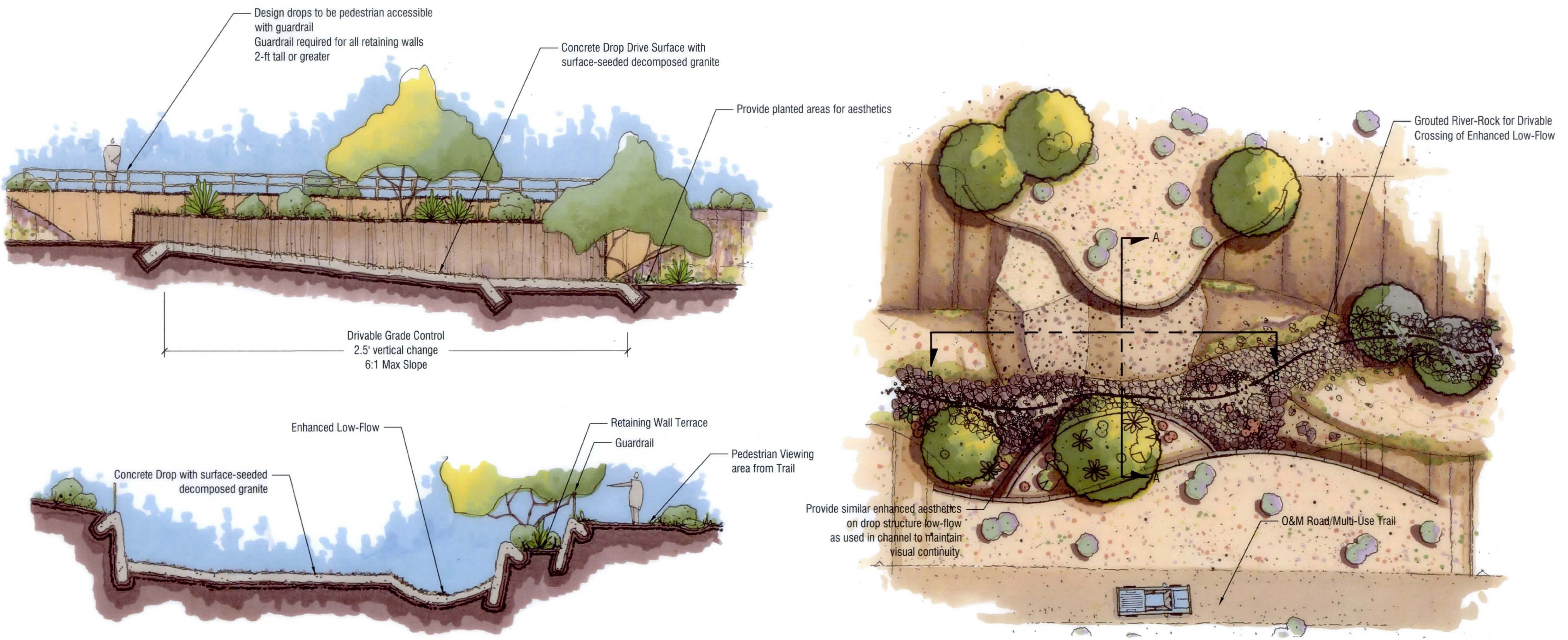
GWESCH

White Tanks FRS No. 3 Outfall Channel
Pre-Design Report
FCD 2009C012

Prepared for:
Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, AZ 85009
(602) 506.1501

January 29, 2010



201 West Indian School Road • Phoenix, AZ 85013 • (602) 252.8384

skin • Ryan Consultants, Inc.
creative engineering solutions

epg JACOBS Cooper Aerial Surveys Alpha Geotechnical & Materials, Inc. Cardno TBE Geological Consultants Inc.

TABLE OF CONTENTS

REGISTERED PROFESSIONAL ENGINEER (CIVIL)
CERTIFICATE NO. 19690
PAUL W.R. HOSKIN
Date Signed
ARIZONA, U.S.A.

EXPIRES 3/31/2012

TABLE OF CONTENTS (Continued)

REGISTERED PROFESSIONAL ENGINEER (CIVIL)
CERTIFICATE NO. 19690
PAUL W.R. HOSKIN
ARIZONA, U.S.A.

EXPIRES 3/31/2012

1 INTRODUCTION

Hoskin•Ryan Consultants, Inc. (HRC), has been contracted by the Flood Control District of Maricopa County (District) to prepare final design for the White Tanks FRS No. 3 (FRS#3) Outfall Channel project. The District is in the process of performing rehabilitation to FRS#3, including a new Principal Spillway that discharges adjacent to the Beardsley Canal. The project provides a channel along the Jackrabbit Trail corridor, to convey the Principal Spillway flows from FRS#3 to FRS#4. The outfall channel will extend south from the Principal Spillway of FRS#3 to the existing FRS#4 inlet channel north of McDowell Road, and will lie within the Town of Buckeye and unincorporated Maricopa County.

The goals of the project include:

- Provide an outfall for the FRS#3 Principal Spillway flows.
- Intercept and convey the 100-year flood flows reaching the channel to the planned outfall at FRS#4.
- Reduce the effective FEMA 100-year floodplain along Jackrabbit Trail.
- Accommodate the future widening of Jackrabbit Trail.
- Design the facilities to complement the existing and planned future setting through implementation of context sensitive planning and design.
- Provide an opportunity to implement trail linkage as part of the Maricopa County Regional Trail System.

The existing FRS#4 inlet channel is a concrete-lined channel which extends from south of Interstate 10 (I-10) to north of McDowell Road. North of the existing concrete-lined channel, the existing Jackrabbit Channel and Wash are a series of unlined channels and ditches of varying dimensions and capacities. Between Missouri Avenue and the Bethany Home Road alignment, natural drainage patterns continue across the Jackrabbit Trail alignment from west to east. From the Bethany Home Road alignment north to FRS#3, the predominant land slope is east towards the Beardsley Canal.

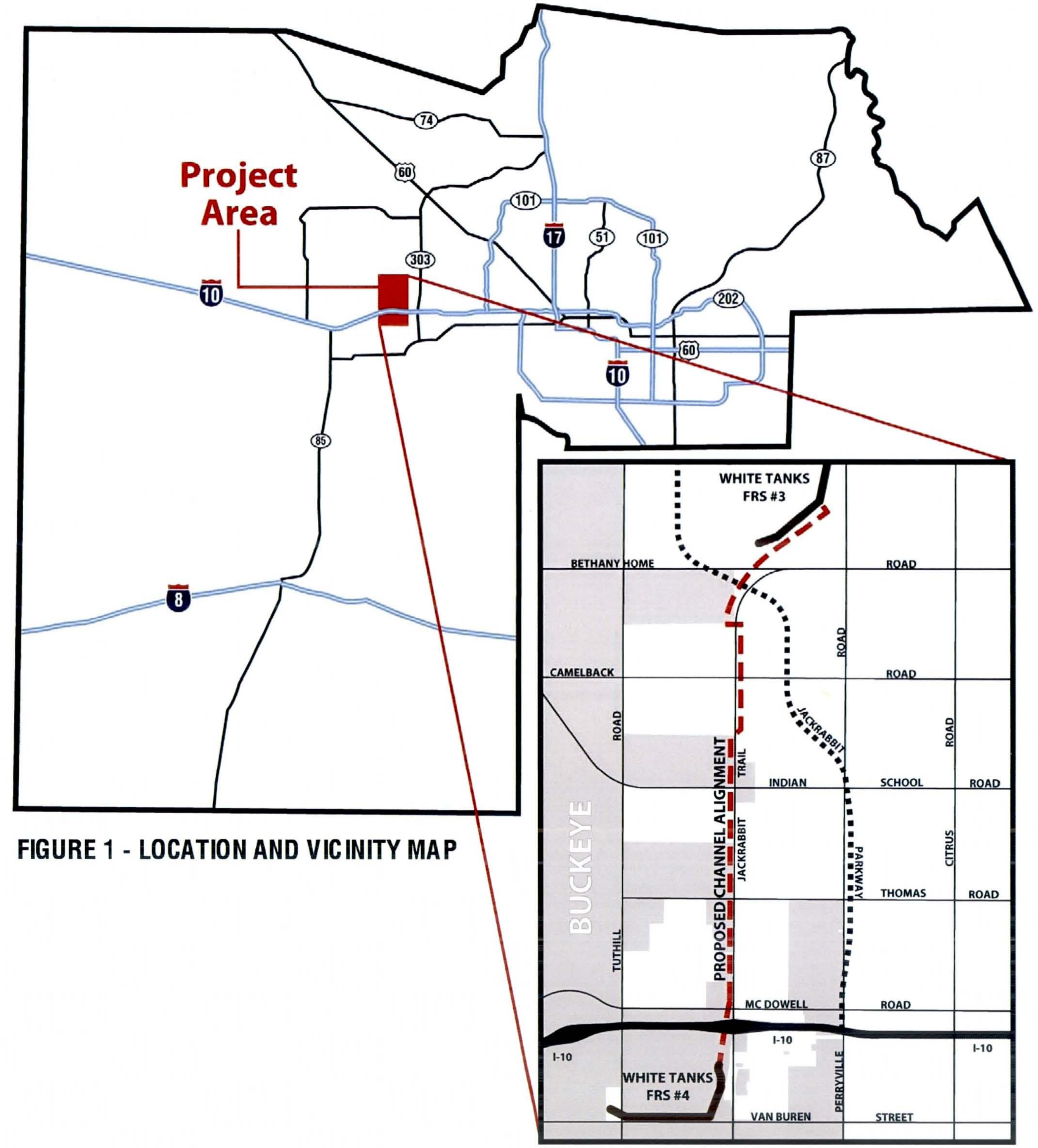


FIGURE 1 - LOCATION AND VICINITY MAP

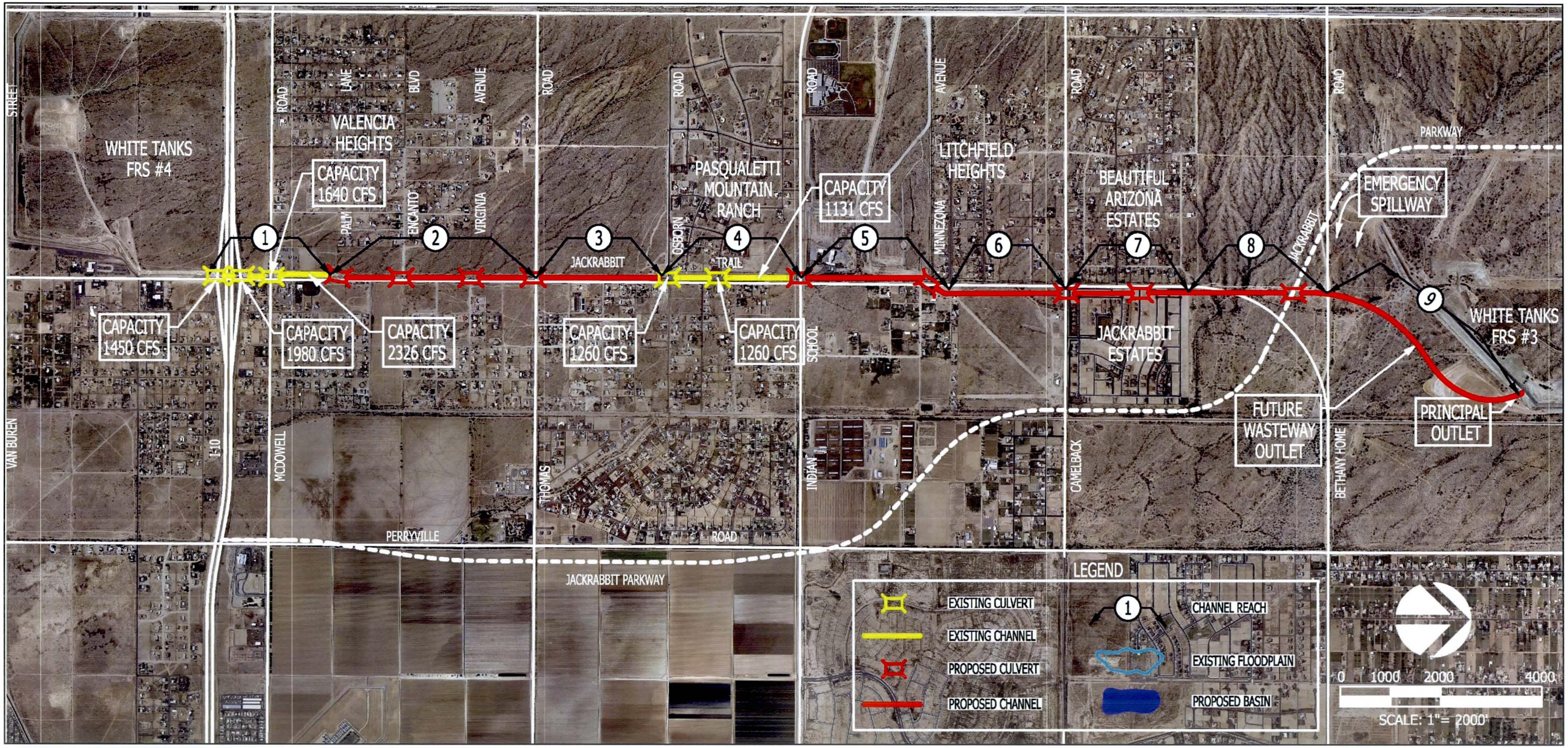


FIGURE 2 – PROJECT SCHEMATIC MAP

1.1 Stakeholders

On-going projects and interested stakeholders include the District, the Arizona Department of Transportation (ADOT), Maricopa County Department of Transportation (MCDOT), the Town of Buckeye, the Maricopa County Municipal Water Conservation District (MWD), existing developments such as Jackrabbit Estates (Arryo Mountain Estates), Beautiful Arizona Estates, Pasqualetti Ranch, and Litchfield Heights, and private development interests such as DMB White Tanks (Verrado, north of Indian School Road) and SouthWest Value Partners (north of Missouri Avenue).

1.2 Purpose

The *Design Report and 30% Plans* for the White Tanks FRS#3 Outfall Channel project (Figure 1) were completed on June 30, 2009 (Refs. 34, 35) and form the basis for the final design. This Pre-Design Report documents the re-evaluation of several alternative channel alignments and design approaches that were highlighted as a part of a Value Analysis conducted by the District.

This report is submitted in conjunction with a *Landscape Architecture Pre-Design Report* (Ref. 12). The 30% Plans were prepared without the guidance of a landscape architect, therefore it is the intent of the Landscape Pre-Design to identify methods to incorporate landscape materials, aesthetic structural treatments and trail connectivity into the project.

Results from this report will be incorporated into the Final Design Plans and Reports, as applicable.

1.3 Value Analysis and Value Engineering Review

A Value Analysis was conducted for the entire project limits. The purpose of the Value Analysis was to identify alternative design concepts that may have been overlooked in the planning and engineering stages of the project. Results from the Value Analysis are documented in a separate report (Ref. 40). Many different ideas and concepts were developed over the three-day Value Analysis session. Members of the Value Analysis team voted on ideas of merit; a shortlisted group of concepts was further developed, and cost estimates were prepared. These concepts were presented to a panel of District personnel and some were eliminated because they did not meet the original intent of the project or they appeared unfeasible due to schedule or inter-agency conflicts.

In addition to the Value Analysis Session conducted by the District, Jacobs prepared a Value Engineering review of the 30% Plans; a copy of the resulting memorandum is included in Appendix G. The main recommendations from the Value Engineering review include potentially using HDPE pipe within Reach 9, and arch culverts within Reach 6.

1.4 Authority for Study

A detailed Scope of Work was formulated as a part of the contract and proposal process. The Flood Control District of Maricopa County's contract number is FCD 2009C012. The official Notice to Proceed date is October 22, 2009. The District Project Manager is Gary Wesch, P.E.

1.5 Location of Study

The main area of interest lies along Jackrabbit Trail between FRS#3 and FRS#4, from approximately Roosevelt Street to Glendale Avenue, and includes the jurisdictions of the Town of Buckeye and unincorporated Maricopa County. The immediate watershed area contributing to the channel extends west to Tuthill Road, and north to FRS#3. Additionally, the watershed area includes all areas, which drain into the FRS#3 from the White Tanks Mountains, east to the Perryville Road alignment and north to McMicken Dam, near the Cactus Road alignment.

2 DESIGN CONSIDERATIONS

2.1 Introduction

The White Tanks Flood Retarding Structure No. 3 (FRS#3) Outfall Channel will provide an outfall for the FRS#3 Principal Spillway flows. This conveyance channel will extend south from the Principal Spillway at FRS#3 to the existing FRS#4 inlet channel north of McDowell Road. The District recently constructed a new Principal Spillway for FRS#3 at the east end of the dam, and has a design for a new emergency spillway at the west end.

The channel alignment will meander, where possible, to maintain a pleasing aesthetic view, and will serve as a multi-use trail connection. The Design Report and 30% Plans were prepared by Hoskin-Ryan for the District (Refs. 34, 35). The project was broken into nine reaches, each with its own channel cross-section and right-of-way requirements. The Final Design phase will use the 30% Design Plans as the basis for design.

The 30% Design was based upon accepting the full discharge from the Principal Spillway located at the east end of FRS#3. In order to provide flexibility for the dam operations for both FRS#3 and FRS#4, a wasteway was shown which would allow releases from the Principal Spillway to be directed southward along the west side of the Beardsley Canal. Prior to the Value Analysis, District staff decided that a single 48-inch gated outlet from the Principal Spillway could meet these needs (See Appendix B).

The Outfall Channel will be designed to convey 285 cfs that occurs at an elevation head of 1,216 feet (NAVD 88). This is the outflow from a single 48-inch pipe (west pipe) under maximum head from the Probable Maximum Flood (PMF). The wasteway flows from the east pipe will be for a discharge of 221 cfs through the 48-inch gated outlet. This flow will occur when the water surface elevation is at the crest elevation of the emergency spillway.

The FRS#4 inlet channel is a concrete-lined channel which extends from south of I-10 to north of McDowell Road. North of the existing concrete-lined channel, the Jackrabbit Channel is a series of unlined channels and ditches of varying dimensions and capacities. Between Missouri Avenue and the Bethany Home Road alignment, natural drainage patterns continue across the Jackrabbit Trail alignment from west to east. North of the Bethany Home Road alignment, the predominant land slope is to the east, towards the Beardsley Canal. An overchute structure just south of Bethany Home Road conveys runoff, which originates on District property, across the canal.

2.2 FRS#3 Remediation Project

The District has recently completed improvements to the FRS#3 dam as a part of the Phase 1 Dam Remediation (Ref. 52). The modifications included strengthening of the dam to mitigate for the potential of a subsidence and fissure zone through the area. Other improvements included the installation of a new Principal Spillway at the east end of the FRS. The Principal Spillway consists of two 48-inch diameter gated pipe outlets and a riser tower connected to the western pipe. Currently, these pipes would discharge floodwaters along the west side of the Beardsley Canal. The floodwater would flow southward until it crosses the Beardsley Canal at an existing overchute south of Bethany Home Road.

A stockpile of dirt excavated from the FRS#3 North Inlet Channel contains an estimated 500,000 cubic yards of soil. This material, along with additional excavation from within the channel, will be used for landscape mounding and screening of the dam. Design of the Phase 2 Dam Remediation Plans (Ref. 53) is complete and the project bid in early 2010. The Phase 2 plans include structure modifications to the west end of FRS#3 and grading for a new emergency spillway. The improved emergency spillway will contain the PMF flows and train them toward the southeast.

EPG prepared Landscape Design Plans (Ref. 53) that included mounding to help conceal the FRS from view from the future Jackrabbit Parkway and Jackrabbit Trail/Bethany Home Road. These plans might be adapted for use on the Reach 9 section of the Outfall Channel. The free form shape of the grading will help to break up the straight-engineered lines of the dam. Variable sideslopes on both sides of the channel in this reach will be evaluated.

2.3 Jackrabbit Trail and Jackrabbit Parkway

A recent study by MCDOT (Refs. 10, 11) proposed a new highway, referred to as the Jackrabbit Parkway, which follows an alignment along Perryville Road and then crosses Jackrabbit Trail north of Missouri Avenue. This parkway will be considered in the Final Design; however, no improvements will be made since the exact alignment has not been established. In another MCDOT study, the right-of-way width for the Jackrabbit Trail was identified as 130 feet in width; however, Jackrabbit Trail is currently termed as a "Road of Regional Significance" (RRS) by MCDOT, which means that a right-of-way width of 140 feet is desirable. Planning studies by MCDOT indicate that the Jackrabbit Parkway will ultimately assume this designation and therefore Jackrabbit Trail will be re-classified.

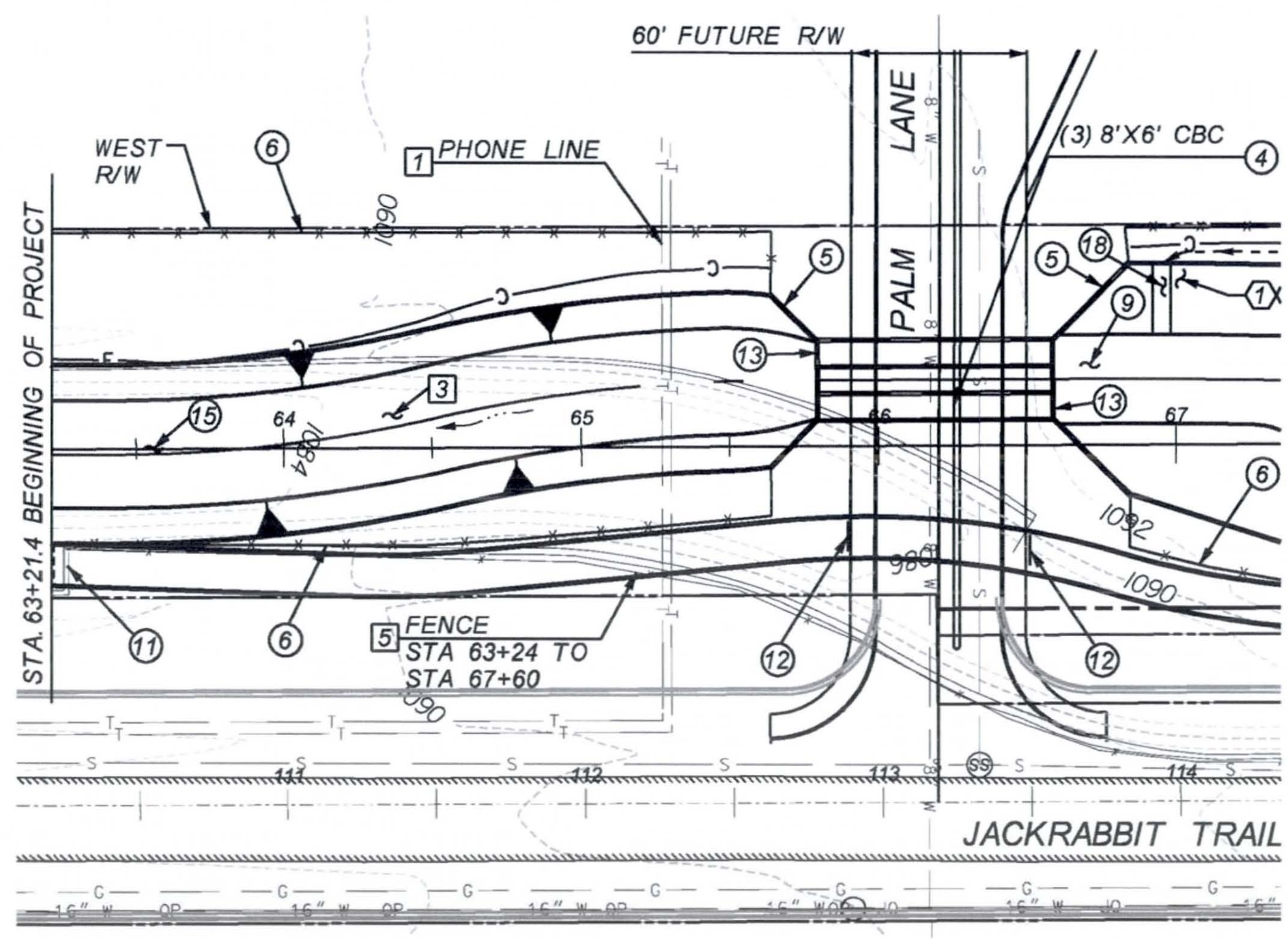


FIGURE 3 – BUCKEYE PARK AND RIDE PALM LANE ENTRANCE

A procedural step by the Town of Buckeye is necessary to remove the designation of RRS. Discussions should be held with the Town of Buckeye and MCDOT to resolve the ultimate requirements.

2.4 Buckeye Park and Ride

The Town of Buckeye plans to solicit proposals to prepare design plans for a new Park and Ride facility. This 5-acre site will be located on a 6.88-acre parcel (MCR 502-34-017L) on the northwest corner of Jackrabbit Trail and Palm Lane. Palm Lane, which does not currently exist, will be constructed with the Park and Ride project. A new culvert crossing will be necessary along with a segment of concrete channel at the outlet. The District is in the process of forming an Intergovernmental Agreement (IGA) with Buckeye to coordinate the design and construction of the culvert and channel. Some temporary channel improvements will be necessary at the upstream end of the culvert.

2.5 Buckeye Sewer Improvement Project

Final Design Plans are complete and construction is underway for a sewer extension within Jackrabbit Trail from approximately Roosevelt Street to 1,300 feet north of Indian School Road. The new 12- to 15-inch sewer line will intercept future lateral extensions to the west. Sewer lateral extensions should be designed with each culvert crossing of the major side streets. A future extension of this line from Indian School Road north to Bethany Home Road should be considered in the Final Design.

2.6 Operations and Maintenance Road

Where right-of-way will not be too constrained, the Operations and Maintenance (O&M) road will meander to align with the sideslope contours and will be placed at the top of channel slope on both sides of the channel. The O&M road will also serve as the Multi-Use Trail for the project and will provide a connection to the Maricopa Regional Trail, Segment 35 (Ref. 37). Fencing, gates, or removable bollards will be used to limit access to the channel and yet still maintain the trail use. Decomposed granite, with a stabilizer to reduce erosion and dust, may be used to help blend to the surroundings.

2.7 Channel Scour and Erosion Protection

The natural slope along the existing Jackrabbit Channel alignment is steep enough to cause flow velocities in excess of 3 feet per second. Drop structures of 2.5 feet in height were specified in the 30% Design Plans (Refs. 34, 35) providing an overall design bed slope of 0.0010 ft/ft. They are shown as a sloped concrete transition set at a maximum slope of 20 percent, allowing maintenance vehicles to drive between channel segments. The District's O&M personnel have indicated that access ramps are an important feature and that the grade should not exceed a slope of 6:1. In the 30% Design, a riprap transition was proposed downstream of each grade control structure, to force a hydraulic jump and slow the flow velocity. The rock riprap may pose a challenge to the passage of maintenance vehicles.

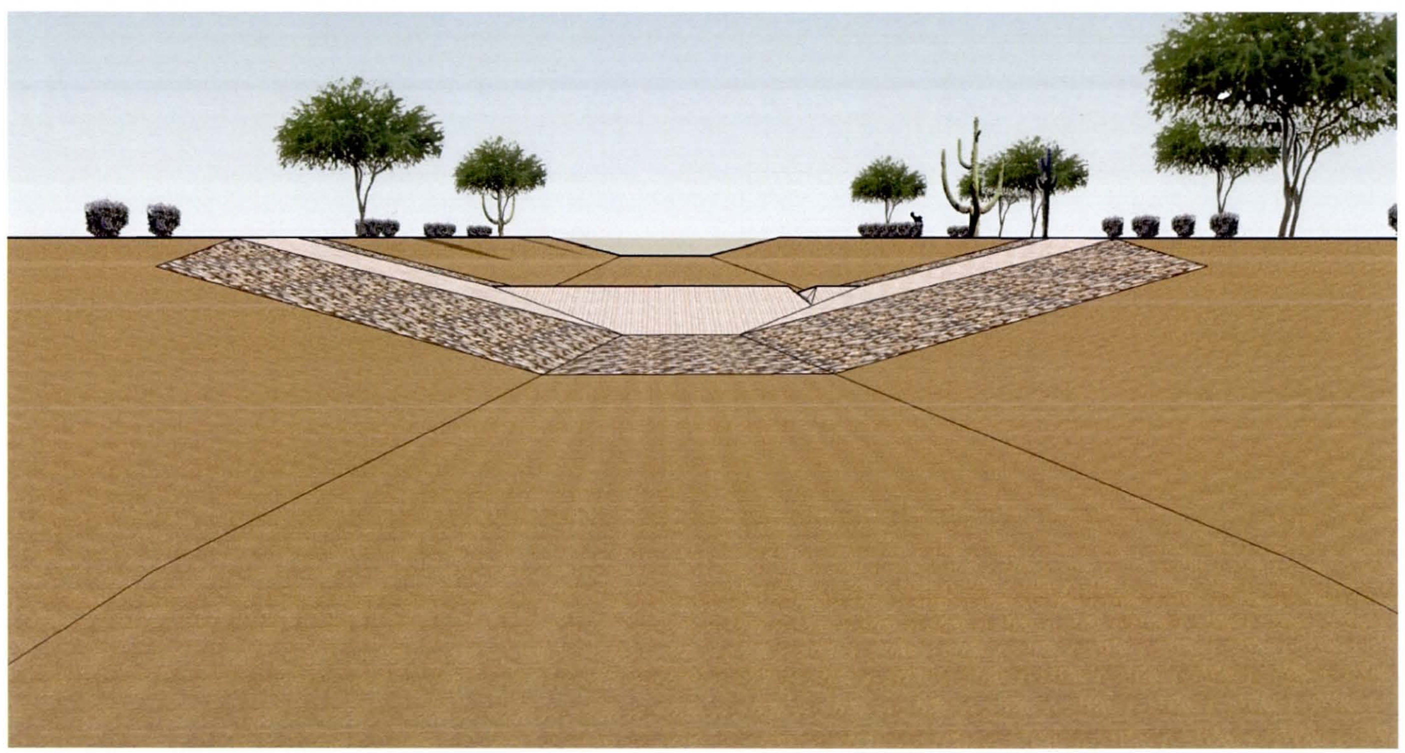


FIGURE 4 – TYPICAL GRADE CONTROL STRUCTURE LOOKING UPSTREAM IN THE CHANNEL

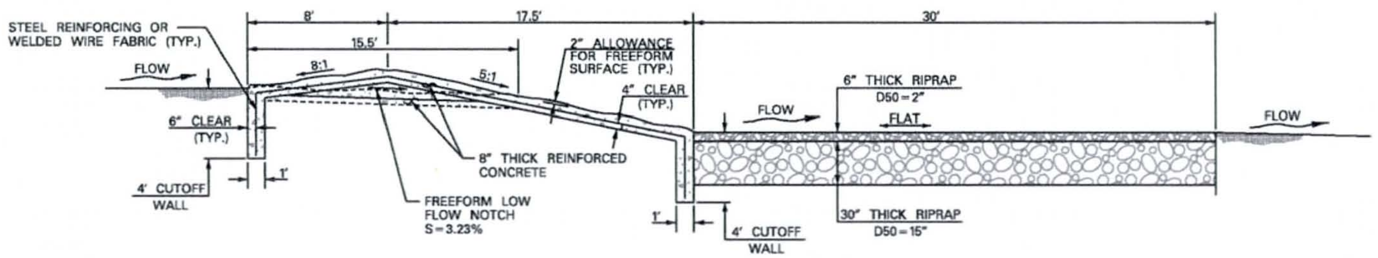


FIGURE 5 – CROSS-SECTION THROUGH GRADE CONTROL STRUCTURE

A low flow thalweg (notch) will be provided in the weir crest to allow smaller flows to pass without affecting the maintenance vehicle path. Additionally, the position of the low flow thalweg along the weir crest may be varied from structure to structure, allowing the low flows to create a more natural meandering wash appearance along the length of the channel.

Landscape and aesthetic treatments will be incorporated into the Final Design. Boulders, colored concrete, aggregate surfaces and form liners will be explored as options to improve the appearance of these structures. The earthen banks of the channel will be protected from rill erosion with gravel mulch and hydro seeding.

2.8 Side Drainage Inlets

Local washes and drainage from the west enter the current channel along Jackrabbit Trail. This drainage will be handled in a manner that eliminates erosion and prevents migration outside of District property. The 30% Design shows the use of concrete spillways to control erosion. Other methods will be explored that can minimize structures and be compatible with adjacent properties. The spillways will be designed to coincide with the grade control structures, where possible, to minimize the use of concrete and riprap. Alternative measures will be explored for a range of design flows.

2.9 Culvert Crossings

Culverts will be used where the channel alignment crosses roads. District policy does not allow for funding of the culvert construction to the full build-out length, therefore the culverts will be built to accommodate the existing roadway or right-of-way widths. Grade control structures will be built at most culvert inlets in order to reduce the need for grade control structures.

2.10 Reach 6

Within the Litchfield Heights subdivision, several washes collect from watersheds to the west and combine in a drainage channel on the west side of Jackrabbit Road. This drainage collects behind berms that parallel Jackrabbit Road and is conveyed south through two concrete box culverts. Future widening of Jackrabbit Trail may interrupt the channel and culverts. A means to intercept this drainage and convey it within the new channel is desirable. Additional conveyance capacity should help reduce the existing floodplain in the area.

At approximately Jackrabbit Trail and Minnezona Avenue, two existing earthen channels merge with the culvert structure. Flowline elevation differences between the three channels require the design of a complex junction structure. The 30% Design proposed two energy-dissipating structures at this location. Alternatives for Reach 6 are explored further in Section 6.1 of this report.

2.11 Reach 7

The right-of-way width available within Reach 7 limits the amount of channel meander and bottom width. According to the 30% Design, an existing screen wall that separates Jackrabbit Estates from Jackrabbit Trail will be removed. Removal of the theme wall around the project would cause disruption of the existing landscape and irrigation systems. In places, the right-of-way is not wide enough to accommodate a full maintenance road; therefore, the use of the local streets within the subdivision was proposed.

In a meeting with the HOA and Shea Homes (developer of the project), it appears that there is reluctance for the new channel to be integrated into the development. The HOA appears to prefer to wall the development from the channel. Other alternatives to reduce the impact on this development should be pursued and are discussed in Section 6.1 of this report.

2.12 Reach 9

2.12.1 Principal Spillway Channel

Reach 9 lays between the FRS#3 Principal Spillway and the Bethany Home Road alignment. A coordination meeting with ADWR and NRCS indicated that their approval would not be necessary if there is no impact to the operation of the dam structure. The design as presented in the 30% Design Plans will need to meet USACE and FEMA criteria for levee design, CFR 65.10. The 30% Design Plans show an earth embankment along the south bank. This embankment will need to be designed in accordance with the USACE's levee requirements, and therefore a minimum of 3 feet of freeboard should be provided for the 100-year event. The north bank will not require the same freeboard but should slope toward the channel. Landscape mounds will be placed in a manner similar to that shown for the FRS#3 rehabilitation project (Ref. 51) in order to mask the appearance of the dam. Alternative design options for this reach will be explored, including widening of the berms to remove the restrictions placed on the design by classification as a dam or levee.

2.12.2 Emergency Spillway

The 30% Design Plans show the channel crosses under the emergency spillway via a concrete box culvert. The design of this box culvert needs to be integrated into the spillway training dike design which will be built with the Phase 2 Dam Remediation (Ref. 53). Since the culvert will interrupt the training dikes which will be built, methods to protect against erosion will need to be explored. The NRCS approved SITES model for the emergency spillway will need to revised.

2.12.3 Earth Fissures and Subsidence

A geotechnical investigation performed by AMEC (Ref. 2) as part of the dam remediation project indicates that there is the potential for subsidence and fissures in the area of FRS#3. If subsidence or fissuring were to occur, the channel in Reach 9 could be vulnerable. Subsidence risks are discussed further in the Geotechnical Report for this project (Ref.61). The 30% Design Plans included a contingency item for the inclusion of a hardened structure into the Outfall Channel project. Reach 9 Alternatives are discussed further in Section 6.2 of this report.

2.12.4 Principal Spillway Wasteway

The Structures Management Branch required the inclusion of a wasteway for the Principal Spillway. The wasteway structure currently shown on the 30% Design Plans consists of a spillway and a gated structure within the Reach 9 channel. Operating conditions for the wasteway might occur if the downstream outfall channel is not complete, or if FRS#4 is unable to accept additional discharge.

Since preparation of the 30% Design Plans, the Structures Management Branch recommends that the wasteway is eliminated. Instead, it is proposed to direct the eastern outlet pipe toward the Beardsley Canal wash and the western pipe to the outfall channel. An evaluation of the impact to the Beardsley Canal wash downstream of the Principal Outlet is included in Section 4.3 of this report.

3 HYDROLOGY

HEC-1 models were prepared for the existing conditions and "future conditions with project-in-place." The existing conditions model was created in December 2009 and was based upon the *Loop303/White Tanks ADMPU Area Hydrologic Analysis* (the ADMPU AHA) submitted by HDR on September 4, 2009. The future conditions model was prepared in June 2009 for the *White Tanks FRS No.3 Outfall Channel 30% Design Report* (Refs. 34, 35), and was based upon the ADMPU AHA submitted by HDR on March 9, 2009. HRC reviewed the ADMPU AHA models and has confirmed that the recent updates do not affect the validity of the models previously prepared.

3.1 Existing Conditions with Project in Place

Existing conditions models for the 10-year and 100-year storm events were created based upon the "existing conditions with CIP" model (ECIP-MB2.dat) of the ADMPU AHA. Modifications made by HRC include updates to NOAA 14 precipitation, the stage-storage-discharge curve of FRS3, retention volumes, and routing channel geometries.

To reflect the precipitation difference between the "mountain terrain" and "range terrain," the watershed of Major Basin 02 in the ADMPU AHA was divided into two basins. The FRS#3 major basin covers the watershed area upstream of White Tanks FRS#3, with a 100-year point precipitation of 4.016 inches and a 10-year point precipitation of 2.572 inches. The Jackrabbit Corridor major basin covers the watershed area downstream of FRS#3, with a 100-year point precipitation of 3.661 inches and a 10-year point precipitation of 2.353 inches. Separate HEC-1 models were created for each major basin. HEC-DSS was employed for data transfer between the two models.

The stage-storage-discharge curve for the "future condition," which is defined as the condition with the Principal Spillway open and the gated outlet closed, was used to update the ADMPU AHA model for FRS#3 storage routing. Additional information regarding this update is documented in the *White Tanks FRS No.3 Outfall Channel 30% Design Report* (Refs. 34, 35).

A retention volume of 12.5 acre-feet was applied to the Pasqualetti Mountain Ranch in the ADMPU AHA model. The Final Plat indicates on-lot retention; however, the current development does not appear to provide on-lot retention, and does not have room for significant retention storage. It is not clear whether on-lot retention will be required for future phase, therefore, to be conservative, the retention diversion was removed from the model.

The channel proposed by the Preliminary Design Plans prepared by Gannett-Fleming (Ref. 30) was used for channel routing in the ADMPU AHA model. Updates were made to reflect the channel geometry proposed by the 30% Design Report (Refs. 34, 35).

The computed existing conditions discharges along proposed channel are shown in Table 1.

3.2 Future Conditions with Project in Place

A future conditions model for the 10-year storm event was created based upon the "future condition with CIP" model (Future_CIP_MB02.dat) of the ADMPU AHA. Modifications made by HRC include updates to land use types, retention volumes, NOAA 14 precipitation, and routing channel geometries. Additional information regarding the updates is documented in the *White Tanks FRS No.3 Outfall Channel 30% Design Report* (Refs. 34, 35). The computed future conditions discharges along the proposed channel are shown in Table 1.

Table 1: HEC-1 Model and Design Discharges

Reach	Existing Conditions			Future Conditions			Design Discharge
	Concentration Point	100-Year	10-Year	Concentration Point	100-Year	10-Year	
Reach 1	CPW37	1065	346	CPW38	1549	397	1549
Reach 2	CPW36	935	286	CPW37A	648	222	700
Reach 3	CPW36	935	286	CPW36	670	241	700
Reach 4	CPW35	853	294	CPW35	701	302	700
Reach 5	CPW33	792	293	CPW33	795	360	800
Reach 6	CPW33	792	293	CPW33	795	360	800
Reach 7	CPW28A	511	211	CPW28A	664	81	700
Reach 8	CPW28A	522	211	CPW28A	664	81	700
Reach 9	CPW21A	187	54	CPW21A	218	87	285

3.3 Probable Maximum Flood (PMF) for FRS#3

The Natural Resource Conservation Services (NRCS) developed Probable Maximum Flood (PMF) hydrographs for various Probable Maximum Precipitations (PMP) using TR-20. The TR-20 model prepared by NRCS was updated by URS for the *FRS3 Remediation Project* (Refs. 49, 50). The FRS#3 reservoir routing results for future conditions indicate that the 6-hour local PMP will cause a maximum reservoir elevation of 1216 feet (NAVD 88), with a corresponding Principal Spillway discharge of 284 cfs. Therefore, the design discharge for Reach 9 was set at 285 cfs.

4 HYDRAULICS

Soils information collected during the *White Tanks FRS No.3 Outfall Channel 30% Design Report* (Refs. 34, 35) indicates that a sandy loam covers the project alignment. Based upon guidelines in the District Hydraulics Manual (Ref. 17), a maximum design velocity of 3 feet per second was selected for the unlined portions of the channel. Alternatives other than an unlined channel were identified for Reaches 6, 7, and 9 during the Value Analysis Session held by the District. This report documents the hydraulic analysis for these alternatives.

4.1 Sedimentation and Scour Analysis

Although the non-erosive velocity method was selected as the criteria for the 30% design, it is also recognized that the equilibrium slope method documented in the District's *River Mechanics Manual* (Ref. 29) is potentially applicable. This report documents the equilibrium slope calculations performed using available soil data.

At each tributary, the sediment yield was calculated using the District's DDMSW program (beta version 4.5.3). The DDMSW program calculates wash load using the Modified Universal Soil Loss Equation (MUSLE) method and bed load using the Zeller-Fullerton equation, as documented in the District's *River Mechanics Manual* (Ref. 29). The results are provided in Appendix E. Sediment-trapping basins will be designed to capture sediments conveyed by major tributary washes approaching the channel from the west.

4.1.1 Soil Data

Alpha Geotechnical and Materials, Inc., geotechnical subconsultant for this project, has collected 60 soil samples along the proposed channel alignment, 5 soil samples at the stockpile, and 12 soil samples within the sandy bottom of the Jackrabbit Wash (Ref. 61). This information will be used to determine the equilibrium slope for the channel for both clearwater and sediment laden discharges. The grain size distribution from the laboratory tests indicates that the soil at the design depth of the channel generally contains about 30% silt, while the soil sample from the existing wash sandy bottom contains less than 10% silt (Ref. 61). The equilibrium slope analysis and sediment yield calculations were conducted using the grain size distribution of the existing wash sandy bottom sample ($D84=4.0$mm, $D50=1.2$mm, and $D14=0.2$mm), as this is the existing equilibrium state of the wash.

4.1.2 Equilibrium Slope

Per discussion with District staff, the channel was designed based on the permissible velocity of 3 feet per second. Equilibrium slope analysis using the Schoklitsch equation was used to verify the channel design slope for clearwater flows. For lower discharge flows, sediment will trap behind the FRS, however, at full discharge, the outlet pipes may carry sediments. The channel or pipe slope from the Principal Spillway, west along the Reach 9 segment, will be steepened by an additional one foot (from 0.10% to 0.129%) to allow for the potential of future differential subsidence as identified by Geological Consultants, Inc. (Ref.61). The PMF outflow of 285 cfs from the west Principal Spillway, or the 10-year flow from the HEC-1 models, whichever is larger, was used for the equilibrium slope analysis for each reach. The results are provided in Appendix E.

4.2 Channel Hydraulics

The hydraulic performance of alternatives for Reaches 6, 7, and 9 were analyzed using FlowMaster and Dodson Hydrocalc (Appendix D). The channel, pipes and culverts have been sized properly to convey the design flows.

In the 30% design, a Manning's 'n' of 0.035 was selected for un-lined earthen channel, and the channel slope was identified to be 0.1% to achieve a non-erosive velocity of 3 feet per second. One of the landscape scenarios could potentially lead to a Manning's 'n' of 0.050 when vegetation is fully established. Accordingly, the channel slope could theoretically be increased to 0.2% for an earthen channel with a non-erosive velocity of 3 feet per second. With the increase of channel slope, six of 19 drop structures between Reach 2 and Reach 6 could be eliminated. However, it is recognized that Manning's 'n' will vary with the growth of the landscape vegetation and its impact on channel hydraulics need further investigation. The channel will be designed for post-construction and full-growth conditions.

The sensitivity of flow velocities on channel slopes and Manning's roughness was evaluated for Reaches 2 and 3. A narrow cross-section with a 30-foot channel bottom and 4:1 side slope and a wide cross-section with a 44-foot channel bottom and 6:1 sideslope were selected for analysis. The results indicate that the flow velocity will fall below 3 fps for a design channel slope of 0.1% with 0.025 <n<0.035 and for a design channel slope of 0.2% with 0.035<n<0.050. The results are included in Appendix E.

4.3 Wasteway Flows to Beardsley Canal and Wash

One of the two Principal Spillway pipes (east pipe) will remain for use as an emergency wasteway. This wasteway will be used if the operation of FRS#4 does not allow a discharge, if construction of the outfall channel is incomplete, or if an earth fissure develops. This project maps the inundation effects which could result from a discharge of 221 cfs from the gated outlet when the water surface elevation in the FRS #3 reservoir reaches the crest of the emergency spillway, i.e. 1,212 feet (NAVD 88). The potential flood inundation area occurs along the west side of the Beardsley Canal, southward toward an overchute that is located south of Bethany Home Road.

A steady flow HEC-RAS model was prepared using cross-section geometry obtained from the one-foot aerial mapping prepared by Cooper Aerial in December 2009 (Appendix H). Cross-sections were located along the wash every 200 feet except at the Beardsley Canal overchute and where trails cross the wash. Ineffective flow areas were identified at some cross-sections where water could pond. Due to the density of the vegetation, a Manning's 'n' roughness coefficient of 0.045 was chosen for the entire wash along the Beardsley Canal. The results from the HEC-RAS model were used to delineate the floodplain shown in Figure 6.

The principal spillway inundation area was mapped by JE Fuller using Flo2D, as part of the FRS#3 Emergency Action Plan EAP) study (Ref. 62). The EAP indicates that the flow of 221 cfs would not be contained within the Beardsley Wash and would overtop Beardsley Canal. To resolve the difference in results, a sample of the Flo2D grid was compared with the aerial mapping (Appendix J). The 50'x50' square grid used in the Flo2D model does not provide sufficient precision to represent the Beardsley Wash, whose total width is approximately 50 feet. The Flo2D model underestimated the existing wash capacity and, as a result, overtopping of the Beardsley Canal was predicted. The HEC-RAS model provides a more accurate model of the wash capacity and shows that overtopping of the canal will not occur.

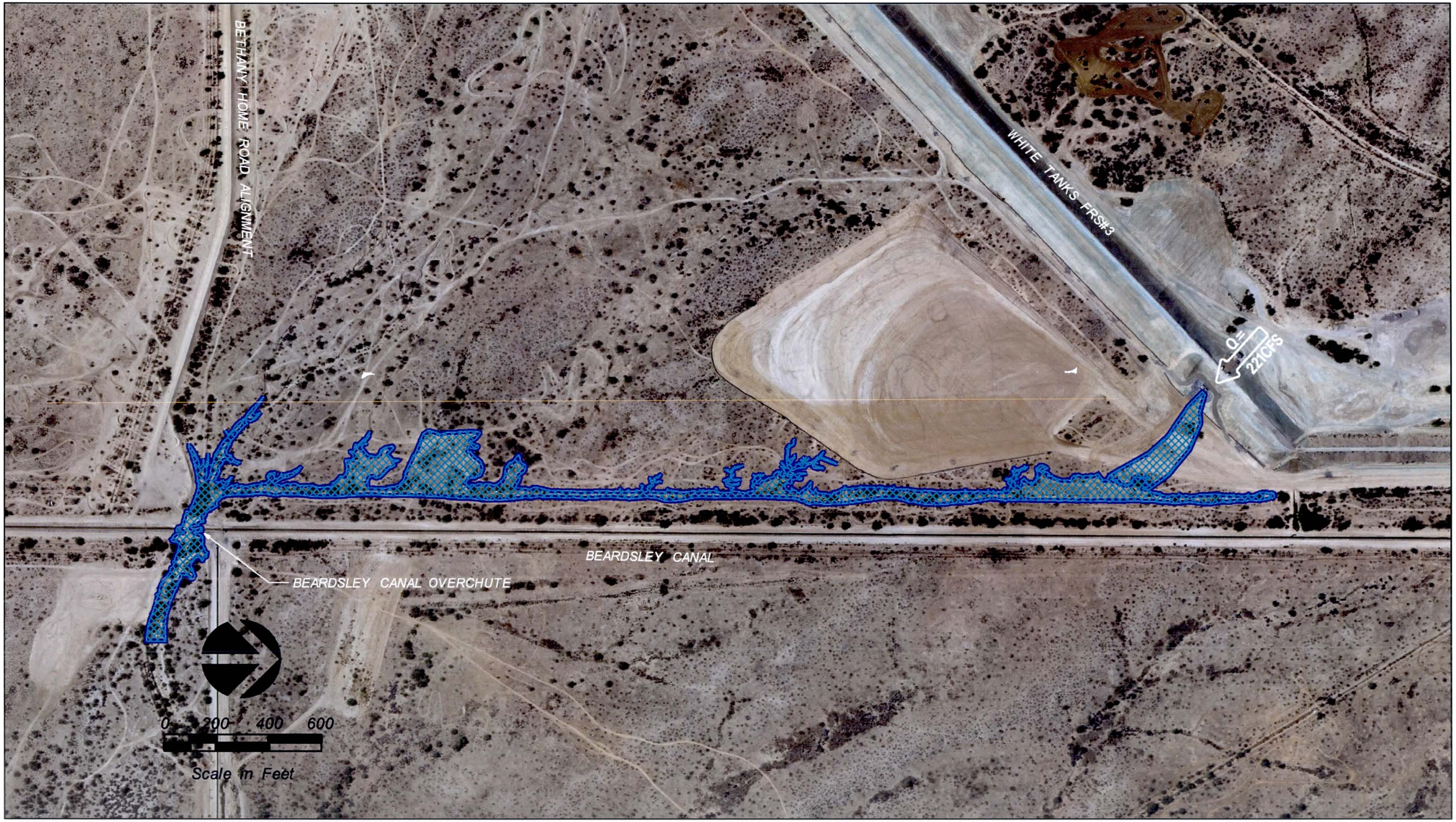


FIGURE 6 – WASTEWAY FLOW INUNDATION AREA

5 DESIGN ELEMENTS

The 30% Design Plans were prepared without input from a landscape architect and were based upon the need for a functional channel system. During the Value Analysis, several design elements were discussed that could improve the aesthetics and maintenance of the channel and structures. Landscape concepts have been developed in conjunction with EPG and are further discussed in the *Landscape Architecture Pre-Design Report* (Ref. 12).

5.1 Culverts

The 30% Design Plans proposed ADOT concrete box culvert throughout the project in the size range of 2-10' x 6' and 3-10' x 6' were proposed in the 30% Design Plans. A minimum height of 6-feet is recommended by MCDOT due to maintenance access. These structures have gained popular support from municipalities throughout the country and are universally used.

