAX	E-MAIL
<i>DS</i>	1.	Debbi Shortal	Flood Control District of Maricopa County (FCDMC)	2801 West Durango Street Phoenix, AZ 85009	602-506-1034 Direct 602-372-0617 Office 602-506-2903 Fax	dls@mail.maricopa.gov
<i>SM</i>	2.	Scott Mars, P.E.	HDR Engineering	3200 E. Camelback Road Suite 350 Phoenix, AZ 85018-2311	602-522-4347 Direct 602-522-7700 Office 602-522-7707 Fax	scott.mars@hdrinc.com
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<i>RR</i>	6.	Ryan Riggs	HDR Engineering	3200 E. Camelback Road Suite 350 Phoenix, AZ 85018-2311	602-522-7779 Direct 602-522-7700 Office 602-522-7707 Fax	ryan.riggs@hdrinc.com
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<i>BL</i>	8.	Burke Lokey	Flood Control District of Maricopa County (FCDMC)	2801 West Durango Street Phoenix, AZ 85009	602-506-0867 Direct 602-372-0617 Office 602-506-2903 Fax	burkelokey@mail.maricopa.gov
<i>LC</i>	9.	Lance Calvert	El Mirage		623-816-2971	lcalvert@cityofelmirgae.org

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	12.	Hobart Wingard	City of Surprise		623-222-3156	Hobart.wingard@surpriseaz.com
JMP	13.	Jew Pokorski	FCD			
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Waddell CAR
Preferred Alternative Selection
January 15, 2009
2:00 – 3:30 pm

Invitees: Lance Calvert, El Mirage; Hobart Wingard, Jeff Davidson, Surprise; Debbi Shortal, Burke Lokey, John Holmes, Jon Loxley- FCD; Scott Mars, Janelle Moyer, Laura Paty, HDR Consultant Team

Purpose of Meeting:

Identify preferred alternatives for the Waddell Road area drainage and the Cactus Basin and/or develop hybrids based on the proposed alternatives that are amenable to the respective Cities.

Desired Outcome: Develop preferred alternatives that will be refined into a recommended plan for each area.

Topic	Desired Outcomes	Who & Time
Meeting Overview <ul style="list-style-type: none"> • Meeting Purpose • Desired Outcomes • Ground Rules 	Understanding of agenda, agreement on desired outcomes and process	Debbi Shortal; 10 minutes
Proposed Alternatives Development <ul style="list-style-type: none"> • Alternatives Review • Variations • Evaluation Criteria 	Understanding of alternatives development and differences	Scott Mars, All; 30 minutes
Consensus Building <ul style="list-style-type: none"> • Discuss Proposed Alternatives • Adv/ Disadv for Stakeholders and Communities 	Consensus building for selection of Preferred Alternatives	SM, DS, All; 20 minutes
Preferred Alternatives Recommendation <ul style="list-style-type: none"> • Recommend Preferred Alternatives • Changes necessary to develop into Recommended Plan • Benefits/ Opportunities/ Constraints 	Select/ refine preferred alternatives to develop into Recommended Plan Expand on Stakeholder benefits/ other issues	SM, DS, All; 20 minutes
Next Steps <ul style="list-style-type: none"> • Action items and responsibilities • Schedule 	Agree on next steps and responsibilities	SM; 10 Minutes

Flood Control District of Maricopa County (FCDMC)
Waddell CAR
Contract FCD 2007C015
HDR Project No. 86345

MEETING NOTES

Meeting: Alternatives Review and Selection Presentation
Location: City of El Mirage
Date: January 15, 2009
Time 10:00am – 11:30am

Prepared by: Scott Mars, Laura Paty, Janelle Moyer (HDR)

Attendees: Debbi Shortal- FCDMC
Burke Lokey- FCDMC
Jeff Davidson – Surprise
Vamshee Kovusu - Surprise
Scott Mars - HDR
Laura Paty – HDR
Janelle Moyer – HDR
Lance Calvert – El Mirage

Alternatives Discussion

Meeting Overview

- Introductions
- Scott stated exhibits have been updated from November 2008 field meeting
- Scott asked that meeting format be interactive; described the items in the packet stakeholders and FCDMC received
- Lance asked about L-303 study. Debbi provided an update that the draft model was submitted and still under review by FCDMC
- Scott introduced Criteria Evaluation and Summary
- Scott summarizes all the alternatives and noted that three each are being discussed today, and the fourth is a no-action alternative.
- Debbi noted to the stakeholders that this CAR is a 15% conceptual level study

Proposed Alternatives Development

1. Waddell Alternative #1

- Jeff noted that water is definitely crossing the tracks and a curb was blown out along Waddell

- Jeff noted that City of Surprise's channel requirements are a 6:1 side slope when adjacent to a sidewalk. He stated we may be able to go to 3:1, but can be considered further in final design.
- Jeff mentioned we may be able to commingle off-site and on-site flows in the channel along Waddell, even though their code says it can't be done. A berm separating the existing private residential retention basin and the proposed channel (north side of Waddell) carrying off-site flow would be acceptable (as long as enough ROW exists). Jeff noted that a subsurface pipe/culvert (under the private residential detention basin) would also be allowable.
- Jeff is concerned about sufficient ROW for the channel along Waddell (north side).
- Jeff asked if the channel had to be on the north side of Waddell. It was noted there are too many other conflicts on the south side including overhead power lines.

Waddell Alternative #2

- Burke noted that they may be able to increase the AT&SF Channel capacity facilitating the elimination of the proposed detention basin (SW of Sweetwater and AT&SF channel intersection).
- Jeff stated that the \$50,000/acre estimate for property acquisition is too low. The area proposed for acquisition is zoned Commercial C2, and is estimated at \$200,000/acre.

Waddell Alternative #3

- Scott explains alternative and mentions that this alternative has already been removed due to the constraints with Surprise Pointe.
- Burke suggested reversing the direction of the channel along Waddell to flow back to Litchfield Road. It was determined that would require "bucking grade" at least 8 feet and not feasible.
- Debbi questioned if the actual sizes of the detention basins in Alternative #2 and Alternative #3 are realistic. Scott said they are drawn to scale.

West Cactus Alternative #1

- Scott noted that the improvements for all the West Cactus alternatives are within El Mirage's jurisdiction, therefore no property acquisition is required.
- Scott noted that all the West Cactus alternatives discharge less than 1,000 cfs at El Mirage Road.
- Janelle noted that the existing West Cactus Basin outlet elevation at El Mirage Road is approximately 3-feet higher than the inlet elevation at Cactus Road.
- Janelle discussed that in all West Cactus alternatives, the culverts under Cactus Road need to be raised ~3' (due to inlet-outlet elevation condition stated previous) to allow for positive drainage through the basin/channel area. This will result in 3' ponding in Lower El Mirage Wash just upstream of Cactus Road. This may result in the need for a drywell in El Mirage Wash, but will be considered in more detail in the future during final design.
- Lance asked if HDR considered the 127th and 129th crossings along Lower El Mirage Wash. HDR stated that the proposed alternative flows into El Mirage Wash do not increase existing condition flows, therefore no flood control improvements were

recommended for these two locations. Lance requested that HDR consider these crossings to see if overtopping would occur. If so, Lance requested improvements at these locations. Janelle asked if there was evidence of a flooding issue at these locations. Lance stated he does not know of recorded evidence of flooding.

- Lance thought the Conarch is a good amenity. Scott stated that the Conarch can be used in any of the West Cactus alternatives.

West Cactus Alternative #2

- Scott stated that this alternative includes a soccer/sports field. However, due to El Mirage's request that no parking be included at this location, it may not be the most desirable option. Lance noted that the adjacent gas station and future commercial area could provide some parking.

West Cactus Alternative #3

- Burke asked if additional culverts are needed under El Mirage Road. Janelle stated that in all the alternatives, additional culverts are needed and proposed under El Mirage Road.
- Burke asked if Roberts Resort can grade their channel to allow for lower elevation culverts under El Mirage Road. Lance stated that no plans for the channel have been submitted (by Roberts Resort) and they are waiting for the Waddell CAR project to be completed.
- Burke asked about the outfall of Lower El Mirage Wash and MCDOT's involvement. Debbi stated that if El Mirage wants to cost share with FCDMC, that the outfall will need to be looked at.