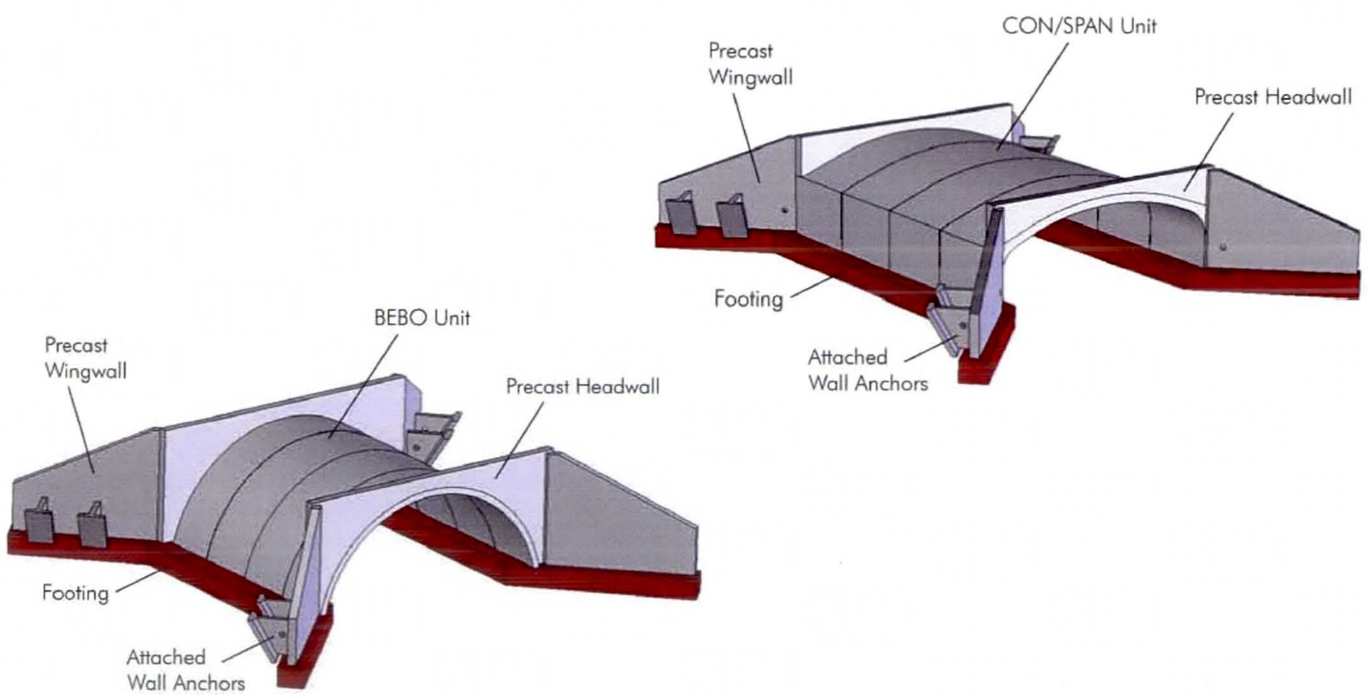


FIGURE 7 – CON-SPAN AND BEBO PRE-CAST CULVERT OPTIONS

During the Value Analysis, the use of a pre-manufactured culvert system was proposed. The use of these may have some benefits over a cast-in-place culvert system. The road network in this area is fragmented and there are houses that may only have one paved point of access. Prolonged shutdowns of roads could be a significant challenge. Pre-cast units have an advantage because they are manufactured off-site and can reduce road closure times. Installation takes less time and there is no concrete cure time to be concerned about.

Pre-cast arch units available from Contech present an alternative that can create a more aesthetic structure economically (Appendix A). The two pre-cast units presented here are the Con-Span and the BEBO unit. Product information from Contech is provided in Appendix A. Initial price quotes from Contech (Appendix A) show a price of $670/LF for (1) 16'x6' Con/Span Precast Arch Culvert installed versus $1121/LF presented in the 30% Design for a (2) 8'x6' CBC, and $754/LF for (1) 24'x6' Con/Span Precast Arch Culvert installed versus $1604/LF presented in the 30% Design for a (3) 8'x6' CBC. Pre-cast wingwalls are an option and since they are made to order, formliners and colored concrete can be specified.

5.2 Pipe Options

The design discharge for the outfall channel within Reach 9 will be reduced to 285cfs from its original 560 cfs. With a lower design discharge, a pipe option for Reach 9, including underneath the emergency spillway, may be more economically feasible. Since Reach 9 lies within a subsidence and fissure risk zone (Ref. 2), there is the potential for long-term differential settlement.

FIGURE 8 – HDPE WELDED SEAM PIPE

At the Value Analysis workshop, the use of a welded seam HDPE pipe was suggested. Contech has a product called DuroMaxx that has a steel ribbed reinforcement that minimizes pipe deflection. Duromaxx is available in sizes up to 72-inches in diameter. The estimated installed price for 72-inch diameter Duromaxx pipe is $186/LF. A competing product is Weholite, a profile wall pipe. Product information for both can be found in Appendix A.

5.3 Grade Control Structures

The 30% Design shows nineteen (19) grade control structures within Reach 2 to Reach 6. The O&M Division at the District has indicated a desire to be able to drive along the length of the channel. The 30% Design Plans show the use of a sloped concrete grade control structure with a downslope face of 5:1 and a vertical grade change of 2.5 feet. Each grade control structure also has a 30-foot long riprap section to help reduce the flow velocity and to contain the hydraulic jump that will occur. Loose rock riprap of sufficient size to withstand the flow velocities expected will be difficult to traverse with vehicles and may require frequent maintenance.

FIGURE 9 – ARMORFLEX USED FOR SPILLWAY AND GRADE CONTROL STRUCTURE

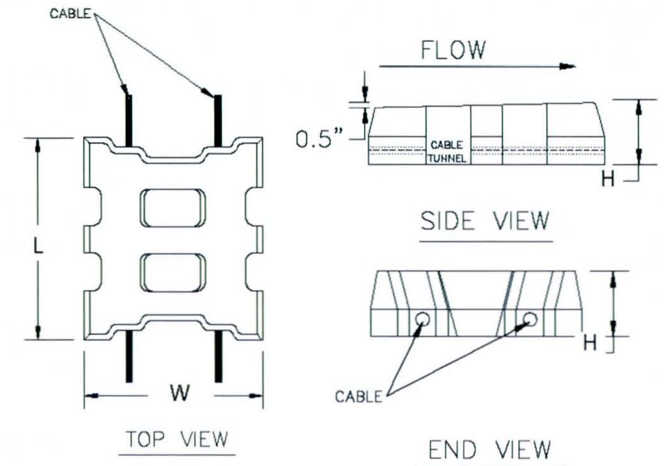


FIGURE 10 – ARMORFLEX BLOCK

An alternative product from Contech that might be usable in this application is called ArmorFlex. This articulated concrete block is tied together with cables to provide a uniform drivable surface. This product could be used in conjunction with the concrete grade control, or it could also be used for the grade control and side drainage spillways. This block is available to order with an integral colored concrete. Block can be open or closed cell and should use a filter fabric below an aggregate base. Cost of ArmorFlex installed is estimated at $9.04/SF compared to 3-feet of rock riprap at $7.77/SF and concrete spillway at $12.41/SF.

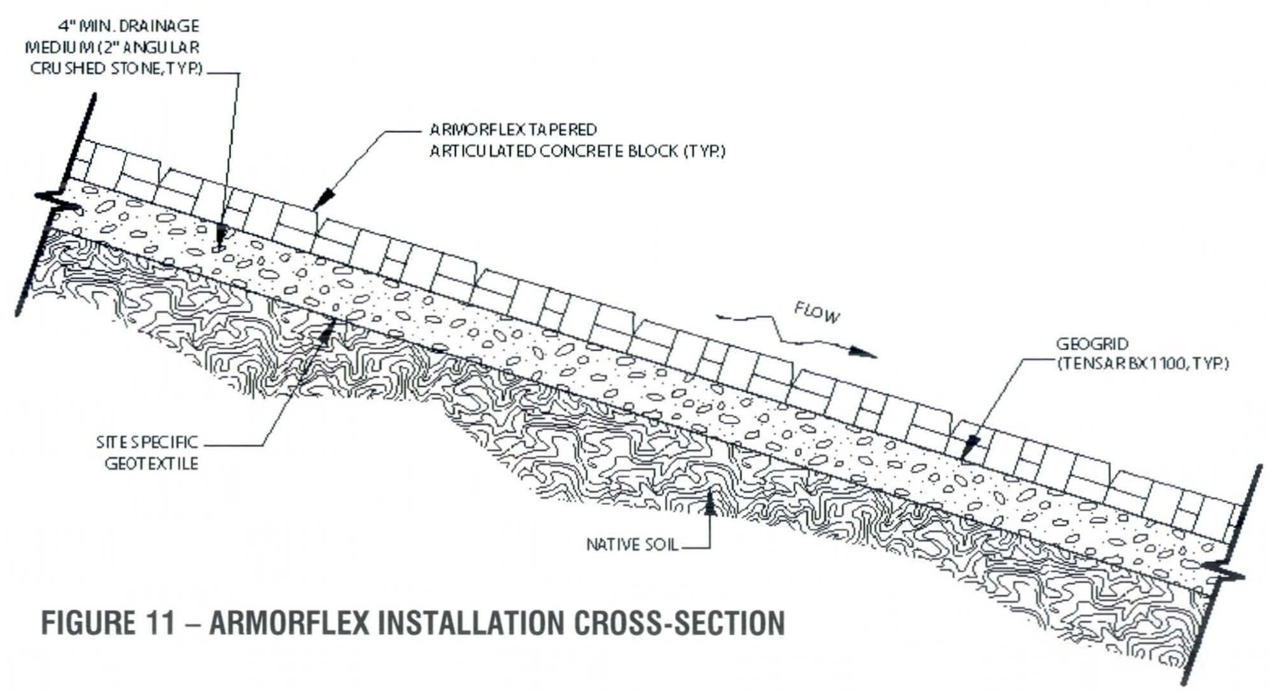


FIGURE 11 – ARMORFLEX INSTALLATION CROSS-SECTION

5.4 Retaining Walls

Where the right-of-way is narrower than desirable to meet the landscape and aesthetic goals of the project, the use of retaining walls may be necessary and is referred to as a "Restricted Channel" (Ref. 12). In addition, in certain locations such as at Jackrabbit Estates or Pasqualetti Mountain Ranch, an O&M road will not fit within the available right-of-way. In order to allow for a channel with variable sideslopes and meander, retaining walls should be considered. Retaining walls should be kept below 2.0-feet in order to avoid the need for fall protection. The 30% Design considered the use of formed cast-in-place concrete retaining walls. Gabion basket retaining walls were discussed at the Value Analysis meeting, however, the O&M Division indicated that they cause maintenance problems and can be subject to vandalism.

FIGURE 12 – TERRACED KEYSTONE WALL SYSTEM

FIGURE 13 – STRAIGHT-FACED AND TRI-PLANE VARIANTS OF KEYSTONE BLOCK SYSTEM

An alternative that was discussed was the use of a dry stack gravity wall system such as Keystone. These types of products allow for significant height of retaining wall with a variety of stone and color finishes.

Another alternative would be to use a colored gunite concrete laid at a 1:1 slope. The surface could be kept rough and the aggregate exposed, and the need for wire mesh could possibly be avoided using a "Fibermesh" mixture of cement and fiberglass. A variable texture can be introduced with a coarse mix design, and it could be scalloped to look like the layers of caliche in the area if done with skill. The relative cost of these alternatives was estimated as follows:

- Formed cast-in-place concrete retaining wall = $132/LF
- Keystone Block = $56/LF
- Pneumatically-placed mortar (gunite) = $34/LF
- Gabion basket (3x3) = $37/LF

5.5 Landscape Integration

Based upon the channel corridor's land context, the landscape design theme for this project is Desert Sonoran. This theme lends itself to a low maintenance low water use landscape that will fit with the natural desert. It is the team's desire to create a conveyance channel that mimics that found within a natural wash system. Natural washes tend to meander, erode, have soft banks and have predominant vegetation along the low flow wash banks. Overbank areas are typically less densely vegetated and differ in plant species. Further discussion of landforms and concepts are provided in the *Landscape Architecture Pre-Design Report* prepared by EPG (Ref. 12).

Four different channel concepts are discussed in the LA Pre-Design Report as follows:

- Natural Form Channel
- Meandered Trapezoidal Channel
- Restricted Open Channel
- Hardened Channel

5.5.1 Natural Form Channel

This would consist of a meandered low-flow channel located within a shallow floodplain area with flat-sloped overbank areas. The entire floodplain would be accommodated within the right-of-way using a depressed trapezoidal section. The low-flow channel would be approximately one foot in depth with erodible banks and would be allowed to erode and meander within the overbank areas. As would be typical of many desert washes, vegetation would follow the thread of the low-flow, and thus the fully-grown channel Manning's n value would need to be designed to be high enough to allow the freeboard requirements to be maintained after the vegetation becomes mature.

In order to accommodate denser vegetation within the low-flow portion of the channel, a higher Manning's 'n' value may be appropriate. A higher 'n' value will meet the intent of maintaining lower flow velocities. The 30% Design was based upon the use of an 'n' value of 0.035 and resulted in nineteen (19) grade control structures with a bed slope of 0.0010 ft/ft. By increasing the 'n' value to 0.050, the same velocity can be held with a bed slope of 0.0020 ft/ft. This beds slope helps to eliminate six (6) grade control structures. The optimum bed slope will be evaluated for a range of flow conditions from a low 'n' value after completion of construction, to a fully-grown in condition. The channel hydraulics will be assessed for a range of flows given the various stages of vegetative growth and the varying soils and locations of caliche as identified by geological Consultants, Inc. and Alpha Geotechnical.

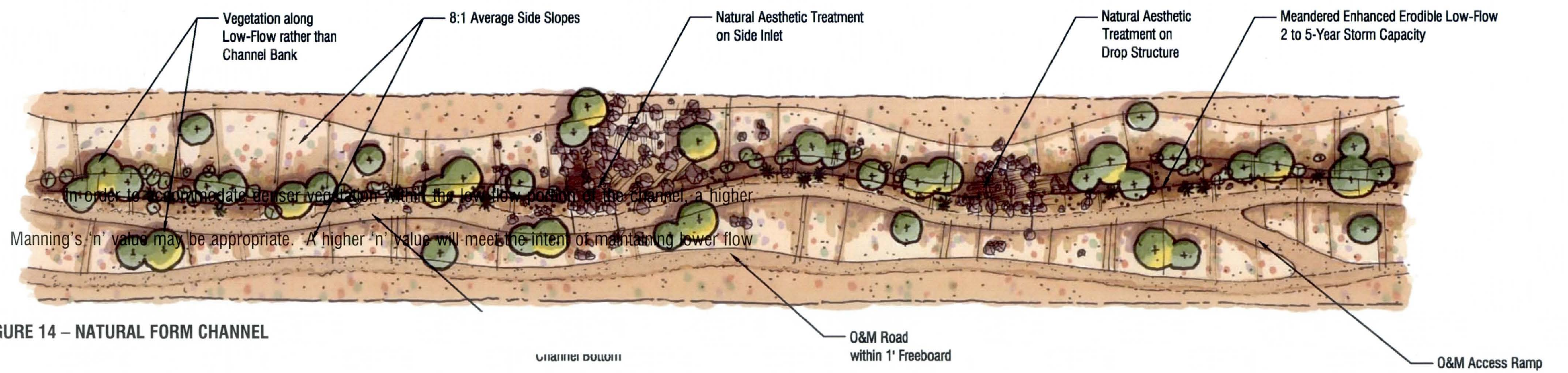


FIGURE 14 – NATURAL FORM CHANNEL

5.5.2 Meandered Trapezoidal Channel

The meandered open channel concept is based upon the 30% Design Plans configuration. The channel consists of a uniform bottom width trapezoidal channel section that meanders within a straight right-of-way and thus results in either variable sideslopes or in the top of bank location. The vegetation within this concept is located along the top of bank outside of the freeboard zone and within a landscape setback, where available. A low flow could still be incorporated into this concept.

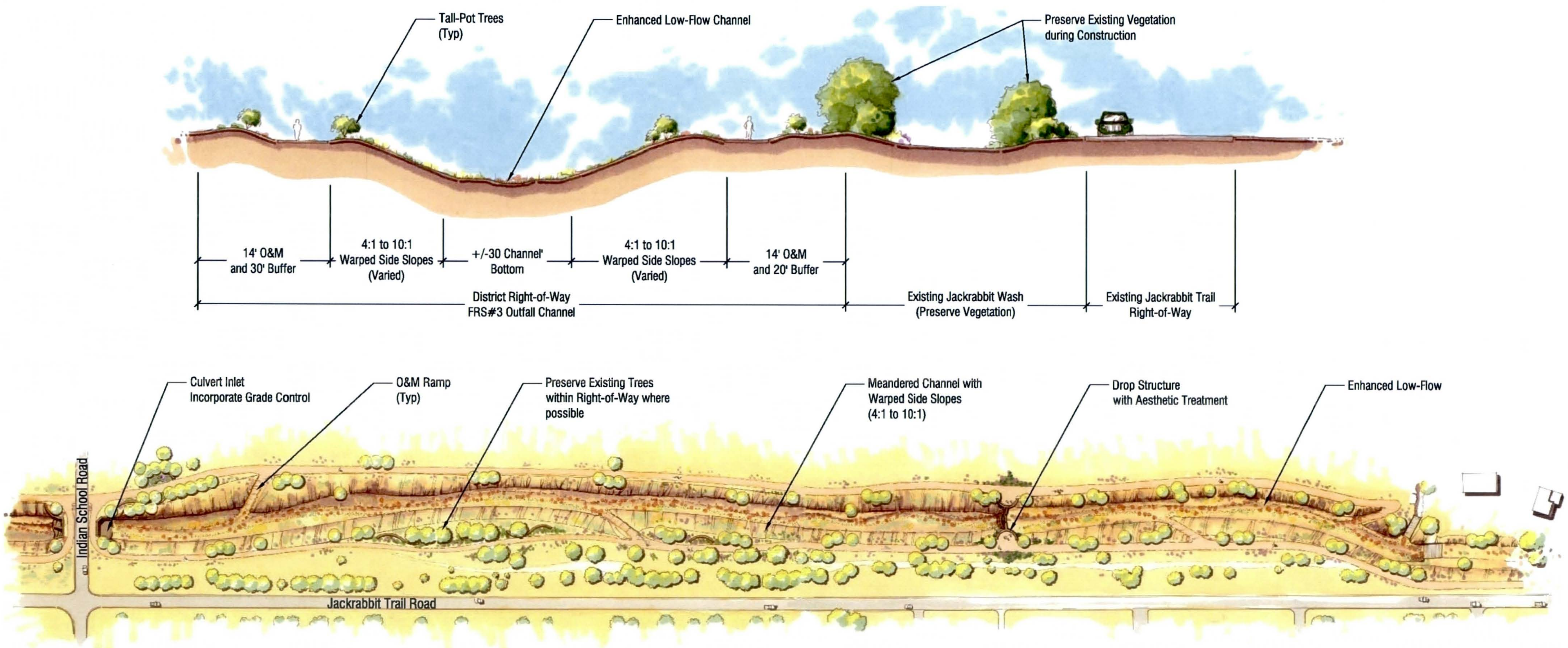


FIGURE 15 – MEANDERED TRAPEZOIDAL CHANNEL

5.5.3 Restricted Open Channel

With the Restricted Open Channel concept, the right-of-way width is considered less than optimum (Reaches 2, 3, 4 & 7) which makes the incorporation of meanders and landscape setbacks more difficult. This can be countered to some extent with the inclusion of retaining walls that would vary in location (alternating sides of channel), and in length. Retaining walls would occur more predominantly downstream of grade control structures where the channel depth increases and causes a "pinching-in" of the channel. Retaining wall options are discussed further in Section 5.4 of this report.

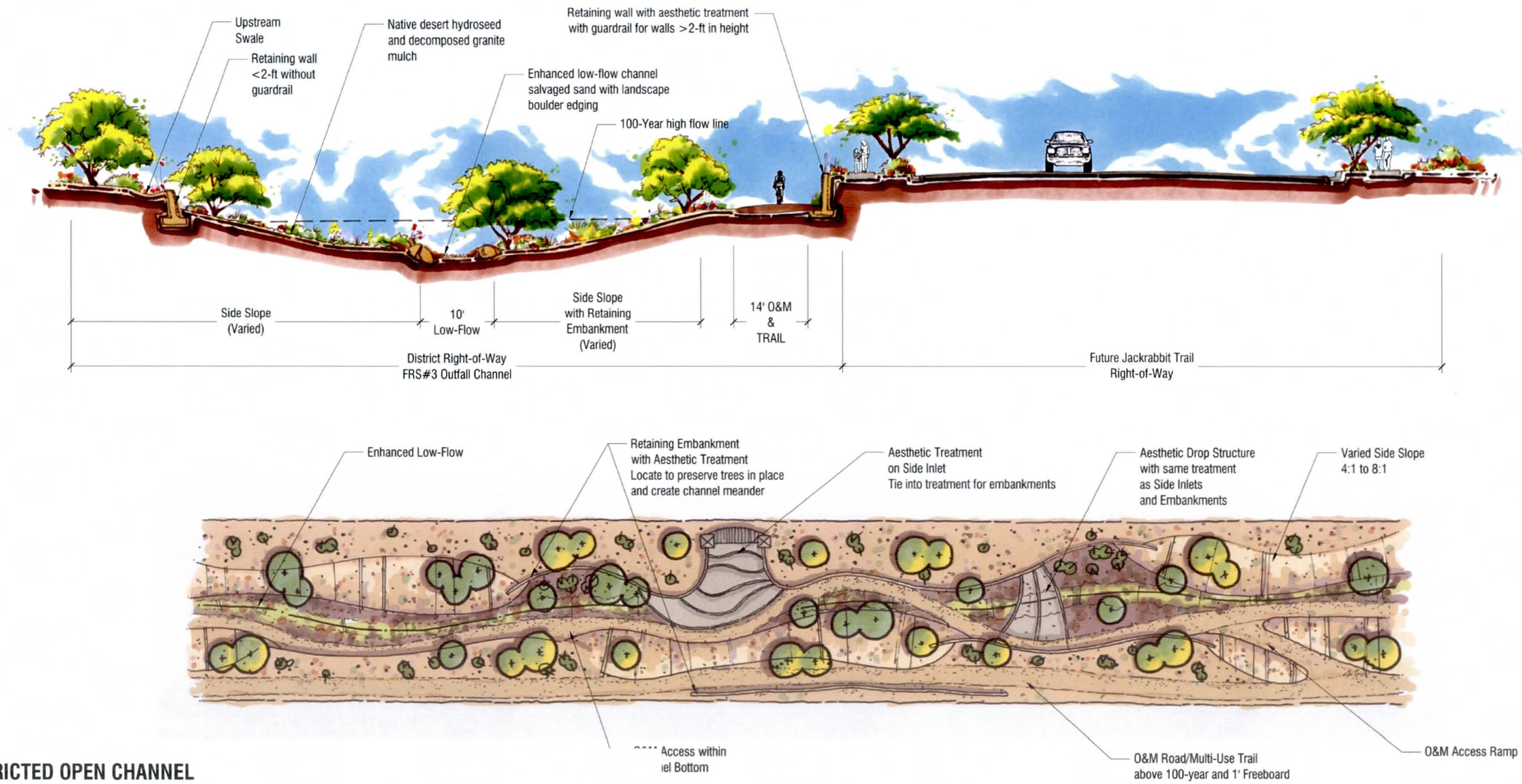


FIGURE 16 – RESTRICTED OPEN CHANNEL

5.5.4 Hardened Channel

A hardened channel would not typically fit into the context of a Sonoran Natural Desert theme, however, its use is considered for Reach 7 through the Jackrabbit Estates. Here, the right-of-way is restricted by several factors including street knuckles, depth of channel, and existing landscape and perimeter walls to the subdivision.

Preliminary discussion with the Jackrabbit Estates HOA indicates a reluctance to assume landscape maintenance responsibilities for a Natural Sonoran Desert theme. If the existing perimeter walls and landscape could remain intact and the channel built within the narrow confines of the existing lots, then the remainder of the open space could be walled from the subdivision and used for vegetative screening. The Jackrabbit Estates HOA may be more willing to maintain the landscape if it is similar to that which exists today.

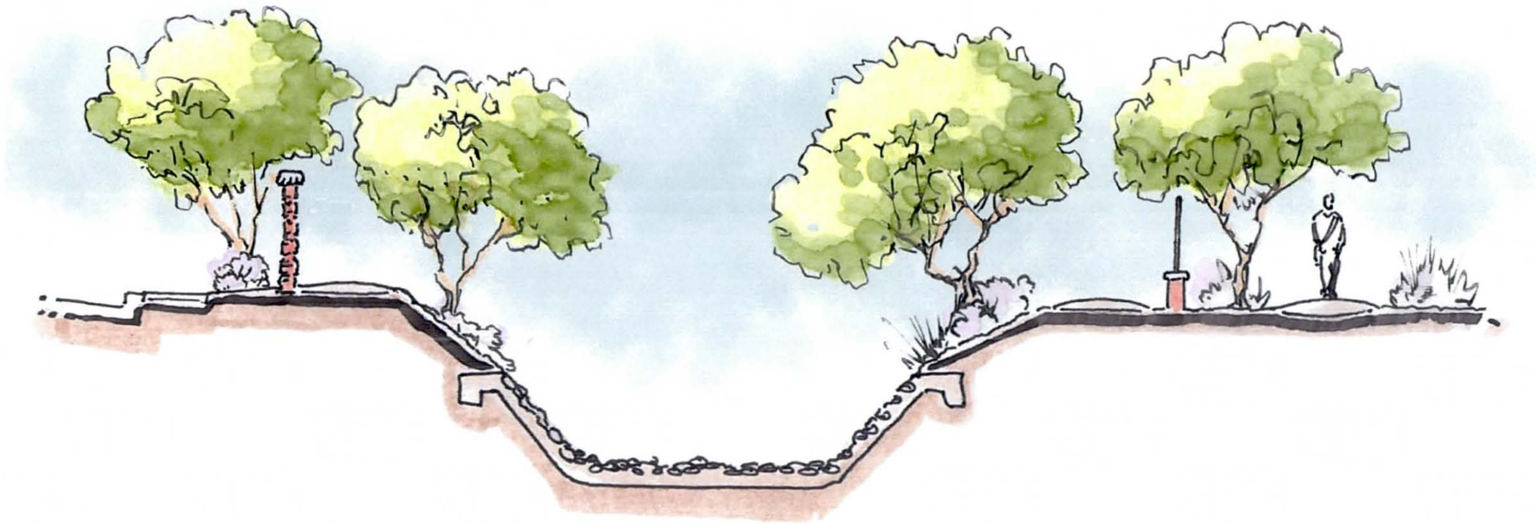


FIGURE 17 – HARDENED CHANNEL

6 REACH EVALUATION

Prior to the commencement of the Final Design, a Value Analysis session was held to review the 30% Design Plans (Refs. 34, 35). Many different design concepts were discussed during this session and additional alternatives were conceived for Reaches 6, 7 and 9. Each of these Alternatives is discussed below:

6.1 Reaches 6 and 7

Reach 6 extends from an outfall on the west side of Jackrabbit Trail, near Sells Road, north to Camelback Road. The 30% Design Plans show that the channel within Reach 6 lies on the east side of Jackrabbit Trail within a property referred to as Missionary Wings. Reach 7 extends from Camelback Road, north through the Jackrabbit Estates subdivision on the east side of Jackrabbit Trail to the Missouri Road alignment.

Because of discussions at the Value Analysis session and PAAC 1 meeting several other alternatives were evaluated as discussed herein.

6.1.1 Alternative 6/7A

Alternative 6/7A is the plan presented in the *Design Report and 30% Plans* (Refs. 34, 35).

6.1.2 Alternative 6/7B

Alternative 6/7B represents the 30% Design Alternative within these two reaches with the addition of a cross-drainage culvert north of Meadowbrook Avenue. This culvert will alleviate siltation upstream of Meadowbrook Avenue and the cost was added to the Baseline Alternative. Additional retaining walls may be necessary within Reach 7 (Jackrabbit Estates) in order to provide additional channel meander and to allow for continuous maintenance road. The Restricted Open Channel landscape concept is discussed in further detail in the *Landscape Architecture Pre-Design Report* (Ref. 12).

6.1.3 Alternative 6/7C

Alternative 6/7C consists of a closed conduit along the full length of Reach 6 and 7 to replace the open channel through Jackrabbit Estates and avoid the need for right-of-way acquisition through the Missionary Wings property. This alternative would still require side drainage inlets along the west side of Jackrabbit Trail.

6.1.4 Alternative 6/7D

Alternative 6D consists of construction of an open channel on vacant land located on the west side of Jackrabbit Trail and a culvert through Litchfield Heights to replace existing undersized culverts across Minnezona Avenue and Meadowbrook Avenue. Within Reach 7, this alternative would be the same as Alternative 7B.

6.1.5 Alternative 6/7E

Alternative 6E would be the same as Alternative 6B. Within Reach 7, the open channel shown in Alternative 7A would be replaced with an underground conduit.

6.1.6 Alternative 6/7F

Alternative 6F would be the same as Alternative 6B. Within Reach 7, the earthen channel would be replaced with a concrete-lined channel with minimum freeboard requirements. The Restricted Open Channel landscape concept is discussed in further detail in the *Landscape Architecture Pre-Design Report* (Ref. 12).

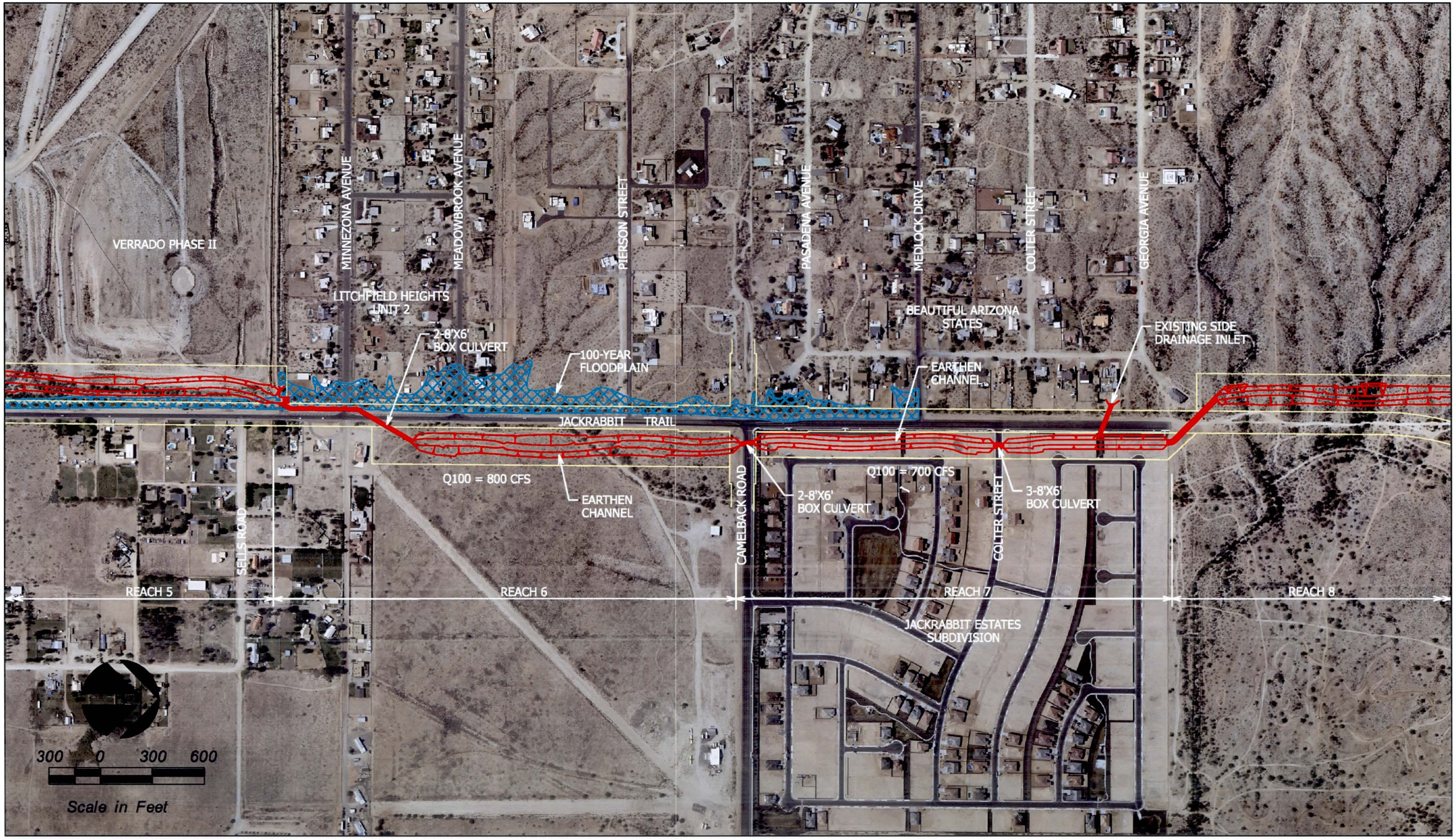


FIGURE 18 – ALTERNATIVE 6/7A

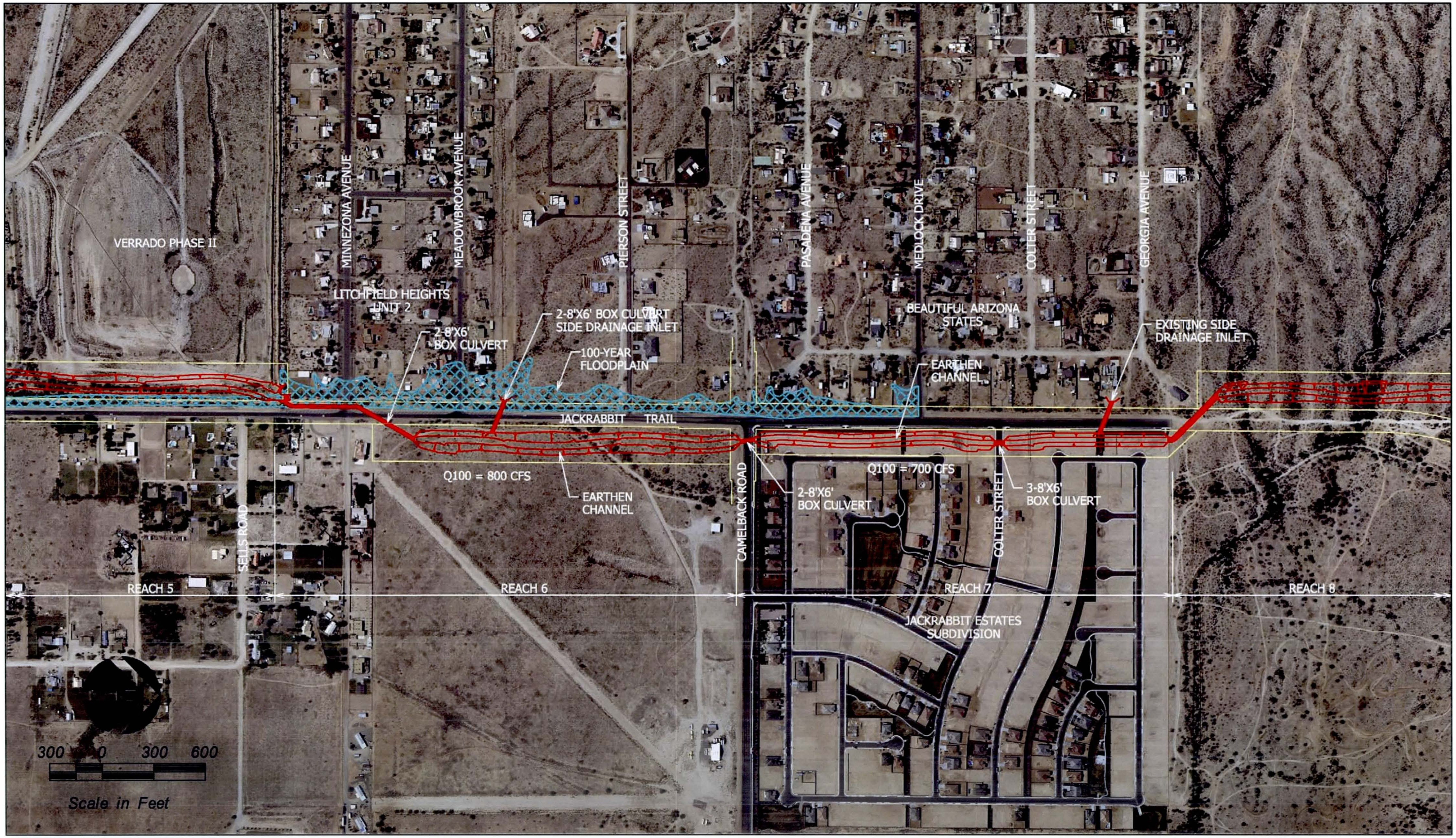


FIGURE 19 – ALTERNATIVE 6/7B

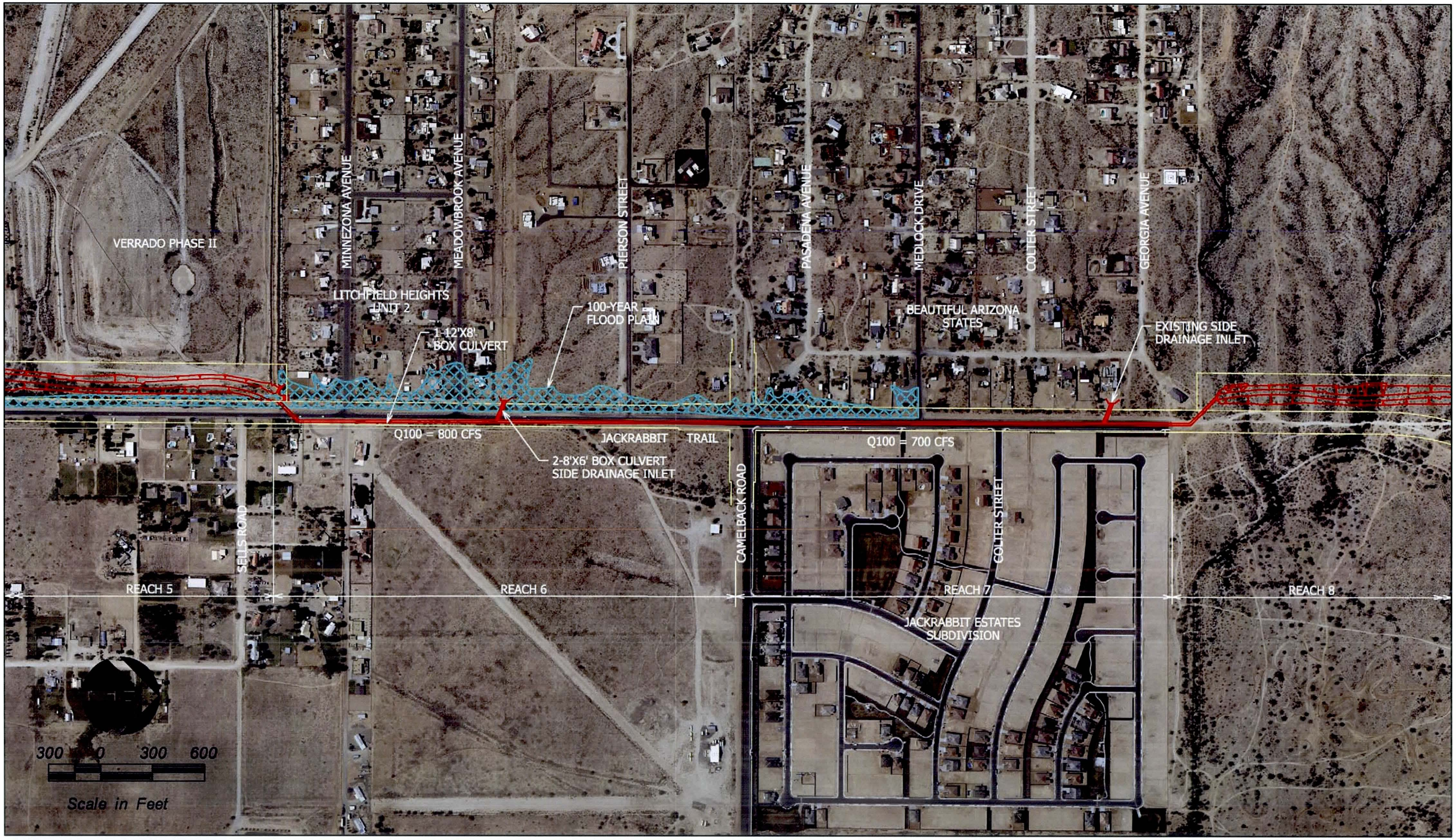


FIGURE 20 – ALTERNATIVE 6/7C

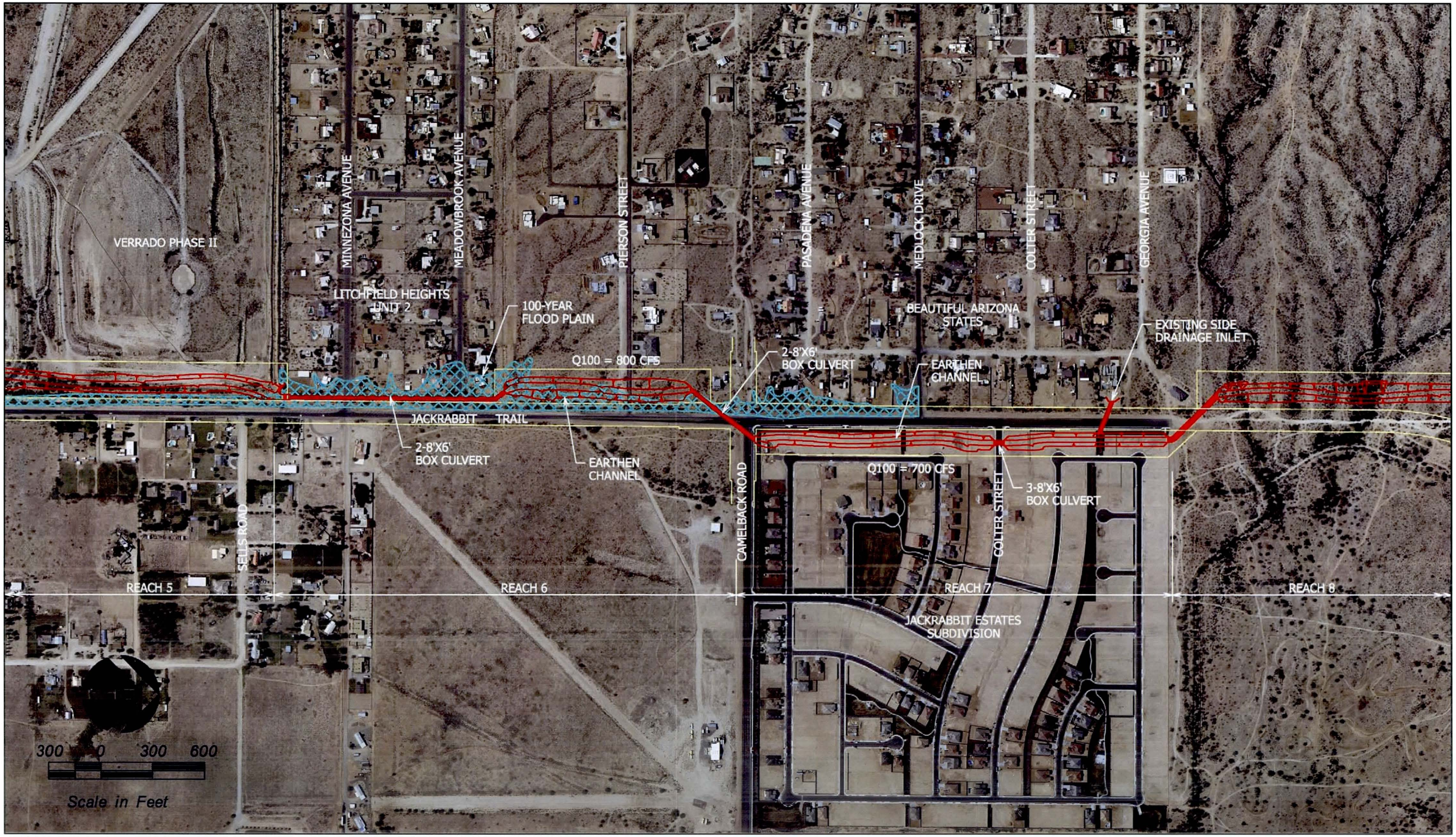


FIGURE 21 – ALTERNATIVE 6/7D

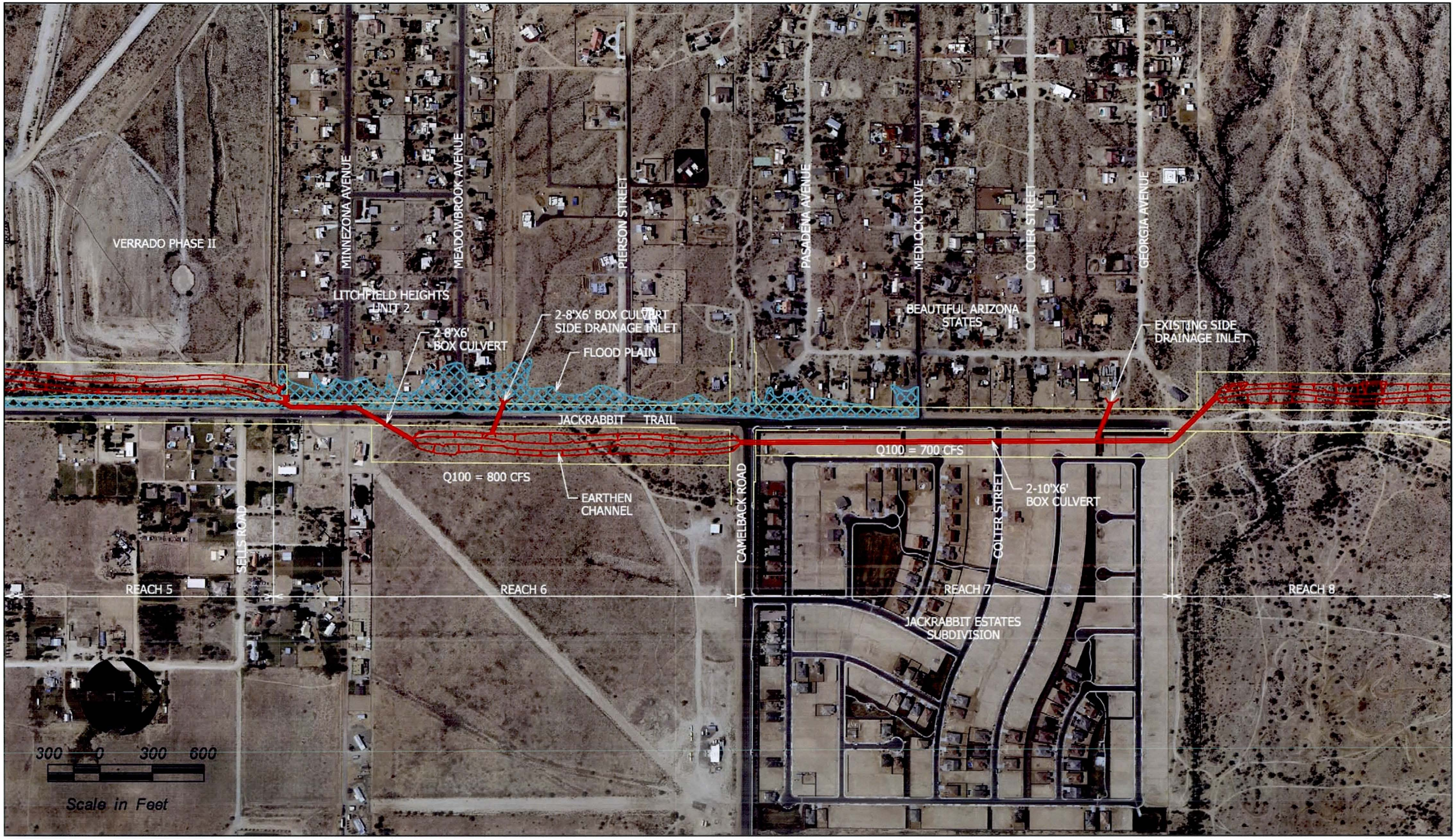


FIGURE 22 – ALTERNATIVE 6/7E

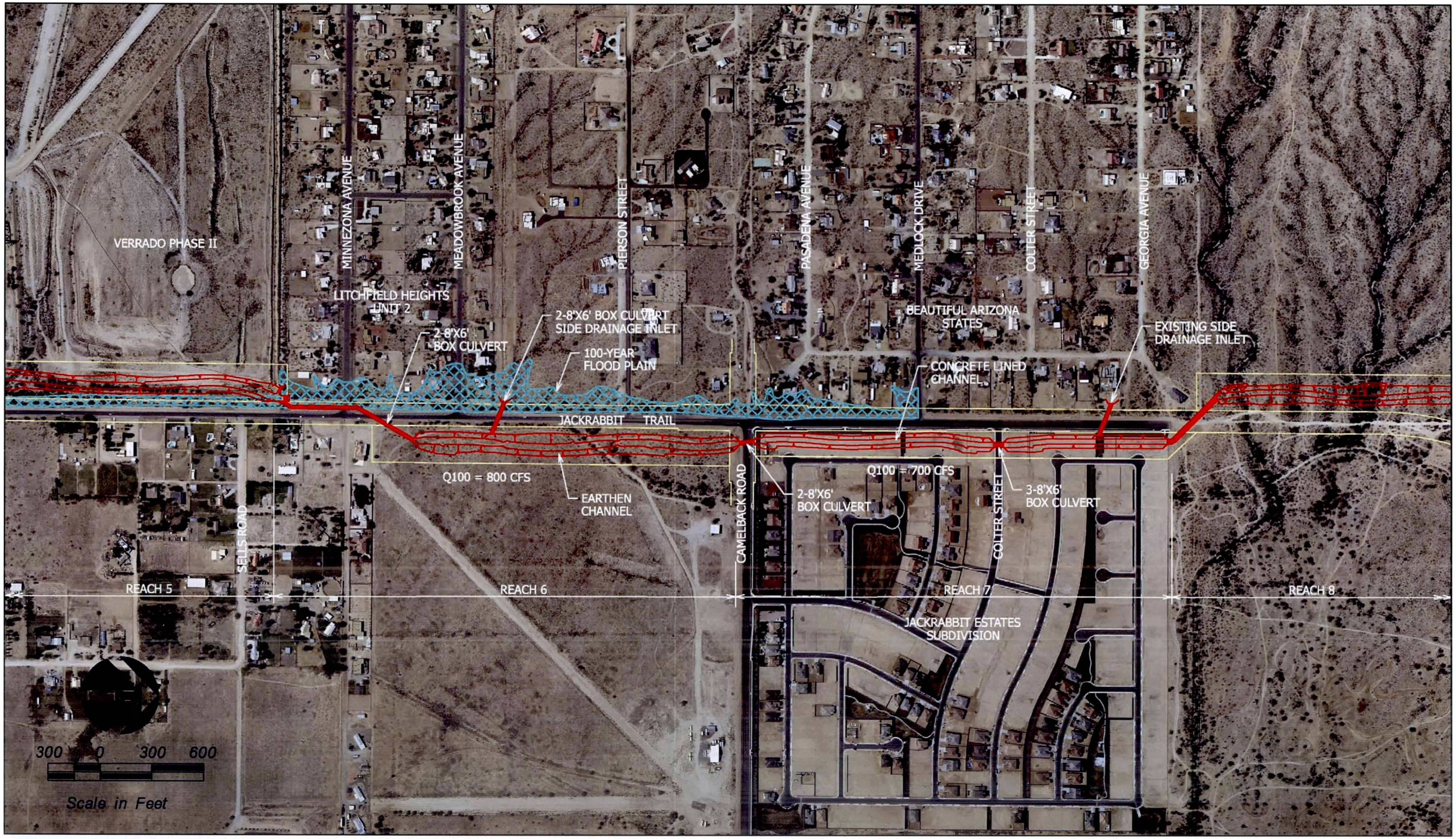


FIGURE 23 – ALTERNATIVE 6/7F

6.2 Reach 9

Reach 9 extends from the Principal Spillway in a southwesterly direction toward the emergency spillway, and then south across the emergency spillway to Bethany Home Road. The design discharge for this reach has decreased from the PMF flow of 560 cfs to 285 cfs. The Principal Spillway consists of two 48-inch diameter gated pipes which currently outlet to a channel along the west side of the Beardsley Canal. One of the two pipes (west pipe) will be directed into the Outfall Channel, thus allowing flexibility to discharge from FRS#3 to either location. Aesthetic berming for Reach 9 is illustrated in the LA Pre-Design Report (Ref. 12). The location of this berming will be refined during the Final Design stage to ensure that flow from the emergency spillway is not impeded. In addition, assessment of the emergency spillway flows may necessitate extention of the left training dike and re-evaluation of the NRCS approved SITES model. Reference will be made to the EAP inundation map during the Final Design (Ref. 62).

6.2.1 Alternative 9A

Alternative 9A represents the 30% Design Alternative which includes an earthen channel and raised embankment, wasteway spillway and gates to the Beardsley Canal wash, and allowance for a hardened channel lining, and concrete box culverts underneath the emergency spillway. Alternative 9A is no longer under consideration.

6.2.2 Alternative 9B

Alternative 9B is the revised Baseline Alternative and consists of the same earthen channel as Alternative 9A except that it will be designed to handle a flow of 285 cfs and will be connected to the westerly Principal Spillway pipe. Subsidence monitoring replaces the hardened channel, and the culvert size underneath the emergency spillway will be reduced in size. The existing east pipe of the Principal Spillway would act as a wasteway and discharge to the Beardsley Canal wash.

6.2.3 Alternative 9C

Alternative 9C follows the same alignment as Alternative 9B except that a single pressure pipe connects to the westerly outlet pipe and outlets near Bethany Home Road, south of the emergency spillway. Alternative 9C is no longer under consideration due to concerns about its effect on the operational characteristics of the dam and the delays that could result from reviews through ADWR and NRCS.

6.2.4 Alternative 9D

Alternative 9D consists of a sedimentation basin at the outlet from the Principal Spillway and two 72-inch diameter HDPE pipes that would drain southwesterly along the same alignment as Alternative 9B. The existing east pipe of the Principal Spillway would act as a wasteway and discharge to the Beardsley Canal wash.

6.2.5 Alternative 9E

Alternative 9E consists of an organic shaped detention basin downstream of the Principal Spillway, and then a conduit under the emergency spillway. This alternative is similar to that produced for the Phase II Remediation Plans and the landscape grading plans prepared by EPG (Ref. 53). The existing east pipe of the Principal Spillway would act as a wasteway and discharge to the Beardsley Canal wash.

6.2.6 Alternative 9F

Alternative 9F consists of a single pipe across the dam along the Jackrabbit Trail alignment. The Principal Spillway would remain and be used as a wasteway option. Due to concerns about a jack and bore process under the dam, and agency reviews and delays, this alternative was eliminated.

6.2.7 Alternative 9G

Alternative 9G consists of a single pipe or pipes around the west end of the dam. The Principal Spillway would remain and used as a wasteway option. Due to concerns about agency reviews and delays, this alternative was eliminated.

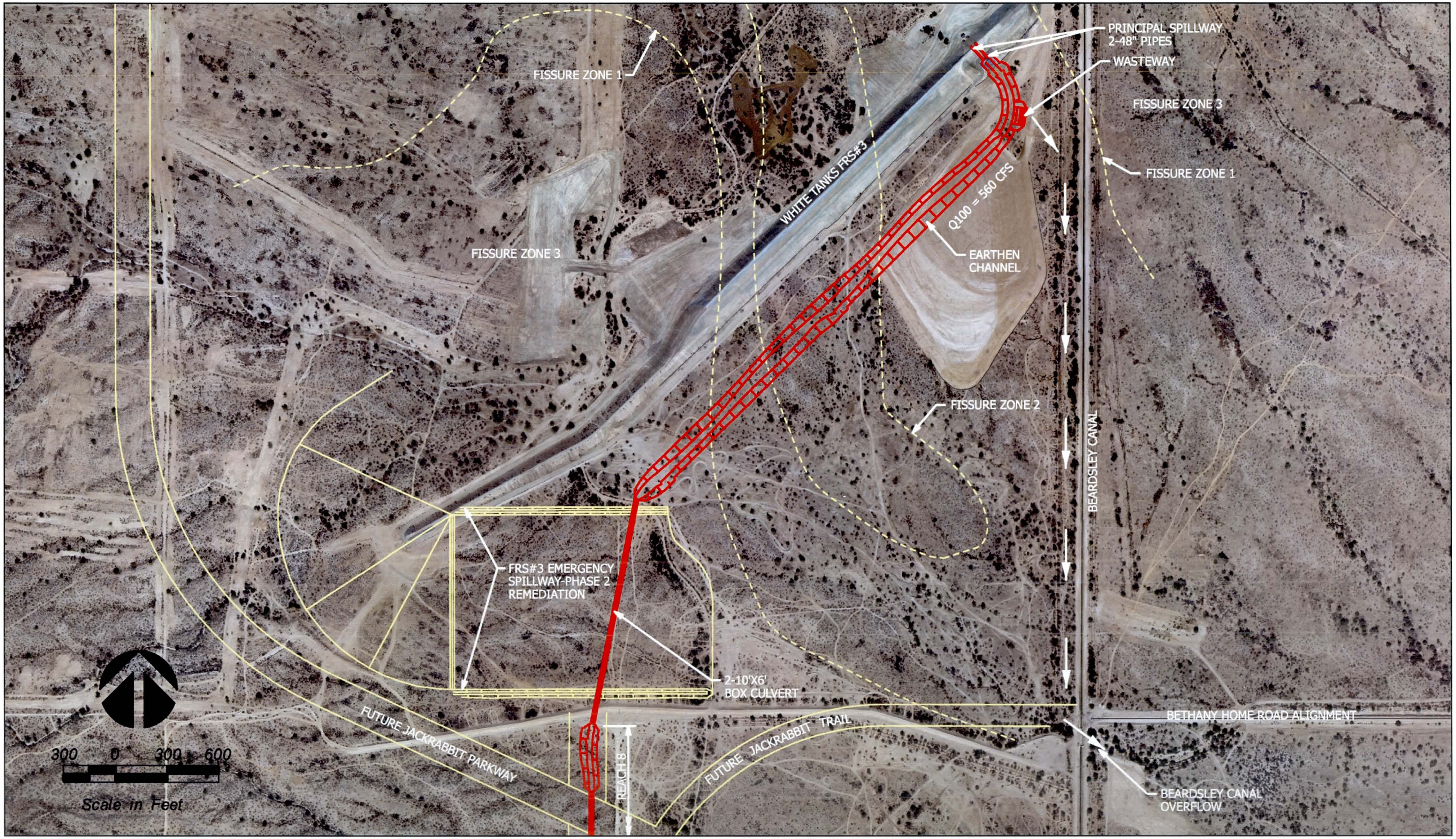


FIGURE 24 – ALTERNATIVE 9A

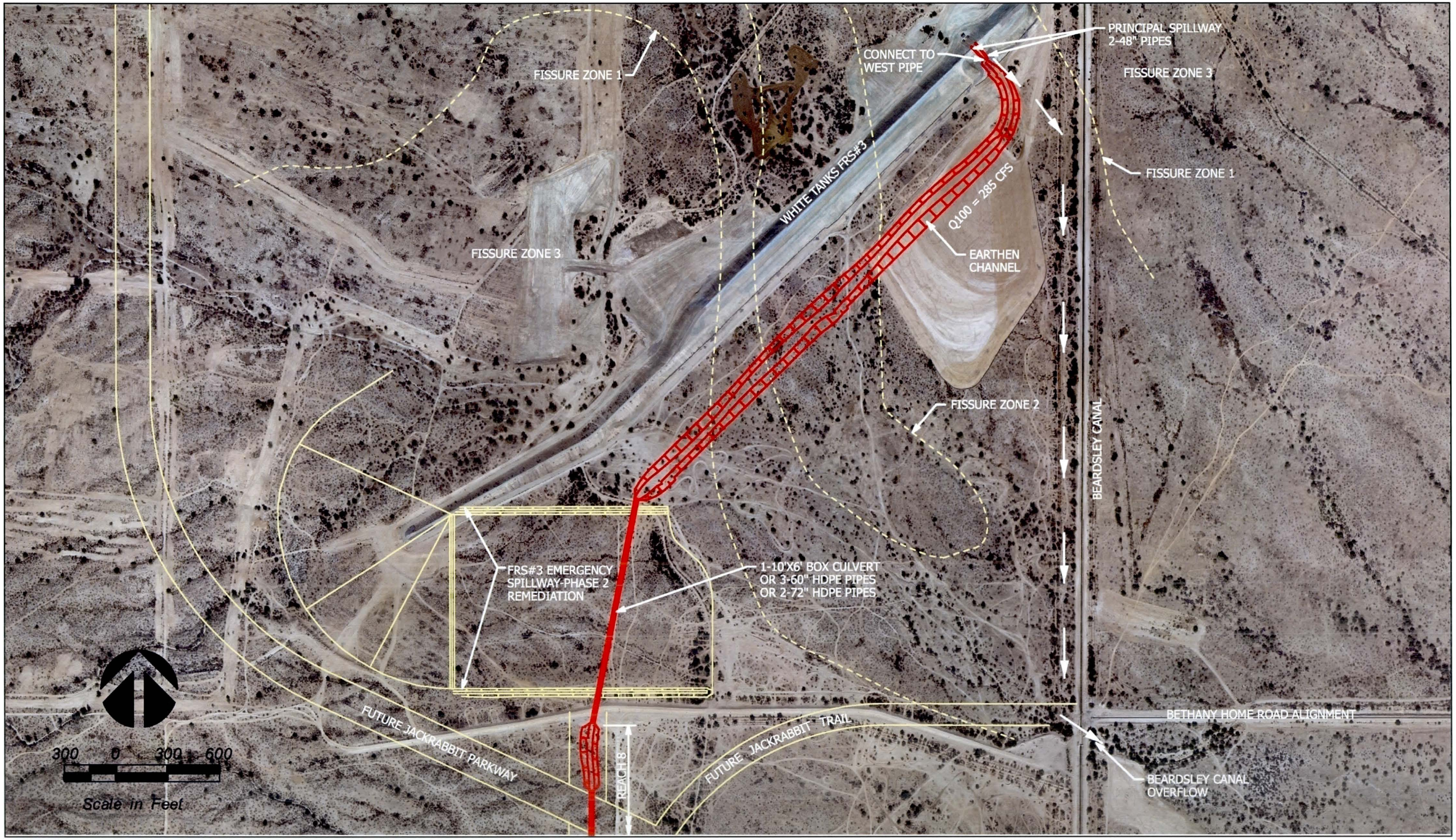


FIGURE 25 – ALTERNATIVE 9B

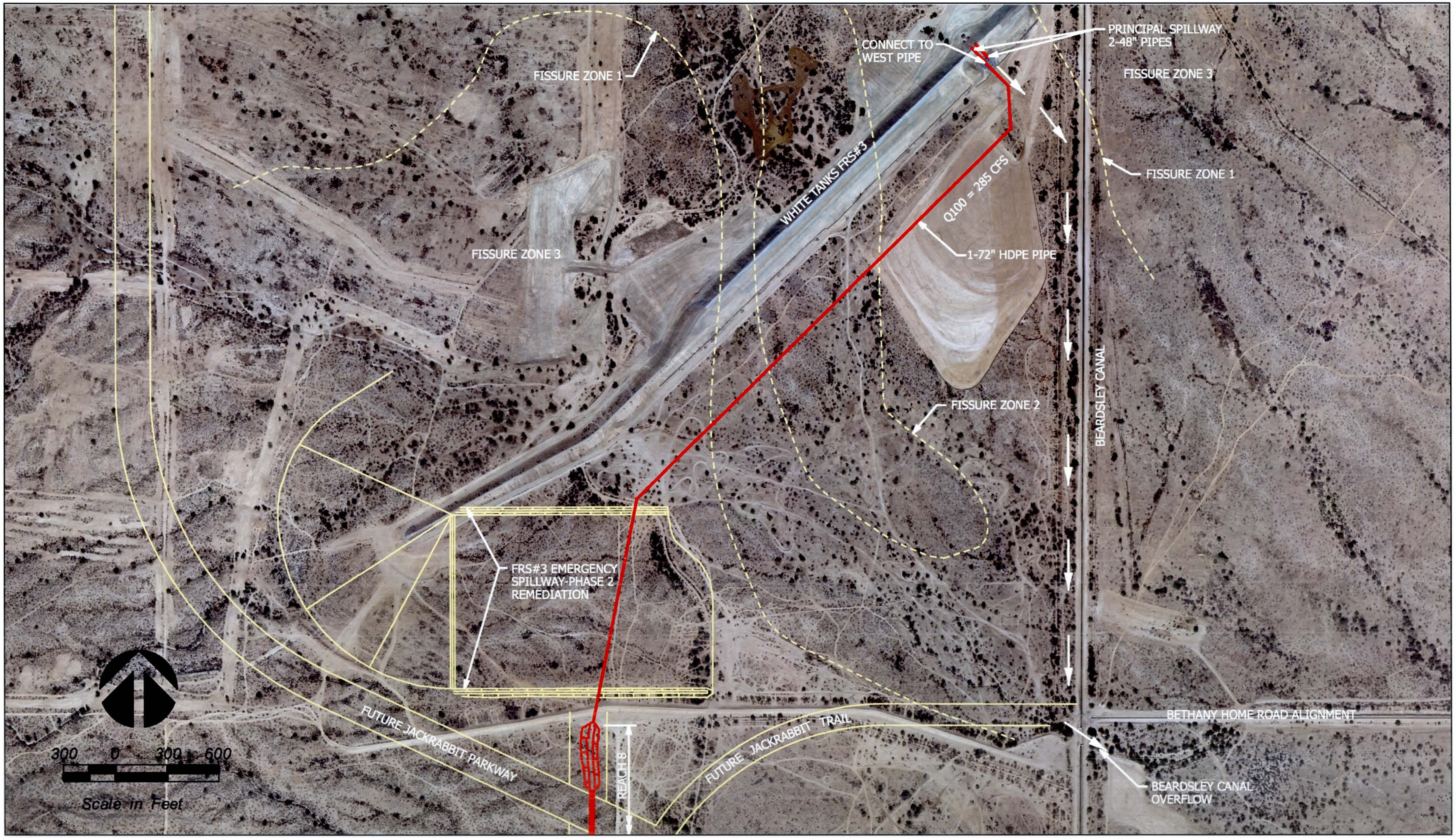


FIGURE 26 – ALTERNATIVE 9C

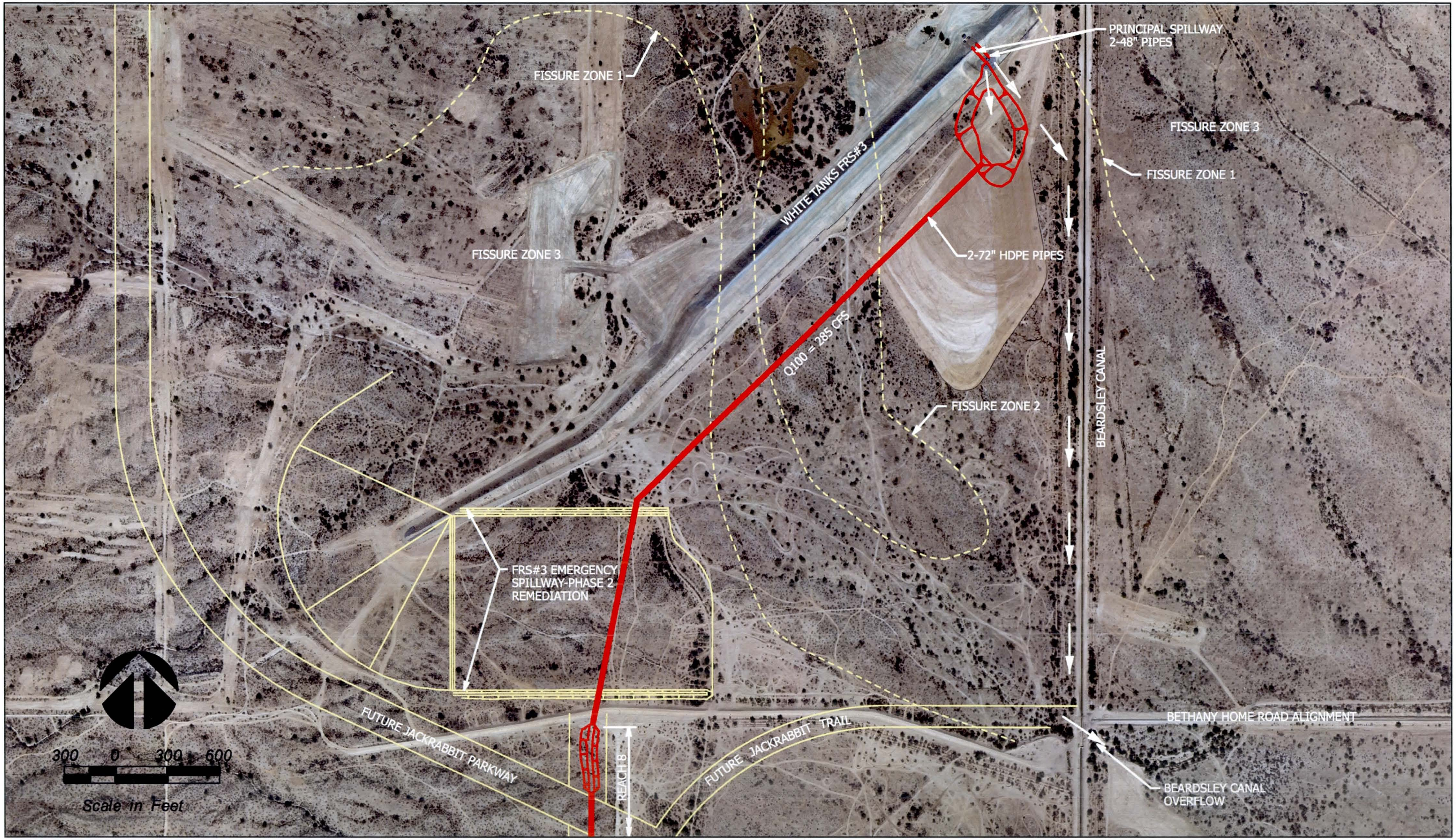


FIGURE 27 – ALTERNATIVE 9D

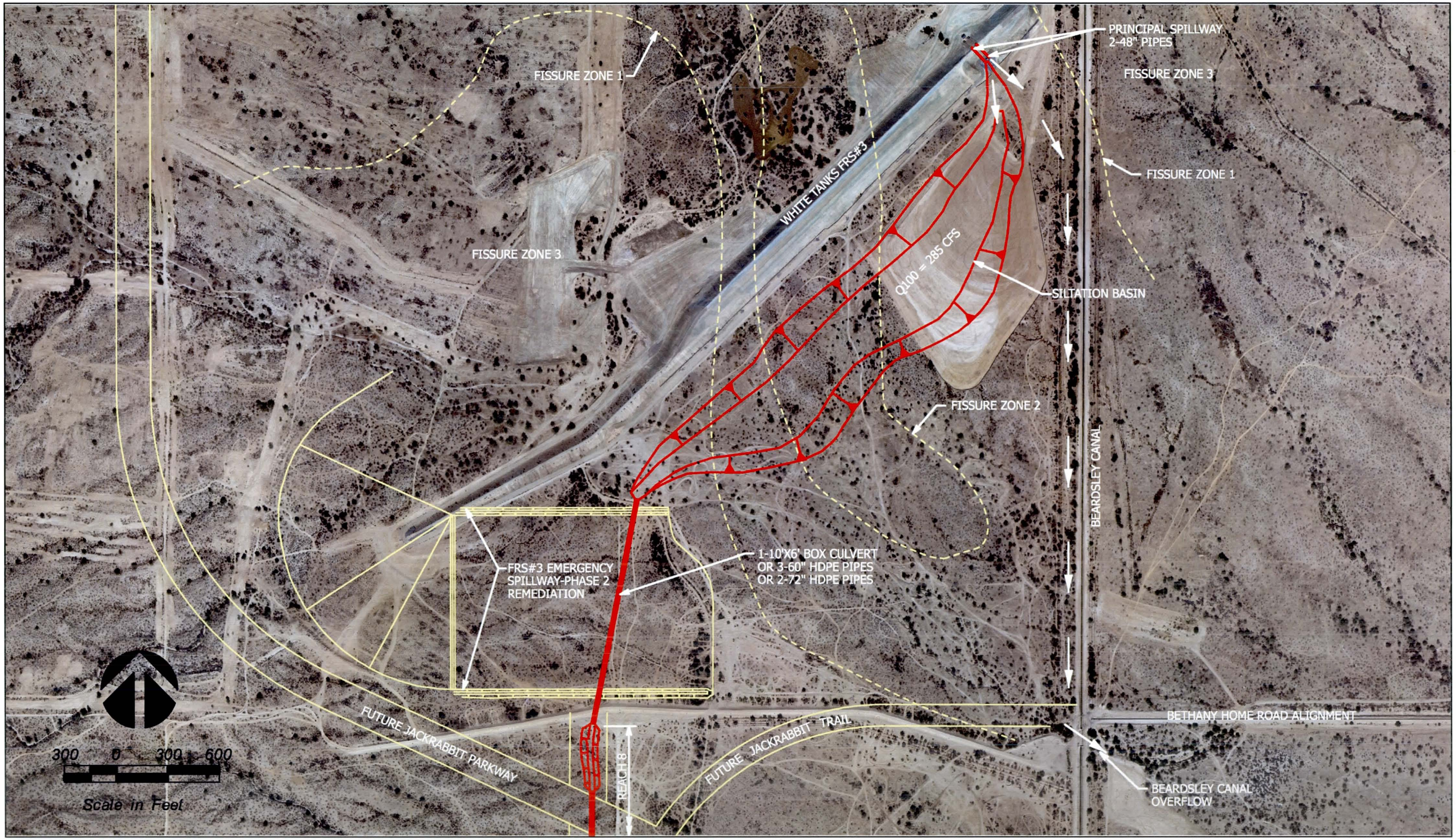


FIGURE 28 – ALTERNATIVE 9E

FIGURE 29 – ALTERNATIVE 9F

FIGURE 30 – ALTERNATIVE 9G

6.3 Cost Comparison

Cost estimates and quantity summaries for the 30% Design were prepared for the project by reach and by plan sheet in the *30% Design Report* (Refs. 34, 35). The unit prices used in the 30% Design Report were used for the comparison of alternatives within this report. Following completion of the 30% Design Plans and Report, several decisions were made that affect the basis of comparison. In order to make sure that the Alternatives presented in this report were evaluated relative to the same level of protection and cost, a Baseline Alternative was developed. The Baseline Alternative is the 30% Design adjusted as follows:

- Channel within Reach 9 sized for ½ Principal Spillway flow (285 cfs)
- Culvert across emergency spillway reduced to single barrel box culvert from double barrel culvert
- Wasteway eliminated, outlet structure modification added
- Hardened Channel allowance removed
- Earthwork for Reach 9 is unchanged
- The cost of aesthetic berming in Reach 9 was not included
- Culvert across Jackrabbit Trail at Minnezona added
- All unit prices and contingencies remain the same as the 30% Design
- Operations and Maintenance costs are not included
- Additonal costs due to hard dig into caliche layer are not included

Since the 30% Design Report was prepared, land prices may have declined and could result in an overall decrease in project cost. The land unit prices presented in the 30% Design and those estimated for 2010 are compared in Table 2.

Table 2: Land Cost Comparison

Category	30% Design Report Values	2010 Estimated Values
Platted Parcel	$205,000 per acre	$60,000 per acre
Unplatted Parcel	$152,500 per acre	$40,000 per acre

Table 3: Reach Evaluation Cost Comparison, 30% Design Report Cost Estimates

Reach	Alternative	Reach Cost*	Difference from Baseline	Least Cost
6	Alt 6A (30% Design)	$3,913,070	($328,866)	
	Alt 6B (Baseline)	**$4,241,936**	**$0**	
	Alt 6C	$4,104,888	($137,048)	
	Alt 6D	$3,611,941	($629,995)	**
	Alt 6E	$4,241,936	$0	
	Alt 6F	$4,241,936	$0	
7	Alt 7A (30% Design)	$1,172,339	$0	
	Alt 7B (Baseline)	**$1,172,339**	**$0**	**
	Alt 7C	$3,652,382	$2,480,043	
	Alt 7D	$1,172,339	$0	
	Alt 7E	$5,646,173	$4,473,834	
	Alt 7F	$2,849,023	$1,676,684	
9	Alt 9A (30% Design)	$4,223,440	$1,625,398	
	Alt 9B (Baseline)	**$2,598,042**	**$0**	
	Alt 9D	$2,414,391	($183,651)	**
	Alt 9E	$2,924,342	$326,300	

* Using land costs from the *30% Design Report* (Ref. 34) see Table 2.

Table 4: Reach Evaluation Cost Comparison, 2010 Land Cost Estimates

Reach	Alternative	Reach Cost*	Difference from Baseline	Least Cost
6	Alt 6A (30% Design)	$2,778,893	($328,866)	
	Alt 6B (Baseline)	**$3,107,759**	**$0**	
	Alt 6C	$4,104,888	$997,129	
	Alt 6D	$2,968,441	($139,318)	**
	Alt 6E	$3,107,759	$0	
	Alt 6F	$3,107,759	$0	
7	Alt 7A (30% Design)	$1,172,339	$0	
	Alt 7B (Baseline)	**$1,172,339**	**$0**	**
	Alt 7C	$3,652,382	$2,480,043	
	Alt 7D	$1,172,339	$0	
	Alt 7E	$5,646,173	$4,473,834	
	Alt 7F	$2,849,023	$1,676,684	
9	Alt 9A (30% Design)	$4,223,440	$1,625,398	
	Alt 9B (Baseline)	**$2,598,042**	**$0**	
	Alt 9D	$2,414,391	($183,651)	**
	Alt 9E	$2,924,342	$326,300	

* Using 2010 land costs estimates provided by the District, See Table 2.

Using the unit land prices presented in Table 2, a reach-by-reach comparison was prepared for each alternative as presented in Table 3 and Table 4. A comparison of Table 3 costs indicates that a combination of Alternatives 6D, 7B, and 9D result in the best cost solution. Using the 2010 unit land prices, as presented in Table 4, the lowest cost solution remains the same, however, the gap narrows.

For each of the Alternatives presented, changes in design concepts associated with the use of different landscape treatments, aesthetic berming, retaining walls, and preservation of existing landscape features are not included in the comparative cost estimates. These design costs will be accounted for with the 60% submittal.

7 CONCLUSIONS AND RECOMMENDATIONS

This *Pre-Design Report* accompanies the *Landscape Architecture Pre-Design Report* (Ref. 12). The purpose of the LA Pre-Design Report is to present concepts for the integration of aesthetic treatments and a connection to the Maricopa Trail. This report provides an evaluation of these concepts and re-evaluates alternatives for Reaches 6, 7 and 9 in response to ideas generated from the Value Analysis meeting.

Final Design is ongoing, and decisions reached from this Pre-Design Report will be integrated into the 60% Design Plans and 30% Landscape Design Plans.

Reach 6

The Baseline cost increased over that from the 30% Design due to the inclusion of an additional culvert across Jackrabbit Trial north of Minnezona Avenue. The addition of a means to intercept drainage from the north and west is recommended. This will help to reduce the 100-year floodplain within the Litchfield Heights subdivision.

Alternatives 6C and 6D both reduce the overall project cost due to a reduction in the right-of-way acquisition costs. Use of a collection channel on the west side of Jackrabbit Trail is preferred over the Baseline Alternative because it will provide for collection of street drainage and incoming silts. The three-channel convergence upstream of Sells Drive would be avoided, and future MCDOT widening of Jackrabbit Trail on the west side would be accommodated.

Right-of-way acquisition has commenced for all land parcels identified on the 30% Design Plans. Due to project goals for construction commencement and the completion of land acquisition prior to the end of the fiscal year, the Baseline Alternative is recommended.

Reach 7

Within Reach 7, the least cost solution is the Baseline Alternative presented in the 30% Design Plans. This alternative would require the removal of existing landscape improvements along the frontage of Jackrabbit Estates. Construction of a new perimeter wall to the east of the channel is not included since Jackrabbit Estates was compensated as part of the District's land acquisition settlement. In addition, it is desirable to keep the O&M road within the District's right-of-way, therefore, additional retaining walls are recommended along the length of Reach 7. Alternative 7B is recommended.

9B is cheaper if 2-72" HDPE is used instead of 10x6 RCB

Reach 9

Within Reach 9, the least cost alternative is 9D. This alternative included (2) 72-inch diameter HDPE pipes from the Principal Spillway, across the emergency spillway and across Bethany Home Road to Reach 8. This alternative avoids the need to build a FEMA certified levee embankment across the fissure risk zone. Because of the long-term risk of subsidence, it is recommended to increase the fall along the pipe's length by 1.0 foot to accommodate future potential differential subsidence. Monitoring of long-term movement will require periodic measurements to the pipe invert at benchmark manhole locations.

A comparison of the costs for pipe and channel alternatives show that they are similar and would not be a reason for selection of one alternative over another. O&M costs, safety concerns and FEMA levee certification should be overriding decision factors.

Summary Cost

Implementation of Alternatives 6D, 7B, and 9D would result in a total project cost of approximately $21,400,771 compared to the Baseline cost of $22,214,417 (assuming the land costs do not decrease). Implementation of Landscape Design Elements as discussed in Section 5 and the LA Pre-Design Report is recommended following receipt of the Geotechnical Investigation and further review with District staff.

8 REFERENCES

1. AMEC Infrastructure, Inc., *Jackrabbit Trail (195th Avenue) Design Concept Report, Yuma Road to Thomas Road*, prepared for Maricopa County Department of Transportation, Engineering Division, MCDOT Work Order No. 69039, January 2004.
2. AMEC Infrastructure, Inc., *White Tanks FRS No. 3 Preliminary Geotechnical Report, Contract FCD 2003C014, Work Assignment No. 1*, December 2004.
3. Arizona Water Company, *Water Distribution Quarter Section Maps*, October 19, 1981.
4. CMX, *Zanjero Trails Parcel 34 Conceptual Site Plan*, Draft, March 30, 2009.
5. CMX, *Zanjero Trails RUPD/CUPD-PAD Zone Change Request, Proposed Zoning Map,* April 2006.
6. Coe and Van Loo, *Verrado Agua Fria Irrigation Pump Station No. 1*, September 19, 2004, As-Built July 8, 2005.
7. Coe and Van Loo, *Verrado Indian School Road Well*, March 7, 2003, As-Built January 9, 2004.
8. Coe and Van Loo, *Zone 3S Booster Pump Station, Agua Fria Plant Booster Station No. 9,* April 5, 2003, As-Built January 9, 2004.
9. Dodson & Associates, Inc., *HydroCalc*, Version 1.2a for Windows, 1996.
10. DMJM Harris / AECOM, *Jackrabbit Trail Access Control and Corridor Improvement Study, Interstate-10 to Bell Road, Volume I Final Report*, October 2008.
11. DMJM Harris / AECOM, *Jackrabbit Trail Access Control and Corridor Improvement Study, Interstate-10 to Bell Road, Volume II Appendices*, October 2008.
12. EPG, Inc., in association with Hoskin-Ryan Consultants, Inc., *White Tanks FRS No. 3 Outfall Channel Final Design, FCD 2009C012, Landscape Architecture Pre-Design Report*, December 17, 2009.
13. EPG, Inc., in association with Hoskin-Ryan Consultants, Inc., *White Tanks FRS No. 3 Outfall Channel Final Design, FCD 2009C012, Site Analysis Report*, November 20, 2009.
14. Flood Control District of Maricopa County, *Aesthetic and Multiple-Use Design Guidelines for Flood Control Structures*, January 5, 2005.
15. Flood Control District of Maricopa County, *Computer Aided Drafting & Design Data Delivery Specifications*, Rev. 1.0, January 2000.
16. Flood Control District of Maricopa County, *Consultant Guidelines, Incorporated by Reference for Consultant Services Contracts*, Third Edition, Revision 1, December 1, 2003.
17. Flood Control District of Maricopa County, *Drainage Design Manual for Maricopa County, Arizona, Hydraulics*, Draft September 2003.
18. Flood Control District of Maricopa County, *Drainage Design Manual for Maricopa County, Arizona, Hydrology*, Draft November 2003.
19. Flood Control District of Maricopa County, *Drainage Policies and Standards for Maricopa County, Arizona*, January 11, 2007.
20. Flood Control District of Maricopa County, *Flood Protection Methods*, November 6, 2006.
21. Flood Control District of Maricopa County, *Flood Protection Structures Types Handbook*, April 1, 2008.
22. Flood Control District of Maricopa County, *FY 08/09 0.8-ft Orthophotography Tiles for the White Tanks FRS No. 3 Outfall Channel Project Area in Tif Format*, February 11, 2009, Date of Photography October-December 2008.
23. Flood Control District of Maricopa County, *FY 08/09 1-ft Orthophotography Tiles for the White Tanks FRS No. 3 Outfall Channel Project Area in Tif Format*, March 5, 2009, Date of Photography October-December 2008.
24. Flood Control District of Maricopa County, *GIS Data for the White Tanks FRS No. 3 Outfall Channel Project Area in Various Formats*, Project 2007-C016 Assignment #4, February 12, 2009.
25. Flood Control District of Maricopa County, *Landscape Aesthetics and Multi-Use Consultant Handbook*, April 2003.
26. Flood Control District of Maricopa County, *Landscape Design Themes Handbook*, July 27, 2007.
27. Flood Control District of Maricopa County, *Mission, Vision, Goals, and Objectives for Planning Studies*, February 12, 2007.
28. Flood Control District of Maricopa County, *Policy for the Treatment and Landscaping for Flood Control Projects*, December 16, 1992.
29. Flood Control District of Maricopa County, *River Mechanics Manual for DDMSW*, Draft, September 2009.
30. Gannett Fleming, *White Tanks FRS No. 3 Outfall Channel Project, Preliminary Design Report*, December 2008.
31. Haestad Methods, Inc., *FlowMaster*, Version 5.17, 1995.
32. HDR, *Loop 303/White Tanks ADMPU Area Hydrologic Analysis*, March 2009.
33. Hoskin-Ryan Consultants, Inc., *On-Call Contract FCD 2007C016, Work Assignment No. 4, White Tanks FRS No. 3 Outfall Channel, Survey Report*, March 19, 2009.
34. Hoskin-Ryan Consultants, Inc., *White Tanks FRS No. 3 Outfall Channel 30% Design Report, FCD 2007C016 Assignment 4, Volume I – Design Report and 30% Plans*, June 30, 2009.
35. Hoskin-Ryan Consultants, Inc., *White Tanks FRS No. 3 Outfall Channel 30% Design Report, FCD 2007C016 Assignment 4, Volume II – Appendices*, June 30, 2009.
36. KVL Consultants, Inc., for Flood Control District of Maricopa County, *Drainage Design Management System for Windows*, Version 3.5.4, April 1, 2008.
37. Maricopa County Trails Commission, *Maricopa County Regional Trail System Plan*, adopted 2004.
38. Morrison Maierle, Inc., *Off-Site Water Plans for Jackrabbit Estates*, March 29, 2005, As-Built October 11, 2007.
39. Phillips, Jeff V., and Saeid Tadayon, United States Geological Survey, in association with Flood Control District of Maricopa County, *Selection of Manning's Roughness Coefficient for Natural and*

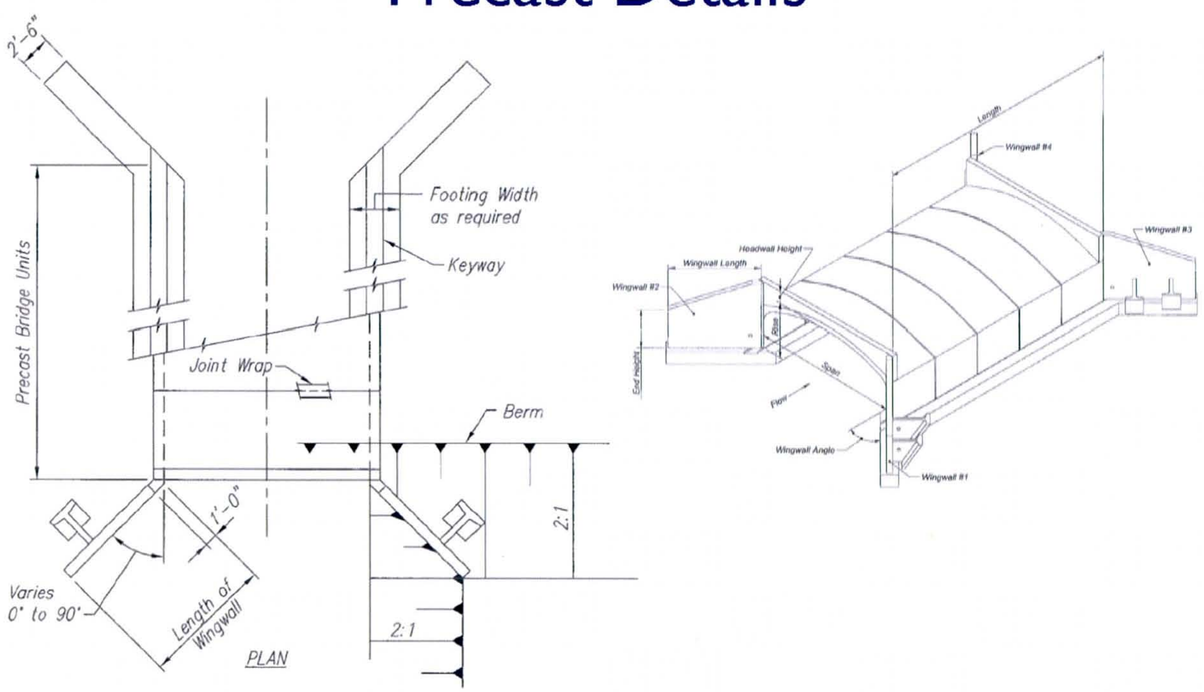
Constructed Vegetated and Non-Vegetated Channels, and Vegetation Maintenance Plan Guidelines for Vegetated Channels in Central Arizona, Scientific Investigations Report 2006-5108, 2007.

40. SiteTek Financial Arts, Inc., *Value Analysis Workshop, November 3-5, 2009, 30% Design Phase White Tanks FRS III Outfall Channel, Value Analysis Draft Report*, November 9, 2009.
41. Thomsen, B.W. and Hjalmarson, H.W., with U. S. Geological Survey, Water Resources Division, for Flood Control District of Maricopa County, *Estimated Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County, Arizona*, April 1991.
42. Town of Buckeye, *Transportation Design Manual, DM202*, May 2007.
43. United Engineering Group, *Water Plans for Jackrabbit Estates*, April 12, 2005, As-Built September 7, 2006.
44. United States Army Corps of Engineers, *Hydrologic Engineering Center, HEC-1 Flood Hydrograph Package*, Version 4.1, June 1998.
45. United States Army Corps of Engineers, *Hydrologic Engineering Center, HEC-RAS River Analysis System*, Version 4.0.0, March 2008.
46. URS, *Loop 303 Corridor/White Tanks Area Drainage Master Plan Update, Volume IV: Level III Area Drainage Master Plan Update Report, Final*, FCD Contract 99-40, February 2005.
47. URS, *Loop 303 Corridor/White Tanks Area Drainage Master Plan Update, Volume V: Existing Condition Hydrology Technical Data Notebook*, August 2004.
48. URS, *Loop 303 Corridor/White Tanks Area Drainage Master Plan Update, Volume V: Future Condition Hydrology Technical Data Notebook*, January 2005.
49. URS, *Design Report, White Tanks FRS No. 3 Remediation Project – Phase 1, Volume 1*, March 23, 2005.
50. URS, *Design Report, White Tanks FRS No. 3 Remediation Project – Phase 1, Volume 2*, March 23, 2005.
51. URS, *Geotechnical Data Report, White Tanks FRS No. 3 Remediation Project*, March 23, 2005.
52. URS, *White Tanks FRS No. 3 Remediation Project – Phase 1: Embankment Fill Plan and Outlet Works Channel Plan and Profile, PCN 470.04.30, FCD Contract No. 2004C017*, March 2005.
53. URS, *White Tanks FRS No. 3 Remediation Project – Phase 2, PCN 470.04.30, FCD Contract No. 2008C031*, March 3, 2009.
54. WLB Group, *White Tanks/Agua Fria Area Drainage Master Study*, 1994.
55. Wood, Patel and Associates, Inc., *Indian School Road Utilities, Verrado*, February 17, 2003, As-Built February 9, 2004.
56. Wood, Patel and Associates, Inc., *Nonpotable Waterline Plan, Sells Road to Indian School Road*, November 1, 2004, As-Built March 11, 2005.
57. Wood, Patel and Associates, Inc., *Offsite Water Transmission Main, Verrado*, April 17, 2003, As-Built October 22, 2003.
58. Wood, Patel and Associates, Inc., *Verrado Planning Unit Drainage Plan for Portions of Planning Units II and IV (Phase 3 South and Phase 3 East), and Update to Master Drainage Plan*, August 22, 2006.
59. Wood, Patel and Associates, Inc., *White Tanks FRS No. 4 Rehabilitation Project*, December 2008.
60. Simon, Li & Associates, *Design Manual for Engineering Analysis of Fluvial Systems*, 1985.
61. Alpha Geotechnical and Materials, Inc., *Geotechnical Exploration, White Tanks FRS No.3 Outfall Channel Between White Tanks FRS No.3 and White Tanks FRS No. 4, Maricopa County, Arizona,* Draft January 2010.
62. J.E. Fuller Hydrology and Geomorphology, Inc., *Emergency Action Plan Final report for White Tanks FRS #3*, October 2009.

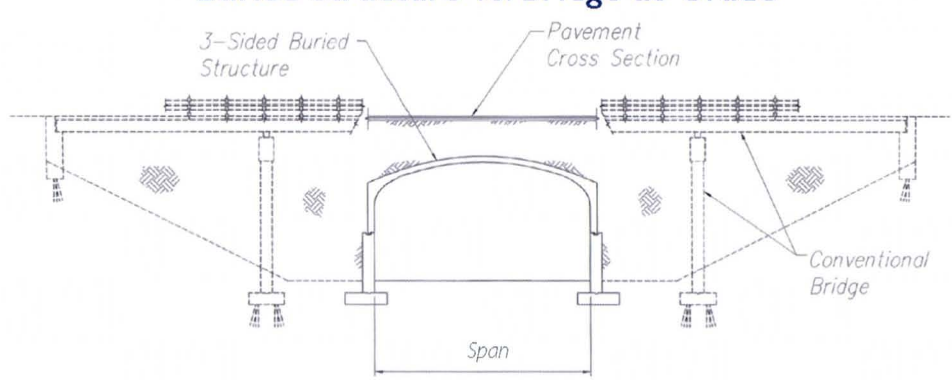
APPENDIX A PRODUCT LITERATURE

CONTECH® CONSTRUCTION PRODUCTS INC.

Precast Details



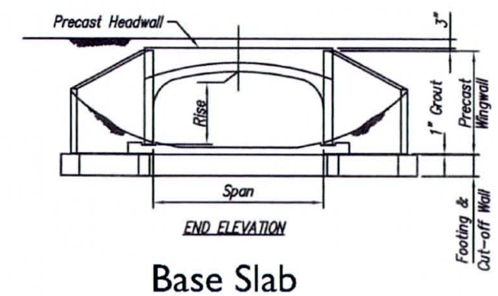
Buried Structure vs. Bridge-at-Grade



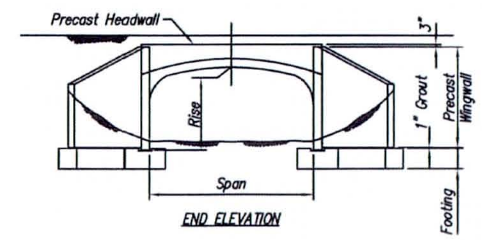
DESIGN SPECIFICATIONS
AASHTO:
Standard Specifications for Highway Bridges - Section 16.8
LRFD Bridge Design Specifications - Section 12.14

MANUFACTURING SPECIFICATIONS
ASTM C1504

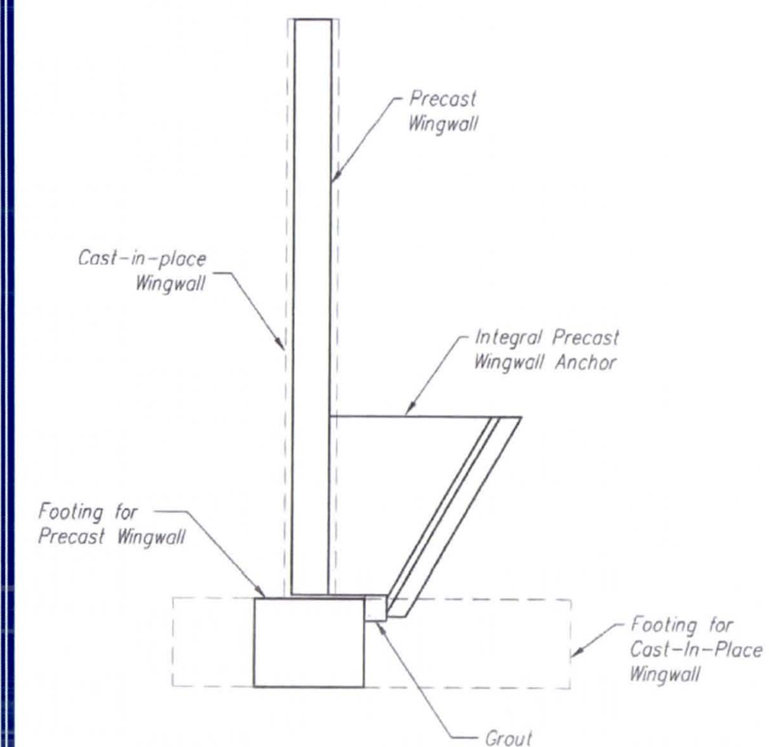
CON/SPAN® BRIDGE SYSTEMS BEBO® Arch Systems



Base Slab



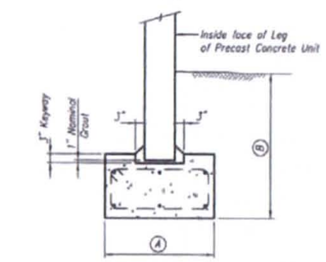
Strip Footing



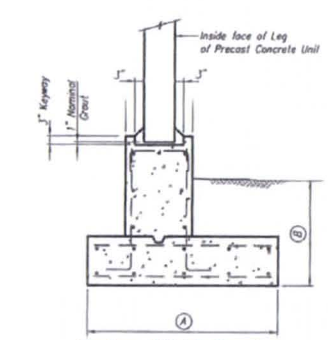
Significant Economic Advantages are Gained from Precast Wingwalls through:

- Narrower Footings
- Thinner Walls
- Reduced Excavation

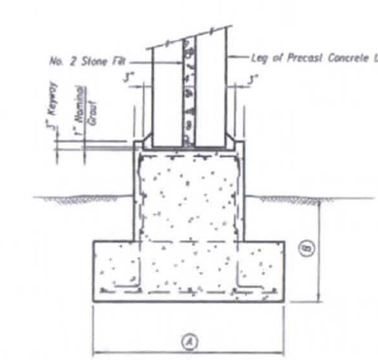
Footing Details



Strip Footing



Pedestal Wall Footing



Multi Cell Pier Footing

CON/SPAN® BRIDGE SYSTEMS

STANDARD CON/SPAN® BRIDGE UNITS

WATERWAY AREA (FT.²)

RISE (FT.)	SPAN (FEET) 12	14	16	20	24	28	32	36	42	48	54	60
3	30	*	*	*	*	*	*	*	*	*	*	*
4	42	50	55	65	*	*	*	*	*	*	*	*
5	54	64	71	85	95	*	*	*	*	*	*	*
6	66	78	87	105	119	139	*	*	*	*	*	*
7	78	92	103	125	143	167	184	*	*	*	*	*
8	90	106	119	145	167	195	216	232	*	*	*	*
9	102	120	135	165	191	223	248	268	*	*	*	*
10	114	134	151	185	215	251	280	304	334	387	435	*
11	*	*	*	*	239	279	312	340	376	435	489	*
12	*	*	*	*	*	*	344	376	418	483	543	578
13	*	*	*	*	*	*	*	412	460	531	599	638
14	*	*	*	*	*	*	*	448	501	579	652	698

WEIGHT (TONS/FT.)

RISE (FT.)	SPAN (FEET) 12	14	16	20	24	28	32	36	42	48	54	60
3	.94	*	*	*	*	*	*	*	*	*	*	*
4	1.04	1.14	1.59	1.73	*	*	*	*	*	*	*	*
5	1.14	1.24	1.71	1.86	2.05	*	*	*	*	*	*	*
6	1.24	1.34	1.83	1.99	2.18	2.84	*	*	*	*	*	*
7	1.34	1.44	1.96	2.12	2.31	2.99	3.56	*	*	*	*	*
8	1.44	1.54	2.09	2.24	2.44	3.14	3.71	4.06	*	*	*	*
9	1.54	1.64	2.21	2.36	2.57	3.29	3.86	4.23	*	*	*	*
10	1.64	1.74	2.33	2.49	2.69	3.44	4.01	4.40	4.87	5.27	6.52	*
11	*	*	*	*	2.81	3.59	4.16	4.58	5.04	5.48	6.72	*
12	*	*	*	*	*	*	4.31	4.76	5.21	5.67	6.92	7.76
13	*	*	*	*	*	*	*	4.93	5.38	5.88	7.12	7.98
14	*	*	*	*	*	*	*	5.11	5.58	6.08	7.32	8.21

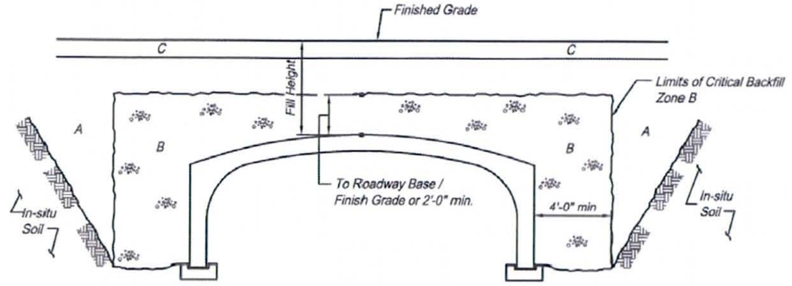
ARCH LAY LENGTHS (Nominal)

12'-24' SPAN	8' LAY LENGTH
28'-42' SPAN	6' LAY LENGTH
48'-60' SPAN	4' LAY LENGTH

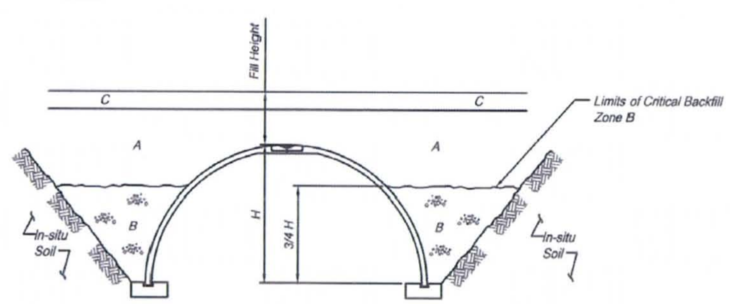
*1/4" Joints between Precast Concrete Units

Backfill Requirements

Backfill is a key component of any buried structure.
Please refer to the precast element specifications for detailed requirements.



CON/SPAN® Arch



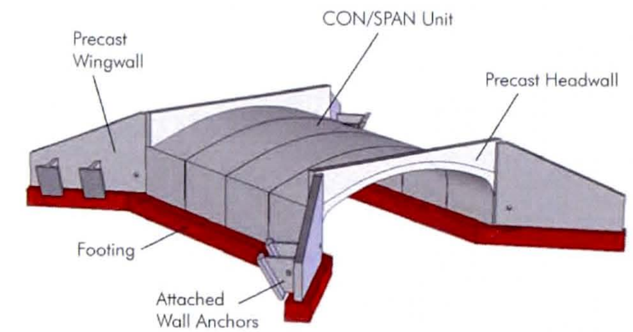
BEBO® Arch

1. In-situ material must be sufficiently stable to allow support of the precast units.
2. Zone A: Embankment or overfill material shall be properly graded and compacted, per project specifications.
3. Zone B: Structural backfill material per CON/SPAN® or BEBO® specifications. (Generally, a well-graded angular sand or gravel placed in 8" lifts and compacted to 95% of the maximum dry density, per AASHTO T-99 specification.)
4. Zone C: Roadway base and surface materials, per project specifications.

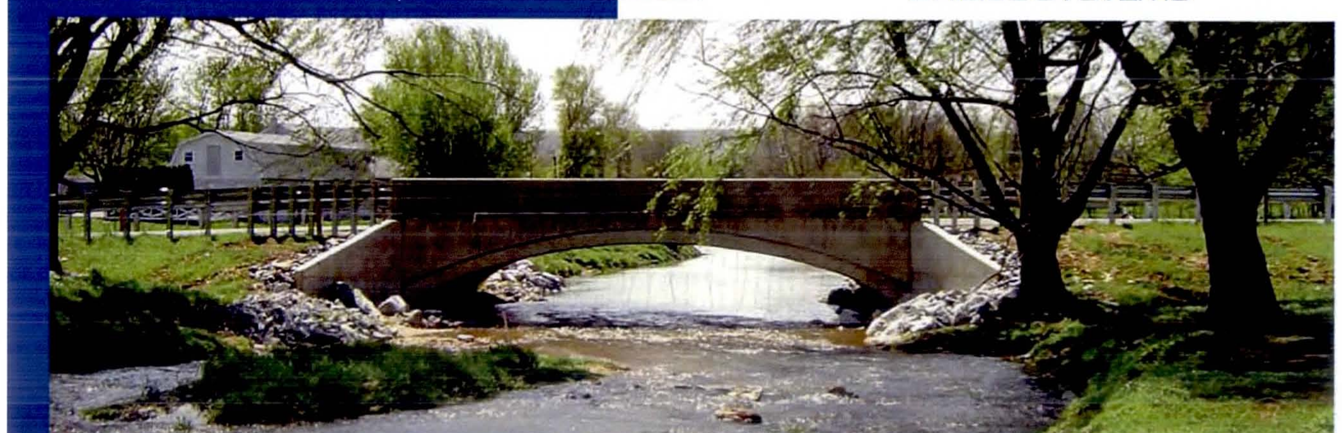
CON/SPAN® Bridge Systems

The CON/SPAN® Bridge System offers fully engineered and precast modular component systems for bridges, culverts and underground structures. The precast arch system, complete with headwalls and wingwalls, delivers fast installation and is accompanied by extensive technical support.