Consensus Building/Preferred Alternatives Recommendation Summary

Waddell Road Area Consensus Discussion

Alternative #1		Alternative #2		Alternative #3	
Advantage	Disadvantage	Advantage	Disadvantage	Advantage	Disadvantage
Lower flows into ATSF Channel	ROW constraints	Possibly remove proposed detention basin and increase ATSF Channel size	Proposed detention basin will only be accessed by pedestrians		Alternative not desired
	HOA Basin comingling		No proposed detention basin access by police		
			Not enough anticipated use		

- Jeff (Surprise) prefers Alternative #1
- Jeff suggested possibly using storm drain instead of Channel along Waddell in Alternatives #1 and #2
- City of Surprise wants to talk to Surprise Pointe about the potential channel configurations
- It was requested that Surprise design guidelines for landscaping be followed where applicable.
- The basins in alternatives 2 or 3 could be eliminated if the AT&SF channel were increased in size.
- Laura asked about an engineered basin (no multi-use landscaping) – wouldn't it also have security and access issues?
- Jeff noted that in the past Surprise has built 'functional' basins with the intent of enhancing them into a 'park' in the future.

Consensus: Alternative #1 was preferred with the following:

1. **City of Surprise wants to discuss and confirm internally**
2. **Proposed channel on north side of Waddell may require City of Surprise variance due to ROW limitations**

Cactus Area Consensus Discussion

Alternative #1		Alternative #2		Alternative #3	
Advantage	Disadvantage	Advantage	Disadvantage	Advantage	Disadvantage
Conarch		Adjacent residents will be able to take advantage of soccer/sports field			

- Lance stated turf areas are desirable, and will be a driver for adjacent commercial development.
- It was noted by HDR that costs don't include improvements to Cactus Road and El Mirage Road, only conarch/culvert cost. Lance requested to add road improvements cost for the areas of drainage improvements.
- Lance requested HDR to follow FCDMC landscape design guidelines
- Lance requested HDR to consider erosion issues at 127th and 129th crossings.
- Lance requested that landscaping be brought up to FCDMC minimum landscape standards in Lower El Mirage Wash between Dysart and Cactus. This would include a cost estimate for a 10-foot path and associated landscaping.
- Lance wasn't sure if there would be city preference on turf or no turf. El Mirage is lacking park space per capita (turf is an advantage).
- Lance could see that the neighbors would like the amenities in Alternative #2. Lance preferred the conarch over the culverts under Cactus Road (nice amenity and safety crossing)
- The biggest priority for this project is not to flood the Cactus Road crossing.
- Lance prefers Alternative #2 because it has the least flow into Roberts Resort (advantage) and it has an active play area.

Consensus: Alternative #2 was preferred with the following:

1. **Add the Conarch to add the conarch from Alternative #1.**
2. **Convert proposed "tot lot" in SE corner to a "future commercial area"**

Next Steps

- Scott discussed schedule. Next presentation on Feb. 5th (recommended plan). This meeting will be held in El Mirage (no time set yet).
- Draft CAR is scheduled for submittal to the FCDMC on Feb. 12th
- Surprise and El Mirage will hold internal discussions, and will respond back to FCDMC regarding alternatives preferred by January 22, 2009.
- HDR will provide meeting minutes to FCDMC on January 16, 2009.



Waddell CAR Preliminary Alternatives Meeting Sign-in Sheet

Meeting Location

El Mirage City Hall (12145 NW Grand Ave)

Meeting Date

January 15, 2009

INITIAL HERE	NO.	NAME	COMPANY/ AFFILIATION	ADDRESS	PHONE/FAX	E-MAIL
<i>DS</i>	1.	Debbi Shortal	Flood Control District of Maricopa County (FCDMC)	2801 West Durango Street Phoenix, AZ 85009	602-506-1034 Direct 602-372-0617 Office 602-506-2903 Fax	dls@mail.maricopa.gov
<i>SM</i>	2.	Scott Mars, P.E.	HDR Engineering	3200 E. Camelback Road Suite 350 Phoenix, AZ 85018-2311	602-522-4347 Direct 602-522-7700 Office 602-522-7707 Fax	scott.mars@hdrinc.com
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<i>LP</i>	5.	Laura Paty	HDR Engineering	101 N. 1 st Ave. Suite 1950/1300 Phoenix, AZ 85003	602-792-8836 Direct 602-792-8800 Office 602-385-1620 Fax	laura.paty@hdrinc.com
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<i>BL</i>	8.	Burke Lokey	Flood Control District of Maricopa County (FCDMC)	2801 West Durango Street Phoenix, AZ 85009	602-506-0867 Direct 602-372-0617 Office 602-506-2903 Fax	burkelokey@mail.maricopa.gov
<i>LC</i>	9.	Lance Calvert	El Mirage		623-816-2971	lcalvert@cityofelmirgae.org