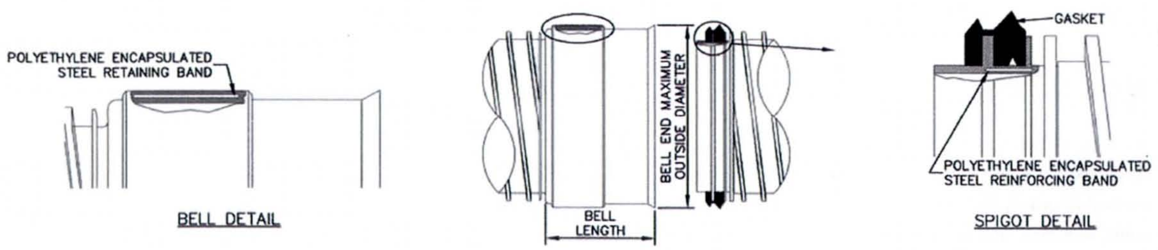
- Over 6,000 installations since 1983
- Complete precast system
- Outstanding span to rise ratio for wide, low crossings
- Spans from 12 feet to 60 feet
- Evaluated, approved and used by more state DOTs than any other bridge system on the market today
- Meets standard AASHTO and AASHTO LRFD specifications



CON/SPAN® BRIDGE SYSTEMS



Joint Details – The Design Behind the Performance



DuroMaxx Environmental Benefits

DuroMaxx consumes 35% less of the natural resources required to produce AASHTO M294 pipe. Steel reinforcing ribs in the profile wall provide the structural integrity for the pipe. These ribs are made out of steel with recycled content levels ranging from 55-80%. DuroMaxx pipe is eligible for LEED credits in a variety of the U.S. Green Building Council's categories for sustainable sites, water efficiency and landscaping, and materials and resources.

CONTECH Construction Products Inc. provides site solutions for the civil engineering industry. CONTECH's portfolio includes bridges, drainage, retaining walls, sanitary sewer, stormwater, erosion control and soil stabilization products.

For more information, call one of CONTECH's Regional Offices located in the following cities:

Ohio (Corporate Office)	**513-645-7000**
California (San Bernardino)	909-885-8800
Colorado (Denver)	303-431-8999
Florida (Tampa)	727-544-8811
Georgia (Atlanta)	770-409-0814
Indiana (Indianapolis)	317-842-7766
Kansas (Kansas City)	913-906-9200
Maryland (Baltimore)	410-740-8490
Oregon (Portland)	503-258-3180
Texas (Dallas)	972-590-2000

Visit our web site: www.contech-cpi.com
800.338.1122

DuroMaxx is supported by Plastream technology.

duromaxxbro 10M 3/09 MC STEEL RECYCLED PAPER

CONTECH CONSTRUCTION PRODUCTS INC.

DuroMaxx
A REINFORCED STORM DRAIN PIPE

CONTECH® CONSTRUCTION PRODUCTS INC.

DuroMaxx™ – The Next Generation of Drainage Pipe

Knowledge. Solutions. Service.

Key Performance Advantages

High Strength Steel Ribs

The strength of steel with the durability of plastic

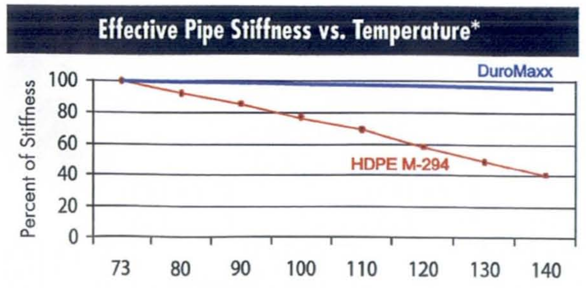
It's the ideal combination of materials that makes DuroMaxx an exceptional pipe. Steel reinforcing ribs provide the strength. High-Density Polyethylene Resin (HDPE) provides the durability. The combination of materials results in an extraordinarily strong and durable pipe. CONTECH design engineers also provide DuroMaxx with a smooth inner wall for outstanding hydraulics. DuroMaxx provides the properties you can count on for long term service and performance in the most demanding environments. Finally, a drainage product that is engineered for service and long life.

High Strength Steel for Lifelong Performance

DuroMaxx steel rib profile wall construction will not creep or buckle. The built-in capacity of the high strength steel eliminates concerns that have long plagued open profile wall pipe. Today, it is possible to design with confidence to meet the structural demands of the most difficult storm drain projects, ensuring long-term performance.

Effects of Temperature

All flexible pipes must be designed to have adequate pipe stiffness to resist handling, installation and construction loads. The required stiffness must be sufficient to minimize deflection, ensuring a successful installation. Published pipe stiffness levels are measured at 73°F in a laboratory. The actual or apparent field pipe stiffness due to the effects of sunlight and a modest 80° temperature will produce results that are very different in the field – where it counts with a pipe wall temperature in excess of 110°. This results in a loss of pipe stiffness greater than 30% for a non-reinforced open profile polyethylene pipe. Steel-reinforced DuroMaxx pipe loses less than 1% of its stiffness under the same conditions.



*The information in this graph is an average stiffness loss observed over several diameters of one AASHTO M294 HDPE profile wall product.

High Stress Rated Resins

High Performance Resins for Lifelong Performance

Predictable service life demands predictable material properties. CONTECH engineers have designed DuroMaxx with high quality stress rated materials that provide predictable engineering properties. DuroMaxx will not experience the dreaded cracking and delamination that has undermined HDPE pipe supplier credibility. CONTECH's decision to manufacture DuroMaxx using stress rated resins was a choice made to support the professional engineer and to avoid further negative experiences for the contractor. Shouldn't you demand similar Hydrostatic Design Basis (HDB) stress rated materials from your supplier?

Low Head Water Tight Joints

High Performance Low Head Joints

The integrated bell and spigot DuroMaxx design achieves a level of performance that sets it apart from conventional storm drain products. The DuroMaxx joint is designed to meet the highest standards of performance for storm drains for the added assurance often required but not cost effectively available to the engineer. DuroMaxx bell and spigots are designed to achieve 15 psi when tested in the laboratory in accordance with ASTM D3212. DuroMaxx Water Tight (WT) sets a new industry standard for joint performance.

Longer Lengths: Fewer Joints

DuroMaxx pipe is manufactured in standard lengths of 20 feet with bell and spigot joints – resulting in fewer joints to assemble on site and faster installation rates for the contractor. If your project requires custom lengths, DuroMaxx can be provided in plain end or with bell and spigot joints.

Applications and Savings

Applications

Drainage Pipe

DuroMaxx drainage pipe is ideally suited for the collection and removal of gravity flow stormwater from residential developments, industrial sites and urban projects. Anywhere the need to move water exists, DuroMaxx meets that need.

Subsoil Drainage Pipes

DuroMaxx can also be produced as perforated pipe for subsoil drainage applications. Used to collect and transfer subsurface water through ground seepage into the pipeline, DuroMaxx perforated pipe can eliminate the need for open drainage channels.

Stormwater Detention Systems

Detention systems are used to regulate stormwater flow through main pipelines by acting as a buffer during peak loads. DuroMaxx systems are designed to contain the water and slowly release it into the main system over a period of time. These systems are often custom made to water tight specifications in order to suit the project requirements. DuroMaxx systems can incorporate a wide range of fittings such as bends, risers, bulk headed ends and inlet/outlet pipes. The systems can be custom manufactured to individual lengths in sizes and configurations that can be economically transported and assembled on site. The light weight and ease of handling of the sections, even large diameters, allows easy placement and installation of pipe and other structures on site.

DuroMaxx is an engineered polyethylene steel composite pipe with a rib profile outer wall and a smooth internal surface. Suitable for drainage and detention applications, DuroMaxx is extruded using virgin high-density polyethylene, which is embedded with ribs of high yield steel. This composite structure creates a pipe with exceptional strength and a relatively low material mass, that is manufactured in accordance with and meets ASTM F2562 for steel reinforced thermoplastic ribbed pipe.

Savings

Higher Flow Rates

Higher flow rates are achieved with a smooth polyethylene water way wall thereby providing the engineer with the design option to reduce the pipeline diameter, saving money overall.

Lighter Weight

DuroMaxx pipe is light weight which means it can be easily and quickly handled and installed, often eliminating the need to use heavy construction equipment. As the two main cost drivers to install water conveyance products are manpower and machinery, DuroMaxx provides the opportunity to save in both, resulting in less overall spending. The longer lengths and easy joint assembly are just some of the DuroMaxx installation advantages. For the nationally accepted installation standard, reference the ASTM D2321 or contact your local CONTECH representative for the DuroMaxx installation guide.

Fittings

DuroMaxx pipe is compatible with a full range of fabricated fittings such as elbows, tees, wyes, slope junctions and reducers. Both standard and custom fittings can be readily fabricated from sections of the pipe.

CONTECH CONSTRUCTION PRODUCTS INC.

ENGINEERS ESTIMATE

Page 1 of 1

Date: 12/8/09
Client: Hoskin/Ryan
Contact: Paul Hoskin
PROJECT: FRS NO.3 Outfall Channel

Quote: 1
Territory:
Reply to: John Bacigalupi
602-377-5347

This estimate is a comparison of CON/SPAN equivalents to Cast in Place Box Culvert structures- (CBC).

Item No.	Approx. Quantity	Description	Unit Price	Unit	Unit Total
1	825	CON/SPAN Precast Arch Culvert-16' x 6'	$504.00	LF	$415,800.00
		Precast-16' span x 6' rise replaces (2)8'x6' CBC			
1A	825	Foundations and Installation of Precast	$166.00	LF	$136,950.00
		Includes excavation/foundations/erection			
1Total	**1**	**Total Installed Cost of Precast Option 1**	**$670.00**	**LF**	**$552,750.00**
2	63	CON/SPAN Precast Arch Culvert-24' x 6'	$567.00	LF	$35,721.00
		Precast -24' span x 6' rise replaces (3)8'x6' CBC			
2A	63	Foundations and Installation of Precast	$187.00	LF	$11,781.00
		Includes excavation/foundations/erection			
2T	**1**	**Total Installed Cost of Precast Option 2**	**$754.00**	**LF**	**$47,502.00**

Unless documentation of tax exempt status is provided, tax will be **added** to invoiced price. *(tax not included)* TOTAL

Notes

1. Installation of precast is by others
2. Design is included
3. Quantities above based on estimated quantites. Buyer must verify quantity at unit price above at time of order.
4. On site consultation is provided during installation
5. Prices are F.O.B. plant, freight allowed to jobsite with purchaser to unload at a truck accessible delivery point.

PAYMENT TERMS ARE 1/2%-10, NET 30 DAYS FROM DATE OF INVOICE UNLESS MATERIAL IS OTHERWISE NOTED AS NONSTANDARD ABOVE. IF NONSTANDARD, PAYMENT TERMS ARE 1/3 AT ORDER ACCEPTANCE AND PRIOR TO START OF PRODUCTION, 2/3 NET 30 DAYS FROM DATE OF INVOICE. THIS OFFER IS SUBJECT TO CREDIT APPROVAL. PRICES QUOTED APPLY ONLY TO THE REFERENCED PROJECT AND ARE IN EFFECT FOR 30 DAYS FROM THE DATE OF THIS QUOTATION. SELLER RESERVES THE RIGHT TO ADJUST PRICES AFTER 30 DAYS FROM THE DATE OF QUOTATION BUT THE CONTECH COS REMAIN APPLICABLE. PRICES ARE BASED ON ESTIMATED QUANTITIES SHOWN. IF A DIFFERENT QUANTITY IS PURCHASED, CONTECH RESERVES THE RIGHT TO ADJUST PRICES. THIS QUOTATION CONTAINS THE ENTIRE AGREEMENT WITH RESPECT TO THE PURCHASE AND SALE OF THE PRODUCTS DESCRIBED AND SUPERSEDES ALL PREVIOUS COMMUNICATIONS. BUYER'S SIGNATURE BELOW, DIRECTION TO MANUFACTURE, OR ACCEPTANCE OF DELIVERY OF GOODS DESCRIBED ABOVE, SHALL BE DEEMED AN ACCEPTANCE OF THE CONTECH COS. SELLER EXPRESSLY REJECTS ANY OTHER TERMS AND CONDITIONS. PRICES ARE F.O.B.ORIGIN WITH FREIGHT ALLOWED TO THE JOBSITE WITH UNLOADING BY OTHERS AT A TRUCK ACCESSIBLE LOCATION.

ACCEPTANCE

WE HEREBY ORDER THE DESCRIBED MATERIAL SUBJECT TO THE TERMS AND CONDITIONS OF THIS QUOTATION AND IN THE CONTECH CONDITIONS OF SALE INCLUDED HEREWITH AND VIEWABLE AT www.contech-cpi.com/cos.

Company:__________

By:__________

Title:__________ Date:__________

CONTECH CONSTRUCTION PRODUCTS INC.

By: John Bacigalupi

Title: **District Manager**

The lightweight pipe that takes a heavier load

Weholite® pipe is large diameter, profile wall pipe made from high-density polyethylene (HDPE) resin. Designed for gravity and low-pressure applications, Weholite's raw material properties have been combined with patented structural wall technology to create a lightweight engineered pipe with superior loading capacity. It is used to convey liquids or air, under ground or above ground, in low-pressure applications.

Lighter. Stronger. Chemical Resistant.

Weholite pipe is much lighter than similarly sized concrete pipe. Combine this with longer manufacturing lengths and Weholite allows you to achieve savings in labour and equipment.

Weholite HDPE pipe will not corrode, tuberculate or support biological growth, making it the material of choice in harsh chemical environments. It is inert to salt water and the chemicals likely to be present in sanitary sewage effluent.

Like all HDPE pipe, Weholite has a smooth ID that maintains its flow capability over time. The low Manning's roughness factor of 0.01 remains constant, even after years of use.

Easier to Transport. Easier to Install. Leak Proof.

Weholite pipe is much easier to handle and install than heavier, rigid concrete or metallic pipe. This means potential cost savings during the construction process. It is structurally designed to withstand an impact, especially in cold weather installations when other pipes are prone to cracks and breaks.

Weholite pipe is usually joined by a thermal fusion process (extrusion welding) to form a joint that is as strong as the pipe itself. Extrusion welding eliminates potential leak points every 8-20 feet commonly found with concrete, PVC and ductile iron pipe. Since fused joints are self-restraining, costly thrust restraints or thrust blocks may not required.

Extrusion welded Weholite pipe is leak proof. The properties of HDPE pipe and the thermal fusion method of joining produces a continuous pipeline, eliminating the risk of leakage caused by shifting unstable soils. A continuous Weholite pipeline eliminates the joint infiltration and exfiltration problems experienced with other pipe materials.

Cost Effective. Permanent.

Weholite pipe offers distinct chemical and physical advantages over concrete or iron pipe. It can be bent to a radius 200 times the nominal pipe diameter to eliminate many fittings required for directional changes in piping systems made from other materials. In addition, the flexibility of Weholite pipe makes it well suited for dynamic soils and areas prone to earthquakes.

Weholite is cost effective in both the short and long term. The fact that it is lightweight makes it easier to transport and install. The fact that it is leak proof and fatigue resistant means years of maintenance free use. The Plastics Pipe Institute conservatively estimates the service life for HDPE pipe to be 50-100 years.

Weholite Advantages

- *Lightweight*
- *Impact Resistant*
- *Corrosion Resistant*
- *Chemical Resistant*
- *Fatigue Resistant*
- *Leak Proof*
- *Flexible*
- *Long Life*
- *Environmentally Friendly*

Technical Info

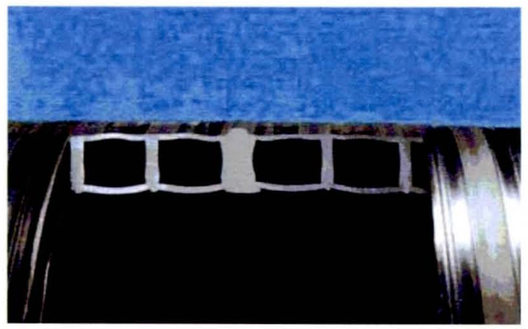
The Weholite Structure

Weholite pipe is manufactured with a unique profile design that takes advantage of structural shape efficiencies to provide a product that is suitable for a wide range of loading conditions. The structure is the optimal solution when comparing performance versus weight.

Material Properties

Weholite Pipe is Corrosion and Chemical Resistant

Weholite pipe will not corrode, tuberculate or support biological growth. It is the material of choice in harsh chemical environments. Weholite has a smooth ID and maintains its flow capability over time - Mannings n Factor remains 0.010, even after years of use.



Weholite Pipe is Flexible and Fatigue Resistant

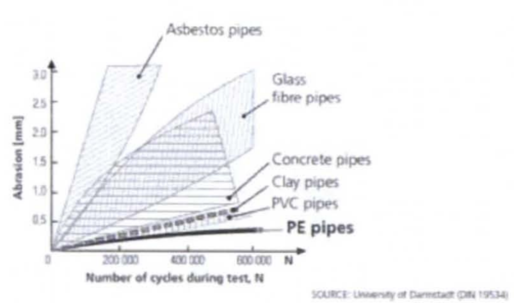
Weholite can be bent to a radius 200 times the nominal pipe diameter. This can eliminate many fittings required for directional changes compared to piping systems made from other materials. In addition, the flexibility of Weholite makes it well suited for dynamic soils and areas prone to earthquake.

Weholite Pipe is Lightweight and Impact Resistant

Weholite is much easier to handle and install than heavier, rigid metallic or concrete pipe, allowing for cost advantages in the construction process. Structurally, it is better suited to withstand an impact than other pipe materials, especially in cold weather installations when other pipes like PVC are prone to cracks and breaks.

Weholite Pipe Abrasion resistance

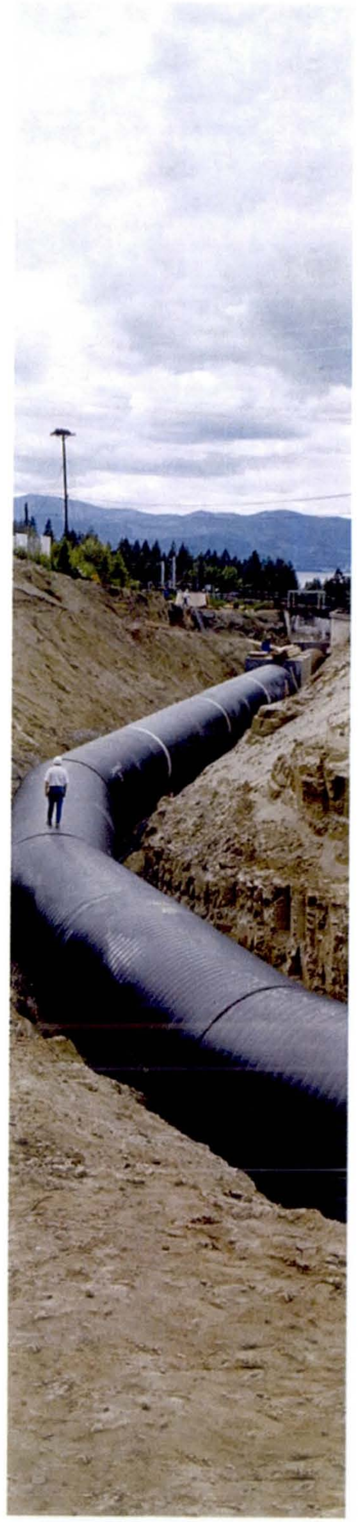
Weholite pipes show superior abrasion-resistant qualities compared to traditional pipeline materials. This is proven by the fact that HDPE pipes have been the first choice for the mining industry during many decades.



Item			Dimensions	
Size (inch)	Class	Spec	Avg. OD (inch)	Avg. ID* (inch)
66	160	F894	72.4	66.0
66	*250*	*F894*	*73.8*	*66.0*
72	100	F894	78.4	72.0
72	160	F894	79.1	72.0
72	*250*	*F894*	*80.5*	*72.0*
78	100	F894	84.4	78.0
78	160	F894	85.8	78.0
78	*250*	*F894*	*86.5*	*78.0*
84	100	F894	90.3	84.0
84	160	F894	91.8	84.0
84	250	F894	93.2	84.0
90	160	F894	97.8	90.0
90	250	F894	99.2	90.0
90	400	F894	100.6	90.0
96	160	F894	104.5	96.0
96	250	F894	105.9	96.0
96	400	F894	107.4	96.0
108	160	F894	117.2	108.0
108	250	F894	118.6	108.0
108	400	F894	120.8	108.0
120	160	F894	129.9	120.0
120	250	F894	131.3	120.0
120	400	F894	134.2	120.0
132	160	F894**	141.6	132.0

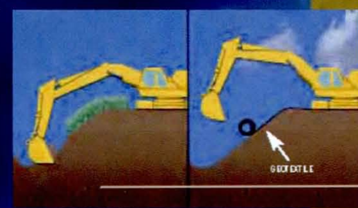
Standard Inventory Product
*Minimum ID is 1% less than Average ID
**Pipe complies entirely with ASTM F894 with the exception of the nominal OD value.

Note: This dimensional table for Weholite pipe contains a range of product sizes and stiffness classes. The specification associated with each of these items is ASTM F894. Pipe sizes 48" and smaller are available in lower stiffness classes that do not comply with the minimum waterway wall thickness requirement of ASTM F894. If the analysis using our online tools indicates that one of these lower stiffness items is suitable, the standard that will be indicated on all documentation is NONF894. The items comply in all respects with ASTM F894 except the waterway wall.

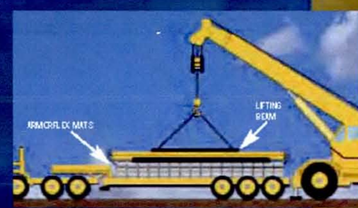


ARMORFLEX® INSTALLATION

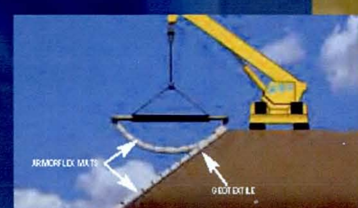
- ArmorFlex arrives on-site as a system of factory-assembled mats. ArmorFlex is placed on a site specific geotextile which has been placed on a prepared subgrade using conventional construction equipment.
- Mats are supplied on 42-foot trailers, up to 1600 square feet per truck.
- Mats can be handled with a spreader bar which is provided by Armortec with the initial load.
- Permanent anchorage can be achieved by connecting the mat cables to patented anchors such as "Helix" or "Duckbill".
- Mats subject to wave attack should be blinded with a sand/gravel mixture. Above normal waterline mats may be topsoiled and seeded to give a "green" effect.
- Proper toe trench requires a minimum of 2 rows of block buried below predicated soil depth.
- Mats subject to wave attack are required to have a bedding layer of crushed stone or gravel.



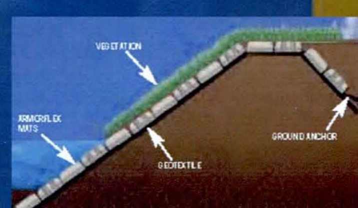

SITE PREPARATION




DELIVERY & UNLOADING




INSTALLING & LIFTING DEVICE




BACKFILL & VEGETATION

OTHER ARMORTEC® BROCHURES

ARMORLOC · A-JACKS COASTAL
A-JACKS STREAMBANK & SCOUR
ARMORTEC MULTI-PRODUCT
ARMORFLEX HAND PLACED · ARMORFLEX OS
ARMORWEDGE

ARMORTEC is a subsidiary of

CONTECH EARTH STABILIZATION SOLUTIONS INC.

9025 Centre Pointe Drive
Suite 400
West Chester, OH 45069

Toll Free (866) 551-8325
www.contechess.com
www.armortecsoftware.com

AUTHORIZED AGENT

AAF06

ARMORTEC Erosion Control Solutions
A CONTECH COMPANY

ARMORFLEX®

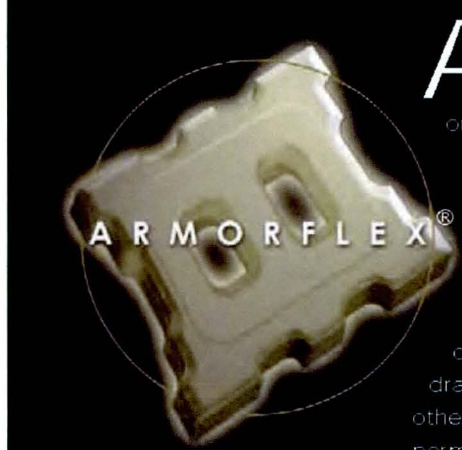
ARTICULATING CONCRETE BLOCK REVETMENT SYSTEM

APPLICATIONS

CHANNEL LINING · RIVERBANK PROTECTION
DRAINAGE DITCH LINING · PIPELINE PROTECTION
BOAT RAMPS · RESERVOIR SLOPE PROTECTION
LAKE SHORELINE PROTECTION
BRIDGE ABUTMENT PROTECTION
DIKES AND LEVY PROTECTION
DAM CRESTS AND SPILLWAYS
WEIRS AND OVERFLOW CHANNELS

CONTECH EARTH STABILIZATION SOLUTIONS INC.

EROSION CONTROL SOLUTIONS

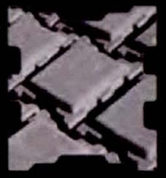


ArmorFlex is a flexible, interlocking matrix of concrete blocks of uniform size, shape and weight connected by a series of cables which pass longitudinally through preformed ducts in each block. ArmorFlex is installed over site specific filter fabric on a prepared surface. ArmorFlex revetment systems combine the favorable aspects of lightweight blankets and meshes, such as porosity, flexibility, vegetation encouragement and habitat enhancement with nonerodible, self-weight and high tractive force resistance of a rigid lining.

ArmorFlex has proven to be an aesthetic and functional alternative to dumped stone riprap, gabions, structural concrete and other heavy-duty, durable erosion protection systems. ArmorFlex is easy to install, therefore, can dramatically reduce overall project costs. More specifically, when compared to other systems, life-cycle costs have been reduced because ArmorFlex is a permanent system and saves on subsequent maintenance expenses.

BLOCK STYLES

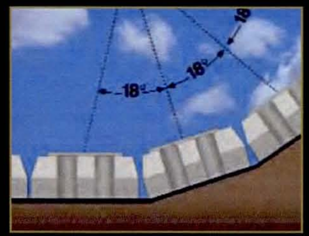
OPEN CELL | CLOSED CELL

20% OPEN | 10% OPEN

When placed on a site specific filter fabric, the permeability of the revetment system relieves hydrostatic pressure in the subgrade. The system's capability for soil retention prevents leaching of subsoils throughout the installation.

FLEXIBILITY



ArmorFlex blocks are interconnected by flexible cables, providing articulation between adjacent blocks. Block walls are designed with beveled side walls to allow for flexibility in all directions.

FEATURES & BENEFITS

- STABILITY
- FLEXIBILITY
- PERFORMANCE
- COST-EFFECTIVE
- VEGETATION
- PERMEABILITY
- EASY TO INSTALL

ARMORFLEX® BLOCK SPECIFICATIONS

STANDARD CLASS CONCRETE BLOCK OPEN AREA 20%

MINIMUM PHYSICAL REQUIREMENTS

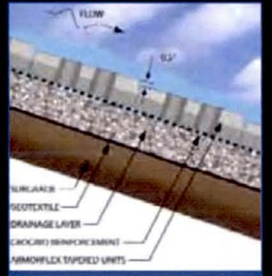
MIN. DENSITY (IN AIR) LBS/FT³		MIN. COMPRESSIVE STRENGTH PSI		MAX. WATER ABSORPTION LBS/FT³	
AVE. OF 3 UNITS	INDIVIDUAL UNIT	AVE. OF 3 UNITS	INDIVIDUAL UNIT	AVE. OF 3 UNITS	INDIVIDUAL UNIT
130	125	4,000	3,500	9.1	11.7

*Unit weight and density values may vary due to availability of local materials.

CONCRETE BLOCK CLASS	OPEN/ CLOSED CELL	NOMINAL DIMENSIONS L	NOMINAL DIMENSIONS W	NOMINAL DIMENSIONS H	GROSS AREA/ (sq. ft.)	BLOCK WEIGHT lbs.	BLOCK WEIGHT lbs./sq. ft.	OPEN AREA %
30s	Open	13.0	11.6	4.75	0.98	31-36	32-37	20
50s	Open	13.0	11.6	6.00	0.98	45-52	45-53	20
40	Open	17.4	15.5	4.75	1.77	62-71	35-40	20
50	Open	17.4	15.5	6.00	1.77	81-94	46-53	20
70	Open	17.4	15.5	8.50	1.77	120-138	68-78	20
40L	Open	17.4	23.6	4.75	2.58	90-106	35-41	20
70L	Open	17.4	23.6	8.50	2.58	173-201	67-78	20
45s	Closed	13.0	11.6	4.75	0.98	39-45	40-45	10
55s	Closed	13.0	11.6	6.00	0.98	53-61	54-62	10
45	Closed	17.4	15.5	4.75	1.77	78-89	43-50	10
55	Closed	17.4	15.5	6.00	1.77	94-108	53-61	10
85	Closed	17.4	15.5	8.50	1.77	145-167	82-98	10
45L	Closed	17.4	23.6	4.75	2.58	108-126	42-49	10
85L	Closed	17.4	23.6	8.50	2.58	209-243	81-94	10
High Velocity Application Block Classes								
40-T	Open	17.4	15.5	4.75	1.77	62-71	35-40	20
50-T	Open	17.4	15.5	6.00	1.77	81-94	46-53	20
70-T	Open	17.4	15.5	8.50	1.77	120-138	68-78	20

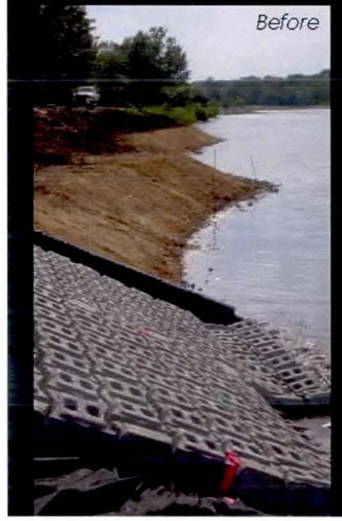
Note: Please see your local sales representative for regional block availability

DAMS, SPILLWAYS, AND HIGH VELOCITY CHANNELS



ArmorFlex T-Series

ArmorFlex unique Tapered block design offers superior protection for embankment dams, spillways, and high velocity channels and chutes. The essential design component of the ArmorFlex Tapered system is a 0.5-inch taper that virtually eliminates destabilizing impact flow forces, thereby providing higher factors of safety. The ArmorFlex Tapered block system has been successfully tested under hydraulic jump conditions at Colorado State University.



Before

After

RESEARCH AND DESIGN

Since 1980, Armortec has initiated and participated in a wide range of research projects to evaluate the performance of ArmorFlex, including the following:

- Tetratech model tests - California, U.S.A.
- Wave Attack Tests, Report No. M1910 - Delft Hydraulics Laboratory, 1982
- "Large-Scale model study of ArmorFlex slope protection" Tekmarine, Inc., May, 1984
- "Design for Reinforced Grass Waterways," - CIRIA Report 116, 1987
- "Minimizing Embankment Damage During Overtopping Flows," FHWA Report-RD-88-181 prepared by Simons, Li and Associates, Inc., November 1988
- "Hydraulic Stability of Articulated Concrete Block Revetment Systems During Overtopping Flow," FHWA Report-RD-89-199 prepared by Simons, Li and Associates, Inc., July 1989
- ArmorFlex Overtopping Test, prepared by Ayers Associates, Inc.

RESEARCH PROVEN PERFORMANCE

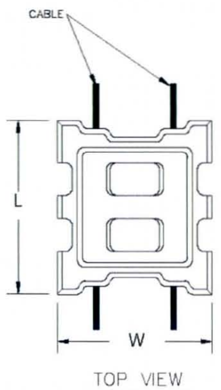
Armortec has carried out extensive research into wave and open channel flow conditions on ArmorFlex in the United States and the Netherlands. Design manuals and computer programs are available to assist in the proper ArmorFlex block selection for your hydraulic conditions.

ARMORTEC®
Erosion Control Solutions
A CONTECH COMPANY

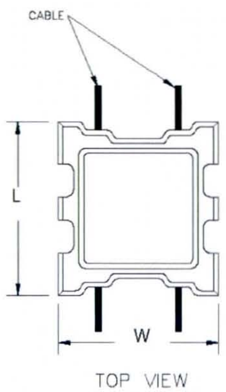
Dam Overtopping Tests

WL | delft hydraulics

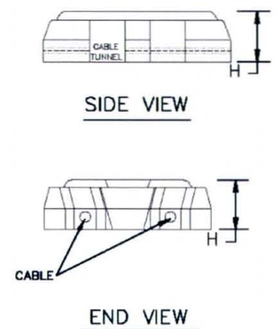
ArmorFlex® (not to scale)

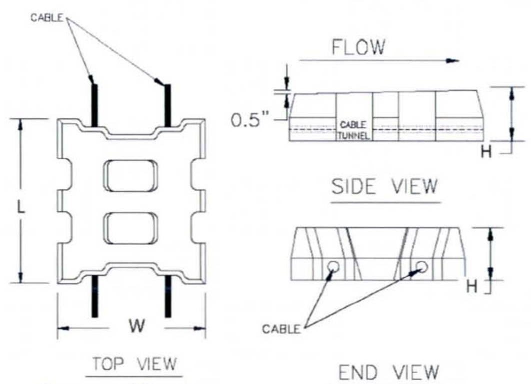


Open Cell Block

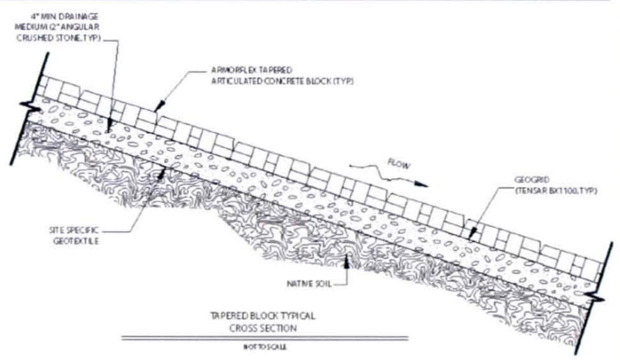


Close Cell Block

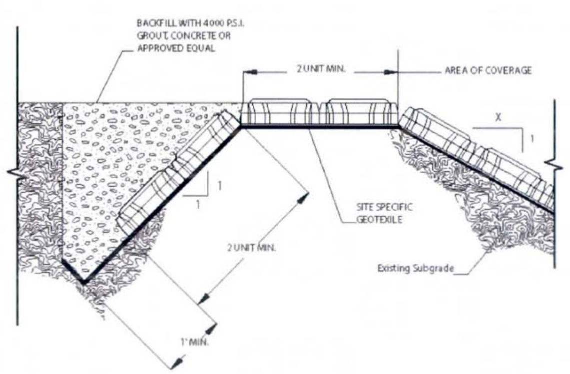




Tapered Series



Tapered Series - Cross Section

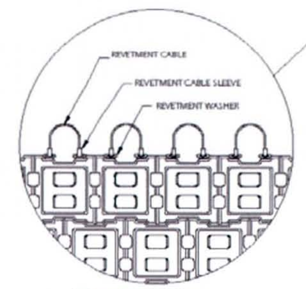


Top of Slope - Standard Detail

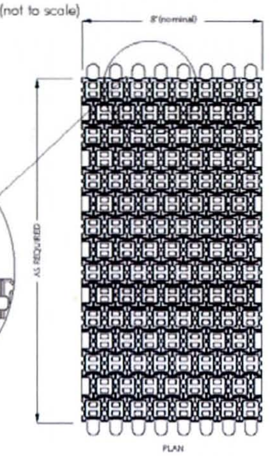
ArmorFlex Unit Specification

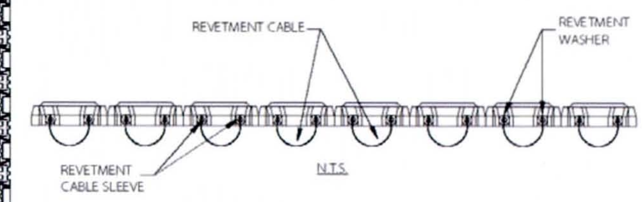
Concrete Block Class	Open/Closed Cell	Nominal Dimensions			Gross Area/ (sq. ft.)	Block Weight		Open Area %
		L	W	H		lbs	lbs/sq. ft.	
30s	Open	13.0	11.6	4.75	0.98	31-36	32-37	20
50s	Open	13.0	11.6	6.00	0.98	45-52	45-53	20
40	Open	17.4	15.5	4.75	1.77	62-71	35-40	20
50	Open	17.4	15.5	6.00	1.77	81-94	46-53	20
70	Open	17.4	15.5	8.50	1.77	120-138	68-78	20
40L	Open	17.4	23.6	4.75	2.58	90-106	35-41	20
70L	Open	17.4	23.6	8.50	2.58	173-201	67-78	20
45s	Closed	13.0	11.6	4.75	0.98	39-45	40-45	10
55s	Closed	13.0	11.6	6.00	0.98	53-61	54-62	10
45	Closed	17.4	15.5	4.75	1.77	78-89	43-50	10
55	Closed	17.4	15.5	6.00	1.77	94-108	53-61	10
85	Closed	17.4	15.5	8.50	1.77	145-167	82-98	10
45L	Closed	17.4	23.6	4.75	2.58	108-126	42-49	10
85L	Closed	17.4	23.6	8.50	2.58	209-243	81-94	10
High Velocity Application Block Classes								
40-T	Open	17.4	15.5	4.75	1.77	62-71	35-40	20
50-T	Open	17.4	15.5	6.00	1.77	81-94	46-53	20
70-T	Open	17.4	15.5	8.50	1.77	120-138	68-78	20

ArmorFlex® cont. (not to scale)

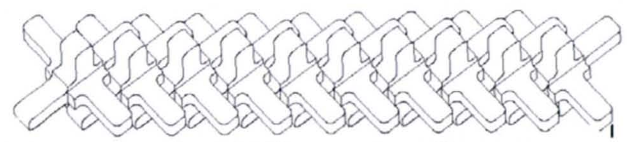


Typical Mat

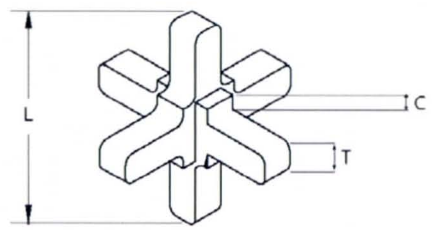




A-Jacks® (not to scale)



A-Jacks Placement Profile

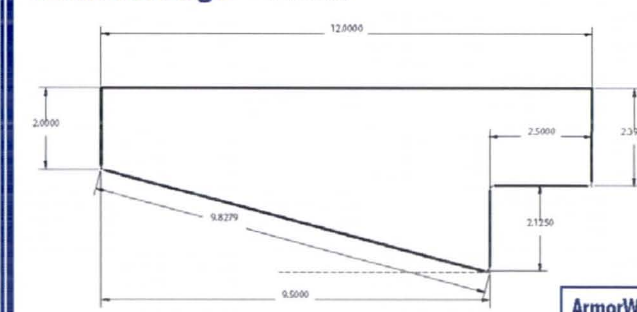


A-Jacks Unit

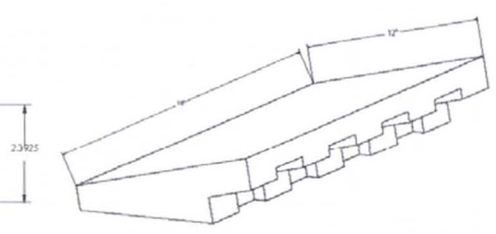
A-Jacks Unit Specification

A-JACKS	L(IN)	T(IN)/H(IN)	C(IN)	VOL(FT³)	WT (LBS)
AJ-24	24	4	1.84	0.56	78
AJ-48	48	7.36	3.68	4.49	629
AJ-72	72	11.04	5.52	15.14	2.120
AJ-96	96	14.72	7.396	35.87	5.022
AJ-120	120	18.40	9.20	70.69	9.699

ArmorWedge® (not to scale)



Side View - Typical Block



ArmorWedge Unit Specification

UNIT DIMENSION	UNIT WEIGHT (LBS)	SYSTEM WEIGHT (LBS)	UNIT COVERAGE (SF)	COMPRESSIVE STRENGTH (PSI)	MAXIMUM ABSORPTION (LBS/FT³)
12x18	40-52	36-40	1.1875	4000	12

APPENDIX B – FRS No. 3 Outlet Design Capacity Memorandum

Flood Control District
of Maricopa County

PROJECT MEMORANDUM

Date: November 16, 2009

To: Gary Wesch, P.E.
Project Manager

From: Michael Greenslade, P.E.
Project Manager

Subject: White Tanks FRS No. 3 Outlet Design Capacity

In your e-mail of November 3, 2009 you requested clarification regarding the design outlet capacity for White Tanks FRS No. 3. You indicated that your meeting notes reference a capacity of 230 cfs which corresponds to the capacity when the reservoir water surface elevation is at the crest of the auxiliary (emergency) spillway. In order to clearly understand the channel capacity needed for discharges through the principal spillway the design and the operational procedures for the interim and future conditions must be understood. For reference in this discussion, the discharge rating curve for the principal spillway and gated outlet (Table 14-2) from the White Tanks No. 3 Phase 1 design is attached.

The principal spillway consists of two 48" pipes of which one is connected to a stand alone gated outlet and the other is connected to an NRCS riser which includes a bypass gated outlet. With the NRCS riser currently capped (interim condition), the 48" pipe connected to the NRCS riser can be utilized via the bypass gated outlet. The capping of the NRCS riser was done so that uncontrolled flows through the principal spillway would not occur until outlet channels had been constructed and uncontrolled flows could be safely discharged (ultimate future condition). The ultimate future condition is defined as follows:

- The overall rehabilitation of White Tanks FRS No. 3 and White Tanks FRS No. 4 is completed,
- The outlet channel from White Tanks No. 3 to White Tanks No. 4 has been constructed,
- The outlet channel from White Tanks No. 4 has been constructed, and
- The earth fissure risk at White Tanks No. 3 has either been reduced due to additional studies or mitigated through design.

While the 30% design for the outlet channel assumed a capacity utilizing both the 48" pipes with the principal spillway uncapped (537 cfs) a review of the original design intent and preferred operational procedures indicates that a capacity significantly less is needed. Future operation in the ultimate future condition defined above assumes the principal spillway (right 48" pipe) is uncapped and connected to the outlet channel. The stand alone gated outlet (left 48" pipe) should not be connected to the outlet channel and therefore its capacity ignored for the outlet channel design. The purpose for not connecting the stand alone gated outlet to the outlet channel is that operationally this outlet will only be utilized if there is a condition where the outlet channel should not be utilized as discussed below:

- Following construction of the White Tanks FRS No. 3 outlet channel and under certain flooding conditions there may be a need to prohibit flows from White Tanks FRS No. 3 to the outlet channel prior to construction completion of the White Tanks FRS No. 4 outlet channel. Under these flooding conditions, the stand alone gated outlet would only be utilized after implementation of the District's emergency action plan (EAP).

- A condition where the stand alone gated outlet might be utilized in the ultimate future condition is one where a hazard exists within the earth fissure risk zone such that discharges into the outlet channel would create a dam safety concern to White Tanks FRS No. 3 and discharges should be directed away from the earth fissure risk zone. Under this condition, the stand alone gated outlet would only be utilized after implementation of the District's EAP.

Recommendations

Based on the planned operational procedures and ultimate future condition the outlet channel should be designed for the discharge associated with the principal spillway uncapped. Under this condition, a maximum discharge of **284 cfs** will occur when the water surface elevation is at its maximum (PMF elevation) which is 1,216 feet (NAVD 88).

The design for any structure to accommodate the stand alone gated outlet should be for a maximum discharge of 253 cfs that will occur during operation of this structure at a maximum water surface elevation discussed above. Typically, the stand alone gated outlet will not be operated until spillway flows have ceased but to ensure the outlet channel design capacity is not exceeded the maximum discharge should be utilized for design.

Furthermore, the design of the conveyance system through the emergency spillway should be such that failure will not occur during spillway flows and the calculated scour resulting from those flows. The analysis should include modifications to the final approved SITES models to account for the conveyance system.

TABLE 14-2
Outlet Works Discharge Rating Curve

Elevation (feet) (NAVD 88)	Future Condition (Principal Spillway Open) Discharge (cfs)			Interim Condition & Future Condition (Principal Spillway Closed) Discharge (cfs)		
	Gated Outlet (48-inch)	Principal Spillway[1] (48-inch)	Combined	Gated Outlet (48-inch)	Gated Principal Spillway Bypass outlet (48-inch)	Combined
1,197	-	-	-	-	-	-
1,199	24	-	24	24	24	48
1,201	87	76	163	87	87	174
1,203	123	181	304	123	123	246
1,205	150	201	351	150	150	300
1,207	173	218	391	173	173	346
1,209	194	234	428	194	194	388
1,211	212	249	461	212	212	424
1,212	221	257	478	221	221	442
1,213	229	264	493	229	229	458
1,214	237	270	507	237	237	474
1,215	245	277	522	245	245	490
1,216	253	284	537	253	253	506
1,217	260	290	550	260	260	520
1,218	267	296	563	267	267	534

Notes:
1. Principal spillway crest elevation is set at 1,200 ft (NAVD 88).

URS Design Report
White Tanks Flood Retarding Structure No. 3
Remediation Project
Flood Control District of Maricopa County
March 2005
URS Job No.23443748
P:\FCDMC\23443698 WHITE TANKS\DESIGN REPORT\100 PERCENT\100 PERCENT TABLES\TABLE 14-2.DOC

APPENDIX C – HYDROLOGIC MODELING

C.1 SCHEMATIC MAPS

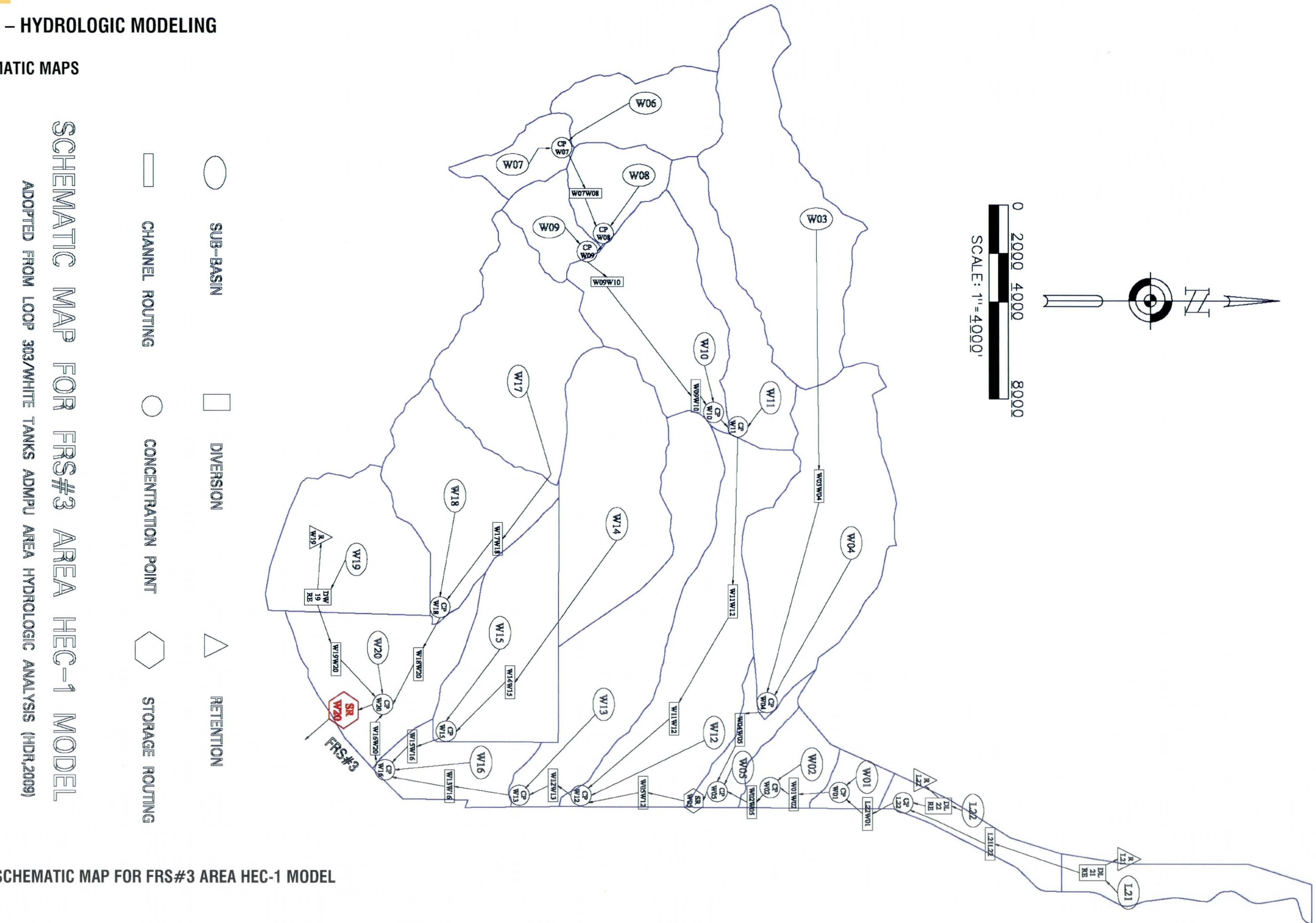


FIGURE 31 – SCHEMATIC MAP FOR FRS#3 AREA HEC-1 MODEL

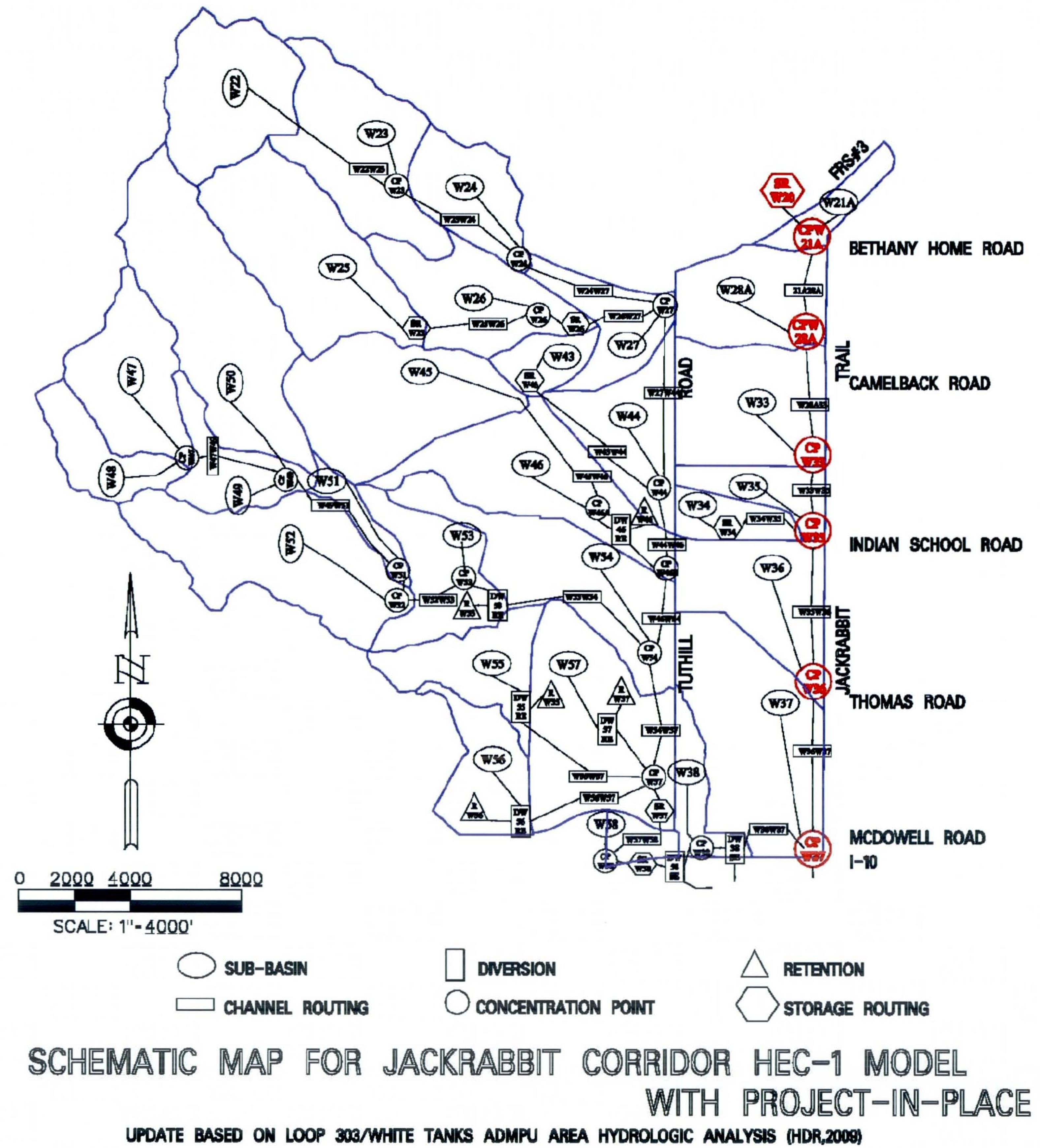


FIGURE 32 – SCHEMATIC MAP FOR JACKRABBIT CORRIDOR HEC-1 MODEL, EXISTING CONDITION WITH PROJECT IN PLACE

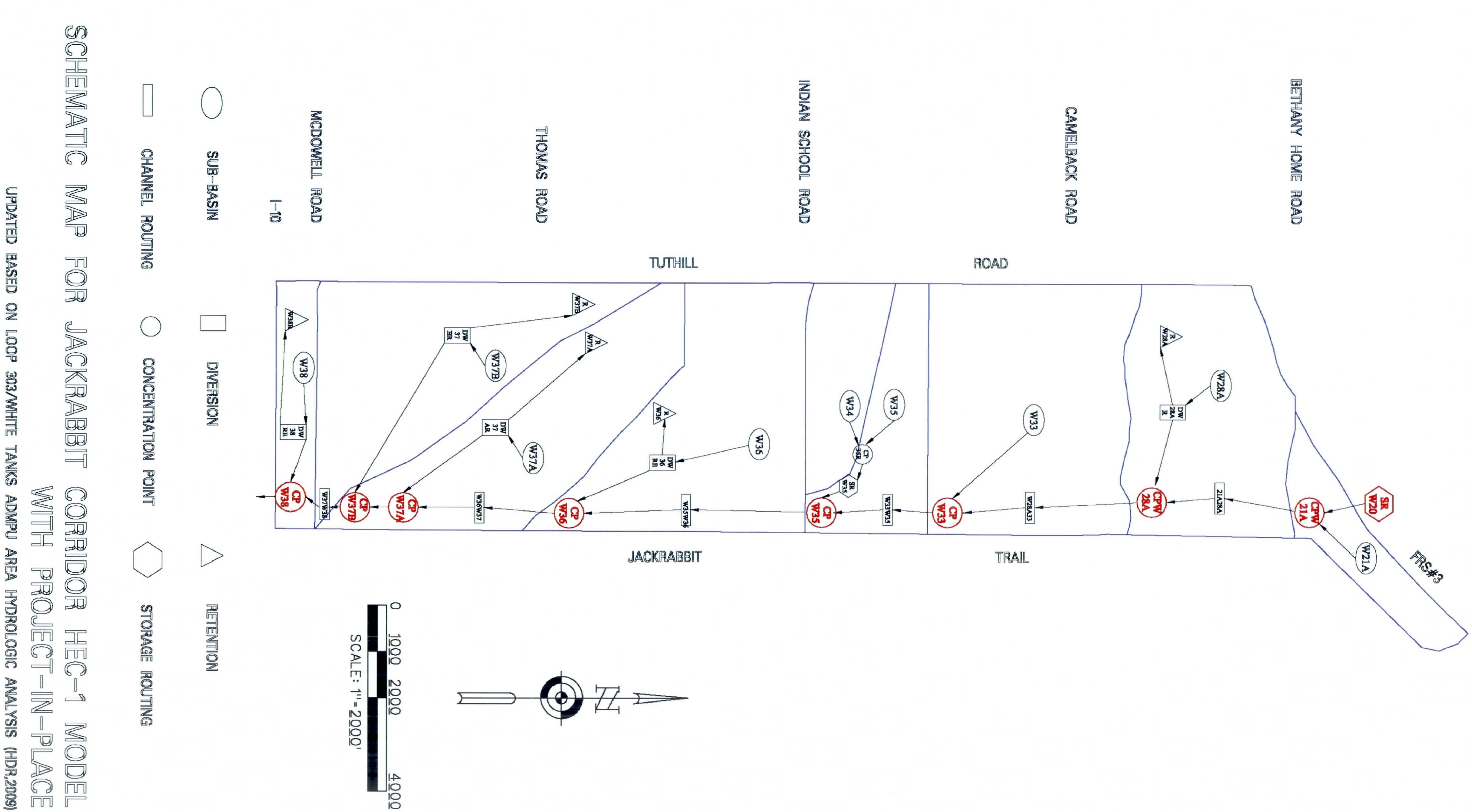


FIGURE 33 – SCHEMATIC MAP FOR JACKRABBIT CORRIDOR HEC-1 MODEL, FUTURE CONDITION WITH PROJECT IN PLACE

C.2 FUTURE CONDITIONS WITH PROJECT IN PLACE, 10-YEAR FOR FRS#3 AREA

```
1**************************************          **************************************
*                                      *          *                                    *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *          *  U.S. ARMY CORPS OF ENGINEERS      *
*            JUN  1998                 *          *  HYDROLOGIC ENGINEERING CENTER     *
*          VERSION 4.1                 *          *       609 SECOND STREET            *
*                                      *          *    DAVIS, CALIFORNIA 95616         *
*  RUN DATE   02DEC09  TIME  09:51:06  *          *       (916) 756-1104               *
*                                      *          *                                    *
**************************************            **************************************


          X     X  XXXXXXX   XXXXX          X
          X     X  X        X     X        XX
          X     X  X        X               X
          XXXXXXX  XXXX     X       XXXXX   X
          X     X  X        X               X
          X     X  X        X     X         X
          X     X  XXXXXXX   XXXXX         XXX


THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                    HEC-1 INPUT                                        PAGE  1

 LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   1         ID          FUTURE CONDITION 10-YEAR 24HOUR EVENT
   2         ID          PRECIPITATION FROM DDMSW
   3         ID          WHITE TANKS AREA, WATERSHED CONTRIBUTING TO FRS#3
   4         ID          PREPARED BY HOSKIN RYAN CONSULTANTS EXCLUSIVELY FOR
   5         ID          FRS#3 OUTLET CHANNEL DESIGN, 12-02-2009
   6         ID          BASED ON HDR HEC-1 MODEL OF FUTURE CONDITION WITH CIP
   7         ID          MODIFICATIONS INCLUDE:
   8         ID           (1) UPDATE WITH AVERAGE RAINFALL DEPTH FOR FRS#3 WATERSHED ONLY
   9         ID           (2) UPDATE THE STAGE-STORAGE-DISCHARGE CURVE BASED ON URS DESIGN
  10         ID               OF FRS#3 PRINCIPAL AND EMERGENCY SPILLWAY (DISCHARGE
  11         ID                INCLUDING INFILTRATION)
  12         ID           (3) SEPARATE FRS#3 OUTFLOW AND INFILTRATION
  13         ID     *****************************************************************
  14         ID       Flood Control District of Maricopa County
  15         ID       FU_CIP_MB02 - Loop 303/ White Tanks ADMPU AHA
  16         ID       Major Basin: 02
  17         ID       100 Year - Return Period
  18         ID       24 Hour Storm
  19         ID       Multiple Storms
  20         ID       Unit Hydrograph: S-Graph
  21         ID       03/08/2009
  22         IT       5  1JAN99    1200    2000
  23         IN      15
  24         IO       5
             *DIAGRAM
             *
  25         JD   2.572  0.0001
  26         PC   0.000   0.002   0.005   0.008   0.011   0.014   0.017   0.020   0.023   0.026
  27         PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056   0.060
  28         PC   0.064   0.068   0.072   0.076   0.080   0.085   0.090   0.095   0.100   0.105
  29         PC   0.110   0.115   0.120   0.126   0.133   0.140   0.147   0.155   0.163   0.172
  30         PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
  31         PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
  32         PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
  33         PC   0.913   0.918   0.922   0.926   0.930   0.934   0.938   0.942   0.946   0.950
  34         PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977   0.980
  35         PC   0.983   0.986   0.989   0.992   0.995   0.998   1.000
  36         JD   2.443    10.0
  37         JD   2.315    30.0
             *

  38         KK     L21   BASIN
  39         BA   0.525
  40         LG    0.34    0.25    4.55    0.45      14
  41         UI       0      16      15      16      16      15      41      45      62      70
  42         UI      82      93     101     112     121     131     136     144     143     150
  43         UI     152     150     149     145     141     136     130     115     109     102
  44         UI      91      87      79      73      68      64      59      55      49      46
  45         UI      43      40      35      34      30      30      27      25      24      24
             *
1                                    HEC-1 INPUT                                        PAGE  2

 LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


  46         KK  DL21RE  DIVERT
  47         DT    RL21    57.3     0.0
  48         DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
  49         DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
             *

  50         KK  L21L22   ROUTE
  51         RS       1    FLOW      -1
  52         RC   0.032   0.032   0.032    8793  0.0020    0.00
  53         RX  100.00  101.00  107.00  117.00  169.00  409.00  512.00  513.00
  54         RY  1328.1 1328.00 1326.00 1324.00 1324.10 1326.00 1328.00 1328.10
             *

  55         KK     L22   BASIN
  56         BA   0.362
  57         LG    0.46    0.25    4.35    0.58       2
  58         UI       0       7       6       7       7       6       7       7       7      14
  59         UI      19      19      24      26      30      32      36      38      40      43
  60         UI      48      47      49      55      55      57      60      60      61      61
  61         UI      64      64      64      64      65      65      62      61      61      60
  62         UI      58      57      54      50      48      46      46      42      39      38
             *

  63         KK  DL22RE  DIVERT
  64         DT    RL22    15.6     0.0
  65         DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
  66         DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
             *

  67         KK   CPL22 COMBINE
  68         HC       2   0.887
             *

  69         KK  L22W01   ROUTE
  70         RS       1    FLOW      -1
  71         RC   0.032   0.032   0.032    3159  0.0063    0.00
  72         RX  100.00  101.00  102.00  115.00  128.00  140.00  141.00  142.00
  73         RY  1320.2 1320.10 1320.00 1314.00 1314.10 1320.00 1320.10 1320.20
             *

  74         KK     W01   BASIN
  75         BA   0.191
  76         LG    0.50    0.25    3.95    0.40       0
  77         UI       0       9      10       9      24      34      46      55      65      74
  78         UI      82      86      89      89      89      82      77      68      59      52
  79         UI      46      41      35      32      28      24      21      19      17      14
  80         UI      14      10      10      10       7       6       7       6       5       2
  81         UI       2       3       2       2       2       3       2       2       2       2
             *
1                                    HEC-1 INPUT                                        PAGE  3

 LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


  82         KK   CPW01 COMBINE
  83         HC       2   1.078
             *

  84         KK  W01W02   ROUTE
  85         RS       2    FLOW      -1
  86         RC   0.035   0.035   0.035    2650  0.0053    0.00
  87         RX  100.00  111.00  122.00  139.00  162.00  182.00  191.00  200.00
  88         RY  1290.5 1290.25 1290.00 1286.00 1286.10 1290.00 1290.25 1290.50
             *
```

```
  89        KK     W02   BASIN
  90        BA   0.394
  91        LG    0.31    0.25    4.65    0.40      16
  92        UI       0      41      81     192     284     356     393     378     320     238
  93        UI     185     142     107      82      64      45      35      29      21      10
  94        UI      11      10       9      11       0       0       0       0       0       0
  95        UI       0       0       0       0       0       0       0       0       0       0
  96        UI       0       0       0       0       0       0       0       0       0       0
            *

  97        KK   CPW02 COMBINE
  98        HC       2   1.472
            *

  99        KK  W02W05   ROUTE
 100        RS       1    FLOW      -1
 101        RC   0.035   0.035   0.035    2214  0.0045    0.00
 102        RX  100.00  106.00  112.00  119.00  135.00  137.00  138.00  141.00
 103        RY  1280.0 1278.00 1277.00 1276.00 1275.90 1277.00 1278.00 1280.00
            *

 104        KK     W03   BASIN
 105        BA   1.971
 106        LG    0.10    0.25    4.00    0.74      25
 107        UI       0     251     720    1471    1998    2675    1648    1355    1116     875
 108        UI     660     563     428     312     278     192     163     123     123      52
 109        UI      49      48      47      49      48       0       0       0       0       0
 110        UI       0       0       0       0       0       0       0       0       0       0
 111        UI       0       0       0       0       0       0       0       0       0       0
            *

 112        KK  W03W04   ROUTE
 113        RS       3    FLOW      -1
 114        RC   0.035   0.035   0.035   18417  0.0490    0.00
 115        RX  100.00  140.00  180.00  210.00  235.00  305.00  345.00  385.00
 116        RY  1511.0 1510.50 1510.00 1502.00 1502.10 1510.00 1511.00 1512.00
            *
1                                   HEC-1 INPUT                                        PAGE  4

LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 117        KK     W04   BASIN
 118        BA   2.034
 119        LG    0.14    0.25    4.60    0.50      26
 120        UI       0     233     582    1223    1697    2408    2028    1390    1203     990
 121        UI     795     619     527     421     317     265     212     181     125     115
 122        UI     109      45      45      46      45      44      46       0       0       0
 123        UI       0       0       0       0       0       0       0       0       0       0
 124        UI       0       0       0       0       0       0       0       0       0       0
            *

 125        KK   CPW04 COMBINE
 126        HC       2   4.005
            *

 127        KK  W04W05   ROUTE
 128        RS       3    FLOW      -1
 129        RC   0.038   0.038   0.038    5298  0.0098    0.00
 130        RX  100.00  120.00  140.00  160.00  174.00  214.00  234.00  254.00
 131        RY  1313.0 1312.50 1312.00 1308.00 1308.10 1312.00 1312.50 1313.00
            *

 132        KK     W05   BASIN
 133        BA   0.316
 134        LG    0.26    0.25    4.25    0.47      14
 135        UI       0      48     200     294     451     549     367     251     129      72
 136        UI      41      15      15      15       0       0       0       0       0       0
 137        UI       0       0       0       0       0       0       0       0       0       0
 138        UI       0       0       0       0       0       0       0       0       0       0
 139        UI       0       0       0       0       0       0       0       0       0       0
            *

 140        KK   CPW05 COMBINE
 141        HC       3   5.793
            *

 142        KK   SRW05 STORAGE
 143        KO
 144        RS       1    STOR      -1
 145        SV                                    0.70    2.75    8.64   29.89   76.16
 146        SQ           87.84  302.83  591.07 1137.58 1394.68 1845.95 2402.27 2963.92 8536.34
 147        SE  1258.0 1260.00 1262.00 1264.00 1268.00 1270.00 1272.00 1274.00 1276.00 1278.00
            *

 148        KK  W05W12   ROUTE
 149        RS       1    FLOW      -1
 150        RC   0.025   0.025   0.025    5316  0.0071    0.00
 151        RX  100.00  105.00  109.00  125.00  135.00  151.00  155.00  160.00
 152        RY  1000.0  999.50  999.00  995.00  995.10  999.00  999.50 1000.00
            *
1                                   HEC-1 INPUT                                        PAGE  5

LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 153        KK     W06   BASIN
 154        BA   0.707
 155        LG    0.10    0.25    4.30    0.64      25
 156        UI       0     328    1223    1551     876     569     363     215     139      86
 157        UI      43      35      34       0       0       0       0       0       0       0
 158        UI       0       0       0       0       0       0       0       0       0       0
 159        UI       0       0       0       0       0       0       0       0       0       0
 160        UI       0       0       0       0       0       0       0       0       0       0
            *

 161        KK     W07   BASIN
 162        BA   0.312
 163        LG    0.10    0.25    4.25    0.60      96
 164        UI       0     306     934     548     303     157      82      44      20      21
 165        UI       0       0       0       0       0       0       0       0       0       0
 166        UI       0       0       0       0       0       0       0       0       0       0
 167        UI       0       0       0       0       0       0       0       0       0       0
 168        UI       0       0       0       0       0       0       0       0       0       0
            *

 169        KK   CPW07 COMBINE
 170        HC       2   1.019
            *

 171        KK  W07W08   ROUTE
 172        RS       1    FLOW      -1
 173        RC   0.032   0.022   0.032    5589  0.0796    0.00
 174        RX  100.00  136.00  173.00  197.00  234.00  254.00  298.00  342.00
 175        RY  2880.0 2865.00 2850.00 2840.00 2840.00 2850.00 2865.00 2880.00
            *

 176        KK     W08   BASIN
 177        BA   0.445
 178        LG    0.10    0.25    3.95    0.40      25
 179        UI       0     496    1400     767     395     198      98      45      32       0
 180        UI       0       0       0       0       0       0       0       0       0       0
 181        UI       0       0       0       0       0       0       0       0       0       0
 182        UI       0       0       0       0       0       0       0       0       0       0
 183        UI       0       0       0       0       0       0       0       0       0       0
            *

 184        KK   CPW08 COMBINE
 185        HC       2   1.464
            *

 186        KK     W09   BASIN
 187        BA   0.335
 188        LG    0.15    0.25    3.95    0.40      64
 189        UI       0     394    1068     570     288     141      71      30      24       0
 190        UI       0       0       0       0       0       0       0       0       0       0
 191        UI       0       0       0       0       0       0       0       0       0       0
 192        UI       0       0       0       0       0       0       0       0       0       0
 193        UI       0       0       0       0       0       0       0       0       0       0
            *
1                                   HEC-1 INPUT                                        PAGE  6

LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 194        KK   CPW09 COMBINE
 195        HC       2   1.799
            *
```

```
 196          KK  W09W10   ROUTE
 197          RS       1    FLOW      -1
 198          RC   0.035   0.022   0.035   11134  0.0683    0.00
 199          RX  100.00  137.00  172.00  192.00  220.00  230.00  284.00  338.00
 200          RY  1990.0 1975.00 1960.00 1950.00 1950.00 1960.00 1975.00 1990.00
              *

 201          KK     W10   BASIN
 202          BA   1.338
 203          LG    0.10    0.25    3.95    0.40      25
 204          UI       0     395    1548    2646    1783    1282     874     611     394     273
 205          UI     184     135      70      52      53      53       0       0       0       0
 206          UI       0       0       0       0       0       0       0       0       0       0
 207          UI       0       0       0       0       0       0       0       0       0       0
 208          UI       0       0       0       0       0       0       0       0       0       0
              *

 209          KK   CPW10 COMBINE
 210          HC       2   3.137
              *

 211          KK     W11   BASIN
 212          BA   0.812
 213          LG    0.10    0.25    3.95    0.40      25
 214          UI       0     275    1046    1697    1048     762     488     340     214     147
 215          UI      93      65      34      34      34       0       0       0       0       0
 216          UI       0       0       0       0       0       0       0       0       0       0
 217          UI       0       0       0       0       0       0       0       0       0       0
 218          UI       0       0       0       0       0       0       0       0       0       0
              *

 219          KK   CPW11 COMBINE
 220          HC       2   3.949
              *

 221          KK  W11W12   ROUTE
 222          RS       6    FLOW      -1
 223          RC   0.035   0.022   0.035   21182  0.0205    0.00
 224          RX  100.00  107.00  114.00  125.00  140.00  154.00  244.00  334.00
 225          RY  1310.0 1309.00 1308.00 1306.00 1305.90 1308.00 1309.00 1310.00
              *

 226          KK     W12   BASIN
 227          BA   1.805
 228          LG    0.18    0.25    4.60    0.46      14
 229          UI       0     176     316     723    1114    1380    1905    1487    1091     947
 230          UI     808     705     564     448     406     338     262     222     192     151
 231          UI     137     103      85      87      64      34      34      34      34      34
 232          UI      33      34       0       0       0       0       0       0       0       0
 233          UI       0       0       0       0       0       0       0       0       0       0
              *
1                                           HEC-1 INPUT                                            PAGE  7

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 234          KK   CPW12 COMBINE
 235          HC       3  11.547
              *

 236          KK  W12W13   ROUTE
 237          RS       1    FLOW      -1
 238          RC   0.022   0.022   0.022    2059  0.0121    0.00
 239          RX  100.00  107.00  124.00  130.00  159.00  165.00  177.00  183.00
 240          RY  1230.0 1228.00 1224.00 1222.00 1221.90 1224.00 1228.00 1230.00
              *

 241          KK     W13   BASIN
 242          BA   1.584
 243          LG    0.21    0.25    4.90    0.36      14
 244          UI       0     163     322     742    1082    1371    1809    1158     947     811
 245          UI     694     579     443     387     335     252     205     181     140     125
 246          UI      91      80      80      46      31      32      31      31      31      32
 247          UI      31       0       0       0       0       0       0       0       0       0
 248          UI       0       0       0       0       0       0       0       0       0       0
              *

 249          KK   CPW13 COMBINE
 250          HC       2  13.131
              *

 251          KK  W13W16   ROUTE
 252          RS       3    FLOW      -1
 253          RC   0.035   0.022   0.035    6232  0.0042    0.00
 254          RX  100.00  167.00  178.00  189.00  218.00  228.00  239.00  250.00
 255          RY  1216.0 1214.00 1212.00 1210.00 1209.90 1212.00 1214.00 1216.00
              *

 256          KK     W15   BASIN
 257          BA   1.227
 258          LG    0.25    0.25    4.55    0.40      24
 259          UI       0     140     338     725    1009    1399    1252     848     726     601
 260          UI     489     377     321     260     195     162     134     109      82      68
 261          UI      70      31      27      27      27      27      27      26       0       0
 262          UI       0       0       0       0       0       0       0       0       0       0
 263          UI       0       0       0       0       0       0       0       0       0       0
              *

 264          KK  DW15RE  DIVERT
 265          DT    W15R    91.9     0.0
 266          DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
 267          DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
              *

 268          KK     W14   BASIN
 269          BA   1.582
 270          LG    0.14    0.25    5.20    0.37      19
 271          UI       0     330    1263    2143    2612    1581    1214     868     644     451
 272          UI     324     238     167     134      76      52      52      53       0       0
 273          UI       0       0       0       0       0       0       0       0       0       0
1                                           HEC-1 INPUT                                            PAGE  8

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 274          UI       0       0       0       0       0       0       0       0       0       0
 275          UI       0       0       0       0       0       0       0       0       0       0
              *

 276          KK  W14W15   ROUTE
 277          RS       1    FLOW      -1
 278          RC   0.025   0.025   0.025    7308  0.0104    0.00
 279          RX  100.00  105.00  109.00  125.00  135.00  151.00  155.00  160.00
 280          RY  1000.0  999.50  999.00  995.00  995.10  999.00  999.50 1000.00
              *

 281          KK   CPW15 COMBINE
 282          HC       2   2.809
              *

 283          KK  W15W16   ROUTE
 284          RS       2    FLOW      -1
 285          RC   0.035   0.035   0.035    2750  0.0087    0.00
 286          RX  100.00  135.00  232.00  328.00  360.00  498.00  635.00  735.00
 287          RY  1202.0 1200.00 1199.00 1198.00 1197.90 1199.00 1200.00 1202.00
              *

 288          KK     W16   BASIN
 289          BA   0.530
 290          LG    0.27    0.25    4.55    0.41      21
 291          UI       0      67     213     353     466     717     736     529     396     266
 292          UI     131      94      58      21      20      21       0       0       0       0
 293          UI       0       0       0       0       0       0       0       0       0       0
 294          UI       0       0       0       0       0       0       0       0       0       0
 295          UI       0       0       0       0       0       0       0       0       0       0
              *

 296          KK  DW16RE  DIVERT
 297          DT    W16R    39.7     0.0
 298          DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
 299          DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
              *

 300          KK   CPW16 COMBINE
 301          HC       3   16.47
              *

 302          KK  W16W20   ROUTE
 303          RS       1    FLOW      -1
 304          RC   0.025   0.025   0.025    3633  0.0130    0.00
 305          RX  100.00  105.00  109.00  125.00  135.00  151.00  155.00  160.00
```

```
306          RY  1000.0  999.50  999.00  995.00  995.10  999.00  999.50 1000.00
                 *

307          KK     W18   BASIN
308          BA   1.260
309          LG    0.24    0.25    4.40    0.44      46
310          UI       0    7025    2342     356       0       0       0       0       0       0
311          UI       0       0       0       0       0       0       0       0       0       0
312          UI       0       0       0       0       0       0       0       0       0       0
1                                       HEC-1 INPUT                                        PAGE  9

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

313          UI       0       0       0       0       0       0       0       0       0       0
314          UI       0       0       0       0       0       0       0       0       0       0
             *

315          KK  DW18RE  DIVERT
316          DT    W18R    94.3     0.0
317          DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
318          DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
             *

319          KK     W17   BASIN
320          BA   1.497
321          LG    0.28    0.25    4.30    0.43      24
322          UI       0     266    1071    1806    2464    1531    1172     893     631     493
323          UI     334     263     187     126     121      49      47      47      47       0
324          UI       0       0       0       0       0       0       0       0       0       0
325          UI       0       0       0       0       0       0       0       0       0       0
326          UI       0       0       0       0       0       0       0       0       0       0
             *

327          KK  W17W18   ROUTE
328          RS       1    FLOW      -1
329          RC   0.045   0.035   0.045    8559  0.0257    0.00
330          RX  100.00  140.00  150.00  156.00  194.00  216.00  255.00  342.00
331          RY  1302.0 1300.00 1298.00 1296.00 1295.90 1298.00 1300.00 1302.00
             *

332          KK   CPW18 COMBINE
333          HC       2   2.757
             *

334          KK  W18W20   ROUTE
335          RS       3    FLOW      -1
336          RC   0.025   0.025   0.025    6914  0.0058    0.00
337          RX  100.00  105.00  109.00  125.00  135.00  151.00  155.00  160.00
338          RY  1000.0  999.50  999.00  995.00  995.10  999.00  999.50 1000.00
             *

339          KK     W19   BASIN
340          BA   1.158
341          LG    0.11    0.25    3.88    0.42      97
342          UI       0     923    3202    2092    1231     701     372     209     106      70
343          UI       0       0       0       0       0       0       0       0       0       0
344          UI       0       0       0       0       0       0       0       0       0       0
345          UI       0       0       0       0       0       0       0       0       0       0
346          UI       0       0       0       0       0       0       0       0       0       0
             *

347          KK  DW19RE  DIVERT
348          DT    RW19    86.7     0.0
349          DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
350          DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
             *
1                                       HEC-1 INPUT                                        PAGE 10

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

351          KK  W19W20   ROUTE
352          RS       1    FLOW      -1
353          RC   0.025   0.025   0.025    3790  0.0158    0.00
354          RX  100.00  105.00  109.00  125.00  135.00  151.00  155.00  160.00
355          RY  1000.0  999.50  999.00  995.00  995.10  999.00  999.50 1000.00
             *

356          KK     W20   BASIN
357          BA   1.137
358          LG    0.26    0.25    4.10    0.54      25
359          UI       0     138     365     765    1050    1503     993     779     662     534
360          UI     409     332     276     203     166     136     105      82      67      65
361          UI      27      26      27      26      27      26       0       0       0       0
362          UI       0       0       0       0       0       0       0       0       0       0
363          UI       0       0       0       0       0       0       0       0       0       0
             *

364          KK  DW20RE  DIVERT
365          DT    W20R    85.2     0.0
366          DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
367          DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
             *

368          KK   CPW20 COMBINE
369          HC       4  21.522
             *

370          KK   SRW20 STORAGE
371          KM   STAGE-STORAGE-DISCHARGE CURVE FROM URS DESIGN OF FRS#3 OUTLET STRUCTURE
372          KM   THE DISCHARGE INCLUDING OUTFLOW FROM PRINCIPAL AND EMERGENCY SPILLWAY,
373          KM   AS WELL AS INFILTRATION
374          RS       1    STOR      -1
375          SV    44.8     388     585     846    1002    2045    3218    3557    4693    6510
376          SQ    0.02    0.17     4.5     187     203     276     330    2936   24545   70439
377          SE    1188    1198    1200    1202    1203    1208    1212    1213    1216    1220
             *

378          KK   OUTFL
379          KM   SEPRATE OUTFLOW FROM INFILTRATION
             * KO      1
380          ZW   A=WT B=FRS3 C=FLOW
381          DT    INFL
382          DI       0     4.5      86     203     330    2936   24545   70439
383          DQ       0     4.5      10      22      73      79      96     121
384          ZZ
```

```
1
              SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE     (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.     (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

   38        L21
              .
              .
   47         .------->    RL21
   46      DL21RE
              V
              V
   50      L21L22
              .
              .
   55         .           L22
              .            .
              .            .
   64         .            .------->    RL22
   63         .        DL22RE
              .            .
              .            .
   67       CPL22...........
              V
              V
   69      L22W01
              .
              .
   74         .           W01
              .            .
              .            .
   82       CPW01...........
              V
              V
   84      W01W02
              .
              .
   89         .           W02
              .            .
              .            .
   97       CPW02...........
              V
```

```
             V
   99   W02W05
             .
             .
  104        .        W03
             .          V
             .          V
  112        .     W03W04
             .          .
             .          .
  117        .          .        W04
             .          .          .
             .          .          .
  125        .      CPW04...........
             .          V
             .          V
  127        .     W04W05
             .          .
             .          .
  132        .          .        W05
             .          .          .
             .          .          .
  140    CPW05......................
             V
             V
  142    SRW05
             V
             V
  148   W05W12
             .
             .
  153        .        W06
             .          .
             .          .
  161        .          .        W07
             .          .          .
             .          .          .
  169        .      CPW07...........
             .          V
             .          V
  171        .     W07W08
             .          .
             .          .
  176        .          .        W08
             .          .          .
             .          .          .
  184        .      CPW08...........
             .          .
             .          .
  186        .          .        W09
             .          .          .
             .          .          .
  194        .      CPW09...........
             .          V
             .          V
  196        .     W09W10
             .          .
             .          .
  201        .          .        W10
             .          .          .
             .          .          .
  209        .      CPW10...........
             .          .
             .          .
  211        .          .        W11
             .          .          .
             .          .          .
  219        .      CPW11...........
             .          V
             .          V
  221        .     W11W12
             .          .
             .          .
  226        .          .        W12
             .          .          .
             .          .          .
  234    CPW12......................
             V
             V
  236   W12W13
```

```
             .
             .
  241        .        W13
             .          .
             .          .
  249    CPW13...........
             V
             V
  251   W13W16
             .
             .
  256        .        W15
             .          .
             .          .
  265        .          .------->    W15R
  264        .     DW15RE
             .          .
             .          .
  268        .          .        W14
             .          .          V
             .          .          V
  276        .          .     W14W15
             .          .          .
             .          .          .
  281        .      CPW15...........
             .          V
             .          V
  283        .     W15W16
             .          .
             .          .
  288        .          .        W16
             .          .          .
             .          .          .
  297        .          .          .------->    W16R
  296        .          .     DW16RE
             .          .          .
             .          .          .
  300    CPW16......................
             V
             V
  302   W16W20
             .
             .
  307        .        W18
             .          .
             .          .
  316        .          .------->    W18R
  315        .     DW18RE
             .          .
             .          .
  319        .          .        W17
             .          .          V
             .          .          V
  327        .          .     W17W18
             .          .          .
             .          .          .
  332        .      CPW18...........
             .          V
             .          V
  334        .     W18W20
             .          .
             .          .
  339        .          .        W19
             .          .          .
             .          .          .
  348        .          .          .------->    RW19
  347        .          .     DW19RE
             .          .          V
             .          .          V
  351        .          .     W19W20
             .          .          .
             .          .          .
  356        .          .          .        W20
             .          .          .          .
             .          .          .          .
  365        .          .          .          .------->    W20R
  364        .          .          .     DW20RE
             .          .          .          .
             .          .          .          .
  368    CPW20.................................
```

```
          V
          V
 370    SRW20
          .
          .
 381      .------->    INFL
 378    OUTFL
```

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

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+ HYDROGRAPH AT	L21	80.	13.58	31.	9.	3.	.52		
+ DIVERSION TO	RL21	80.	13.58	31.	9.	3.	.52		
+ HYDROGRAPH AT	DL21RE	0.	.00	0.	0.	0.	.52		
+ ROUTED TO	L21L22	0.	.00	0.	0.	0.	.52		
+ HYDROGRAPH AT	L22	21.	14.75	10.	2.	1.	.36		
+ DIVERSION TO	RL22	21.	14.75	10.	2.	1.	.36		
+ HYDROGRAPH AT	DL22RE	0.	.00	0.	0.	0.	.36		
+ 2 COMBINED AT	CPL22	0.	.00	0.	0.	0.	.89		
+ ROUTED TO	L22W01	0.	.00	0.	0.	0.	.89		
+ HYDROGRAPH AT	W01	37.	13.00	9.	2.	1.	.19		
+ 2 COMBINED AT	CPW01	37.	13.00	8.	2.	1.	1.08		
+ ROUTED TO	W01W02	35.	13.25	8.	2.	1.	1.08		
+ HYDROGRAPH AT	W02	193.	12.42	27.	8.	3.	.39		
+ 2 COMBINED AT	CPW02	194.	12.42	35.	10.	3.	1.47		
+ ROUTED TO	W02W05	179.	12.58	35.	10.	3.	1.47		
+ HYDROGRAPH AT	W03	965.	12.33	142.	45.	15.	1.97		
+ ROUTED TO	W03W04	729.	12.67	142.	45.	15.	1.97		
+ HYDROGRAPH AT	W04	1086.	12.33	164.	51.	17.	2.03		
+ 2 COMBINED AT	CPW04	1497.	12.42	304.	95.	32.	4.01		
+ ROUTED TO	W04W05	1432.	12.58	304.	95.	32.	4.01		
+ HYDROGRAPH AT	W05	216.	12.33	21.	6.	2.	.32		
+ 3 COMBINED AT	CPW05	1681.	12.58	358.	111.	37.	5.79		
+ ROUTED TO	SRW05	1655.	12.67	358.	111.	37.	5.79		
+ ROUTED TO	W05W12	1593.	12.75	358.	111.	37.	5.79		
+ HYDROGRAPH AT	W06	561.	12.17	53.	17.	6.	.71		
+ HYDROGRAPH AT	W07	447.	12.08	57.	20.	7.	.31		
+ 2 COMBINED AT	CPW07	992.	12.17	110.	37.	12.	1.02		
+ ROUTED TO	W07W08	934.	12.17	110.	37.	12.	1.02		
+ HYDROGRAPH AT	W08	490.	12.08	39.	12.	4.	.44		
+ 2 COMBINED AT	CPW08	1397.	12.17	148.	48.	16.	1.46		
+ HYDROGRAPH AT	W09	442.	12.08	47.	16.	5.	.34		
+ 2 COMBINED AT	CPW09	1807.	12.17	194.	64.	21.	1.80		
+ ROUTED TO	W09W10	1512.	12.25	194.	64.	21.	1.80		
+ HYDROGRAPH AT	W10	1133.	12.17	116.	35.	12.	1.34		
+ 2 COMBINED AT	CPW10	2578.	12.25	309.	99.	33.	3.14		
+ HYDROGRAPH AT	W11	716.	12.17	71.	22.	7.	.81		
+ 2 COMBINED AT	CPW11	3247.	12.17	379.	120.	40.	3.95		
+ ROUTED TO	W11W12	2332.	12.67	378.	120.	40.	3.95		
+ HYDROGRAPH AT	W12	778.	12.42	117.	34.	11.	1.80		
+ 3 COMBINED AT	CPW12	4296.	12.67	838.	261.	87.	11.55		
+ ROUTED TO	W12W13	4269.	12.67	838.	261.	87.	11.55		
+ HYDROGRAPH AT	W13	762.	12.42	109.	32.	11.	1.58		
+ 2 COMBINED AT	CPW13	4666.	12.67	936.	289.	97.	13.13		
+ ROUTED TO	W13W16	4547.	12.83	936.	289.	97.	13.13		
+ HYDROGRAPH AT	W15	674.	12.33	100.	31.	10.	1.23		
+ DIVERSION TO	W15R	674.	12.33	100.	31.	10.	1.23		
+ HYDROGRAPH AT	DW15RE	0.	.00	0.	0.	0.	1.23		
+ HYDROGRAPH AT	W14	1120.	12.25	119.	36.	12.	1.58		

+	ROUTED TO	W14W15	876.	12.33	119.	35.	12.	1.58
+	2 COMBINED AT	CPW15	871.	12.33	119.	35.	12.	2.81
+	ROUTED TO	W15W16	758.	12.50	119.	35.	12.	2.81
+	HYDROGRAPH AT	W16	347.	12.42	41.	12.	4.	.53
+	DIVERSION TO	W16R	347.	12.42	41.	12.	4.	.53
+	HYDROGRAPH AT	DW16RE	0.	.00	0.	0.	0.	.53
+	3 COMBINED AT	CPW16	4956.	12.83	1034.	318.	107.	16.47
+	ROUTED TO	W16W20	4940.	12.83	1034.	318.	107.	16.47
+	HYDROGRAPH AT	W18	1778.	12.08	140.	46.	15.	1.26
+	DIVERSION TO	W18R	1778.	12.08	140.	46.	15.	1.26
+	HYDROGRAPH AT	DW18RE	2.	22.42	1.	0.	0.	1.26
+	HYDROGRAPH AT	W17	1020.	12.25	119.	37.	12.	1.50
+	ROUTED TO	W17W18	735.	12.42	119.	37.	12.	1.50
+	2 COMBINED AT	CPW18	732.	12.42	118.	37.	12.	2.76
+	ROUTED TO	W18W20	656.	12.58	118.	36.	12.	2.76
+	HYDROGRAPH AT	W19	1610.	12.17	212.	74.	25.	1.16
+	DIVERSION TO	RW19	1597.	12.08	151.	44.	15.	1.16
+	HYDROGRAPH AT	DW19RE	768.	12.33	99.	31.	10.	1.16
+	ROUTED TO	W19W20	624.	12.42	98.	31.	10.	1.16
+	HYDROGRAPH AT	W20	603.	12.33	88.	28.	9.	1.14
+	DIVERSION TO	W20R	603.	12.33	88.	28.	9.	1.14
+	HYDROGRAPH AT	DW20RE	0.	.00	0.	0.	0.	1.14
+	4 COMBINED AT	CPW20	5555.	12.83	1203.	374.	125.	21.52
+	ROUTED TO	SRW20	91.	22.17	91.	74.	35.	21.52
+	DIVERSION TO	INFL	11.	21.75	11.	9.	7.	21.52
+	HYDROGRAPH AT	OUTFL	81.	22.17	80.	64.	28.	21.52

C.3 FUTURE CONDITIONS WITH PROJECT IN PLACE, 10-YEAR FOR JACKRABBIT CORRIDOR

```
1****************************************              ***************************************
 *                                      *              *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *              *   U.S. ARMY CORPS OF ENGINEERS      *
 *             JUN   1998               *              *   HYDROLOGIC ENGINEERING CENTER     *
 *           VERSION 4.1                *              *        609 SECOND STREET            *
 *                                      *              *     DAVIS, CALIFORNIA 95616         *
 *  RUN DATE   02DEC09  TIME  11:04:20  *              *         (916) 756-1104              *
 *                                      *              *                                     *
 ****************************************              ***************************************


                    X     X  XXXXXXX   XXXXX           X
                    X     X  X        X     X         XX
                    X     X  X        X                X
                    XXXXXXX  XXXX     X         XXXXX  X
                    X     X  X        X                X
                    X     X  X        X     X          X
                    X     X  XXXXXXX   XXXXX          XXX


   THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

   THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
   THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
   NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
   DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
   KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


1                                        HEC-1 INPUT                                        PAGE  1

 LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   1          ID           FUTURE CONDITION 10-YEAR 24HOUR EVENT
   2          ID           PRECIPITATION FROM DDMSW
   3          ID           WHITE TANKS AREA, WATERSHED CONTRIBUTING TO FRS#3
   4          ID           PREPARED BY HOSKIN RYAN CONSULTANTS EXCLUSIVELY FOR
   5          ID           FRS#3 OUTLET CHANNEL DESIGN, 12-02-2009
   6          ID           BASED ON HDR HEC-1 MODEL OF FUTURE CONDITION WITH CIP
   7          ID           MODIFICATIONS INCLUDE:
   8          ID           (1) UPDATE WITH AVERAGE RAINFALL DEPTH FOR JACKRABBIT CORRIDOR
   9          ID           (2) CHANGE BASIN W21A TO UNDEVELOPMENT CONDITION
  10          ID           (3) ADD RETENTION DIVERSION FOR W28A
  11          ID           (4) REMOVE RETENTION DIVERSION FOR W33
  12          ID           (5) UPDATE VERRADO DEVELOPMENT FOR W34 AND W35
  13          ID           (6) UPDATE RETENTION FOR W36 AND W37 (ARROYO SECO DEVELOPMENT)
  14          ID           (7) DIVIDE BASIN W37 INTO W37A AND W37B
  15          ID           (8) UPDATE PROPOSED CHANNEL ALONG JACKRABBIT TRAIL
  16          ID           *****************************************************************
  17          ID        Flood Control District of Maricopa County
  18          ID        FU_CIP_MB02 - Loop 303/ White Tanks ADMPU AHA
  19          ID        Major Basin: 02
  20          ID        100 Year - Return Period
  21          ID        24 Hour Storm
  22          ID        Multiple Storms
  23          ID        Unit Hydrograph: S-Graph
  24          ID        03/08/2009
  25          IT       5  1JAN99    1200    2000
  26          IN      15
  27          IO       5
              *DIAGRAM
              *
  28          JD   2.353  0.0001
  29          PC   0.000   0.002   0.005   0.008   0.011   0.014   0.017   0.020   0.023   0.026
  30          PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056   0.060
  31          PC   0.064   0.068   0.072   0.076   0.080   0.085   0.090   0.095   0.100   0.105
  32          PC   0.110   0.115   0.120   0.126   0.133   0.140   0.147   0.155   0.163   0.172
  33          PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
  34          PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
  35          PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
  36          PC   0.913   0.918   0.922   0.926   0.930   0.934   0.938   0.942   0.946   0.950
  37          PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977   0.980
  38          PC   0.983   0.986   0.989   0.992   0.995   0.998   1.000
  39          JD   2.235    10.0
              *

  40          KK     WT3
  41          KM   OUTFLOW FROM WT FRS#3 OUTLET
  42          BA   21.52
  43          KO       5
  44          ZR  =QI A=WT B=FRS3 C=FLOW
              *
1                                        HEC-1 INPUT                                        PAGE  2

 LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  45          KK    W21A   BASIN
  46          KM   FCD PROPERTY ADJACENT TO EMERGENCY AND PRINCIPAL SPILLWAY, NO LAND DEVELOPMEN
  47          KM   IN FUTURE
  48          ZW   A=WT B=W21A C=FLOW
  49          BA   0.199
  50          LG    0.35    0.35    4.35    0.40       0
  51          UI       0      38     150     260     315     274     179     117      75      49
  52          UI      30      23       8       8       9       0       0       0       0       0
  53          UI       0       0       0       0       0       0       0       0       0       0
  54          UI       0       0       0       0       0       0       0       0       0       0
  55          UI       0       0       0       0       0       0       0       0       0       0
              *

  56          KK  CPW21A COMBINE
  57          ZW   A=WT B=CPW21A C=FLOW
  58          HC       2   0.199
              *

  59          KK  21A28A   ROUTE
  60          KM   PROPOSED JACKRABBIT CHANNEL, BOTTOM WIDTH=30FT, SIDE SLOPE 6:1
  61          ZW   A=WT B=21A28A C=FLOW
  62          RS       4    FLOW      -1
  63          RC   0.045   0.035   0.045    3560  0.0010
  64          RX     100     110     120     150     180     210     220     230
  65          RY    1001    1000    1000     995     995    1000    1000    1001
              *

  66          KK    W28A   BASIN
  67          BA   0.642
  68          LG    0.26    0.25    4.55    0.41      22
  69          UI       0      85     281     456     611     978     845     622     457     266
  70          UI     145      96      47      26      26      27       0       0       0       0
  71          UI       0       0       0       0       0       0       0       0       0       0
  72          UI       0       0       0       0       0       0       0       0       0       0
  73          UI       0       0       0       0       0       0       0       0       0       0
              *

  74          KK  DW28AR
  75          KM   FUTURE DEVELOPMENT ON 301AC VACANT LAND OF MARACAY, 80% RETENTION VOLUME ASSU
  76          KM   (C=0.65)(P=2.3IN)
  77          ZW   A=WT B=DW28AR C=FLOW
  78          DT   RW28A    30.0
  79          DI       0   10000
  80          DQ       0   10000
              *

  81          KK  CPW28A COMBINE
  82          ZW   A=WT B=CPW28A C=FLOW
  83          HC       2   0.841
              *
1                                        HEC-1 INPUT                                        PAGE  3

 LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  84          KK  W28A33   ROUTE
  85          KM   PROPOSED JACKRABBIT CHANNEL, BOTTOM WIDTH=40FT, SIDE SLOPE 4:1
  86          ZW   A=WT B=W28A33 C=FLOW
  87          RS       5    FLOW      -1
  88          RC   0.045   0.035   0.045    4336  0.0010
  89          RX     100     110     120     140     180     200     210     220
  90          RY    1001    1000    1000     995     995    1000    1000    1001
              *

  91          KK     W33   BASIN
```

```
 92          ZW   A=WT B=W33 C=FLOW
 93          BA   0.839
 94          LG    0.30    0.25    4.00    0.55      15
 95          UI       0      96     254     469     595     819    1172     911     714     530
 96          UI     367     191     142      97      37      29      30      29       0       0
 97          UI       0       0       0       0       0       0       0       0       0       0
 98          UI       0       0       0       0       0       0       0       0       0       0
 99          UI       0       0       0       0       0       0       0       0       0       0
             *

100          KK   CPW33 COMBINE
101          ZW   A=WT B=CPW33 C=FLOW
102          HC       2    1.68
             *

103          KK  W33W35   ROUTE
104          KM   PROPOSED JACKRABBIT CHANNEL, BOTTOM WIDTH=40FT, SIDE SLOPE 6:1
105          ZW   A=WT B=W33W35 C=FLOW
106          RS       3    FLOW      -1
107          RC   0.045   0.035   0.045    2658  0.0010
108          RX     100     110     116     152     192     228     240     250
109          RY    1001    1000    1000     994     994    1000    1000    1001
             *
             * UPDATE VERRADO DEVELOPMENT AT INDIAN SCHOOL AND JACKRABBIT TRAIL RD
             * PER VERRADO MASTER DRAINAGE PLAN PREPARED BY WOOD PATEL. THE SCHOOL
             * SITE (~0.184 SQ MI) COULD RETAIN 100-YR 24-HR RAINFALL, THEREFORE IS
             * REMOVED FROM HEC-1 MODEL AS NON-CONTRIBUTING AREA, PER VERRADO MDP.
             *

110          KK     W34
111          KM     THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
112          KM     L=       .78  Lca=       .35    S=   69.7  Kn= .054  LAG=    21
113          KM     PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
114          BA     .238
115          LG      .25     .25    3.95     .58      31
116          UI       40     161     238     384     397     267     176      80      48      22
117          UI       12      12      0.      0.      0.      0.      0.      0.      0.      0.
118          UI       0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *
1                                          HEC-1 INPUT                                        PAGE  4

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


119          KK     W35
120          KM     THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
121          KM     L=    0.860  Lca=      .32    S=   49.2  Kn= .054  LAG=    23
122          KM     PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
123          BA     .089
124          LG      .25     .25    3.95     .57      25
125          UI       13      50      75     108     155     108      76      50      22      14
126          UI       7.      4.      4.      0.      0.      0.      0.      0.      0.      0.
127          UI       0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

128          KK   CP35R
129          KM        ADD HYDROGRAPHS AT SRW35
130          HC       2
             *

131          KK   SRW35
132          KM        RET BASIN AT CP30 - 54' WEIR OUTFALL
133          ZW   A=WT B=SRW35 C=FLOW
134          RS       1    STOR       0       0
135          SV       0    3.67    7.67   12.21   17.26   19.89   22.59   25.36   28.21
136          SE    1153    1154    1155    1156    1157  1157.5    1158  1158.5    1159
137          SQ     0.1    0.11    0.12    0.13    0.14    0.15    0.15   50.21  142.02
             *

138          KK   CPW35
139          KM        ADD HYDROGRAPHS AT JACKRABBIT TRAIL AND INDIAN SCHOOL RD
140          ZW   A=WT B=CPW35 C=FLOW
141          HC       2
             *

142          KK  W35W36   ROUTE
143          KM   PROPOSED JACKRABBIT CHANNEL, BOTTOM WIDTH=40FT, SIDE SLOPE 4:1
144          ZW   A=WT B=W35W36 C=FLOW
145          RS       7    FLOW      -1
146          RC   0.045   0.035   0.045    6051  0.0010
147          RX     100     110     116     140     180     204     220     230
148          RY    1001    1000    1000     994     994    1000    1000    1001
             *

149          KK     W36   BASIN
150          BA   0.720
151          LG    0.30    0.25    4.00    0.55      15
152          UI       0      75     166     331     432     543     773     886     660     517
153          UI     403     292     150     125      75      48      23      23      23      23
154          UI       0       0       0       0       0       0       0       0       0       0
155          UI       0       0       0       0       0       0       0       0       0       0
156          UI       0       0       0       0       0       0       0       0       0       0
             *
1                                          HEC-1 INPUT                                        PAGE  5

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


157          KK  DW36RE  DIVERT
158          KM   ARROYO SECO FUTURE DEVELOPMENT HOLDS 127AC VACANT LAND IN BASIN W36. ASSUME 8
159          KM   100-YEAR 2-HOUR RETENTION. (C=0.65)(P=2.3IN). PASSQUALITY MOUNTAIN RANCH
160          KM   PROVIDES A DETENTION BASIN OF NEGLIGIBLE SIZE AND NO RETENTION.
161          ZW   A=WT B=DW36RE C=FLOW
162          DT    RW36    12.7
163          DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
164          DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
             *

165          KK   CPW36 COMBINE
166          ZW   A=WT B=CPW36 C=FLOW
167          HC       2   2.911
             *

168          KK  W36W37   ROUTE
169          KM   PROPOSED JACKRABBIT CHANNEL, BOTTOM WIDTH=30FT, SIDE SLOPE 5:1
170          ZW   A=WT B=W36W37 C=FLOW
171          RS       5    FLOW      -1
172          RC   0.045   0.035   0.045    4527  0.0010
173          RX     100     110     120     150     180     210     220     230
174          RY    1001    1000    1000     994     994    1000    1000    1001
             *

175          KK     W37A
176          KM     LG VARIABLE VALUES FROM HDR MODEL.
177          KM     THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
178          KM     L=       1.9  Lca=       1.0    S=   60.1  Kn= .034  LAG=  28.5
179          KM     PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
180          BA      .63
181          LG      .29     .25    4.30     .48   19.00
182          UI      74.    203.    370.    478.    657.    903.    674.    517.    388.    244.
183          UI     128.     96.     62.     23.     23.     23.     23.      0.      0.      0.
184          UI       0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

185          KK  DW37AR  DIVERT
186          KM   ARROYO SECO FUTURE DEVELOPMENT HOLDS 162AC VACANT LAND IN BASIN W37A. ASSUME
187          KM   80% 100-YEAR 2-HOUR RETENTION. (C=0.65)(P=2.3IN). THE SOUTH SUBDIVIION IN
188          KM   BASIN W37A DOES NOT PROVIDE RETENTION.
189          ZW   A=WT B=DW37AR C=FLOW
190          DT   RW37A    16.1
191          DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
192          DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
             *

193          KK  CPW37A COMBINE
194          ZW   A=WT B=CPW37A C=FLOW
195          HC       2   3.541
             *
1                                          HEC-1 INPUT                                        PAGE  6

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


196          KK     W37B
197          KM     LG VARIABLE VALUES FROM HDR MODEL.
198          KM     THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
199          KM     L=       2.0  Lca=       1.0    S=   59.2  Kn= .034  LAG=  28.7
200          KM     PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
201          BA      .67
202          LG      .29     .25    4.30     .48   19.00
```

```
 203          UI     79.    214.    390.    503.    686.    962.    720.    553.    416.    270.
 204          UI    137.    105.     69.     24.     24.     24.     24.      0.      0.      0.
 205          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
              *

 206          KK  DW37BR  DIVERT
 207          KM   ARROYO SECO FUTURE DEVELOPMENT HOLDS 30AC VACANT LAND IN BASIN W37B. ASSUME
 208          KM   80% 100-YEAR 2-HOUR RETENTION. (C=0.65)(P=2.3IN). THE SOUTH SUBDIVIION IN
 209          KM   BASIN W37B DOES NOT PROVIDE RETENTION.
 210          ZW   A=WT B=DW37BR C=FLOW
 211          DT   RW37B     3.0
 212          DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
 213          DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
              *

 214          KK  CPW37B COMBINE
 215          ZW   A=WT B=CPW37B C=FLOW
 216          HC       2   4.214
              *

 217          KK  W37W38   ROUTE
 218          ZW   A=WT B=W37W38 C=FLOW
 219          RS       1    FLOW      -1
 220          RC   0.015   0.015   0.015     833  0.0015    0.00
 221          RX  100.00  105.00  109.00  125.00  135.00  151.00  155.00  160.00
 222          RY  1000.0  999.50  999.00  995.00  995.10  999.00  999.50 1000.00
              *

 223          KK     W38   BASIN
 224          BA   0.163
 225          LG    0.10    0.25    4.15    0.59      84
 226          UI       0      72     224     403     305     162      58      21      11       0
 227          UI       0       0       0       0       0       0       0       0       0       0
 228          UI       0       0       0       0       0       0       0       0       0       0
 229          UI       0       0       0       0       0       0       0       0       0       0
 230          UI       0       0       0       0       0       0       0       0       0       0
              *

 231          KK  DW38RE  DIVERT
 232          KM   ASSUME 80% 100-YEAR 2-HOUR RETENTION. (C=0.65)(P=2.3IN).
 233          ZW   A=WT B=DW38RE C=FLOW
 234          DT    W38R    10.4     0.0
 235          DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
 236          DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
              *
1                                           HEC-1 INPUT                                         PAGE  7

        LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 237          KK   CPW38 COMBINE
 238          ZW   A=WT B=CPW38 C=FLOW
 239          HC       2   4.377
              *
 240          ZZ
```

```
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

  NO.       (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

   40        WT3
              .
              .
   45         .        W21A
              .           .
              .           .
   56      CPW21A...........
              V
              V
   59      21A28A
              .
              .
   66         .        W28A
              .           .
              .           .
   78         .           .------->   RW28A
   74         .        DW28AR
              .           .
              .           .
   81      CPW28A...........
              V
              V
   84      W28A33
              .
              .
   91         .         W33
              .           .
              .           .
  100       CPW33...........
              V
              V
  103      W33W35
              .
              .
  110         .         W34
              .           .
              .           .
  119         .           .          W35
              .           .            .
              .           .            .
  128         .         CP35R...........
              .           V
              .           V
  131         .         SRW35
              .           .
              .           .
  138       CPW35...........
              V
              V
  142      W35W36
              .
              .
  149         .         W36
              .           .
              .           .
  162         .           .------->   RW36
  157         .        DW36RE
              .           .
              .           .
  165       CPW36...........
              V
              V
  168      W36W37
              .
              .
  175         .        W37A
              .           .
              .           .
  190         .           .------->   RW37A
  185         .        DW37AR
              .           .
              .           .
  193      CPW37A...........
              .
              .
  196         .        W37B
              .           .
              .           .
  211         .           .------->   RW37B
  206         .        DW37BR
              .           .
              .           .
  214      CPW37B...........
              V
              V
  217      W37W38
              .
              .
  223         .         W38
              .           .
              .           .
  234         .           .------->    W38R
  231         .        DW38RE
              .           .
              .           .
  237       CPW38...........
```