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	12.	Hobart Wingard	City of Surprise		623-222-3156	Hobart.wingard@surpriseaz.com
	13.	Vanshee Kovuzh	City of Surprise.		623-222-3662	Vanshee.kovuzh@ Surpriseaz.com.
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**Waddell CAR
Recommended Plan Presentation
February 12, 2009
2:00 – 3:30 pm**

Invitees: Lance Calvert, El Mirage; Hobart Wingard, Jeff Davidson, Surprise; Debbi Shortal, Burke Lokey, John Holmes, Jon Loxley, Mike Duncan- FCD; Scott Mars, Janelle Moyer, HDR Consultant Team

Purpose of Meeting:

Present Recommended Plan that was developed through the preliminary alternatives meeting with project stakeholders on January 15, 2009. The recommended plan is for the Waddell Road Area and the West Cactus Basin Area.

Desired Outcome: Stakeholder approval of recommended plan and generation of implementation details and issues.

Topic	Desired Outcomes	Who & Time
Meeting Overview <ul style="list-style-type: none"> • Meeting Purpose • Desired Outcome 	Understanding of agenda, agreement on desired outcome and process	Debbi Shortal; 5 minutes
Recommended Plan <ul style="list-style-type: none"> • Waddell Area • West Cactus Area 	Understanding of Recommended Plan development process (advantages of plan)	Scott Mars, All; 30 minutes
Recommended Plan Approval <ul style="list-style-type: none"> • Refinements to Recommended Plan (if any) 	Refine recommended plan	SM, DS, All; 20 minutes
Implementation Issues <ul style="list-style-type: none"> • Budget • Schedule 	Generate implementation issues	SM, DS, All; 20 minutes
Next Steps <ul style="list-style-type: none"> • Action items and responsibilities • Schedule 	Agree on next steps and responsibilities	SM; 10 Minutes

Flood Control District of Maricopa County (FCDMC)
Waddell CAR
Contract FCD 2007C015
HDR Project No. 86345

MEETING NOTES

Meeting: Recommended Plan Presentation
Location: City of El Mirage
Date: February 12, 2009
Time 2pm – 3:30pm

Prepared by: Scott Mars, Janelle Moyer (HDR)

Attendees: Debbi Shortal- FCDMC
Burke Lokey- FCDMC
John Holmes - FCDMC
Scott Mars - HDR
Janelle Moyer – HDR
Lance Calvert – El Mirage

Alternatives Discussion

Meeting Overview

- Introductions
- Scott stated exhibits have been updated from the January 15, 2009 Alternatives selection meeting based upon stakeholder and FCDMC input
- Scott discussed the narrative and boards. He started with the West Cactus Basin, as the City of Surprise did not attend the meeting.
- Scott noted that many things were added to the exhibit such as cross-section dimensions, the additional 30% for landscaping (per FCDMC guideline), maintenance road/path, and the commercial property as requested by Lance at the last meeting.
- Debbi asked that regional benefits be discussed in CAR

Recommended Alternative Discussion

Waddell Area

- Lance said that Roberts Resort has a PAD approval meeting tonight. The engineer in Wickenburg has improvement plans for drainage at Roberts Resort assuming 1,000 cfs input from the West Cactus Basin.