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

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT	WT3	81.	22.17	80.	64.	28.	21.52		
HYDROGRAPH AT	W21A	87.	12.25	7.	2.	1.	.20		
2 COMBINED AT	CPW21A	87.	12.25	80.	64.	29.	.20		
ROUTED TO	21A28A	81.	22.67	80.	64.	29.	.20		
HYDROGRAPH AT	W28A	372.	12.33	44.	13.	5.	.64		
DIVERSION TO	RW28A	372.	12.33	44.	13.	5.	.64		
HYDROGRAPH AT	DW28AR	0.	.00	0.	0.	0.	.64		
2 COMBINED AT	CPW28A	81.	22.67	80.	64.	29.	.84		
ROUTED TO	W28A33	81.	23.25	80.	64.	29.	.84		
HYDROGRAPH AT	W33	363.	12.42	44.	13.	4.	.84		
2 COMBINED AT	CPW33	360.	12.42	82.	70.	33.	1.68		
ROUTED TO	W33W35	302.	12.67	82.	70.	33.	1.68		
HYDROGRAPH AT	W34	153.	12.25	18.	6.	2.	.24		
HYDROGRAPH AT	W35	52.	12.25	6.	2.	1.	.09		
2 COMBINED AT	CP35R	205.	12.25	24.	8.	3.	.33		
ROUTED TO	SRW35	0.	21.33	0.	0.	0.	.33		
2 COMBINED AT	CPW35	302.	12.67	82.	70.	33.	2.01		
ROUTED TO	W35W36	219.	13.33	82.	69.	33.	2.01		
HYDROGRAPH AT	W36	293.	12.50	38.	11.	4.	.72		
DIVERSION TO	RW36	278.	12.42	23.	6.	2.	.72		
HYDROGRAPH AT	DW36RE	207.	12.67	18.	5.	2.	.72		
2 COMBINED AT	CPW36	241.	13.25	83.	73.	35.	2.91		
ROUTED TO	W36W37	213.	13.75	83.	73.	35.	2.91		
HYDROGRAPH AT	W37A	312.	12.33	39.	12.	4.	.63		
DIVERSION TO	RW37A	312.	12.33	30.	8.	3.	.63		
HYDROGRAPH AT	DW37AR	122.	12.67	12.	4.	1.	.63		
2 COMBINED AT	CPW37A	222.	13.75	84.	75.	36.	3.54		
HYDROGRAPH AT	W37B	330.	12.33	41.	13.	4.	.67		
DIVERSION TO	RW37B	8.	10.58	4.	2.	1.	.67		
HYDROGRAPH AT	DW37BR	330.	12.33	41.	11.	4.	.67		
2 COMBINED AT	CPW37B	329.	12.33	112.	84.	40.	4.21		
ROUTED TO	W37W38	321.	12.33	112.	84.	40.	4.21		
HYDROGRAPH AT	W38	198.	12.17	25.	9.	3.	.16		
DIVERSION TO	W38R	198.	12.17	18.	5.	2.	.16		
HYDROGRAPH AT	DW38RE	92.	12.33	11.	3.	1.	.16		
2 COMBINED AT	CPW38	397.	12.33	122.	87.	41.	4.38		

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

C.4 EXISTING CONDITIONS WITH PROJECT IN PLACE, 100-YEAR FOR FRS#3 AREA

```
1*****************************************                    *****************************************
 *                                       *                    *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                    *  U.S. ARMY CORPS OF ENGINEERS         *
 *              JUN  1998                *                    *  HYDROLOGIC ENGINEERING CENTER        *
 *            VERSION 4.1                *                    *       609 SECOND STREET               *
 *                                       *                    *    DAVIS, CALIFORNIA 95616            *
 * RUN DATE   05DEC09  TIME  14:12:37    *                    *        (916) 756-1104                 *
 *                                       *                    *                                       *
 *****************************************                    *****************************************


                 X     X  XXXXXXX   XXXXX          X
                 X     X  X        X     X        XX
                 X     X  X        X               X
                 XXXXXXX  XXXX     X       XXXXX   X
                 X     X  X        X               X
                 X     X  X        X     X         X
                 X     X  XXXXXXX   XXXXX         XXX


 THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

 THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
 THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
 NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
 DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
 KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM
```

```
1                                  HEC-1 INPUT                                        PAGE  1

 LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   1       ID           WHITE TANKS AREA, WATERSHED CONTRIBUTING TO FRS#3
   2       ID           PREPARED BY HOSKIN RYAN CONSULTANTS EXCLUSIVELY FOR
   3       ID           FRS#3 OUTLET CHANNEL DESIGN, 12-05-2009
   4       ID           BASED ON HDR LOOP303/WHITE TANKS ADMPU AHA (09-04-09)
   5       ID           HEC-1 MODEL OF EXISTING CONDITION W/ CIP
   6       ID           MODIFICATIONS INCLUDE:
   7       ID           (1) UPDATE WITH AVERAGE RAINFALL DEPTH FOR FRS#3 WATERSHED ONLY
   8       ID           (2) UPDATE THE STAGE-STORAGE-DISCHARGE CURVE BASED ON URS DESIGN
   9       ID               OF FRS#3 PRINCIPAL AND EMERGENCY SPILLWAY (DISCHARGE
  10       ID               INCLUDING INFILTRATION)
  11       ID           (3) SEPARATE FRS#3 OUTFLOW AND INFILTRATION
  12       ID       ****************************************************************
  13       ID        Flood Control District of Maricopa County
  14       ID        L303_EX_CIP_MB02 - Loop 303/ White Tanks ADMPU AHA
  15       ID        100 YEAR
  16       ID        24 Hour Storm
  17       ID        Unit Hydrograph: S-Graph
  18       ID        08/18/2009
  19       ID           FCDMC CONTRACT 2007C031
  20       ID           BY HDR ENGINEERING (#79902)
  21       ID           EXISTING CONDITIONS WITH CIP-AUGUST 2009
  22       ID           MAJOR BASIN 02
  23       ID           FILE NAME: ECIP-MB2.DAT
  24       IT       5  1JAN99    1200    2000
  25       IN      15
  26       IO       5
           *DIAGRAM
           *
  27       JD   4.016  0.0001
  28       PC   0.000   0.002   0.005   0.008   0.011   0.014   0.017   0.020   0.023   0.026
  29       PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056   0.060
  30       PC   0.064   0.068   0.072   0.076   0.080   0.085   0.090   0.095   0.100   0.105
  31       PC   0.110   0.115   0.120   0.126   0.133   0.140   0.147   0.155   0.163   0.172
  32       PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
  33       PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
  34       PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
  35       PC   0.913   0.918   0.922   0.926   0.930   0.934   0.938   0.942   0.946   0.950
  36       PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977   0.980
  37       PC   0.983   0.986   0.989   0.992   0.995   0.998   1.000
  38       JD   3.815    10.0
  39       JD   3.614    30.0
           *

  40       KK     L21BASIN
  41       KM        BASIN BOUNDARY FROM MCMICKEN DAM ON THE WEST AND THE
  42       KM        BEARDSLEY CSR ON THE EAST
  43       BA   0.525
  44       LG    0.34    0.32    4.55    0.37       1
  45       UI       0      20      20      20      21      58      70      88     109     125
  46       UI     140     158     170     180     187     193     193     194     187     179
  47       UI     172     150     140     123     113     101      93      83      76      70
  48       UI      61      56      51      45      40      38      34      31      32      22
  49       UI      21      21      20      14      14      14      13      14      11       5
           *
1                                  HEC-1 INPUT                                        PAGE  2

 LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  50       KK  DL21REDIVERT
  51       KM        Mass grading and Storage along canal
  52       DT    RL21    57.3     0.0
  53       DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
  54       DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
           *

  55       KK  L21L22ROUTE
  56       KM        Cross-section: Cross-section determined from A-team survey
  57       KM        Manning's N Value: earth w/sparse trees and brush, ponding against canal
  58       RS       1    FLOW
  59       RC   0.032   0.032   0.032    8793  0.0020    0.00
  60       RX  100.00  101.00  107.00  117.00  169.00  409.00  512.00  513.00
  61       RY  1328.1 1328.00 1326.00 1324.00 1324.10 1326.00 1328.00 1328.10
           *

  62       KK     L22BASIN
  63       KM        BASIN BOUNDARY FROM MCMICKEN DAM ON THE WEST AND THE
  64       KM        BEARDSLEY CSR ON THE EAST
  65       BA   0.362
  66       LG    0.34    0.34    4.35    0.39       0
  67       UI       0      19      19      21      56      79     101     124     144     162
  68       UI     170     183     184     177     172     154     133     117     103      89
  69       UI      78      68      59      52      43      38      36      29      28      20
  70       UI      20      18      13      13      13      12       5       5       4       5
  71       UI       5       4       5       4       5       5       4       0       0       0
           *

  72       KK  DL22REDIVERT
  73       KM        Storage along canal
  74       DT    RL22    15.6     0.0
  75       DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
  76       DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
           *

  77       KK   CPL22COMBINE
  78       HC       2   0.887
           *

  79       KK  L22W01ROUTE
  80       KM        Cross-section: Cross-section determined from 1991 topo
  81       KM        Manning's N Value: earth w/ sparse trees and brush
  82       RS       4    FLOW
  83       RC   0.032   0.032   0.032    3159  0.0063    0.00
  84       RX  100.00  101.00  102.00  115.00  128.00  140.00  141.00  142.00
  85       RY  1320.2 1320.10 1320.00 1314.00 1314.10 1320.00 1320.10 1320.20
           *

  86       KK     W01BASIN
  87       KM        BASIN BOUNDARY FROM FRS#3 ON THE WEST AND THE BEARDSLEY CSR ON THE EAST
  88       BA   0.191
  89       LG    0.34    0.34    3.95    0.40       0
  90       UI       0      38     144     258     304     262     170     110      71      44
  91       UI      29      21       8       7       8       0       0       0       0       0
1                                  HEC-1 INPUT                                        PAGE  3

 LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  92       UI       0       0       0       0       0       0       0       0       0       0
  93       UI       0       0       0       0       0       0       0       0       0       0
```

```
  94         UI       0       0       0       0       0       0       0       0       0       0
             *

  95         KK   CPW01COMBINE
  96         HC       2   1.078
             *

  97         KK  W01W02ROUTE
  98         KM        Cross-section: Estimated 3' deep and 4:1 side slopes
  99         KM        width based on aerial
 100         KM        Manning's N Value: natural desert wash w/ vegetation
 101         RS       1    FLOW
 102         RC   0.035   0.035   0.035    2650  0.0053    0.00
 103         RX  100.00  111.00  122.00  139.00  162.00  182.00  191.00  200.00
 104         RY  1290.5 1290.25 1290.00 1286.00 1286.10 1290.00 1290.25 1290.50
             *

 105         KK     W02BASIN
 106         KM        BASIN BOUNDARY FROM 1990 TOPO, ALL FLOW TO SOUTH
 107         KM        MCMICKEN DAM ON THE WEST AND THE BEARDSLEY CSR ON THE EAST
 108         BA   0.394
 109         LG    0.35    0.35    4.65    0.32       0
 110         UI       0      56     195     370     497     530     435     300     209     145
 111         UI      99      70      46      38      14      13      14      13       0       0
 112         UI       0       0       0       0       0       0       0       0       0       0
 113         UI       0       0       0       0       0       0       0       0       0       0
 114         UI       0       0       0       0       0       0       0       0       0       0
             *

 115         KK   CPW02COMBINE
 116         HC       2   1.472
             *

 117         KK  W02W05ROUTE
 118         KM        Cross-section: Natural Desert Wash w/ vegatation
 119         RS       1    FLOW
 120         RC   0.035   0.035   0.035    2214  0.0045    0.00
 121         RX  100.00  106.00  112.00  119.00  135.00  137.00  138.00  141.00
 122         RY  1280.0 1278.00 1277.00 1276.00 1275.90 1277.00 1278.00 1280.00
             *

 123         KK     W03BASIN
 124         KM        BASIN BOUNDARY FROM 1990 TOPO
 125         BA   1.971
 126         LG    0.35    0.35    4.00    0.47      20
 127         UI       0     145     146     415     653     907    1064    1233    1685    1257
 128         UI     947     849     756     672     606     522     442     374     341     315
 129         UI     263     217     186     167     159     119     113     107      71      72
 130         UI      70      71      37      27      28      28      28      28      28      28
 131         UI      27      29      27       0       0       0       0       0       0       0
             *
1                                      HEC-1 INPUT                                          PAGE  4

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 132         KK  W03W04ROUTE
 133         KM        Cross-section: Side slopes and width based on aerial and topo
 134         KM        Manning's N Value: natural desert wash w/ vegetation
 135         RS       3    FLOW
 136         RC   0.035   0.035   0.035   18417  0.0490    0.00
 137         RX  100.00  140.00  180.00  210.00  235.00  305.00  345.00  385.00
 138         RY  1511.0 1510.50 1510.00 1502.00 1502.10 1510.00 1511.00 1512.00
             *

 139         KK     W04BASIN
 140         KM        BASIN BOUNDARY FROM 1990 TOPO
 141         BA   2.034
 142         LG    0.35    0.35    4.60    0.34      10
 143         UI       0     144     147     379     620     881    1032    1176    1561    1470
 144         UI     998     876     788     702     637     566     477     407     357     335
 145         UI     304     239     203     188     158     157     113     111     105      72
 146         UI      71      71      71      40      28      28      27      28      28      28
 147         UI      28      28      27      28       0       0       0       0       0       0
             *

 148         KK   CPW04COMBINE
 149         HC       2   4.005
             *

 150         KK  W04W05ROUTE
 151         KM        Cross-section: Estimated 3' deep and 4:1 side slopes
 152         KM        width based on aerial / Manning's N Value: clean straight earth
 153         RS       2    FLOW
 154         RC   0.035   0.035   0.035    5298  0.0098    0.00
 155         RX  100.00  120.00  140.00  160.00  174.00  214.00  234.00  254.00
 156         RY  1313.0 1312.50 1312.00 1308.00 1308.10 1312.00 1312.50 1313.00
             *

 157         KK     W05BASIN
 158         KM        BASIN BOUNDARY FROM 1990 TOPO AND BEARDSELY CSR
 159         BA   0.316
 160         LG    0.35    0.35    4.25    0.42       0
 161         UI       0      32      62     147     214     282     302     300     260     199
 162         UI     153     119      90      67      54      40      32      22      22       9
 163         UI       7       8       8       8       8       0       0       0       0       0
 164         UI       0       0       0       0       0       0       0       0       0       0
 165         UI       0       0       0       0       0       0       0       0       0       0
             *

 166         KK   CPW05COMBINE
 167         HC       3   5.793
             *

 168         KK  DW05SEDIVERT
 169         KM        North Inlet Channel Divert from L303M3LA.OUT model given to HDR by
 170         KM        FCDMC 05062009
 171         DT   DW05S     0.0     0.0
 172         DI   600.0   800.0  1000.0  1200.0  1400.0  1600.0  2000.0  2400.0  2715.0  2800.0
 173         DQ   105.0   163.0   361.0   498.0   640.0   792.0  1100.0  1437.0  1605.0  1630.0
             *
1                                      HEC-1 INPUT                                          PAGE  5

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 174         KK  W0512AROUTE
 175         KM        White Tanks FRS#3 North Inlet Channel South
 176         KM        Channel plans FCD Contract No 2007C021
 177         KM        Cholla Wash
 178         RS       3    FLOW
 179         RC   0.050   0.030   0.050    5306  0.0083    0.00
 180         RX  1010.0 1015.00 1020.00 1050.00 1100.00 1275.00 1580.00 1750.00
 181         RY  1251.0 1249.00 1249.00 1245.00 1244.90 1250.00 1250.00 1254.00
             *

 182         KK     W06BASIN
 183         KM        BASIN BOUNDARY FROM 1990 TOPO
 184         BA   0.707
 185         LG    0.35    0.35    4.30    0.41      18
 186         UI       0     103     362     675     987     837     576     461     363     257
 187         UI     217     150     119      90      72      49      48      20      20      19
 188         UI      20      20       0       0       0       0       0       0       0       0
 189         UI       0       0       0       0       0       0       0       0       0       0
 190         UI       0       0       0       0       0       0       0       0       0       0
             *

 191         KK     W07BASIN
 192         KM        BASIN BOUNDARY FROM 1990 TOPO
 193         BA   0.312
 194         LG    0.35    0.35    4.25    0.42      19
 195         UI       0      65     253     428     510     316     236     171     126      89
 196         UI      63      46      33      26      14      11      10      10       0       0
 197         UI       0       0       0       0       0       0       0       0       0       0
 198         UI       0       0       0       0       0       0       0       0       0       0
 199         UI       0       0       0       0       0       0       0       0       0       0
             *

 200         KK   CPW07COMBINE
 201         HC       2   1.019
             *

 202         KK  W07W08ROUTE
 203         KM        Cross-section: Based on aerial and topo
 204         KM        Manning's N Value: Natural Desert wash w/ vegetation
 205         KM        N value modified to slow velocity
 206         RS       1    FLOW
 207         RC   0.045   0.040   0.045    5589  0.0796    0.00
 208         RX  100.00  136.00  173.00  197.00  234.00  254.00  298.00  342.00
 209         RY  2880.0 2865.00 2850.00 2840.00 2840.00 2850.00 2865.00 2880.00
```

```
                  *

 210              KK     W08BASIN
 211              KM        BASIN BOUNDARY FROM 1990 TOPO
 212              BA   0.446
 213              LG    0.35    0.35    3.95    0.40      20
 214              UI       0     156     587     941     577     413     262     183     117      78
 215              UI      49      32      19      19      19       0       0       0       0       0
 216              UI       0       0       0       0       0       0       0       0       0       0
 217              UI       0       0       0       0       0       0       0       0       0       0
1                                             HEC-1 INPUT                                            PAGE  6

LINE              ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 218              UI       0       0       0       0       0       0       0       0       0       0
                  *

 219              KK   CPW08COMBINE
 220              HC       2   1.465
                  *

 221              KK     W09BASIN
 222              KM        BASIN BOUNDARY FROM 1990 TOPO
 223              BA   0.335
 224              LG    0.35    0.35    3.95    0.40      20
 225              UI       0     125     468     716     427     304     193     127      85      53
 226              UI      37      19      14      15       0       0       0       0       0       0
 227              UI       0       0       0       0       0       0       0       0       0       0
 228              UI       0       0       0       0       0       0       0       0       0       0
 229              UI       0       0       0       0       0       0       0       0       0       0
                  *

 230              KK   CPW09COMBINE
 231              HC       2     1.8
                  *

 232              KK  W09W10ROUTE
 233              KM        Cross-section: Based on aerial and topo
 234              KM        Manning's N Value: Natural Desert wash w/ vegetation
 235              KM        N value modified to slow velocity
 236              RS       1     FLOW
 237              RC   0.045   0.040   0.045   11134  0.0683    0.00
 238              RX  100.00  137.00  172.00  192.00  220.00  230.00  284.00  338.00
 239              RY  1990.0 1975.00 1960.00 1950.00 1950.00 1960.00 1975.00 1990.00
                  *

 240              KK     W10BASIN
 241              KM        BASIN BOUNDARY FROM 1990 TOPO
 242              BA   1.338
 243              LG    0.35    0.35    3.95    0.40      20
 244              UI       0     153     376     806    1108    1572    1334     920     794     647
 245              UI     533     402     350     278     212     175     141     119      85      75
 246              UI      75      29      30      30      29      30      29       0       0       0
 247              UI       0       0       0       0       0       0       0       0       0       0
 248              UI       0       0       0       0       0       0       0       0       0       0
                  *

 249              KK   CPW10COMBINE
 250              HC       2   3.138
                  *

 251              KK     W11BASIN
 252              KM        BASIN BOUNDARY FROM 1990 TOPO
 253              BA   0.812
 254              LG    0.35    0.35    3.95    0.40      20
 255              UI       0     100     272     567     759    1098     696     556     469     375
 256              UI     285     236     190     141     116      92      77      52      48      39
 257              UI      20      19      19      19      19      20       0       0       0       0
 258              UI       0       0       0       0       0       0       0       0       0       0
1                                             HEC-1 INPUT                                            PAGE  7

LINE              ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 259              UI       0       0       0       0       0       0       0       0       0       0
                  *

 260              KK   CPW11COMBINE
 261              HC       2    3.95
                  *

 262              KK  W11W12ROUTE
 263              KM        Cross-section: Based on aerial and topo
 264              KM        Manning's N Value: Natural Desert wash w/ vegetation
 265              RS       8     FLOW
 266              RC   0.045   0.035   0.045   21182  0.0205    0.00
 267              RX  100.00  110.30  290.50  304.40  319.20  330.60  344.60  569.70
 268              RY  1312.0 1310.00 1308.00 1306.00 1305.90 1308.00 1310.00 1312.00
                  *

 269              KK     W12BASIN
 270              KM        BASIN BOUNDARY FROM 1990 TOPO AND BEARDSELY CSR
 271              BA   1.868
 272              LG    0.34    0.34    4.60    0.34       3
 273              UI       0     125     126     289     490     706     847     961    1170    1474
 274              UI    1002     820     727     654     604     537     483     418     353     310
 275              UI     293     266     221     193     160     148     139     120      96      96
 276              UI      83      61      61      61      61      37      24      24      24      24
 277              UI      24      25      24      24      24      24      24       0       0       0
                  *

 278              KK  DW05SERETRIEVE
 279              KM        Flow traveling down North Inlet Channel
 280              DR   DW05S
                  *

 281              KK  W0512BROUTE
 282              KM        White Tanks FRS#3 North Inlet Channel South
 283              KM        Channel plans FCD Contract No 2007C021
 284              KM        N value modifeid to mimic slowing of velocity by drop structures
 285              RS       2     FLOW
 286              RC   0.035   0.035   0.035    5494  0.0170    0.00
 287              RX  100.00  120.00  135.00  165.00  220.00  300.00  315.00  379.00
 288              RY  1244.7 1239.65 1239.50 1232.00 1231.90 1239.50 1239.65 1255.65
                  *

 289              KK   CPW12COMBINE
 290              HC       4   11.61
                  *

 291              KK  W12W13ROUTE
 292              KM        From NIC South Channel Plans at Sta. 535+00
 293              RS       1     FLOW
 294              RC   0.032   0.032   0.032    2062  0.0051    0.00
 295              RX  100.00  120.00  162.50  205.00  355.00  397.50  440.00  460.00
 296              RY  1218.4 1218.18 1211.10 1203.98 1204.45 1211.53 1218.65 1218.85
                  *
1                                             HEC-1 INPUT                                            PAGE  8

LINE              ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 297              KK     W13BASIN
 298              KM        BASIN BOUNDARY FROM 1990 TOPO AND BEARDSELY CSR
 299              BA   1.584
 300              LG    0.35    0.35    4.90    0.29       3
 301              UI       0     107     108     254     430     622     734     838    1035    1255
 302              UI     820     689     615     557     511     445     405     352     287     261
 303              UI     248     223     176     154     137     121     119      90      83      83
 304              UI      59      52      53      53      48      21      20      21      20      21
 305              UI      20      21      21      20      21      21       0       0       0       0
                  *

 306              KK   CPW13COMBINE
 307              HC       2  13.194
                  *

 308              KK  W13W16ROUTE
 309              KM        From NIC South Channel Plans
 310              KM        at Sta. 523+00
 311              RS       2     FLOW
 312              RC   0.032   0.032   0.032    6257  0.0051    0.00
 313              RX  100.00  115.00  162.00  209.10  359.10  435.90  465.00  480.00
 314              RY  1216.9 1216.77 1208.93 1201.09 1203.09 1215.09 1223.54 1223.69
                  *

 315              KK     W15BASIN
 316              KM        BASIN BOUNDARY FROM 1990 TOPO
 317              BA   1.227
 318              LG    0.35    0.35    4.55    0.35       0
 319              UI       0      98     112     315     498     652     757     975    1045     671
```

```
 320          UI     578     523     457     400     352     284     245     227     196     161
 321          UI     128     117     107      86      75      70      49      48      47      43
 322          UI      19      18      19      19      19      19      18      19      19       0
 323          UI       0       0       0       0       0       0       0       0       0       0
              *

 324          KK     W14BASIN
 325          KM        BASIN BOUNDARY FROM 1990 TOPO
 326          BA   1.582
 327          LG    0.35    0.37    5.20    0.25       3
 328          UI       0     165     333     776    1104    1420    1804    1142     948     811
 329          UI     682     567     431     386     320     242     201     182     128     124
 330          UI      82      80      79      32      32      32      32      31      32      32
 331          UI       0       0       0       0       0       0       0       0       0       0
 332          UI       0       0       0       0       0       0       0       0       0       0
              *

 333          KK  W14W15ROUTE
 334          KM        Cross-section: Based on aerial and topo
 335          KM        Manning's N Value: Natural Desert wash w/ vegetation
 336          RS       3    FLOW
 337          RC   0.035   0.035   0.035    7308  0.0104    0.00
 338          RX  100.00  130.00  150.00  184.00  210.00  226.00  246.00  276.00
 339          RY  1280.0 1276.00 1274.00 1270.00 1269.90 1274.00 1276.00 1280.00
              *
1                                         HEC-1 INPUT                                         PAGE  9

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 340          KK   CPW15COMBINE
 341          HC       2   2.809
              *

 342          KK  W15W16ROUTE
 343          KM        Cross-section: Based on aerial and topo
 344          KM        Manning's N Value: Natural Desert wash w/ vegetation
 345          RS       1    FLOW
 346          RC   0.035   0.035   0.035    2750  0.0087    0.00
 347          RX  100.00  135.00  232.00  328.00  360.00  498.00  635.00  735.00
 348          RY  1202.0 1200.00 1199.00 1198.00 1197.90 1199.00 1200.00 1202.00
              *

 349          KK     W16BASIN
 350          KM        BASIN BOUNDARY FROM BEARDSLEY CSR, THE FRS#4 AND 1990 TOPO
 351          BA   0.530
 352          LG    0.22    0.22    4.55    0.33       0
 353          UI       0      61     148     318     464     562     575     509     384     282
 354          UI     211     157     115      87      65      42      42      15      14      15
 355          UI      15      15       0       0       0       0       0       0       0       0
 356          UI       0       0       0       0       0       0       0       0       0       0
 357          UI       0       0       0       0       0       0       0       0       0       0
              *

 358          KK   CPW16COMBINE
 359          HC       3  16.534
              *

 360          KK  W16W20ROUTE
 361          KM        Cross-section: Based on aerial and topo
 362          KM        Manning's N Value: clean earth; straight
 363          RS       1    FLOW
 364          RC   0.022   0.022   0.022    3633  0.0130    0.00
 365          RX  100.00  113.00  127.00  136.00  245.00  272.00  318.00  384.00
 366          RY  1186.0 1184.00 1182.00 1180.00 1179.90 1182.00 1184.00 1186.00
              *

 367          KK     W18BASIN
 368          KM        BASIN BOUNDARY FROM 1990 TOPO
 369          BA   1.260
 370          LG    0.35    0.35    4.40    0.38       8
 371          UI       0      38      38      38      38      38      99     112     147     168
 372          UI     200     230     242     261     278     296     307     348     390     440
 373          UI     461     337     285     264     241     228     223     213     202     195
 374          UI     185     177     171     161     152     148     137     130     119     110
 375          UI     100      97      93      90      89      86      79      81      68      62
              *

 376          KK     W17BASIN
 377          KM        BASIN BOUNDARY FROM 1990 TOPO
 378          BA   1.497
 379          LG    0.35    0.35    4.30    0.41      18
 380          UI       0     169     396     865    1197    1639    1571    1038     892     737
 381          UI     607     469     398     324     247     201     173     131     110      82
1                                         HEC-1 INPUT                                         PAGE 10

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 382          UI      83      52      32      33      32      32      33      32       0       0
 383          UI       0       0       0       0       0       0       0       0       0       0
 384          UI       0       0       0       0       0       0       0       0       0       0
              *

 385          KK  W17W18ROUTE
 386          KM        Cross-section: Based on aerial and topo
 387          KM        Manning's N Value: natural desert wash w/ vegetation
 388          KM        and heavy vegetation
 389          RS       2    FLOW
 390          RC   0.045   0.035   0.045    8559  0.0257    0.00
 391          RX  100.00  140.00  150.00  156.00  194.00  216.00  255.00  342.00
 392          RY  1302.0 1300.00 1298.00 1296.00 1295.90 1298.00 1300.00 1302.00
              *

 393          KK   CPW18COMBINE
 394          HC       2   2.757
              *

 395          KK  W18W20ROUTE
 396          KM        Cross-section: Estimated 3' deep, side slopes and width based
 397          KM        on aerial / Manning's N Value: natural desert wash w/ vegetation
 398          RS       5    FLOW
 399          RC   0.035   0.035   0.035    6914  0.0058    0.00
 400          RX  100.00  155.00  170.00  210.00  216.00  256.00  276.00  336.00
 401          RY  1249.0 1248.25 1248.00 1245.00 1245.10 1248.00 1248.25 1249.00
              *

 402          KK     W19BASIN
 403          KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 404          KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 405          BA   1.158
 406          LG    0.35    0.35    3.88    0.42      20
 407          UI       0     241     939    1587    1896    1172     876     636     467     328
 408          UI     236     172     119      99      51      39      39      39       0       0
 409          UI       0       0       0       0       0       0       0       0       0       0
 410          UI       0       0       0       0       0       0       0       0       0       0
 411          UI       0       0       0       0       0       0       0       0       0       0
              *

 412          KK   SRW19STORAGE
 413          KM        Master Drainage Plan for the Caterpillar Property (Basin #16)
 414          KO
 415          RS       1    STOR
 416          SV            1.00   31.00  114.00  270.00  502.00  807.00 1319.00 1388.00 1460.00
 417          SQ                                                                          135.00
 418          SE  1198.0 1200.00 1210.00 1220.00 1230.00 1240.00 1250.00 1260.00 1261.00 1262.00
 419          ST
              *
1                                         HEC-1 INPUT                                         PAGE 11

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 420          KK  W19W20ROUTE
 421          KM        Cross-section: Estimated 4' deep and 3:1 side slopes, width based
 422          KM        on aerial / Manning's N Value: earth with sparse treese and shrubs
 423          RS       1    FLOW
 424          RC   0.032   0.032   0.032    3790  0.0158    0.00
 425          RX  100.00  120.00  140.00  152.00  158.00  170.00  190.00  210.00
 426          RY  1240.5 1240.25 1240.00 1236.00 1236.00 1240.00 1240.25 1240.50
              *

 427          KK     W20BASIN
 428          KM        BASIN BOUNDARY FROM WHITE TANKS #4 FRS, S-S-D CURVES
 429          KM        FROM JAN 2009 FCDMC, AND FROM 1990 TOPO
 430          BA   1.137
 431          LG    0.29    0.29    4.10    0.44       0
 432          UI       0     104     165     390     618     777     969    1101     712     596
 433          UI     525     458     389     315     265     233     199     157     131     115
 434          UI      98      80      71      51      50      51      26      19      20      20
 435          UI      20      20      20      20      20       0       0       0       0       0
```

```
          436          UI       0       0       0       0       0       0       0       0       0       0
                       *

          437          KK    CPW20COMBINE
          438          HC        4  21.586
                       *

          439          KK    SRW20 STORAGE
          440          KM    STAGE-STORAGE-DISCHARGE CURVE FROM URS DESIGN OF FRS#3 OUTLET STRUCTURE
          441          KM    THE DISCHARGE INCLUDING OUTFLOW FROM PRINCIPAL AND EMERGENCY SPILLWAY,
          442          KM    AS WELL AS INFILTRATION
          443          RS        1     STOR      -1
          444          SV     44.8      388     585     846    1002    2045    3218    3557    4693    6510
          445          SQ     0.02     0.17     4.5     187     203     276     330    2936   24545   70439
          446          SE     1188     1198    1200    1202    1203    1208    1212    1213    1216    1220
                       *

          447          KK    OUTFL
          448          KM    SEPRATE OUTFLOW FROM INFILTRATION
                       * KO      1
          449          ZW    A=WT B=FRS3 C=FLOW
          450          DT     INFL
          451          DI        0      4.5      86     203     330    2936   24545   70439
          452          DQ        0      4.5      10      22      73      79      96     121
          453          ZZ
1
              SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE     (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

  NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

   40         L21
               .
               .
   52          .------->    RL21
   50      DL21RE
               V
               V
   55      L21L22
               .
               .
   62          .           L22
               .           .
               .           .
   74          .           .------->    RL22
   72          .       DL22RE
               .           .
               .           .
   77       CPL22...........
               V
               V
   79      L22W01
               .
               .
   86          .           W01
               .           .
               .           .
   95       CPW01...........
               V
               V
   97      W01W02
               .
               .
  105          .           W02
               .           .
               .           .
  115       CPW02...........
               V
               V
  117      W02W05
               .
               .
  123          .           W03
               .           V
               .           V
  132          .       W03W04
               .           .
               .           .
  139          .           .          W04
               .           .           .
               .           .           .
  148          .        CPW04...........
               .           V
               .           V
  150          .       W04W05
               .           .
               .           .
  157          .           .          W05
               .           .           .
               .           .           .
  166       CPW05.......................
               .
               .
  171          .------->    DW05S
  168      DW05SE
               V
               V
  174      W0512A
               .
               .
  182          .          W06
               .           .
               .           .
  191          .           .          W07
               .           .           .
               .           .           .
  200          .        CPW07...........
               .           V
               .           V
  202          .       W07W08
               .           .
               .           .
  210          .           .          W08
               .           .           .
               .           .           .
  219          .        CPW08...........
               .           .
               .           .
  221          .           .          W09
               .           .           .
               .           .           .
  230          .        CPW09...........
               .           V
               .           V
  232          .       W09W10
               .           .
               .           .
  240          .           .          W10
               .           .           .
               .           .           .
  249          .        CPW10...........
               .           .
               .           .
  251          .           .          W11
               .           .           .
               .           .           .
  260          .        CPW11...........
               .           V
               .           V
  262          .       W11W12
               .           .
               .           .
  269          .           .          W12
               .           .           .
               .           .           .
  280          .           .           .           .<-------    DW05S
  278          .           .           .       DW05SE
               .           .           .           V
               .           .           .           V
  281          .           .           .       W0512B
               .           .           .           .
               .           .           .           .
  289       CPW12...................................
               V
               V
  291      W12W13
               .
               .
  297          .          W13
```

```
                 .          .
                 .          .
 306        CPW13...........
                 V
                 V
 308        W13W16
                 .
                 .
 315             .         W15
                 .          .
                 .          .
 324             .          .         W14
                 .          .          V
                 .          .          V
 333             .          .        W14W15
                 .          .          .
                 .          .          .
 340             .        CPW15...........
                 .          V
                 .          V
 342             .        W15W16
                 .          .
                 .          .
 349             .          .         W16
                 .          .          .
                 .          .          .
 358        CPW16.......................
                 V
                 V
 360        W16W20
                 .
                 .
 367             .         W18
                 .          .
                 .          .
 376             .          .         W17
                 .          .          V
                 .          .          V
 385             .          .        W17W18
                 .          .          .
                 .          .          .
 393             .        CPW18...........
                 .          V
                 .          V
 395             .        W18W20
                 .          .
                 .          .
 402             .          .         W19
                 .          .          V
                 .          .          V
 412             .          .        SRW19
                 .          .          V
                 .          .          V
 420             .          .        W19W20
                 .          .          .
                 .          .          .
 427             .          .          .         W20
                 .          .          .          .
                 .          .          .          .
 437        CPW20.................................
                 V
                 V
 439        SRW20
                 .
                 .
 450             .------->    INFL
 447        OUTFL
```

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

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+ HYDROGRAPH AT	L21	195.	13.25	57.	14.	5.	.52		
+ DIVERSION TO	RL21	195.	13.25	57.	14.	5.	.52		
+ HYDROGRAPH AT	DL21RE	0.	.00	0.	0.	0.	.52		
+ ROUTED TO	L21L22	0.	.00	0.	0.	0.	.52		
+ HYDROGRAPH AT	L22	175.	12.92	38.	10.	3.	.36		
+ DIVERSION TO	RL22	175.	12.92	31.	8.	3.	.36		
+ HYDROGRAPH AT	DL22RE	56.	13.75	7.	2.	1.	.36		
+ 2 COMBINED AT	CPL22	56.	13.75	7.	2.	1.	.89		
+ ROUTED TO	L22W01	41.	14.08	7.	2.	1.	.89		
+ HYDROGRAPH AT	W01	252.	12.25	21.	5.	2.	.19		
+ 2 COMBINED AT	CPW01	249.	12.25	27.	7.	2.	1.08		
+ ROUTED TO	W01W02	196.	12.33	27.	7.	2.	1.08		
+ HYDROGRAPH AT	W02	461.	12.33	44.	11.	4.	.39		
+ 2 COMBINED AT	CPW02	652.	12.33	70.	18.	6.	1.47		
+ ROUTED TO	W02W05	608.	12.42	70.	18.	6.	1.47		
+ HYDROGRAPH AT	W03	1384.	12.58	267.	79.	26.	1.97		
+ ROUTED TO	W03W04	1195.	12.83	267.	79.	26.	1.97		
+ HYDROGRAPH AT	W04	1411.	12.58	257.	70.	23.	2.03		
+ 2 COMBINED AT	CPW04	2341.	12.67	520.	148.	50.	4.01		
+ ROUTED TO	W04W05	2211.	12.83	520.	148.	50.	4.01		
+ HYDROGRAPH AT	W05	269.	12.42	32.	8.	3.	.32		
+ 3 COMBINED AT	CPW05	2517.	12.75	619.	173.	58.	5.79		
+ DIVERSION TO	DW05S	1499.	12.75	310.	96.	32.	5.79		
+ HYDROGRAPH AT	DW05SE	1018.	12.75	309.	77.	26.	5.79		
+ ROUTED TO	W0512A	990.	12.92	309.	77.	26.	5.79		
+ HYDROGRAPH AT	W06	817.	12.25	97.	28.	9.	.71		
+ HYDROGRAPH AT	W07	403.	12.25	43.	13.	4.	.31		
+ 2 COMBINED AT	CPW07	1215.	12.25	139.	40.	13.	1.02		

+	ROUTED TO	W07W08	1094.	12.33	139.	40.	13.	1.02
+	HYDROGRAPH AT	W08	684.	12.17	64.	19.	6.	.45
+	2 COMBINED AT	CPW08	1602.	12.25	202.	59.	20.	1.47
+	HYDROGRAPH AT	W09	522.	12.17	48.	14.	5.	.34
+	2 COMBINED AT	CPW09	2060.	12.25	250.	73.	24.	1.80
+	ROUTED TO	W09W10	1758.	12.33	250.	73.	24.	1.80
+	HYDROGRAPH AT	W10	1364.	12.33	191.	56.	19.	1.34
+	2 COMBINED AT	CPW10	3107.	12.33	438.	128.	43.	3.14
+	HYDROGRAPH AT	W11	864.	12.33	116.	34.	11.	.81
+	2 COMBINED AT	CPW11	3956.	12.33	553.	161.	54.	3.95
+	ROUTED TO	W11W12	2825.	13.00	553.	161.	54.	3.95
+	HYDROGRAPH AT	W12	1185.	12.58	214.	55.	18.	1.87
+	HYDROGRAPH AT	DW05SE	1499.	12.75	310.	96.	32.	5.79
+	ROUTED TO	W0512B	1463.	12.92	310.	96.	32.	5.79
+	4 COMBINED AT	CPW12	5800.	13.00	1359.	382.	128.	11.61
+	ROUTED TO	W12W13	5771.	13.00	1358.	382.	128.	11.61
+	HYDROGRAPH AT	W13	1054.	12.58	188.	48.	16.	1.58
+	2 COMBINED AT	CPW13	6266.	13.00	1525.	425.	142.	13.19
+	ROUTED TO	W13W16	6114.	13.17	1524.	425.	142.	13.19
+	HYDROGRAPH AT	W15	875.	12.50	132.	33.	11.	1.23
+	HYDROGRAPH AT	W14	1482.	12.33	193.	50.	17.	1.58
+	ROUTED TO	W14W15	1336.	12.58	192.	50.	17.	1.58
+	2 COMBINED AT	CPW15	2167.	12.58	322.	82.	27.	2.81
+	ROUTED TO	W15W16	1933.	12.67	322.	82.	27.	2.81
+	HYDROGRAPH AT	W16	581.	12.33	66.	17.	6.	.53
+	3 COMBINED AT	CPW16	7151.	13.08	1864.	511.	171.	16.53
+	ROUTED TO	W16W20	7137.	13.08	1864.	511.	171.	16.53
+	HYDROGRAPH AT	W18	430.	13.50	134.	36.	12.	1.26
+	HYDROGRAPH AT	W17	1456.	12.33	203.	59.	20.	1.50
+	ROUTED TO	W17W18	1293.	12.50	203.	59.	20.	1.50
+	2 COMBINED AT	CPW18	1431.	12.50	336.	95.	32.	2.76
+	ROUTED TO	W18W20	1249.	12.92	336.	95.	32.	2.76
+	HYDROGRAPH AT	W19	1508.	12.25	163.	48.	16.	1.16
+	ROUTED TO	SRW19	0.	.00	0.	0.	0.	1.16
+	ROUTED TO	W19W20	0.	.00	0.	0.	0.	1.16
+	HYDROGRAPH AT	W20	889.	12.42	121.	30.	10.	1.14
+	4 COMBINED AT	CPW20	8283.	13.08	2247.	616.	206.	21.59
+	ROUTED TO	SRW20	212.	17.00	212.	204.	113.	21.59
+	DIVERSION TO	INFL	26.	17.00	25.	23.	14.	21.59
+	HYDROGRAPH AT	OUTFL	187.	17.00	186.	180.	99.	21.59

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

C.5 EXISTING CONDITIONS WITH PROJECT IN PLACE, 100-YEAR FOR JACKRABBIT CORRIDOR

```
1*****************************************                   ***************************************
 *                                       *                   *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                   *  U.S. ARMY CORPS OF ENGINEERS       *
 *             JUN   1998                *                   *  HYDROLOGIC ENGINEERING CENTER      *
 *           VERSION 4.1                 *                   *        609 SECOND STREET            *
 *                                       *                   *     DAVIS, CALIFORNIA 95616         *
 * RUN DATE   09DEC09  TIME  13:37:21    *                   *        (916) 756-1104               *
 *                                       *                   *                                     *
 *****************************************                   ***************************************


                  X     X  XXXXXXX   XXXXX          X
                  X     X  X        X     X        XX
                  X     X  X        X               X
                  XXXXXXX  XXXX     X       XXXXX   X
                  X     X  X        X               X
                  X     X  X        X     X         X
                  X     X  XXXXXXX   XXXXX         XXX


    THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

    THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
    THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
    NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
    DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL    LOSS RATE:GREEN AND AMPT INFILTRATION
    KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                   HEC-1 INPUT                                            PAGE  1

  LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

     1          ID           WHITE TANKS AREA, WATERSHED CONTRIBUTING TO FRS#3
     2          ID           PREPARED BY HOSKIN RYAN CONSULTANTS EXCLUSIVELY FOR
     3          ID           FRS#3 OUTLET CHANNEL DESIGN, 12-09-2009
     4          ID           BASED ON HDR LOOP303/WHITE TANKS ADMPU AHA (09-04-09)
     5          ID           HEC-1 MODEL OF EXISTING CONDITIONS WITH CIP
     6          ID           MODIFICATIONS INCLUDE:
     7          ID           (1) UPDATE WITH AVERAGE RAINFALL DEPTH FOR JACKRABBIT CORRIDOR
     8          ID           (2) UPDATE THE PROPOSED CHANNEL DESIGN
     9          ID           (3) DELETE RETENTION OF PASQUELETTI TO REFLECT EXIST CONDITIONS
    10          ID
    11          ID           *****************************************************************
    12          ID       Flood Control District of Maricopa County
    13          ID       L303_EX_CIP_MB02 - Loop 303/ White Tanks ADMPU AHA
    14          ID       100 YEAR
    15          ID       24 Hour Storm
    16          ID       Unit Hydrograph: S-Graph
    17          ID       08/18/2009
    18          ID           FCDMC CONTRACT 2007C031
    19          ID           BY HDR ENGINEERING (#79902)
    20          ID           EXISTING CONDITIONS WITH CIP-AUGUST 2009
    21          ID           MAJOR BASIN 02
    22          ID           FILE NAME: ECIP-MB2.DAT
    23          IT       5  1JAN99    1200    2000
    24          IN      15
    25          IO       5
                *DIAGRAM
                *
    26          JD   3.661  0.0001
    27          PC   0.000   0.002   0.005   0.008   0.011   0.014   0.017   0.020   0.023   0.026
    28          PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056   0.060
    29          PC   0.064   0.068   0.072   0.076   0.080   0.085   0.090   0.095   0.100   0.105
    30          PC   0.110   0.115   0.120   0.126   0.133   0.140   0.147   0.155   0.163   0.172
    31          PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
    32          PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
    33          PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
    34          PC   0.913   0.918   0.922   0.926   0.930   0.934   0.938   0.942   0.946   0.950
    35          PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977   0.980
    36          PC   0.983   0.986   0.989   0.992   0.995   0.998   1.000
    37          JD   3.478    10.0
                *
    38          KK     WT3
    39          KM   OUTFLOW FROM WT FRS#3 OUTLET
    40          BA   21.52
    41          KO       5
    42          ZR  =QI A=WT B=FRS3 C=FLOW
                *

    43          KK    W21ABASIN
    44          KM         Boundary based on Preliminary Design Plans for
    45          KM         White Tanks FRS #3 Outfall Channel dated
    46          KM         12-08-2008 prepared by Gannett Fleming
    47          ZW   A=CIP B=W21A C=FLOW
    48          BA   0.199
    49          LG    0.35    0.35    4.35    0.40       0
1                                   HEC-1 INPUT                                            PAGE  2

  LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

    50          UI       0      19      35      81     123     161     180     182     168     133
    51          UI     102      82      62      49      38      30      21      18      13      13
    52          UI       5       5       4       5       5       5       0       0       0       0
    53          UI       0       0       0       0       0       0       0       0       0       0
    54          UI       0       0       0       0       0       0       0       0       0       0
                *

    55          KK  CPW21ACOMBINE
    56          ZW   A=CIP B=CPW21A C=FLOW
    57          HC       2   0.199
                *

    58          KK  21A28A   ROUTE
    59          KM   PROPOSED JACKRABBIT CHANNEL, BOTTOM WIDTH=30FT, SIDE SLOPE 6:1
    60          ZW   A=CIP B=21A28A C=FLOW
    61          RS       4    FLOW      -1
    62          RC   0.045   0.035   0.045    3560  0.0010
    63          RX     100     110     120     150     180     210     220     230
    64          RY    1001    1000    1000     995     995    1000    1000    1001
                *

    65          KK    W28ABASIN
    66          KM         Boundary based on Preliminary Design Plans for
    67          KM         White Tanks FRS #3 Outfall Channel dated
    68          KM         12-08-2008 prepared by Gannett Fleming
    69          BA   0.642
    70          LG    0.34    0.32    4.55    0.35       1
    71          UI       0      65     127     296     444     573     621     609     524     407
    72          UI     308     239     181     135     110      80      64      45      44      16
    73          UI      17      16      16      16      16       0       0       0       0       0
    74          UI       0       0       0       0       0       0       0       0       0       0
    75          UI       0       0       0       0       0       0       0       0       0       0
                *

    76          KK  CPW28ACOMBINE
    77          ZW   A=CIP B=CPW28A C=FLOW
    78          HC       2   0.841
                *

    79          KK  W28A33   ROUTE
    80          KM   PROPOSED JACKRABBIT CHANNEL, BOTTOM WIDTH=40FT, SIDE SLOPE 4:1
    81          ZW   A=CIP B=W28A33 C=FLOW
    82          RS       5    FLOW      -1
    83          RC   0.045   0.035   0.045    4336  0.0010
    84          RX     100     110     120     140     180     200     210     220
    85          RY    1001    1000    1000     995     995    1000    1000    1001
                *

    86          KK     W33BASIN
    87          KM         BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
    88          KM         WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
    89          ZW   A=CIP B=W33 C=FLOW
    90          BA   0.839
    91          LG    0.31    0.27    4.00    0.47       4
    92          UI       0      92     207     460     670     834     886     810     641     473
1                                   HEC-1 INPUT                                            PAGE  3

  LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

    93          UI     361     275     195     155     114      85      63      52      23      22
```

```
          UI     23     22     23      0      0      0      0      0      0      0
          UI      0      0      0      0      0      0      0      0      0      0
          UI      0      0      0      0      0      0      0      0      0      0
          *

          KK   CPW33COMBINE
          ZW   A=CIP B=CPW33 C=FLOW
          HC      2    1.68
          *

          KK  W33W35   ROUTE
          KM   PROPOSED JACKRABBIT CHANNEL, BOTTOM WIDTH=40FT, SIDE SLOPE 6:1
          ZW   A=CIP B=W33W35 C=FLOW
          RS      3    FLOW     -1
          RC  0.045  0.035  0.045   2658 0.0010
          RX    100    110    116    152    192    228    240    250
          RY   1001   1000   1000    994    994   1000   1000   1001
          *

          KK     W35BASIN
          KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
          KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
          BA  0.283
          LG   0.32   0.34   3.71   0.47      4
          UI      0     33     83    180    257    312    308    268    201    146
          UI    108     80     58     43     33     22     19      8      8      8
          UI      8      8      0      0      0      0      0      0      0      0
          UI      0      0      0      0      0      0      0      0      0      0
          UI      0      0      0      0      0      0      0      0      0      0
          *

          KK     W34BASIN
          KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
          KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
          BA  0.228
          LG   0.32   0.31   3.74   0.46     20
          UI      0     33    131    238    312    316    236    162    111     74
          UI     52     34     23     13      9      8      9      0      0      0
          UI      0      0      0      0      0      0      0      0      0      0
          UI      0      0      0      0      0      0      0      0      0      0
          UI      0      0      0      0      0      0      0      0      0      0
          *

          KK   SRW34STORAGE
          KM        Master Drainage Plan for the Caterpillar Property (Basin #29)
          KO
          RS      1    STOR
          SV          0.99  12.73  23.45  36.25  50.68  54.76  59.33  83.20
          SQ                                                  88.00 6226.00
          SE 1164.5 1166.00 1170.00 1172.00 1174.00 1176.00 1177.50 1178.00 1180.00
          ST
          *
1                                   HEC-1 INPUT                                         PAGE  4

LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


          KK  W34W35ROUTE
          KM        Cross-section: Estimated 3' deep and 4:1 side slopes, width based on
          KM        aerial. Manning's N Value: clean straight earth
          RS      1    FLOW
          RC  0.022  0.022  0.022    813 0.0111   0.00
          RX 100.00 104.00 108.00 120.00 132.00 144.00 152.00 160.00
          RY 1166.2 1166.10 1166.00 1160.00 1160.10 1162.00 1162.10 1162.20
          *

          KK   CPW35COMBINE
          ZW   A=CIP B=CPW35 C=FLOW
          HC      3   2.191
          *

          KK  W35W36   ROUTE
          KM   PROPOSED JACKRABBIT CHANNEL, BOTTOM WIDTH=40FT, SIDE SLOPE 4:1
          ZW   A=CIP B=W35W36 C=FLOW
          RS      7    FLOW     -1
          RC  0.045  0.035  0.045   6051 0.0010
          RX    100    110    116    140    180    204    220    230
          RY   1001   1000   1000    994    994   1000   1000   1001
          *

          KK     W36BASIN
          KM        Boundary based on Aerial, topo, and Preliminary
          KM        Design Plans for White Tanks FRS #3 Outfall Channel
          KM        dated 12-08-2008 prepared by Gannett Fleming
          BA  0.720
          LG   0.31   0.28   4.00   0.47      4
          UI      0     65    101    247    385    507    591    617    609    513
          UI    409    329    255    204    160    126    102     76     64     45
          UI     45     25     16     16     15     16     16     16      0      0
          UI      0      0      0      0      0      0      0      0      0      0
          UI      0      0      0      0      0      0      0      0      0      0
          *

          KK   CPW36COMBINE
          ZW   A=CIP B=CPW36 C=FLOW
          HC      2   2.911
          *

          KK  W36W37   ROUTE
          KM   PROPOSED JACKRABBIT CHANNEL, BOTTOM WIDTH=30FT, SIDE SLOPE 5:1
          ZW   A=CIP B=W36W37 C=FLOW
          RS      5    FLOW     -1
          RC  0.045  0.035  0.045   4527 0.0010
          RX    100    110    120    150    180    210    220    230
          RY   1001   1000   1000    994    994   1000   1000   1001
          *
1                                   HEC-1 INPUT                                         PAGE  5

LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


          KK     W37BASIN
          KM        WESTERN LIMIT DEFINED BY JACKRABBIT WASH
          KM        CAPACITY APPROX 12,000 CFS, VALENCIA HEIGHTS
          BA  1.210
          LG   0.32   0.31   4.20   0.44      4
          UI      0     96    112    318    497    664    822    897    937    893
          UI    777    643    515    421    344    278    221    186    148    115
          UI    104     69     66     63     23     24     23     24     23     24
          UI     24      0      0      0      0      0      0      0      0      0
          UI      0      0      0      0      0      0      0      0      0      0
          *

          KK     W22BASIN
          KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
          KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
          BA  0.782
          LG   0.35   0.35   4.15   0.44     19
          UI      0    237    914   1559   1035    751    503    352    228    158
          UI    107     80     37     31     31     31      0      0      0      0
          UI      0      0      0      0      0      0      0      0      0      0
          UI      0      0      0      0      0      0      0      0      0      0
          UI      0      0      0      0      0      0      0      0      0      0
          *

          KK  W22W23ROUTE
          KM        Cross-section: Based on aerial and topo
          KM        Manning's N Value: pavement and natural desert wash w/ vegetation
          RS      1    FLOW
          RC  0.035  0.013  0.035   4866 0.0719   0.00
          RX 100.00 112.00 113.00 126.00 439.00 477.00 496.00 515.00
          RY 1820.0 1815.00 1810.00 1800.00 1799.90 1810.00 1815.00 1820.00
          *

          KK     W23BASIN
          KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
          KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
          BA  0.897
          LG   0.35   0.35   4.35   0.40     18
          UI      0    236    906   1581   1306    885    636    424    309    204
          UI    145     98     80     33     34     33     33      0      0      0
          UI      0      0      0      0      0      0      0      0      0      0
          UI      0      0      0      0      0      0      0      0      0      0
          UI      0      0      0      0      0      0      0      0      0      0
          *

          KK   CPW23COMBINE
          HC      2   1.679
          *
1                                   HEC-1 INPUT                                         PAGE  6
```

```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 212         KK  W23W24ROUTE
 213         KM        Cross-section: Based on aerial and topo
 214         KM        Manning's N Value: natural desert wash w/ vegetation
 215         RS       1    FLOW
 216         RC   0.045   0.035   0.045    5335  0.0367    0.00
 217         RX  100.00  120.00  140.00  180.00  220.00  240.00  260.00  280.00
 218         RY  1462.0 1461.00 1460.00 1450.00 1450.10 1460.00 1461.00 1462.00
             *

 219         KK     W24BASIN
 220         KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 221         KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 222         BA   0.475
 223         LG    0.35    0.35    4.90    0.29      14
 224         UI       0      88     342     575     788     483     372     280     201     154
 225         UI     104      82      60      39      38      15      14      15      15       0
 226         UI       0       0       0       0       0       0       0       0       0       0
 227         UI       0       0       0       0       0       0       0       0       0       0
 228         UI       0       0       0       0       0       0       0       0       0       0
             *

 229         KK   CPW24COMBINE
 230         HC       2   2.154
             *

 231         KK  W24W27ROUTE
 232         KM        Cross-section: Based on aerial and topo
 233         KM        Manning's N Value: natural desert wash w/ vegetation
 234         RS       1    FLOW
 235         RC   0.035   0.035   0.035    5873  0.0289    0.00
 236         RX  100.00  120.00  140.00  160.00  180.00  200.00  220.00  240.00
 237         RY  1094.0 1092.00 1090.00 1084.00 1084.10 1090.00 1090.25 1090.50
             *

 238         KK     W25BASIN
 239         KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 240         KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 241         BA   1.099
 242         LG    0.35    0.35    4.80    0.30       8
 243         UI       0     143     438     866    1174    1490     915     737     620     467
 244         UI     358     307     216     171     140     110      76      71      53      27
 245         UI      28      28      27      28       0       0       0       0       0       0
 246         UI       0       0       0       0       0       0       0       0       0       0
 247         UI       0       0       0       0       0       0       0       0       0       0
             *

 248         KK   SRW25STORAGE
 249         KM        Verrado on-line storage basin (WoodPatel ID SR20)
 250         KO
 251         RS       1    STOR
 252         SV            1.05    9.43   26.91   54.31   92.89  138.67  176.47  190.08  219.05
 253         SQ                                                                 265.00 1377.00
 254         SE  1443.0 1446.00 1450.00 1454.00 1458.00 1462.00 1466.00 1469.00 1470.00 1472.00
 255         ST
             *
1                                       HEC-1 INPUT                                           PAGE  7

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 256         KK  W25W26ROUTE
 257         KM        Cross-section: Based on aerial and topo
 258         KM        Manning's N Value: natural desert wash w/ vegetation
 259         RS       1    FLOW
 260         RC   0.035   0.035   0.035    6978  0.0178    0.00
 261         RX  100.00  120.00  140.00  156.00  176.00  192.00  212.00  232.00
 262         RY  1451.5 1451.25 1451.00 1447.00 1447.10 1451.00 1451.25 1451.50
             *

 263         KK     W26BASIN
 264         KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 265         KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 266         BA   0.682
 267         LG    0.33    0.37    6.20    0.17      15
 268         UI       0      86     245     500     680     926     574     465     390     304
 269         UI     231     197     152     110      95      69      59      43      42      21
 270         UI      17      16      17      16      17       0       0       0       0       0
 271         UI       0       0       0       0       0       0       0       0       0       0
 272         UI       0       0       0       0       0       0       0       0       0       0
             *

 273         KK   CPW26COMBINE
 274         HC       2   1.781
             *

 275         KK   SRW26STORAGE
 276         KM        Verrado on-line storage basin (WoodPatel ID SR21 and PH 6 Golf)
 277         KO
 278         RS       1    STOR
 279         SV            0.68   20.68   57.58   95.91  102.34  117.65  130.00
 280         SQ                                            265.00 1377.00 2000.00
 281         SE  1319.0 1320.00 1330.00 1340.00 1347.00 1348.00 1350.00 1351.00
 282         ST
             *

 283         KK  W26W27ROUTE
 284         KM        Cross-section: based on topo and aerial
 285         KM        Manning's N Value: natural desert wash w/ vegetation
 286         RS       1    FLOW
 287         RC   0.035   0.035   0.035    3484  0.0172    0.00
 288         RX  100.00  120.00  140.00  152.00  168.00  180.00  200.00  220.00
 289         RY  1298.5 1298.25 1298.00 1294.00 1294.10 1298.00 1298.25 1298.50
             *

 290         KK     W27BASIN
 291         KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 292         KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 293         BA   0.411
 294         LG    0.32    0.37    5.80    0.20      11
 295         UI       0      76     296     498     681     418     323     241     174     133
 296         UI      91      71      51      34      33      13      13      13      13       0
 297         UI       0       0       0       0       0       0       0       0       0       0
 298         UI       0       0       0       0       0       0       0       0       0       0
 299         UI       0       0       0       0       0       0       0       0       0       0
             *
1                                       HEC-1 INPUT                                           PAGE  8

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 300         KK   CPW27COMBINE
 301         HC       3   4.345
             *

 302         KK  W27W44ROUTE
 303         KM        Cross-section: Clean straight earth
 304         RS       1    FLOW
 305         RC   0.022   0.022   0.022    7169  0.0098    0.00
 306         RX  100.00  182.00  270.00  288.00  318.00  329.00  333.00  338.00
 307         RY  1256.0 1254.00 1250.00 1248.00 1248.00 1250.00 1254.00 1256.00
             *

 308         KK     W43BASIN
 309         KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 310         KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 311         BA   0.209
 312         LG    0.20    0.28    3.48    0.55      61
 313         UI       0     971     508     111       0       0       0       0       0       0
 314         UI       0       0       0       0       0       0       0       0       0       0
 315         UI       0       0       0       0       0       0       0       0       0       0
 316         UI       0       0       0       0       0       0       0       0       0       0
 317         UI       0       0       0       0       0       0       0       0       0       0
             *

 318         KK   SRW43STORAGE
 319         KM        Verrado on-line storage basin (WLB) (WoodPatel ID SR23)
 320         KO
 321         RS       1    STOR
 322         SV            6.04   20.38   53.82  120.38  216.24  325.98  455.42  606.10  645.49
 323         SQ
 324         SE  1272.0 1276.00 1280.00 1284.00 1288.00 1292.00 1296.00 1300.00 1304.00 1305.00
 325         ST
             *

 326         KK  W43W44ROUTE
 327         KM        Cross-section: Side slopes and width based on aerial and topo
```

```
 328          KM        Manning's N Value: natural desert wash w/ vegetation
 329          RS       1     FLOW
 330          RC   0.035   0.035   0.035    8415  0.0125    0.00
 331          RX  100.00  145.00  180.00  210.00  220.00  245.00  270.00  295.00
 332          RY  1266.0 1264.00 1262.00 1258.00 1258.00 1262.00 1265.50 1266.00
              *

 333          KK     W44BASIN
 334          KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 335          KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 336          BA   0.598
 337          LG    0.35    0.35    4.90    0.29       0
 338          UI       0      55      89     214     334     438     500     527     506     421
 339          UI     332     266     206     162     127      99      82      59      48      37
 340          UI      37      13      14      13      14      13      14       0       0       0
 341          UI       0       0       0       0       0       0       0       0       0       0
 342          UI       0       0       0       0       0       0       0       0       0       0
              *
1                                     HEC-1 INPUT                                         PAGE  9

 LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 343          KK   CPW44COMBINE
 344          HC       3   5.153
              *

 345          KK  W44W46ROUTE
 346          KM        Cross-section: Estimated 2' deep, side slopes and width based on aerial
 347          KM        and topo. Manning's N Value: earth w/ sparse trees and shrubs
 348          RS       1     FLOW
 349          RC   0.032   0.032   0.032    1706  0.0070    0.00
 350          RX  100.00  116.00  132.00  162.00  192.00  252.00  272.00  292.00
 351          RY  1216.0 1215.00 1214.00 1208.00 1208.10 1210.00 1211.00 1212.00
              *

 352          KK     W45BASIN
 353          KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 354          KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 355          BA   1.035
 356          LG    0.35    0.33    7.30    0.11       3
 357          UI       0     136     414     824    1120    1399     860     697     573     441
 358          UI     336     286     202     161     130     104      71      67      47      26
 359          UI      26      26      26      26       0       0       0       0       0       0
 360          UI       0       0       0       0       0       0       0       0       0       0
 361          UI       0       0       0       0       0       0       0       0       0       0
              *

 362          KK  W45W46ROUTE
 363          KM        Cross-section: Based on aerial and topo
 364          KM        Manning's N Value: natural desert wash w/ vegetation
 365          RS       4     FLOW
 366          RC   0.035   0.035   0.035    9372  0.0125    0.00
 367          RX  100.00  160.00  205.00  265.00  285.00  310.00  345.00  385.00
 368          RY  1274.0 1270.00 1268.00 1262.00 1262.10 1272.00 1275.50 1276.00
              *

 369          KK     W46BASIN
 370          KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 371          KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 372          BA   0.926
 373          LG    0.27    0.29    6.40    0.18      16
 374          UI       0      88     165     367     477     592     749    1082     916     727
 375          UI     580     459     331     180     148      97      75      27      27      27
 376          UI      28      27       0       0       0       0       0       0       0       0
 377          UI       0       0       0       0       0       0       0       0       0       0
 378          UI       0       0       0       0       0       0       0       0       0       0
              *

 379          KK  CPW46ACOMBINE
 380          HC       2   1.961
              *
1                                     HEC-1 INPUT                                         PAGE 10

 LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 381          KK  DW46REDIVERT
 382          KM        Master Drainage Plan for the Caterpillar Property (Basin #27)
 383          DT    RW46     0.0     0.0
 384          DI     0.0    35.0    98.0   179.0   276.0   520.0   888.0  1339.0  1859.0  2439.0
 385          DQ     0.0     0.0     0.0     0.0     0.0   135.0   382.0   701.0  1080.0  1509.0
              *

 386          KK  CPW46BCOMBINE
 387          HC       2   7.114
              *

 388          KK  W46W54ROUTE
 389          KM        Cross-section: side slopes, width based on aerial and topo
 390          KM        Manning's N Value: natural desert wash w/ vegetation
 391          RS       1     FLOW
 392          RC   0.035   0.035   0.035    3908  0.0397    0.00
 393          RX  100.00  112.00  124.00  140.00  160.00  190.00  220.00  240.00
 394          RY  1194.5 1194.00 1190.00 1184.00 1184.10 1186.00 1190.00 1190.50
              *

 395          KK     W47BASIN
 396          KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 397          KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 398          BA   0.666
 399          LG    0.35    0.35    3.95    0.40      20
 400          UI       0      96     349     638     936     788     540     432     340     243
 401          UI     202     142     111      83      66      47      43      19      19      18
 402          UI      19      18       0       0       0       0       0       0       0       0
 403          UI       0       0       0       0       0       0       0       0       0       0
 404          UI       0       0       0       0       0       0       0       0       0       0
              *

 405          KK     W48BASIN
 406          KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 407          KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 408          BA   0.353
 409          LG    0.35    0.35    3.95    0.40      20
 410          UI       0      57     232     395     573     367     281     216     157     124
 411          UI      85      65      48      36      28      20      10      11      11      11
 412          UI       0       0       0       0       0       0       0       0       0       0
 413          UI       0       0       0       0       0       0       0       0       0       0
 414          UI       0       0       0       0       0       0       0       0       0       0
              *

 415          KK   CPW47COMBINE
 416          HC       2   1.019
              *

 417          KK  W47W49ROUTE
 418          KM        Cross-section: Based on aerial and topo
 419          KM        Manning's N Value: natural desert wash w/ vegetation
 420          RS       1     FLOW
 421          RC   0.035   0.035   0.035    5077  0.0414    0.00
 422          RX  100.00  150.00  190.00  210.00  235.00  255.00  275.00  310.00
1                                     HEC-1 INPUT                                         PAGE 11

 LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 423          RY  1740.0 1720.00 1710.00 1707.00 1708.00 1714.00 1730.00 1740.00
              *

 424          KK     W50BASIN
 425          KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 426          KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 427          BA   1.345
 428          LG    0.35    0.35    4.25    0.42      19
 429          UI       0     122     193     458     725     898    1129    1321     842     706
 430          UI     619     546     461     378     312     278     240     189     156     135
 431          UI     120      93      88      60      60      59      35      24      23      24
 432          UI      23      24      24      23      23       0       0       0       0       0
 433          UI       0       0       0       0       0       0       0       0       0       0
              *

 434          KK     W49BASIN
 435          KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 436          KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 437          BA   0.385
 438          LG    0.35    0.35    3.95    0.40      20
 439          UI       0      67     265     450     633     398     302     232     166     129
 440          UI      89      70      48      35      31      16      12      12      12      11
 441          UI       0       0       0       0       0       0       0       0       0       0
 442          UI       0       0       0       0       0       0       0       0       0       0
 443          UI       0       0       0       0       0       0       0       0       0       0
```

```
                 *

 444             KK   CPW49COMBINE
 445             HC       3   2.749
                 *

 446             KK  W49W51ROUTE
 447             KM         Cross-section: side slopes, width based on aerial and topo
 448             KM         Manning's N Value: natural desert wash w/ vegetation
 449             RS       1     FLOW
 450             RC   0.035   0.035   0.035    5726  0.0253    0.00
 451             RX  100.00  150.00  220.00  236.00  286.00  300.00  340.00  380.00
 452             RY  1485.0 1482.00 1479.00 1476.00 1476.10 1479.00 1485.00 1490.00
                 *

 453             KK     W51BASIN
 454             KM         BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 455             KM         WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 456             BA   0.149
 457             LG    0.35    0.35    3.85    0.43       1
 458             UI       0      21      74     140     188     200     165     113      79      55
 459             UI      38      26      18      14       5       5       5       5       0       0
 460             UI       0       0       0       0       0       0       0       0       0       0
 461             UI       0       0       0       0       0       0       0       0       0       0
 462             UI       0       0       0       0       0       0       0       0       0       0
                 *
1                                       HEC-1 INPUT                                         PAGE 12

LINE             ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 463             KK   CPW51COMBINE
 464             HC       2   2.898
                 *

 465             KK     W52BASIN
 466             KM         BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 467             KM         WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 468             BA   1.123
 469             LG    0.35    0.35    4.40    0.38       9
 470             UI       0     116     224     522     764     958    1288     824     673     577
 471             UI     489     413     317     275     240     179     147     128     100      88
 472             UI      67      57      56      35      22      22      22      22      22      22
 473             UI      22       0       0       0       0       0       0       0       0       0
 474             UI       0       0       0       0       0       0       0       0       0       0
                 *

 475             KK   CPW52COMBINE
 476             HC       2   4.021
                 *

 477             KK  W52W53ROUTE
 478             KM         Cross-section: Estimated 3' deep and 4:1 side slopes, width based on
 479             KM         aerial. Manning's N Value: natural desert wash w/ vegetation
 480             RS       1     FLOW
 481             RC   0.035   0.035   0.035    4917  0.0112    0.00
 482             RX  100.00  118.00  124.00  130.00  146.00  150.00  164.00  182.00
 483             RY  1375.0 1373.00 1370.00 1368.00 1368.00 1370.00 1373.00 1375.00
                 *

 484             KK     W53BASIN
 485             KM         BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 486             KM         WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 487             BA   0.568
 488             LG    0.30    0.32    4.45    0.42       7
 489             UI       0     223     858    1219     946     528     288     161      89      32
 490             UI      31       0       0       0       0       0       0       0       0       0
 491             UI       0       0       0       0       0       0       0       0       0       0
 492             UI       0       0       0       0       0       0       0       0       0       0
 493             UI       0       0       0       0       0       0       0       0       0       0
                 *

 494             KK   CPW53COMBINE
 495             HC       2   4.589
                 *

 496             KK  DW53REDIVERT
 497             KM         Verrado - Planning Unti Drainage Plan for Portions of Planning Unit V
 498             KM         (2nd Submittal) (ESTIMATED FROM GOLF BASINS IN REPORT)
 499             DT    RW53     0.0     0.0
 500             DI     0.0  1000.0  1500.0  2000.0  2500.0  3000.0  3500.0  4000.0  4145.0  4500.0
 501             DQ     0.0    10.0   115.0   290.0   460.0   715.0   980.0  1100.0  1145.0  1260.0
                 *
1                                       HEC-1 INPUT                                         PAGE 13

LINE             ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 502             KK  W53W54ROUTE
 503             KM         Cross-section: side slopes, width based on aerial and topo
 504             KM         Manning's N Value: natural desert wash w/ vegetation
 505             RS       2     FLOW
 506             RC   0.035   0.035   0.035    9900  0.0157    0.00
 507             RX  100.00  124.00  144.00  150.00  160.00  190.00  220.00  240.00
 508             RY  1194.5 1194.00 1190.00 1184.00 1184.10 1186.00 1190.00 1190.50
                 *

 509             KK     W54BASIN
 510             KM         BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 511             KM         WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 512             BA   0.980
 513             LG    0.23    0.26    4.50    0.43      18
 514             UI       0     105     248     485     621     807    1191    1143     882     676
 515             UI     520     329     183     143     104      33      32      32      33       0
 516             UI       0       0       0       0       0       0       0       0       0       0
 517             UI       0       0       0       0       0       0       0       0       0       0
 518             UI       0       0       0       0       0       0       0       0       0       0
                 *

 519             KK   CPW54COMBINE
 520             HC       3  12.683
                 *

 521             KK  W54W57ROUTE
 522             KM         Cross-section: side slopes and width based on aerial
 523             KM         Manning's N Value: natural desert wash w/ vegetation
 524             RS       1     FLOW
 525             RC   0.035   0.035   0.035    5173  0.0151    0.00
 526             RX  100.00  124.00  144.00  156.00  180.00  204.00  216.00  228.00
 527             RY  1126.0 1125.00 1124.00 1114.00 1114.10 1117.00 1117.50 1118.00
                 *

 528             KK     W56BASIN
 529             KM         BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 530             KM         WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 531             BA   0.448
 532             LG    0.17    0.28    4.20    0.61       5
 533             UI       0     143     474     812     956     583     279     126      47      28
 534             UI       0       0       0       0       0       0       0       0       0       0
 535             UI       0       0       0       0       0       0       0       0       0       0
 536             UI       0       0       0       0       0       0       0       0       0       0
 537             UI       0       0       0       0       0       0       0       0       0       0
                 *

 538             KK  DW56REDIVERT
 539             KM         Sienna Hills (aka Tesota Hills) Preliminary Drainage Report
 540             DT    RW56    35.6     0.0
 541             DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
 542             DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
                 *
1                                       HEC-1 INPUT                                         PAGE 14

LINE             ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 543             KK  W56W57ROUTE
 544             KM         Cross-section: Estimated 3' deep and 4:1 side slopes, width
 545             KM         based on aerial / Manning's N Value: clean straight earth
 546             RS       1     FLOW
 547             RC   0.022   0.022   0.022    4948  0.0038    0.00
 548             RX  100.00  108.00  116.00  128.00  131.00  143.00  153.00  163.00
 549             RY  1108.5 1108.25 1108.00 1105.00 1105.10 1108.00 1108.25 1108.50
                 *

 550             KK     W55BASIN
 551             KM         BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 552             KM         WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 553             BA   0.496
 554             LG    0.32    0.33    4.00    0.50      17
 555             UI       0      80     326     555     806     516     393     304     221     173
```

```
 556          UI     120      92      67      51      38      29      15      15      15      15
 557          UI       0       0       0       0       0       0       0       0       0       0
 558          UI       0       0       0       0       0       0       0       0       0       0
 559          UI       0       0       0       0       0       0       0       0       0       0
              *

 560          KK  DW55REDIVERT
 561          KM         Verado GOB5
 562          DT   DW55S     0.0     0.0
 563          DI     0.0    55.0   101.0   537.0  1297.0  2269.0  4708.0  7684.0 11074.0     0.0
 564          DQ     0.0     0.0     0.0   382.0  1080.0  1984.0  4269.0  7072.0 10310.0     0.0
              *

 565          KK  W55W57ROUTE
 566          KM         Cross-section: Estimated 2' deep and 4:1 side slopes, width
 567          KM         based on aerial / Manning's N Value: natural desert wash w/ vegetation
 568          RS       4    FLOW
 569          RC   0.035   0.035   0.035    5747  0.0096    0.00
 570          RX  100.00  110.00  120.00  136.00  156.00  172.00  192.00  212.00
 571          RY  1136.5 1136.25 1136.00 1134.00 1134.10 1136.00 1136.25 1136.50
              *

 572          KK     W57BASIN
 573          KM         BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 574          KM         WOOD/PATEL, 2006 MODIFIED SLIGHTLY TO MATCH NEW TOPO
 575          BA   1.161
 576          LG    0.27    0.29    4.65    0.37      19
 577          UI       0     138     388     695     889    1284    1641    1231     946     700
 578          UI     409     239     166     101      43      43      42       0       0       0
 579          UI       0       0       0       0       0       0       0       0       0       0
 580          UI       0       0       0       0       0       0       0       0       0       0
 581          UI       0       0       0       0       0       0       0       0       0       0
              *
1                                       HEC-1 INPUT                                             PAGE 15

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 582          KK  DW57REDIVERT
 583          KM         Master Drainage Plan for the Caterpillar Property (Basin #42)
 584          DT    RW57    21.6     0.0
 585          DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
 586          DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
              *

 587          KK   CPW57COMBINE
 588          HC       4  14.788
              *

 589          KK   SRW57STORAGE
 590          KM         Verrado SR42
 591          KO
 592          RS       1    STOR
 593          SV           24.40   29.60   35.70   42.00   48.50   55.20   62.20   69.30   76.70
 594          SQ                                  368.00 1040.00 1912.00 2944.00 4114.00 5410.00
 595          SE  1084.0 1090.00 1091.00 1092.00 1093.00 1094.00 1095.00 1096.00 1097.00 1098.00
 596          ST
              *

 597          KK  W57W58ROUTE
 598          KM         Cross-section: Taken from aerial and topo
 599          RS       1    FLOW
 600          RC   0.022   0.022   0.022    1236  0.0067    0.00
 601          RX  100.00  115.50  121.80  142.00  179.30  191.30  199.60  207.80
 602          RY  1072.0 1070.00 1064.00 1062.00 1061.90 1064.00 1065.00 1066.00
              *

 603          KK     W58BASIN
 604          KM         BASIN BOUNDARY VARIES FROM VERRADO DEVEL.COND.PLAN WOOD/PATEL 2006
 605          KM         NEW 2' CI TOPO OBTAINED 2008
 606          BA   0.131
 607          LG    0.30    0.33    4.65    0.35      18
 608          UI       0      25     101     176     208     180     117      75      48      32
 609          UI      19      14       5       5       6       0       0       0       0       0
 610          UI       0       0       0       0       0       0       0       0       0       0
 611          UI       0       0       0       0       0       0       0       0       0       0
 612          UI       0       0       0       0       0       0       0       0       0       0
              *

 613          KK   CPW58COMBINE
 614          HC       2  14.919
              *

 615          KK   SRW58STORAGE
 616          KM         Storage based on new topo section calculations
 617          KO
 618          RS       1    STOR
 619          SV            0.17    2.57    5.40   13.08   31.52   47.89   64.25  111.96  171.81
 620          SQ                  784.10 2217.60 3099.20 3799.80 4122.90 4540.00 6878.8012249.90
 621          SE  1084.0 1086.00 1088.00 1090.00 1092.00 1094.00 1095.00 1096.00 1098.00 1100.00
 622          ST
              *
1                                       HEC-1 INPUT                                             PAGE 16

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 623          KK  DW58SEDIVERT
 624          KM         Divert is stage storage on 4-10x8 boxes under I-10. Diverted flow goes s
 625          DT   DW58S     0.0     0.0
 626          DI     0.0   100.0  2000.0  4100.0  4200.0  5000.0  6000.0  7000.0  8000.0  9000.0
 627          DQ     0.0   100.0  2000.0  4100.0  4195.5  4606.7  4833.2  4983.7  5102.6  5203.3
              *

 628          KK     W38BASIN
 629          KM         BASIN BOUNDARY FORMED BY MCDOWELL, I-10, JACKRABBIT
 630          KM         AND TUTHILL, DETAILED I-10 TOPO AND CULVERT INFO
 631          BA   0.251
 632          LG    0.32    0.32    4.65    0.33       7
 633          UI       0      30      77     163     235     279     279     236     174     127
 634          UI      93      68      51      36      27      20      14       7       7       8
 635          UI       7       0       0       0       0       0       0       0       0       0
 636          UI       0       0       0       0       0       0       0       0       0       0
 637          UI       0       0       0       0       0       0       0       0       0       0
              *

 638          KK   CPW38COMBINE
 639          HC       2   15.17
              *

 640          KK  DW38SEDIVERT
 641          KM         Full flow capacity of culverts under I-10 is diverted flow
 642          DT   DW38S     0.0     0.0
 643          DI     0.0   100.0   200.0   300.0   400.0   467.0   500.0   800.0  1000.0 10000.0
 644          DQ     0.0   100.0   200.0   300.0   400.0   467.0   467.0   467.0   467.0   467.0
              *

 645          KK  W38W37ROUTE
 646          KM         Cross section based from 1990 topo, Manning's N Value: clean earth
 647          RS       3    FLOW
 648          RC   0.022   0.022   0.022    2849  0.0053    0.00
 649          RX  100.00  204.00  440.00  608.00  687.00  700.00  736.00  759.00
 650          RY  1083.0 1082.00 1080.00 1078.00 1078.00 1080.00 1082.00 1083.00
              *

 651          KK   CPW37COMBINE
 652          ZW   A=CIP B=CPW37 C=FLOW
 653          HC       3  19.291
              *
 654          ZZ
1
              SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
 LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

  NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

  38         WT3
              .
              .
  43          .         W21A
              .            .
              .            .
  55       CPW21A............
              V
              V
  58       21A28A
              .
              .
  65          .         W28A
```

```
                .         .
                .         .
    76     CPW28A..........
                V
                V
    79     W28A33
                .
                .
    86          .       W33
                .         .
                .         .
    97      CPW33..........
                V
                V
   100     W33W35
                .
                .
   107          .       W35
                .         .
                .         .
   117          .         .       W34
                .         .         V
                .         .         V
   127          .         .     SRW34
                .         .         V
                .         .         V
   135          .         .    W34W35
                .         .         .
                .         .         .
   142      CPW35....................
                V
                V
   145     W35W36
                .
                .
   152          .       W36
                .         .
                .         .
   163      CPW36..........
                V
                V
   166     W36W37
                .
                .
   173          .       W37
                .         .
                .         .
   183          .         .       W22
                .         .         V
                .         .         V
   193          .         .    W22W23
                .         .         .
                .         .         .
   200          .         .         .       W23
                .         .         .         .
                .         .         .         .
   210          .         .     CPW23..........
                .         .         V
                .         .         V
   212          .         .    W23W24
                .         .         .
                .         .         .
   219          .         .         .       W24
                .         .         .         .
                .         .         .         .
   229          .         .     CPW24..........
                .         .         V
                .         .         V
   231          .         .    W24W27
                .         .         .
                .         .         .
   238          .         .         .       W25
                .         .         .         V
                .         .         .         V
   248          .         .         .     SRW25
                .         .         .         V
                .         .         .         V
   256          .         .         .    W25W26
                .         .         .         .
                .         .         .         .
```

```
   263          .         .         .         .       W26
                .         .         .         .         .
                .         .         .         .         .
   273          .         .         .     CPW26..........
                .         .         .         V
                .         .         .         V
   275          .         .         .     SRW26
                .         .         .         V
                .         .         .         V
   283          .         .         .    W26W27
                .         .         .         .
                .         .         .         .
   290          .         .         .         .       W27
                .         .         .         .         .
                .         .         .         .         .
   300          .         .     CPW27....................
                .         .         V
                .         .         V
   302          .         .    W27W44
                .         .         .
                .         .         .
   308          .         .         .       W43
                .         .         .         V
                .         .         .         V
   318          .         .         .     SRW43
                .         .         .         V
                .         .         .         V
   326          .         .         .    W43W44
                .         .         .         .
                .         .         .         .
   333          .         .         .         .       W44
                .         .         .         .         .
                .         .         .         .         .
   343          .         .     CPW44....................
                .         .         V
                .         .         V
   345          .         .    W44W46
                .         .         .
                .         .         .
   352          .         .         .       W45
                .         .         .         V
                .         .         .         V
   362          .         .         .    W45W46
                .         .         .         .
                .         .         .         .
   369          .         .         .         .       W46
                .         .         .         .         .
                .         .         .         .         .
   379          .         .         .    CPW46A..........
                .         .         .         .
                .         .         .         .
   383          .         .         .         .------->    RW46
   381          .         .         .    DW46RE
                .         .         .         .
                .         .         .         .
   386          .         .    CPW46B..........
                .         .         V
                .         .         V
   388          .         .    W46W54
                .         .         .
                .         .         .
   395          .         .         .       W47
                .         .         .         .
                .         .         .         .
   405          .         .         .         .       W48
                .         .         .         .         .
                .         .         .         .         .
   415          .         .         .     CPW47..........
                .         .         .         V
                .         .         .         V
   417          .         .         .    W47W49
                .         .         .         .
                .         .         .         .
   424          .         .         .         .       W50
                .         .         .         .         .
                .         .         .         .         .
   434          .         .         .         .         .       W49
                .         .         .         .         .         .
                .         .         .         .         .         .
   444          .         .         .     CPW49....................
```

```
                .         .         .         V
                .         .         .         V
 446            .         .         .     W49W51
                .         .         .         .
                .         .         .         .
 453            .         .         .         .         W51
                .         .         .         .         .
                .         .         .         .         .
 463            .         .         .      CPW51...........
                .         .         .         .
                .         .         .         .
 465            .         .         .         .         W52
                .         .         .         .         .
                .         .         .         .         .
 475            .         .         .      CPW52...........
                .         .         .         V
                .         .         .         V
 477            .         .         .     W52W53
                .         .         .         .
                .         .         .         .
 484            .         .         .         .         W53
                .         .         .         .         .
                .         .         .         .         .
 494            .         .         .      CPW53...........
                .         .         .         .
                .         .         .         .
 499            .         .         .         .------->    RW53
 496            .         .         .     DW53RE
                .         .         .         V
                .         .         .         V
 502            .         .         .     W53W54
                .         .         .         .
                .         .         .         .
 509            .         .         .         .         W54
                .         .         .         .         .
                .         .         .         .         .
 519            .         .     CPW54.......................
                .         .         V
                .         .         V
 521            .         .     W54W57
                .         .         .
                .         .         .
 528            .         .         .     W56
                .         .         .         .
                .         .         .         .
 540            .         .         .         .------->    RW56
 538            .         .         .     DW56RE
                .         .         .         V
                .         .         .         V
 543            .         .         .     W56W57
                .         .         .         .
                .         .         .         .
 550            .         .         .         .         W55
                .         .         .         .         .
                .         .         .         .         .
 562            .         .         .         .         .------->    DW55S
 560            .         .         .         .     DW55RE
                .         .         .         .         V
                .         .         .         .         V
 565            .         .         .         .     W55W57
                .         .         .         .         .
                .         .         .         .         .
 572            .         .         .         .         .         W57
                .         .         .         .         .         .
                .         .         .         .         .         .
 584            .         .         .         .         .         .------->    RW57
 582            .         .         .         .         .     DW57RE
                .         .         .         .         .         .
                .         .         .         .         .         .
 587            .         .     CPW57.................................
                .         .         V
                .         .         V
 589            .         .     SRW57
                .         .         V
                .         .         V
 597            .         .     W57W58
                .         .         .
                .         .         .
 603            .         .         .     W58
                .         .         .         .
```

```
                .         .         .         .
 613            .         .      CPW58...........
                .         .         V
                .         .         V
 615            .         .      SRW58
                .         .         .
                .         .         .
 625            .         .         .------->    DW58S
 623            .         .     DW58SE
                .         .         .
                .         .         .
 628            .         .         .         W38
                .         .         .         .
                .         .         .         .
 638            .         .      CPW38...........
                .         .         .
                .         .         .
 642            .         .         .------->    DW38S
 640            .         .     DW38SE
                .         .         V
                .         .         V
 645            .         .     W38W37
                .         .         .
                .         .         .
 651     CPW37.......................
```

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

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	WT3	187.	17.00	186.	180.	99.	21.52		
+	HYDROGRAPH AT	W21A	139.	12.42	17.	4.	1.	.20		
+	2 COMBINED AT	CPW21A	187.	17.00	186.	180.	101.	.20		
+	ROUTED TO	21A28A	187.	17.42	186.	180.	100.	.20		
+	HYDROGRAPH AT	W28A	508.	12.42	61.	16.	5.	.64		
+	2 COMBINED AT	CPW28A	511.	12.42	200.	186.	105.	.84		
+	ROUTED TO	W28A33	445.	12.83	195.	185.	105.	.84		
+	HYDROGRAPH AT	W33	685.	12.42	81.	21.	7.	.84		
+	2 COMBINED AT	CPW33	792.	12.58	258.	201.	112.	1.68		
+	ROUTED TO	W33W35	764.	12.75	255.	200.	112.	1.68		
+	HYDROGRAPH AT	W35	233.	12.33	26.	7.	2.	.28		
+	HYDROGRAPH AT	W34	255.	12.25	28.	8.	3.	.23		
+	ROUTED TO	SRW34	0.	.00	0.	0.	0.	.23		
+	ROUTED TO	W34W35	0.	.00	0.	0.	0.	.23		
+	3 COMBINED AT	CPW35	853.	12.67	275.	205.	114.	2.19		

+	ROUTED TO	W35W36	804.	13.17	268.	204.	114.	2.19
+	HYDROGRAPH AT	W36	496.	12.50	69.	18.	6.	.72
+	2 COMBINED AT	CPW36	935.	13.08	315.	216.	119.	2.91
+	ROUTED TO	W36W37	888.	13.42	311.	215.	119.	2.91
+	HYDROGRAPH AT	W37	736.	12.58	113.	30.	10.	1.21
+	HYDROGRAPH AT	W22	961.	12.17	92.	27.	9.	.78
+	ROUTED TO	W22W23	934.	12.25	92.	27.	9.	.78
+	HYDROGRAPH AT	W23	1064.	12.17	106.	31.	10.	.90
+	2 COMBINED AT	CPW23	1968.	12.25	198.	58.	19.	1.68
+	ROUTED TO	W23W24	1783.	12.25	198.	58.	19.	1.68
+	HYDROGRAPH AT	W24	547.	12.25	57.	16.	5.	.47
+	2 COMBINED AT	CPW24	2320.	12.25	254.	74.	25.	2.15
+	ROUTED TO	W24W27	2107.	12.33	254.	74.	25.	2.15
+	HYDROGRAPH AT	W25	1037.	12.25	120.	32.	11.	1.10
+	ROUTED TO	SRW25	0.	.00	0.	0.	0.	1.10
+	ROUTED TO	W25W26	0.	.00	0.	0.	0.	1.10
+	HYDROGRAPH AT	W26	714.	12.33	92.	26.	9.	.68
+	2 COMBINED AT	CPW26	710.	12.33	91.	26.	9.	1.78
+	ROUTED TO	SRW26	0.	.00	0.	0.	0.	1.78
+	ROUTED TO	W26W27	0.	.00	0.	0.	0.	1.78
+	HYDROGRAPH AT	W27	495.	12.25	51.	14.	5.	.41
+	3 COMBINED AT	CPW27	2525.	12.33	303.	87.	29.	4.34
+	ROUTED TO	W27W44	2142.	12.50	302.	87.	29.	4.34
+	HYDROGRAPH AT	W43	467.	12.08	41.	14.	5.	.21
+	ROUTED TO	SRW43	0.	.00	0.	0.	0.	.21
+	ROUTED TO	W43W44	0.	.00	0.	0.	0.	.21
+	HYDROGRAPH AT	W44	440.	12.50	58.	14.	5.	.60
+	3 COMBINED AT	CPW44	2572.	12.50	359.	101.	34.	5.15
+	ROUTED TO	W44W46	2548.	12.50	359.	101.	34.	5.15
+	HYDROGRAPH AT	W45	1151.	12.25	134.	34.	11.	1.03
+	ROUTED TO	W45W46	994.	12.58	134.	34.	11.	1.03
+	HYDROGRAPH AT	W46	957.	12.50	130.	37.	12.	.93
+	2 COMBINED AT	CPW46A	1918.	12.50	263.	71.	24.	1.96
+	DIVERSION TO	RW46	1124.	12.50	108.	27.	9.	1.96
+	HYDROGRAPH AT	DW46RE	794.	12.50	155.	44.	15.	1.96
+	2 COMBINED AT	CPW46B	3331.	12.50	512.	144.	48.	7.11
+	ROUTED TO	W46W54	3283.	12.58	512.	144.	48.	7.11
+	HYDROGRAPH AT	W47	692.	12.25	83.	24.	8.	.67
+	HYDROGRAPH AT	W48	389.	12.25	44.	13.	4.	.35
+	2 COMBINED AT	CPW47	1077.	12.25	127.	37.	12.	1.02
+	ROUTED TO	W47W49	998.	12.33	127.	37.	12.	1.02
+	HYDROGRAPH AT	W50	971.	12.42	160.	47.	16.	1.35
+	HYDROGRAPH AT	W49	430.	12.25	48.	14.	5.	.38
+	3 COMBINED AT	CPW49	2214.	12.33	332.	98.	33.	2.75
+	ROUTED TO	W49W51	2034.	12.50	332.	98.	33.	2.75
+	HYDROGRAPH AT	W51	143.	12.33	13.	3.	1.	.15
+	2 COMBINED AT	CPW51	2144.	12.42	345.	101.	34.	2.90
+	HYDROGRAPH AT	W52	850.	12.42	117.	32.	11.	1.12
+	2 COMBINED AT	CPW52	2980.	12.42	459.	132.	44.	4.02
+	ROUTED TO	W52W53	2758.	12.50	459.	132.	44.	4.02
+	HYDROGRAPH AT	W53	791.	12.17	57.	15.	5.	.57
+	2 COMBINED AT	CPW53	2902.	12.50	514.	147.	49.	4.59
+	DIVERSION TO	RW53	665.	12.50	59.	15.	5.	4.59
	HYDROGRAPH AT							

+		DW53RE	2237.	12.50	455.	132.	44.	4.59
+	ROUTED TO	W53W54	2116.	12.67	455.	132.	44.	4.59
+	HYDROGRAPH AT	W54	957.	12.42	122.	35.	12.	.98
+	3 COMBINED AT	CPW54	6076.	12.58	1082.	309.	104.	12.68
+	ROUTED TO	W54W57	5911.	12.67	1081.	309.	104.	12.68
+	HYDROGRAPH AT	W56	558.	12.25	39.	10.	3.	.45
+	DIVERSION TO	RW56	558.	12.25	39.	10.	3.	.45
+	HYDROGRAPH AT	DW56RE	0.	.00	0.	0.	0.	.45
+	ROUTED TO	W56W57	0.	.00	0.	0.	0.	.45
+	HYDROGRAPH AT	W55	507.	12.25	56.	16.	5.	.50
+	DIVERSION TO	DW55S	355.	12.25	24.	6.	2.	.50
+	HYDROGRAPH AT	DW55RE	151.	12.25	31.	10.	3.	.50
+	ROUTED TO	W55W57	136.	12.58	31.	10.	3.	.50
+	HYDROGRAPH AT	W57	1251.	12.42	148.	43.	14.	1.16
+	DIVERSION TO	RW57	559.	12.08	37.	11.	4.	1.16
+	HYDROGRAPH AT	DW57RE	1251.	12.42	121.	32.	11.	1.16
+	4 COMBINED AT	CPW57	6785.	12.58	1228.	350.	117.	14.79
+	ROUTED TO	SRW57	6604.	12.67	1228.	334.	111.	14.79
+	ROUTED TO	W57W58	6575.	12.67	1228.	334.	111.	14.79
+	HYDROGRAPH AT	W58	166.	12.25	17.	5.	2.	.13
+	2 COMBINED AT	CPW58	6608.	12.67	1243.	338.	113.	14.92
+	ROUTED TO	SRW58	5281.	12.92	1244.	338.	113.	14.92
+	DIVERSION TO	DW58S	4670.	12.92	1207.	329.	110.	14.92
+	HYDROGRAPH AT	DW58SE	611.	12.92	37.	9.	3.	14.92
+	HYDROGRAPH AT	W38	237.	12.33	27.	7.	2.	.25
+	2 COMBINED AT	CPW38	657.	12.92	63.	16.	5.	15.17
+	DIVERSION TO	DW38S	467.	12.83	58.	15.	5.	15.17
+	HYDROGRAPH AT	DW38SE	190.	12.92	5.	1.	0.	15.17
+	ROUTED TO	W38W37	78.	13.17	5.	1.	0.	15.17
+	3 COMBINED AT	CPW37	1065.	13.25	406.	240.	129.	19.29