- Burke asked Lance if Roberts Resort would be interested in cost sharing in the recommended plan. Lance responded that it's a good possibility they would be interested.
- Debbie requested that it be noted in the CAR that basin and culvert sizes may change during final design.
- Lance noted that during future design, he may want to consider the channel alternative and use the remaining land for development.
- Scott explained that the maximum flow rate achievable under Cactus Road is 885 cfs. This is due to the culverts at El Mirage being ~3 feet higher than the existing culverts at Cactus Road. In all the alternatives, HDR had to raise the culverts ~3 feet at Cactus Road (inflow) to achieve positive drainage, which creates ponding upstream in Lower El Mirage Wash, which attenuates the flow to 885 cfs.
- Debbie requested it be noted in the CAR that Lower El Mirage Wash will need to be considered upstream of Cactus Road for drainage within 36 hours.
- Lance is concerned with erosion in Lower El Mirage Wash upstream of Cactus Road and this should be mentioned in the CAR. Debbie responded that this would be a concern of FCDMC as well. Lance prefers Decomposed Granite be placed in the wash.
- Lance stated the City of El Mirage owns the wash and is responsible for maintenance.
- Scott explained the addition of the 6-inch diameter bleed-off pipe to drain the area just west of West Cactus Basin, and that this area will need to be dealt with in the future. Lance stated this area will probably be vacant for a while. Lance also stated this could be a potential city park location. Currently the city is placing fill in this area from roadway projects.
- Lance asked if the whole area is in the floodplain and this should be noted in the CAR. Lance asked FCDMC if a permit would be required to fill in the floodplain. Debbi said she would look in this question.

West Cactus Area

- Scott discussed Sheet 3 of the plans and the existing El Mirage culvert under the Waddell and Dysart intersection. HDR estimated the location of this culvert on the plans. Lance responded and confirmed that it is dual line, and is partially collapsed that runs into a manhole. Lance doesn't know where the culvert ends, as it's covered. Lance plans on abandoning the culvert by grouting.
- John reviewed the culvert design at Waddell and Dysart and stated that it needs to be looked at, as the elevations seemed off. Janelle responded that she will look into it, and also mentioned the challenges having to use the only available topo from 1990. Some of the elevations had to be estimated. John asked if this area was flown with the L303 ADMPU project. Janelle responded that this area was flown but not compiled. Debbie requested that this be noted in the CAR and it could be compiled in the future for this project.
- Burke questioned the proposed culvert alignment at Waddell and Dysart. Scott responded that the alignment was based on discussions with Jeff Davidson at City of Surprise and considerations were taken for the existing power poles and railroad.

- Lance stated that the city controls/owns Dysart road starting at the center line - 55 feet west of the centerline. City of Surprise owns the next 10 feet to the west. The next adjacent 8 feet is a public utility easement for the APS 59 KV electrical line, a waterline, and the Surprise Point stormwater channel.
- Lance stated that 84 Lumber owns the property at the southwest corner of Waddell and Dysart, but it is currently up for sale. He stated that HDR should contact Carnel at Wood/Patel regarding the Dysart Road improvements, and regarding the Surprise Point channel.

Wrap up and Final Statements

- Lance stated he has funds for this project and is interested in pursuing the project.
- Burke stated this project could be a regional solution for all parties.

Next Steps

- Scott noted that the Draft CAR is the next and last deliverable associated with the project.
- Scott Will obtain confirmation from Wood-Patel regarding the "title" of the channel which runs parallel to Dysart on the west side of the road.
- HDR will provide meeting minutes to FCDMC on February 13, 2009.



Waddell CAR Recommended Plan Presentation Sign-in Sheet

Meeting Location

El Mirage City Hall (12145 NW Grand Ave)

Meeting Date

February 12, 2009

INITIAL HERE	NO.	NAME	COMPANY/ AFFILIATION	ADDRESS	PHONE/FAX	E-MAIL
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	2.	Scott Mars, P.E.	HDR Engineering	3200 E. Camelback Road Suite 350 Phoenix, AZ 85018-2311	602-522-4347 Direct 602-522-7700 Office 602-522-7707 Fax	scott.mars@hdrinc.com
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	6.	Ryan Riggs	HDR Engineering	3200 E. Camelback Road Suite 350 Phoenix, AZ 85018-2311	602-522-7779 Direct 602-522-7700 Office 602-522-7707 Fax	ryan.riggs@hdrinc.com
	7.	John Holmes	Flood Control District of Maricopa County (FCDMC)	2801 West Durango Street Phoenix, AZ 85009	602-506-3320 Direct 602-372-0617 Office 602-506-2903 Fax	jwh@mail.maricopa.gov
	8.	Burke Lokey	Flood Control District of Maricopa County (FCDMC)	2801 West Durango Street Phoenix, AZ 85009	602-506-0867 Direct 602-372-0617 Office 602-506-2903 Fax	burkelokey@mail.maricopa.gov
	9.	Lance Calvert	El Mirage		623-876-2971	lcalvert@cityofelmirgae.org

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