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

C.6 EXISTING CONDITIONS WITH PROJECT IN PLACE, 10-YEAR FOR FRS#3 AREA

```
1****************************************          ****************************************
 *                                      *          *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *          *   U.S. ARMY CORPS OF ENGINEERS       *
 *              JUN   1998              *          *   HYDROLOGIC ENGINEERING CENTER      *
 *           VERSION 4.1                *          *        609 SECOND STREET             *
 *                                      *          *     DAVIS, CALIFORNIA 95616          *
 * RUN DATE   10DEC09  TIME  15:52:37   *          *        (916) 756-1104                *
 *                                      *          *                                      *
 ****************************************          ****************************************


                    X     X  XXXXXXX   XXXXX           X
                    X     X  X        X     X         XX
                    X     X  X        X                X
                    XXXXXXX  XXXX     X        XXXXX   X
                    X     X  X        X                X
                    X     X  X        X     X          X
                    X     X  XXXXXXX   XXXXX          XXX


 THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

 THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
 THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
 NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
 DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
 KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                  HEC-1 INPUT                                        PAGE  1

 LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   1       ID          WHITE TANKS AREA, WATERSHED CONTRIBUTING TO FRS#3
   2       ID          PREPARED BY HOSKIN RYAN CONSULTANTS EXCLUSIVELY FOR
   3       ID          FRS#3 OUTLET CHANNEL DESIGN, 12-05-2009
   4       ID          BASED ON HDR LOOP303/WHITE TANKS ADMPU AHA (09-04-09)
   5       ID          HEC-1 MODEL OF EXISTING CONDITION W/ CIP
   6       ID          MODIFICATIONS INCLUDE:
   7       ID          (1) UPDATE WITH AVERAGE RAINFALL DEPTH FOR FRS#3 WATERSHED ONLY
   8       ID          (2) UPDATE THE STAGE-STORAGE-DISCHARGE CURVE BASED ON URS DESIGN
   9       ID              OF FRS#3 PRINCIPAL AND EMERGENCY SPILLWAY (DISCHARGE
  10       ID              INCLUDING INFILTRATION)
  11       ID          (3) SEPARATE FRS#3 OUTFLOW AND INFILTRATION
  12       ID      ****************************************************************
  13       ID        Flood Control District of Maricopa County
  14       ID        L303_EX_CIP_MB02 - Loop 303/ White Tanks ADMPU AHA
  15       ID        100 YEAR
  16       ID        24 Hour Storm
  17       ID        Unit Hydrograph: S-Graph
  18       ID        08/18/2009
  19       ID            FCDMC CONTRACT 2007C031
  20       ID            BY HDR ENGINEERING (#79902)
  21       ID            EXISTING CONDITIONS WITH CIP-AUGUST 2009
  22       ID            MAJOR BASIN 02
  23       ID            FILE NAME: ECIP-MB2.DAT
  24       IT       5  1JAN99    1200    2000
  25       IN      15
  26       IO       5
           *DIAGRAM
           *
  27       JD   2.572  0.0001
  28       PC   0.000   0.002   0.005   0.008   0.011   0.014   0.017   0.020   0.023   0.026
  29       PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056   0.060
  30       PC   0.064   0.068   0.072   0.076   0.080   0.085   0.090   0.095   0.100   0.105
  31       PC   0.110   0.115   0.120   0.126   0.133   0.140   0.147   0.155   0.163   0.172
  32       PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
  33       PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
  34       PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
  35       PC   0.913   0.918   0.922   0.926   0.930   0.934   0.938   0.942   0.946   0.950
  36       PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977   0.980
  37       PC   0.983   0.986   0.989   0.992   0.995   0.998   1.000
```

```
  38       JD   2.443    10.0
  39       JD   2.315    30.0
           *

  40       KK     L21BASIN
  41       KM         BASIN BOUNDARY FROM MCMICKEN DAM ON THE WEST AND THE
  42       KM         BEARDSLEY CSR ON THE EAST
  43       BA   0.525
  44       LG    0.34    0.32    4.55    0.37       1
  45       UI       0      20      20      20      21      58      70      88     109     125
  46       UI     140     158     170     180     187     193     193     194     187     179
  47       UI     172     150     140     123     113     101      93      83      76      70
  48       UI      61      56      51      45      40      38      34      31      32      22
  49       UI      21      21      20      14      14      14      13      14      11       5
           *
1                                  HEC-1 INPUT                                        PAGE  2

 LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  50       KK  DL21REDIVERT
  51       KM         Mass grading and Storage along canal
  52       DT    RL21    57.3     0.0
  53       DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
  54       DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
           *

  55       KK  L21L22ROUTE
  56       KM         Cross-section: Cross-section determined from A-team survey
  57       KM         Manning's N Value: earth w/sparse trees and brush, ponding against canal
  58       RS       1    FLOW
  59       RC   0.032   0.032   0.032    8793  0.0020    0.00
  60       RX  100.00  101.00  107.00  117.00  169.00  409.00  512.00  513.00
  61       RY  1328.1 1328.00 1326.00 1324.00 1324.10 1326.00 1328.00 1328.10
           *

  62       KK     L22BASIN
  63       KM         BASIN BOUNDARY FROM MCMICKEN DAM ON THE WEST AND THE
  64       KM         BEARDSLEY CSR ON THE EAST
  65       BA   0.362
  66       LG    0.34    0.34    4.35    0.39       0
  67       UI       0      19      19      21      56      79     101     124     144     162
  68       UI     170     183     184     177     172     154     133     117     103      89
  69       UI      78      68      59      52      43      38      36      29      28      20
  70       UI      20      18      13      13      13      12       5       5       4       5
  71       UI       5       4       5       4       5       5       4       0       0       0
           *

  72       KK  DL22REDIVERT
  73       KM         Storage along canal
  74       DT    RL22    15.6     0.0
  75       DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
  76       DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
           *

  77       KK   CPL22COMBINE
  78       HC       2   0.887
           *

  79       KK  L22W01ROUTE
  80       KM         Cross-section: Cross-section determined from 1991 topo
  81       KM         Manning's N Value: earth w/ sparse trees and brush
  82       RS       4    FLOW
  83       RC   0.032   0.032   0.032    3159  0.0063    0.00
  84       RX  100.00  101.00  102.00  115.00  128.00  140.00  141.00  142.00
  85       RY  1320.2 1320.10 1320.00 1314.00 1314.10 1320.00 1320.10 1320.20
           *

  86       KK     W01BASIN
  87       KM         BASIN BOUNDARY FROM FRS#3 ON THE WEST AND THE BEARDSLEY CSR ON THE EAST
  88       BA   0.191
  89       LG    0.34    0.34    3.95    0.40       0
  90       UI       0      38     144     258     304     262     170     110      71      44
  91       UI      29      21       8       7       8       0       0       0       0       0
1                                  HEC-1 INPUT                                        PAGE  3

 LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  92       UI       0       0       0       0       0       0       0       0       0       0
  93       UI       0       0       0       0       0       0       0       0       0       0
```

```
 94         UI       0       0       0       0       0       0       0       0       0       0
            *

 95         KK   CPW01COMBINE
 96         HC       2   1.078
            *

 97         KK  W01W02ROUTE
 98         KM        Cross-section: Estimated 3' deep and 4:1 side slopes
 99         KM        width based on aerial
100         KM        Manning's N Value: natural desert wash w/ vegetation
101         RS       1     FLOW
102         RC   0.035   0.035   0.035    2650  0.0053    0.00
103         RX  100.00  111.00  122.00  139.00  162.00  182.00  191.00  200.00
104         RY  1290.5 1290.25 1290.00 1286.00 1286.10 1290.00 1290.25 1290.50
            *

105         KK     W02BASIN
106         KM        BASIN BOUNDARY FROM 1990 TOPO, ALL FLOW TO SOUTH
107         KM        MCMICKEN DAM ON THE WEST AND THE BEARDSLEY CSR ON THE EAST
108         BA   0.394
109         LG    0.35    0.35    4.65    0.32       0
110         UI       0      56     195     370     497     530     435     300     209     145
111         UI      99      70      46      38      14      13      14      13       0       0
112         UI       0       0       0       0       0       0       0       0       0       0
113         UI       0       0       0       0       0       0       0       0       0       0
114         UI       0       0       0       0       0       0       0       0       0       0
            *

115         KK   CPW02COMBINE
116         HC       2   1.472
            *

117         KK  W02W05ROUTE
118         KM        Cross-section: Natural Desert Wash w/ vegatation
119         RS       1     FLOW
120         RC   0.035   0.035   0.035    2214  0.0045    0.00
121         RX  100.00  106.00  112.00  119.00  135.00  137.00  138.00  141.00
122         RY  1280.0 1278.00 1277.00 1276.00 1275.90 1277.00 1278.00 1280.00
            *

123         KK     W03BASIN
124         KM        BASIN BOUNDARY FROM 1990 TOPO
125         BA   1.971
126         LG    0.35    0.35    4.00    0.47      20
127         UI       0     145     146     415     653     907    1064    1233    1685    1257
128         UI     947     849     756     672     606     522     442     374     341     315
129         UI     263     217     186     167     159     119     113     107      71      72
130         UI      70      71      37      27      28      28      28      28      28      28
131         UI      27      29      27       0       0       0       0       0       0       0
            *
1                                  HEC-1 INPUT                                          PAGE  4

LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

132         KK  W03W04ROUTE
133         KM        Cross-section: Side slopes and width based on aerial and topo
134         KM        Manning's N Value: natural desert wash w/ vegetation
135         RS       3     FLOW
136         RC   0.035   0.035   0.035   18417  0.0490    0.00
137         RX  100.00  140.00  180.00  210.00  235.00  305.00  345.00  385.00
138         RY  1511.0 1510.50 1510.00 1502.00 1502.10 1510.00 1511.00 1512.00
            *

139         KK     W04BASIN
140         KM        BASIN BOUNDARY FROM 1990 TOPO
141         BA   2.034
142         LG    0.35    0.35    4.60    0.34      10
143         UI       0     144     147     379     620     881    1032    1176    1561    1470
144         UI     998     876     788     702     637     566     477     407     357     335
145         UI     304     239     203     188     158     157     113     111     105      72
146         UI      71      71      71      40      28      28      27      28      28      28
147         UI      28      28      27      28       0       0       0       0       0       0
            *

148         KK   CPW04COMBINE
149         HC       2   4.005
            *

150         KK  W04W05ROUTE
151         KM        Cross-section: Estimated 3' deep and 4:1 side slopes
152         KM        width based on aerial / Manning's N Value: clean straight earth
153         RS       2     FLOW
154         RC   0.035   0.035   0.035    5298  0.0098    0.00
155         RX  100.00  120.00  140.00  160.00  174.00  214.00  234.00  254.00
156         RY  1313.0 1312.50 1312.00 1308.00 1308.10 1312.00 1312.50 1313.00
            *

157         KK     W05BASIN
158         KM        BASIN BOUNDARY FROM 1990 TOPO AND BEARDSELY CSR
159         BA   0.316
160         LG    0.35    0.35    4.25    0.42       0
161         UI       0      32      62     147     214     282     302     300     260     199
162         UI     153     119      90      67      54      40      32      22      22       9
163         UI       7       8       8       8       8       0       0       0       0       0
164         UI       0       0       0       0       0       0       0       0       0       0
165         UI       0       0       0       0       0       0       0       0       0       0
            *

166         KK   CPW05COMBINE
167         HC       3   5.793
            *

168         KK  DW05SEDIVERT
169         KM        North Inlet Channel Divert from L303M3LA.OUT model given to HDR by
170         KM        FCDMC 05062009
171         DT   DW05S     0.0     0.0
172         DI   600.0   800.0  1000.0  1200.0  1400.0  1600.0  2000.0  2400.0  2715.0  2800.0
173         DQ   105.0   163.0   361.0   498.0   640.0   792.0  1100.0  1437.0  1605.0  1630.0
            *
1                                  HEC-1 INPUT                                          PAGE  5

LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

174         KK  W0512AROUTE
175         KM        White Tanks FRS#3 North Inlet Channel South
176         KM        Channel plans FCD Contract No 2007C021
177         KM        Cholla Wash
178         RS       3     FLOW
179         RC   0.050   0.030   0.050    5306  0.0083    0.00
180         RX  1010.0 1015.00 1020.00 1050.00 1100.00 1275.00 1580.00 1750.00
181         RY  1251.0 1249.00 1249.00 1245.00 1244.90 1250.00 1250.00 1254.00
            *

182         KK     W06BASIN
183         KM        BASIN BOUNDARY FROM 1990 TOPO
184         BA   0.707
185         LG    0.35    0.35    4.30    0.41      18
186         UI       0     103     362     675     987     837     576     461     363     257
187         UI     217     150     119      90      72      49      48      20      20      19
188         UI      20      20       0       0       0       0       0       0       0       0
189         UI       0       0       0       0       0       0       0       0       0       0
190         UI       0       0       0       0       0       0       0       0       0       0
            *

191         KK     W07BASIN
192         KM        BASIN BOUNDARY FROM 1990 TOPO
193         BA   0.312
194         LG    0.35    0.35    4.25    0.42      19
195         UI       0      65     253     428     510     316     236     171     126      89
196         UI      63      46      33      26      14      11      10      10       0       0
197         UI       0       0       0       0       0       0       0       0       0       0
198         UI       0       0       0       0       0       0       0       0       0       0
199         UI       0       0       0       0       0       0       0       0       0       0
            *

200         KK   CPW07COMBINE
201         HC       2   1.019
            *

202         KK  W07W08ROUTE
203         KM        Cross-section: Based on aerial and topo
204         KM        Manning's N Value: Natural Desert wash w/ vegetation
205         KM        N value modified to slow velocity
206         RS       1     FLOW
207         RC   0.045   0.040   0.045    5589  0.0796    0.00
208         RX  100.00  136.00  173.00  197.00  234.00  254.00  298.00  342.00
209         RY  2880.0 2865.00 2850.00 2840.00 2840.00 2850.00 2865.00 2880.00
```

```
                  *

 210              KK     W08BASIN
 211              KM        BASIN BOUNDARY FROM 1990 TOPO
 212              BA   0.446
 213              LG    0.35    0.35    3.95    0.40      20
 214              UI       0     156     587     941     577     413     262     183     117      78
 215              UI      49      32      19      19      19       0       0       0       0       0
 216              UI       0       0       0       0       0       0       0       0       0       0
 217              UI       0       0       0       0       0       0       0       0       0       0
1                                         HEC-1 INPUT                                             PAGE  6

LINE              ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 218              UI       0       0       0       0       0       0       0       0       0       0
                  *

 219              KK   CPW08COMBINE
 220              HC       2   1.465
                  *

 221              KK     W09BASIN
 222              KM        BASIN BOUNDARY FROM 1990 TOPO
 223              BA   0.335
 224              LG    0.35    0.35    3.95    0.40      20
 225              UI       0     125     468     716     427     304     193     127      85      53
 226              UI      37      19      14      15       0       0       0       0       0       0
 227              UI       0       0       0       0       0       0       0       0       0       0
 228              UI       0       0       0       0       0       0       0       0       0       0
 229              UI       0       0       0       0       0       0       0       0       0       0
                  *

 230              KK   CPW09COMBINE
 231              HC       2     1.8
                  *

 232              KK  W09W10ROUTE
 233              KM         Cross-section: Based on aerial and topo
 234              KM         Manning's N Value: Natural Desert wash w/ vegetation
 235              KM         N value modified to slow velocity
 236              RS       1     FLOW
 237              RC   0.045   0.040   0.045   11134  0.0683    0.00
 238              RX  100.00  137.00  172.00  192.00  220.00  230.00  284.00  338.00
 239              RY  1990.0 1975.00 1960.00 1950.00 1950.00 1960.00 1975.00 1990.00
                  *

 240              KK     W10BASIN
 241              KM        BASIN BOUNDARY FROM 1990 TOPO
 242              BA   1.338
 243              LG    0.35    0.35    3.95    0.40      20
 244              UI       0     153     376     806    1108    1572    1334     920     794     647
 245              UI     533     402     350     278     212     175     141     119      85      75
 246              UI      75      29      30      30      29      30      29       0       0       0
 247              UI       0       0       0       0       0       0       0       0       0       0
 248              UI       0       0       0       0       0       0       0       0       0       0
                  *

 249              KK   CPW10COMBINE
 250              HC       2   3.138
                  *

 251              KK     W11BASIN
 252              KM        BASIN BOUNDARY FROM 1990 TOPO
 253              BA   0.812
 254              LG    0.35    0.35    3.95    0.40      20
 255              UI       0     100     272     567     759    1098     696     556     469     375
 256              UI     285     236     190     141     116      92      77      52      48      39
 257              UI      20      19      19      19      19      20       0       0       0       0
 258              UI       0       0       0       0       0       0       0       0       0       0
1                                         HEC-1 INPUT                                             PAGE  7

LINE              ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 259              UI       0       0       0       0       0       0       0       0       0       0
                  *

 260              KK   CPW11COMBINE
 261              HC       2    3.95
                  *

 262              KK  W11W12ROUTE
 263              KM         Cross-section: Based on aerial and topo
 264              KM         Manning's N Value: Natural Desert wash w/ vegetation
 265              RS       8     FLOW
 266              RC   0.045   0.035   0.045   21182  0.0205    0.00
 267              RX  100.00  110.30  290.50  304.40  319.20  330.60  344.60  569.70
 268              RY  1312.0 1310.00 1308.00 1306.00 1305.90 1308.00 1310.00 1312.00
                  *

 269              KK     W12BASIN
 270              KM        BASIN BOUNDARY FROM 1990 TOPO AND BEARDSELY CSR
 271              BA   1.868
 272              LG    0.34    0.34    4.60    0.34       3
 273              UI       0     125     126     289     490     706     847     961    1170    1474
 274              UI    1002     820     727     654     604     537     483     418     353     310
 275              UI     293     266     221     193     160     148     139     120      96      96
 276              UI      83      61      61      61      61      37      24      24      24      24
 277              UI      24      25      24      24      24      24      24       0       0       0
                  *

 278              KK  DW05SERETRIEVE
 279              KM         Flow traveling down North Inlet Channel
 280              DR   DW05S
                  *

 281              KK  W0512BROUTE
 282              KM         White Tanks FRS#3 North Inlet Channel South
 283              KM         Channel plans FCD Contract No 2007C021
 284              KM         N value modifeid to mimic slowing of velocity by drop structures
 285              RS       2     FLOW
 286              RC   0.035   0.035   0.035    5494  0.0170    0.00
 287              RX  100.00  120.00  135.00  165.00  220.00  300.00  315.00  379.00
 288              RY  1244.7 1239.65 1239.50 1232.00 1231.90 1239.50 1239.65 1255.65
                  *

 289              KK   CPW12COMBINE
 290              HC       4   11.61
                  *

 291              KK  W12W13ROUTE
 292              KM         From NIC South Channel Plans at Sta. 535+00
 293              RS       1     FLOW
 294              RC   0.032   0.032   0.032    2062  0.0051    0.00
 295              RX  100.00  120.00  162.50  205.00  355.00  397.50  440.00  460.00
 296              RY  1218.4 1218.18 1211.10 1203.98 1204.45 1211.53 1218.65 1218.85
                  *
1                                         HEC-1 INPUT                                             PAGE  8

LINE              ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 297              KK     W13BASIN
 298              KM        BASIN BOUNDARY FROM 1990 TOPO AND BEARDSELY CSR
 299              BA   1.584
 300              LG    0.35    0.35    4.90    0.29       3
 301              UI       0     107     108     254     430     622     734     838    1035    1255
 302              UI     820     689     615     557     511     445     405     352     287     261
 303              UI     248     223     176     154     137     121     119      90      83      83
 304              UI      59      52      53      53      48      21      20      21      20      21
 305              UI      20      21      21      20      21      21       0       0       0       0
                  *

 306              KK   CPW13COMBINE
 307              HC       2  13.194
                  *

 308              KK  W13W16ROUTE
 309              KM         From NIC South Channel Plans
 310              KM         at Sta. 523+00
 311              RS       2     FLOW
 312              RC   0.032   0.032   0.032    6257  0.0051    0.00
 313              RX  100.00  115.00  162.00  209.10  359.10  435.90  465.00  480.00
 314              RY  1216.9 1216.77 1208.93 1201.09 1203.09 1215.09 1223.54 1223.69
                  *

 315              KK     W15BASIN
 316              KM        BASIN BOUNDARY FROM 1990 TOPO
 317              BA   1.227
 318              LG    0.35    0.35    4.55    0.35       0
 319              UI       0      98     112     315     498     652     757     975    1045     671
```

```
 320           UI     578     523     457     400     352     284     245     227     196     161
 321           UI     128     117     107      86      75      70      49      48      47      43
 322           UI      19      18      19      19      19      19      18      19      19       0
 323           UI       0       0       0       0       0       0       0       0       0       0
               *

 324           KK     W14BASIN
 325           KM         BASIN BOUNDARY FROM 1990 TOPO
 326           BA   1.582
 327           LG    0.35    0.37    5.20    0.25       3
 328           UI       0     165     333     776    1104    1420    1804    1142     948     811
 329           UI     682     567     431     386     320     242     201     182     128     124
 330           UI      82      80      79      32      32      32      32      31      32      32
 331           UI       0       0       0       0       0       0       0       0       0       0
 332           UI       0       0       0       0       0       0       0       0       0       0
               *

 333           KK  W14W15ROUTE
 334           KM         Cross-section: Based on aerial and topo
 335           KM         Manning's N Value: Natural Desert wash w/ vegetation
 336           RS       3    FLOW
 337           RC   0.035   0.035   0.035    7308  0.0104    0.00
 338           RX  100.00  130.00  150.00  184.00  210.00  226.00  246.00  276.00
 339           RY  1280.0 1276.00 1274.00 1270.00 1269.90 1274.00 1276.00 1280.00
               *
1                                        HEC-1 INPUT                                        PAGE  9

LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 340           KK   CPW15COMBINE
 341           HC       2   2.809
               *

 342           KK  W15W16ROUTE
 343           KM         Cross-section: Based on aerial and topo
 344           KM         Manning's N Value: Natural Desert wash w/ vegetation
 345           RS       1    FLOW
 346           RC   0.035   0.035   0.035    2750  0.0087    0.00
 347           RX  100.00  135.00  232.00  328.00  360.00  498.00  635.00  735.00
 348           RY  1202.0 1200.00 1199.00 1198.00 1197.90 1199.00 1200.00 1202.00
               *

 349           KK     W16BASIN
 350           KM         BASIN BOUNDARY FROM BEARDSLEY CSR, THE FRS#4 AND 1990 TOPO
 351           BA   0.530
 352           LG    0.22    0.22    4.55    0.33       0
 353           UI       0      61     148     318     464     562     575     509     384     282
 354           UI     211     157     115      87      65      42      42      15      14      15
 355           UI      15      15       0       0       0       0       0       0       0       0
 356           UI       0       0       0       0       0       0       0       0       0       0
 357           UI       0       0       0       0       0       0       0       0       0       0
               *

 358           KK   CPW16COMBINE
 359           HC       3  16.534
               *

 360           KK  W16W20ROUTE
 361           KM         Cross-section: Based on aerial and topo
 362           KM         Manning's N Value: clean earth; straight
 363           RS       1    FLOW
 364           RC   0.022   0.022   0.022    3633  0.0130    0.00
 365           RX  100.00  113.00  127.00  136.00  245.00  272.00  318.00  384.00
 366           RY  1186.0 1184.00 1182.00 1180.00 1179.90 1182.00 1184.00 1186.00
               *

 367           KK     W18BASIN
 368           KM         BASIN BOUNDARY FROM 1990 TOPO
 369           BA   1.260
 370           LG    0.35    0.35    4.40    0.38       8
 371           UI       0      38      38      38      38      38      99     112     147     168
 372           UI     200     230     242     261     278     296     307     348     390     440
 373           UI     461     337     285     264     241     228     223     213     202     195
 374           UI     185     177     171     161     152     148     137     130     119     110
 375           UI     100      97      93      90      89      86      79      81      68      62
               *

 376           KK     W17BASIN
 377           KM         BASIN BOUNDARY FROM 1990 TOPO
 378           BA   1.497
 379           LG    0.35    0.35    4.30    0.41      18
 380           UI       0     169     396     865    1197    1639    1571    1038     892     737
 381           UI     607     469     398     324     247     201     173     131     110      82
1                                        HEC-1 INPUT                                        PAGE 10

LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 382           UI      83      52      32      33      32      32      33      32       0       0
 383           UI       0       0       0       0       0       0       0       0       0       0
 384           UI       0       0       0       0       0       0       0       0       0       0
               *

 385           KK  W17W18ROUTE
 386           KM         Cross-section: Based on aerial and topo
 387           KM         Manning's N Value: natural desert wash w/ vegetation
 388           KM         and heavy vegetation
 389           RS       2    FLOW
 390           RC   0.045   0.035   0.045    8559  0.0257    0.00
 391           RX  100.00  140.00  150.00  156.00  194.00  216.00  255.00  342.00
 392           RY  1302.0 1300.00 1298.00 1296.00 1295.90 1298.00 1300.00 1302.00
               *

 393           KK   CPW18COMBINE
 394           HC       2   2.757
               *

 395           KK  W18W20ROUTE
 396           KM         Cross-section: Estimated 3' deep, side slopes and width based
 397           KM         on aerial / Manning's N Value: natural desert wash w/ vegetation
 398           RS       5    FLOW
 399           RC   0.035   0.035   0.035    6914  0.0058    0.00
 400           RX  100.00  155.00  170.00  210.00  216.00  256.00  276.00  336.00
 401           RY  1249.0 1248.25 1248.00 1245.00 1245.10 1248.00 1248.25 1249.00
               *

 402           KK     W19BASIN
 403           KM         BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 404           KM         WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 405           BA   1.158
 406           LG    0.35    0.35    3.88    0.42      20
 407           UI       0     241     939    1587    1896    1172     876     636     467     328
 408           UI     236     172     119      99      51      39      39      39       0       0
 409           UI       0       0       0       0       0       0       0       0       0       0
 410           UI       0       0       0       0       0       0       0       0       0       0
 411           UI       0       0       0       0       0       0       0       0       0       0
               *

 412           KK   SRW19STORAGE
 413           KM         Master Drainage Plan for the Caterpillar Property (Basin #16)
 414           KO
 415           RS       1    STOR
 416           SV            1.00   31.00  114.00  270.00  502.00  807.00 1319.00 1388.00 1460.00
 417           SQ                                                                          135.00
 418           SE  1198.0 1200.00 1210.00 1220.00 1230.00 1240.00 1250.00 1260.00 1261.00 1262.00
 419           ST
               *
1                                        HEC-1 INPUT                                        PAGE 11

LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 420           KK  W19W20ROUTE
 421           KM         Cross-section: Estimated 4' deep and 3:1 side slopes, width based
 422           KM         on aerial / Manning's N Value: earth with sparse treese and shrubs
 423           RS       1    FLOW
 424           RC   0.032   0.032   0.032    3790  0.0158    0.00
 425           RX  100.00  120.00  140.00  152.00  158.00  170.00  190.00  210.00
 426           RY  1240.5 1240.25 1240.00 1236.00 1236.00 1240.00 1240.25 1240.50
               *

 427           KK     W20BASIN
 428           KM         BASIN BOUNDARY FROM WHITE TANKS #4 FRS, S-S-D CURVES
 429           KM         FROM JAN 2009 FCDMC, AND FROM 1990 TOPO
 430           BA   1.137
 431           LG    0.29    0.29    4.10    0.44       0
 432           UI       0     104     165     390     618     777     969    1101     712     596
 433           UI     525     458     389     315     265     233     199     157     131     115
 434           UI      98      80      71      51      50      51      26      19      20      20
 435           UI      20      20      20      20      20       0       0       0       0       0
```

```
          436         UI       0       0       0       0       0       0       0       0       0       0
                      *

          437         KK   CPW20COMBINE
          438         HC       4  21.586
                      *

          439         KK   SRW20 STORAGE
          440         KM   STAGE-STORAGE-DISCHARGE CURVE FROM URS DESIGN OF FRS#3 OUTLET STRUCTURE
          441         KM   THE DISCHARGE INCLUDING OUTFLOW FROM PRINCIPAL AND EMERGENCY SPILLWAY,
          442         KM   AS WELL AS INFILTRATION
          443         RS       1    STOR      -1
          444         SV    44.8     388     585     846    1002    2045    3218    3557    4693    6510
          445         SQ    0.02    0.17     4.5     187     203     276     330    2936   24545   70439
          446         SE    1188    1198    1200    1202    1203    1208    1212    1213    1216    1220
                      *

          447         KK   OUTFL
          448         KM   SEPRATE OUTFLOW FROM INFILTRATION
                      * KO      1
          449         ZW   A=WT B=FRS3 C=FLOW
          450         DT    INFL
          451         DI       0     4.5      86     203     330    2936   24545   70439
          452         DQ       0     4.5      10      22      73      79      96     121
          453         ZZ
1
             SCHEMATIC DIAGRAM OF STREAM NETWORK

 INPUT
  LINE     (V) ROUTING         (--->) DIVERSION OR PUMP FLOW

   NO.     (.) CONNECTOR       (<---) RETURN OF DIVERTED OR PUMPED FLOW

   40          L21
               .
               .
   52          .------->   RL21
   50       DL21RE
               V
               V
   55       L21L22
               .
               .
   62          .          L22
               .            .
               .            .
   74          .            .------->   RL22
   72          .       DL22RE
               .            .
               .            .
   77        CPL22............
               V
               V
   79       L22W01
               .
               .
   86          .          W01
               .            .
               .            .
   95        CPW01............
               V
               V
   97       W01W02
               .
               .
  105          .          W02
               .            .
               .            .
  115        CPW02............
               V
               V
  117       W02W05
               .
               .
  123          .          W03
               .            V
               .            V
  132          .       W03W04
               .            .
               .            .
  139          .            .          W04
               .            .            .
               .            .            .
  148          .        CPW04............
               .            V
               .            V
  150          .       W04W05
               .            .
               .            .
  157          .            .          W05
               .            .            .
               .            .            .
  166        CPW05........................
               .
               .
  171          .------->   DW05S
  168       DW05SE
               V
               V
  174       W0512A
               .
               .
  182          .          W06
               .            .
               .            .
  191          .            .          W07
               .            .            .
               .            .            .
  200          .        CPW07............
               .            V
               .            V
  202          .       W07W08
               .            .
               .            .
  210          .            .          W08
               .            .            .
               .            .            .
  219          .        CPW08............
               .            .
               .            .
  221          .            .          W09
               .            .            .
               .            .            .
  230          .        CPW09............
               .            V
               .            V
  232          .       W09W10
               .            .
               .            .
  240          .            .          W10
               .            .            .
               .            .            .
  249          .        CPW10............
               .            .
               .            .
  251          .            .          W11
               .            .            .
               .            .            .
  260          .        CPW11............
               .            V
               .            V
  262          .       W11W12
               .            .
               .            .
  269          .            .          W12
               .            .            .
               .            .            .
  280          .            .            .            .<-------   DW05S
  278          .            .            .       DW05SE
               .            .            .            V
               .            .            .            V
  281          .            .            .       W0512B
               .            .            .            .
               .            .            .            .
  289        CPW12....................................
               V
               V
  291       W12W13
               .
               .
  297          .          W13
```

```
              .          .
              .          .
 306       CPW13...........
              V
              V
 308      W13W16
              .
              .
 315          .         W15
              .          .
              .          .
 324          .          .          W14
              .          .           V
              .          .           V
 333          .          .        W14W15
              .          .           .
              .          .           .
 340          .        CPW15...........
              .          V
              .          V
 342          .       W15W16
              .          .
              .          .
 349          .          .          W16
              .          .           .
              .          .           .
 358       CPW16......................
              V
              V
 360      W16W20
              .
              .
 367          .         W18
              .          .
              .          .
 376          .          .          W17
              .          .           V
              .          .           V
 385          .          .        W17W18
              .          .           .
              .          .           .
 393          .        CPW18...........
              .          V
              .          V
 395          .       W18W20
              .          .
              .          .
 402          .          .          W19
              .          .           V
              .          .           V
 412          .          .         SRW19
              .          .           V
              .          .           V
 420          .          .        W19W20
              .          .           .
              .          .           .
 427          .          .           .          W20
              .          .           .           .
              .          .           .           .
 437       CPW20.................................
              V
              V
 439       SRW20
              .
              .
 450          .------->    INFL
 447       OUTFL
```

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

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	L21	81.	13.25	24.	6.	2.	.52		
+	DIVERSION TO	RL21	81.	13.25	24.	6.	2.	.52		
+	HYDROGRAPH AT	DL21RE	0.	.00	0.	0.	0.	.52		
+	ROUTED TO	L21L22	0.	.00	0.	0.	0.	.52		
+	HYDROGRAPH AT	L22	72.	12.92	15.	4.	1.	.36		
+	DIVERSION TO	RL22	72.	12.92	15.	4.	1.	.36		
+	HYDROGRAPH AT	DL22RE	0.	.00	0.	0.	0.	.36		
+	2 COMBINED AT	CPL22	0.	.00	0.	0.	0.	.89		
+	ROUTED TO	L22W01	0.	.00	0.	0.	0.	.89		
+	HYDROGRAPH AT	W01	112.	12.25	8.	2.	1.	.19		
+	2 COMBINED AT	CPW01	111.	12.25	8.	2.	1.	1.08		
+	ROUTED TO	W01W02	75.	12.42	8.	2.	1.	1.08		
+	HYDROGRAPH AT	W02	209.	12.33	18.	5.	2.	.39		
+	2 COMBINED AT	CPW02	274.	12.33	26.	7.	2.	1.47		
+	ROUTED TO	W02W05	240.	12.42	26.	7.	2.	1.47		
+	HYDROGRAPH AT	W03	658.	12.58	132.	41.	14.	1.97		
+	ROUTED TO	W03W04	525.	12.92	132.	41.	14.	1.97		
+	HYDROGRAPH AT	W04	651.	12.58	118.	33.	11.	2.03		
+	2 COMBINED AT	CPW04	999.	12.67	248.	74.	25.	4.01		
+	ROUTED TO	W04W05	940.	12.92	248.	74.	25.	4.01		
+	HYDROGRAPH AT	W05	110.	12.42	13.	3.	1.	.32		
+	3 COMBINED AT	CPW05	1066.	12.83	286.	83.	28.	5.79		
+	DIVERSION TO	DW05S	406.	12.83	110.	39.	13.	5.79		
+	HYDROGRAPH AT	DW05SE	660.	12.83	176.	44.	15.	5.79		
+	ROUTED TO	W0512A	649.	13.08	176.	44.	15.	5.79		
+	HYDROGRAPH AT	W06	387.	12.25	47.	14.	5.	.71		
+	HYDROGRAPH AT	W07	194.	12.25	21.	6.	2.	.31		
+	2 COMBINED AT	CPW07	578.	12.25	68.	21.	7.	1.02		

+	ROUTED TO	W07W08	516.	12.33	68.	21.	7.	1.02
+	HYDROGRAPH AT	W08	337.	12.17	32.	10.	3.	.45
+	2 COMBINED AT	CPW08	761.	12.25	100.	30.	10.	1.47
+	HYDROGRAPH AT	W09	258.	12.17	24.	7.	2.	.34
+	2 COMBINED AT	CPW09	992.	12.25	124.	37.	13.	1.80
+	ROUTED TO	W09W10	748.	12.42	124.	37.	13.	1.80
+	HYDROGRAPH AT	W10	663.	12.33	95.	29.	10.	1.34
+	2 COMBINED AT	CPW10	1379.	12.42	218.	66.	22.	3.14
+	HYDROGRAPH AT	W11	423.	12.33	58.	18.	6.	.81
+	2 COMBINED AT	CPW11	1785.	12.33	275.	83.	28.	3.95
+	ROUTED TO	W11W12	1304.	13.08	275.	83.	28.	3.95
+	HYDROGRAPH AT	W12	527.	12.67	91.	24.	8.	1.87
+	HYDROGRAPH AT	DW05SE	406.	12.83	110.	39.	13.	5.79
+	ROUTED TO	W0512B	350.	13.08	110.	39.	13.	5.79
+	4 COMBINED AT	CPW12	2513.	13.08	638.	186.	62.	11.61
+	ROUTED TO	W12W13	2489.	13.17	638.	186.	62.	11.61
+	HYDROGRAPH AT	W13	470.	12.67	81.	21.	7.	1.58
+	2 COMBINED AT	CPW13	2669.	13.08	708.	205.	69.	13.19
+	ROUTED TO	W13W16	2577.	13.33	707.	205.	69.	13.19
+	HYDROGRAPH AT	W15	373.	12.50	53.	13.	4.	1.23
+	HYDROGRAPH AT	W14	677.	12.42	83.	22.	7.	1.58
+	ROUTED TO	W14W15	557.	12.67	83.	22.	7.	1.58
+	2 COMBINED AT	CPW15	897.	12.58	135.	35.	12.	2.81
+	ROUTED TO	W15W16	738.	12.75	135.	35.	12.	2.81
+	HYDROGRAPH AT	W16	284.	12.42	30.	8.	3.	.53
+	3 COMBINED AT	CPW16	2925.	13.25	847.	240.	80.	16.53
+	ROUTED TO	W16W20	2910.	13.33	846.	240.	80.	16.53
+	HYDROGRAPH AT	W18	193.	13.50	60.	17.	6.	1.26
+	HYDROGRAPH AT	W17	687.	12.33	100.	30.	10.	1.50
+	ROUTED TO	W17W18	563.	12.58	99.	30.	10.	1.50
+	2 COMBINED AT	CPW18	630.	12.58	159.	46.	16.	2.76
+	ROUTED TO	W18W20	560.	13.00	158.	46.	16.	2.76
+	HYDROGRAPH AT	W19	740.	12.25	82.	25.	8.	1.16
+	ROUTED TO	SRW19	0.	.00	0.	0.	0.	1.16
+	ROUTED TO	W19W20	0.	.00	0.	0.	0.	1.16
+	HYDROGRAPH AT	W20	384.	12.42	50.	12.	4.	1.14
+	4 COMBINED AT	CPW20	3339.	13.25	1016.	289.	97.	21.59
+	ROUTED TO	SRW20	18.	27.33	18.	14.	8.	21.59
+	DIVERSION TO	INFL	5.	27.17	5.	5.	5.	21.59
+	HYDROGRAPH AT	OUTFL	13.	27.33	12.	9.	3.	21.59

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

C.7 EXISTING CONDITIONS WITH PROJECT IN PLACE, 10-YEAR FOR JACKRABBIT CORRIDOR

```
1****************************************                 ***************************************
 *                                      *                 *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                 *   U.S. ARMY CORPS OF ENGINEERS      *
 *             JUN   1998               *                 *   HYDROLOGIC ENGINEERING CENTER     *
 *           VERSION 4.1                *                 *         609 SECOND STREET           *
 *                                      *                 *      DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   10DEC09  TIME  15:53:08  *                 *         (916) 756-1104              *
 *                                      *                 *                                     *
****************************************                  ***************************************


                    X     X  XXXXXXX   XXXXX           X
                    X     X  X        X     X         XX
                    X     X  X        X                X
                    XXXXXXX  XXXX     X        XXXXX   X
                    X     X  X        X                X
                    X     X  X        X     X          X
                    X     X  XXXXXXX   XXXXX          XXX


  THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

  THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
  THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
  NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
  DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL    LOSS RATE:GREEN AND AMPT INFILTRATION
  KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                        HEC-1 INPUT                                        PAGE  1

 LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   1           ID           WHITE TANKS AREA, WATERSHED CONTRIBUTING TO FRS#3
   2           ID           PREPARED BY HOSKIN RYAN CONSULTANTS EXCLUSIVELY FOR
   3           ID           FRS#3 OUTLET CHANNEL DESIGN, 12-09-2009
   4           ID           BASED ON HDR LOOP303/WHITE TANKS ADMPU AHA (09-04-09)
   5           ID           HEC-1 MODEL OF EXISTING CONDITIONS WITH CIP
   6           ID           MODIFICATIONS INCLUDE:
   7           ID           (1) UPDATE WITH AVERAGE RAINFALL DEPTH FOR JACKRABBIT CORRIDOR
   8           ID           (2) UPDATE THE PROPOSED CHANNEL DESIGN
   9           ID           (3) DELETE RETENTION OF PASQUELETTI TO REFLECT EXIST CONDITIONS
  10           ID
  11           ID           ************************************************************
  12           ID       Flood Control District of Maricopa County
  13           ID       L303_EX_CIP_MB02 - Loop 303/ White Tanks ADMPU AHA
  14           ID       100 YEAR
  15           ID       24 Hour Storm
  16           ID       Unit Hydrograph: S-Graph
  17           ID       08/18/2009
  18           ID           FCDMC CONTRACT 2007C031
  19           ID           BY HDR ENGINEERING (#79902)
  20           ID           EXISTING CONDITIONS WITH CIP-AUGUST 2009
  21           ID           MAJOR BASIN 02
  22           ID           FILE NAME: ECIP-MB2.DAT
  23           IT       5  1JAN99    1200    2000
  24           IN      15
  25           IO       5
               *DIAGRAM
               *
  26           JD   2.353  0.0001
  27           PC   0.000   0.002   0.005   0.008   0.011   0.014   0.017   0.020   0.023   0.026
  28           PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056   0.060
  29           PC   0.064   0.068   0.072   0.076   0.080   0.085   0.090   0.095   0.100   0.105
  30           PC   0.110   0.115   0.120   0.126   0.133   0.140   0.147   0.155   0.163   0.172
  31           PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
  32           PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
  33           PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
  34           PC   0.913   0.918   0.922   0.926   0.930   0.934   0.938   0.942   0.946   0.950
  35           PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977   0.980
  36           PC   0.983   0.986   0.989   0.992   0.995   0.998   1.000
  37           JD   2.235    10.0
               *
  38           KK     WT3
  39           KM   OUTFLOW FROM WT FRS#3 OUTLET
  40           BA   21.52
  41           KO       5
  42           ZR  =QI A=WT B=FRS3 C=FLOW
               *
  43           KK     W21ABASIN
  44           KM          Boundary based on Preliminary Design Plans for
  45           KM          White Tanks FRS #3 Outfall Channel dated
  46           KM          12-08-2008 prepared by Gannett Fleming
  47           ZW    A=CIP B=W21A C=FLOW
  48           BA   0.199
  49           LG    0.35    0.35    4.35    0.40       0
1                                        HEC-1 INPUT                                        PAGE  2

 LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  50           UI       0      19      35      81     123     161     180     182     168     133
  51           UI     102      82      62      49      38      30      21      18      13      13
  52           UI       5       5       4       5       5       5       0       0       0       0
  53           UI       0       0       0       0       0       0       0       0       0       0
  54           UI       0       0       0       0       0       0       0       0       0       0
               *
  55           KK  CPW21ACOMBINE
  56           ZW   A=CIP B=CPW21A C=FLOW
  57           HC       2   0.199
               *
  58           KK  21A28A   ROUTE
  59           KM   PROPOSED JACKRABBIT CHANNEL, BOTTOM WIDTH=30FT, SIDE SLOPE 6:1
  60           ZW   A=CIP B=21A28A C=FLOW
  61           RS       4    FLOW      -1
  62           RC   0.045   0.035   0.045    3560  0.0010
  63           RX     100     110     120     150     180     210     220     230
  64           RY    1001    1000    1000     995     995    1000    1000    1001
               *
  65           KK     W28ABASIN
  66           KM          Boundary based on Preliminary Design Plans for
  67           KM          White Tanks FRS #3 Outfall Channel dated
  68           KM          12-08-2008 prepared by Gannett Fleming
  69           BA   0.642
  70           LG    0.34    0.32    4.55    0.35       1
  71           UI       0      65     127     296     444     573     621     609     524     407
  72           UI     308     239     181     135     110      80      64      45      44      16
  73           UI      17      16      16      16      16       0       0       0       0       0
  74           UI       0       0       0       0       0       0       0       0       0       0
  75           UI       0       0       0       0       0       0       0       0       0       0
               *
  76           KK  CPW28ACOMBINE
  77           ZW   A=CIP B=CPW28A C=FLOW
  78           HC       2   0.841
               *
  79           KK  W28A33   ROUTE
  80           KM   PROPOSED JACKRABBIT CHANNEL, BOTTOM WIDTH=40FT, SIDE SLOPE 4:1
  81           ZW   A=CIP B=W28A33 C=FLOW
  82           RS       5    FLOW      -1
  83           RC   0.045   0.035   0.045    4336  0.0010
  84           RX     100     110     120     140     180     200     210     220
  85           RY    1001    1000    1000     995     995    1000    1000    1001
               *
  86           KK     W33BASIN
  87           KM          BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
  88           KM          WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
  89           ZW   A=CIP B=W33 C=FLOW
  90           BA   0.839
  91           LG    0.31    0.27    4.00    0.47       4
  92           UI       0      92     207     460     670     834     886     810     641     473
1                                        HEC-1 INPUT                                        PAGE  3

 LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  93           UI     361     275     195     155     114      85      63      52      23      22
```

```
  94        UI     23     22     23      0      0      0      0      0      0      0
  95        UI      0      0      0      0      0      0      0      0      0      0
  96        UI      0      0      0      0      0      0      0      0      0      0
            *

  97        KK   CPW33COMBINE
  98        ZW   A=CIP B=CPW33 C=FLOW
  99        HC      2   1.68
            *

 100        KK  W33W35   ROUTE
 101        KM   PROPOSED JACKRABBIT CHANNEL, BOTTOM WIDTH=40FT, SIDE SLOPE 6:1
 102        ZW   A=CIP B=W33W35 C=FLOW
 103        RS      3   FLOW     -1
 104        RC  0.045  0.035  0.045   2658 0.0010
 105        RX    100    110    116    152    192    228    240    250
 106        RY   1001   1000   1000    994    994   1000   1000   1001
            *

 107        KK     W35BASIN
 108        KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 109        KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 110        BA   0.283
 111        LG   0.32   0.34   3.71   0.47      4
 112        UI      0     33     83    180    257    312    308    268    201    146
 113        UI    108     80     58     43     33     22     19      8      8      8
 114        UI      8      8      0      0      0      0      0      0      0      0
 115        UI      0      0      0      0      0      0      0      0      0      0
 116        UI      0      0      0      0      0      0      0      0      0      0
            *

 117        KK     W34BASIN
 118        KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 119        KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 120        BA   0.228
 121        LG   0.32   0.31   3.74   0.46     20
 122        UI      0     33    131    238    312    316    236    162    111     74
 123        UI     52     34     23     13      9      8      9      0      0      0
 124        UI      0      0      0      0      0      0      0      0      0      0
 125        UI      0      0      0      0      0      0      0      0      0      0
 126        UI      0      0      0      0      0      0      0      0      0      0
            *

 127        KK   SRW34STORAGE
 128        KM        Master Drainage Plan for the Caterpillar Property (Basin #29)
 129        KO
 130        RS      1   STOR
 131        SV          0.99  12.73  23.45  36.25  50.68  54.76  59.33  83.20
 132        SQ                                                 88.00 6226.00
 133        SE  1164.5 1166.00 1170.00 1172.00 1174.00 1176.00 1177.50 1178.00 1180.00
 134        ST
            *
1                                   HEC-1 INPUT                                  PAGE  4

LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 135        KK  W34W35ROUTE
 136        KM        Cross-section: Estimated 3' deep and 4:1 side slopes, width based on
 137        KM        aerial. Manning's N Value: clean straight earth
 138        RS      1   FLOW
 139        RC  0.022  0.022  0.022    813 0.0111   0.00
 140        RX 100.00 104.00 108.00 120.00 132.00 144.00 152.00 160.00
 141        RY 1166.2 1166.10 1166.00 1160.00 1160.10 1162.00 1162.10 1162.20
            *

 142        KK   CPW35COMBINE
 143        ZW   A=CIP B=CPW35 C=FLOW
 144        HC      3  2.191
            *

 145        KK  W35W36   ROUTE
 146        KM   PROPOSED JACKRABBIT CHANNEL, BOTTOM WIDTH=40FT, SIDE SLOPE 4:1
 147        ZW   A=CIP B=W35W36 C=FLOW
 148        RS      7   FLOW     -1
 149        RC  0.045  0.035  0.045   6051 0.0010
 150        RX    100    110    116    140    180    204    220    230
 151        RY   1001   1000   1000    994    994   1000   1000   1001
            *

 152        KK     W36BASIN
 153        KM        Boundary based on Aerial, topo, and Preliminary
 154        KM        Design Plans for White Tanks FRS #3 Outfall Channel
 155        KM        dated 12-08-2008 prepared by Gannett Fleming
 156        BA   0.720
 157        LG   0.31   0.28   4.00   0.47      4
 158        UI      0     65    101    247    385    507    591    617    609    513
 159        UI    409    329    255    204    160    126    102     76     64     45
 160        UI     45     25     16     16     15     16     16     16      0      0
 161        UI      0      0      0      0      0      0      0      0      0      0
 162        UI      0      0      0      0      0      0      0      0      0      0
            *

 163        KK   CPW36COMBINE
 164        ZW   A=CIP B=CPW36 C=FLOW
 165        HC      2  2.911
            *

 166        KK  W36W37   ROUTE
 167        KM   PROPOSED JACKRABBIT CHANNEL, BOTTOM WIDTH=30FT, SIDE SLOPE 5:1
 168        ZW   A=CIP B=W36W37 C=FLOW
 169        RS      5   FLOW     -1
 170        RC  0.045  0.035  0.045   4527 0.0010
 171        RX    100    110    120    150    180    210    220    230
 172        RY   1001   1000   1000    994    994   1000   1000   1001
            *
1                                   HEC-1 INPUT                                  PAGE  5

LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 173        KK     W37BASIN
 174        KM        WESTERN LIMIT DEFINED BY JACKRABBIT WASH
 175        KM        CAPACITY APPROX 12,000 CFS, VALENCIA HEIGHTS
 176        BA   1.210
 177        LG   0.32   0.31   4.20   0.44      4
 178        UI      0     96    112    318    497    664    822    897    937    893
 179        UI    777    643    515    421    344    278    221    186    148    115
 180        UI    104     69     66     63     23     24     23     24     23     24
 181        UI     24      0      0      0      0      0      0      0      0      0
 182        UI      0      0      0      0      0      0      0      0      0      0
            *

 183        KK     W22BASIN
 184        KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 185        KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 186        BA   0.782
 187        LG   0.35   0.35   4.15   0.44     19
 188        UI      0    237    914   1559   1035    751    503    352    228    158
 189        UI    107     80     37     31     31     31      0      0      0      0
 190        UI      0      0      0      0      0      0      0      0      0      0
 191        UI      0      0      0      0      0      0      0      0      0      0
 192        UI      0      0      0      0      0      0      0      0      0      0
            *

 193        KK  W22W23ROUTE
 194        KM        Cross-section: Based on aerial and topo
 195        KM        Manning's N Value: pavement and natural desert wash w/ vegetation
 196        RS      1   FLOW
 197        RC  0.035  0.013  0.035   4866 0.0719   0.00
 198        RX 100.00 112.00 113.00 126.00 439.00 477.00 496.00 515.00
 199        RY 1820.0 1815.00 1810.00 1800.00 1799.90 1810.00 1815.00 1820.00
            *

 200        KK     W23BASIN
 201        KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 202        KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 203        BA   0.897
 204        LG   0.35   0.35   4.35   0.40     18
 205        UI      0    236    906   1581   1306    885    636    424    309    204
 206        UI    145     98     80     33     34     33     33      0      0      0
 207        UI      0      0      0      0      0      0      0      0      0      0
 208        UI      0      0      0      0      0      0      0      0      0      0
 209        UI      0      0      0      0      0      0      0      0      0      0
            *

 210        KK   CPW23COMBINE
 211        HC      2  1.679
            *
1                                   HEC-1 INPUT                                  PAGE  6
```

```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 212          KK  W23W24ROUTE
 213          KM        Cross-section: Based on aerial and topo
 214          KM        Manning's N Value: natural desert wash w/ vegetation
 215          RS       1    FLOW
 216          RC   0.045   0.035   0.045    5335  0.0367    0.00
 217          RX  100.00  120.00  140.00  180.00  220.00  240.00  260.00  280.00
 218          RY  1462.0 1461.00 1460.00 1450.00 1450.10 1460.00 1461.00 1462.00
              *

 219          KK     W24BASIN
 220          KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 221          KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 222          BA   0.475
 223          LG    0.35    0.35    4.90    0.29      14
 224          UI       0      88     342     575     788     483     372     280     201     154
 225          UI     104      82      60      39      38      15      14      15      15       0
 226          UI       0       0       0       0       0       0       0       0       0       0
 227          UI       0       0       0       0       0       0       0       0       0       0
 228          UI       0       0       0       0       0       0       0       0       0       0
              *

 229          KK   CPW24COMBINE
 230          HC       2   2.154
              *

 231          KK  W24W27ROUTE
 232          KM        Cross-section: Based on aerial and topo
 233          KM        Manning's N Value: natural desert wash w/ vegetation
 234          RS       1    FLOW
 235          RC   0.035   0.035   0.035    5873  0.0289    0.00
 236          RX  100.00  120.00  140.00  160.00  180.00  200.00  220.00  240.00
 237          RY  1094.0 1092.00 1090.00 1084.00 1084.10 1090.00 1090.25 1090.50
              *

 238          KK     W25BASIN
 239          KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 240          KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 241          BA   1.099
 242          LG    0.35    0.35    4.80    0.30       8
 243          UI       0     143     438     866    1174    1490     915     737     620     467
 244          UI     358     307     216     171     140     110      76      71      53      27
 245          UI      28      28      27      28       0       0       0       0       0       0
 246          UI       0       0       0       0       0       0       0       0       0       0
 247          UI       0       0       0       0       0       0       0       0       0       0
              *

 248          KK   SRW25STORAGE
 249          KM        Verrado on-line storage basin (WoodPatel ID SR20)
 250          KO
 251          RS       1    STOR
 252          SV            1.05    9.43   26.91   54.31   92.89  138.67  176.47  190.08  219.05
 253          SQ                                                                265.00 1377.00
 254          SE  1443.0 1446.00 1450.00 1454.00 1458.00 1462.00 1466.00 1469.00 1470.00 1472.00
 255          ST
              *
1                                          HEC-1 INPUT                                          PAGE  7

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 256          KK  W25W26ROUTE
 257          KM        Cross-section: Based on aerial and topo
 258          KM        Manning's N Value: natural desert wash w/ vegetation
 259          RS       1    FLOW
 260          RC   0.035   0.035   0.035    6978  0.0178    0.00
 261          RX  100.00  120.00  140.00  156.00  176.00  192.00  212.00  232.00
 262          RY  1451.5 1451.25 1451.00 1447.00 1447.10 1451.00 1451.25 1451.50
              *

 263          KK     W26BASIN
 264          KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 265          KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 266          BA   0.682
 267          LG    0.33    0.37    6.20    0.17      15
 268          UI       0      86     245     500     680     926     574     465     390     304
 269          UI     231     197     152     110      95      69      59      43      42      21
 270          UI      17      16      17      16      17       0       0       0       0       0
 271          UI       0       0       0       0       0       0       0       0       0       0
 272          UI       0       0       0       0       0       0       0       0       0       0
              *

 273          KK   CPW26COMBINE
 274          HC       2   1.781
              *

 275          KK   SRW26STORAGE
 276          KM        Verrado on-line storage basin (WoodPatel ID SR21 and PH 6 Golf)
 277          KO
 278          RS       1    STOR
 279          SV            0.68   20.68   57.58   95.91  102.34  117.65  130.00
 280          SQ                                            265.00 1377.00 2000.00
 281          SE  1319.0 1320.00 1330.00 1340.00 1347.00 1348.00 1350.00 1351.00
 282          ST
              *

 283          KK  W26W27ROUTE
 284          KM        Cross-section: based on topo and aerial
 285          KM        Manning's N Value: natural desert wash w/ vegetation
 286          RS       1    FLOW
 287          RC   0.035   0.035   0.035    3484  0.0172    0.00
 288          RX  100.00  120.00  140.00  152.00  168.00  180.00  200.00  220.00
 289          RY  1298.5 1298.25 1298.00 1294.00 1294.10 1298.00 1298.25 1298.50
              *

 290          KK     W27BASIN
 291          KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 292          KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 293          BA   0.411
 294          LG    0.32    0.37    5.80    0.20      11
 295          UI       0      76     296     498     681     418     323     241     174     133
 296          UI      91      71      51      34      33      13      13      13      13       0
 297          UI       0       0       0       0       0       0       0       0       0       0
 298          UI       0       0       0       0       0       0       0       0       0       0
 299          UI       0       0       0       0       0       0       0       0       0       0
              *
1                                          HEC-1 INPUT                                          PAGE  8

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 300          KK   CPW27COMBINE
 301          HC       3   4.345
              *

 302          KK  W27W44ROUTE
 303          KM        Cross-section: Clean straight earth
 304          RS       1    FLOW
 305          RC   0.022   0.022   0.022    7169  0.0098    0.00
 306          RX  100.00  182.00  270.00  288.00  318.00  329.00  333.00  338.00
 307          RY  1256.0 1254.00 1250.00 1248.00 1248.00 1250.00 1254.00 1256.00
              *

 308          KK     W43BASIN
 309          KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 310          KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 311          BA   0.209
 312          LG    0.20    0.28    3.48    0.55      61
 313          UI       0     971     508     111       0       0       0       0       0       0
 314          UI       0       0       0       0       0       0       0       0       0       0
 315          UI       0       0       0       0       0       0       0       0       0       0
 316          UI       0       0       0       0       0       0       0       0       0       0
 317          UI       0       0       0       0       0       0       0       0       0       0
              *

 318          KK   SRW43STORAGE
 319          KM        Verrado on-line storage basin (WLB) (WoodPatel ID SR23)
 320          KO
 321          RS       1    STOR
 322          SV            6.04   20.38   53.82  120.38  216.24  325.98  455.42  606.10  645.49
 323          SQ
 324          SE  1272.0 1276.00 1280.00 1284.00 1288.00 1292.00 1296.00 1300.00 1304.00 1305.00
 325          ST
              *

 326          KK  W43W44ROUTE
 327          KM        Cross-section: Side slopes and width based on aerial and topo
```

```
 328          KM        Manning's N Value: natural desert wash w/ vegetation
 329          RS      1    FLOW
 330          RC  0.035   0.035   0.035    8415  0.0125    0.00
 331          RX 100.00  145.00  180.00  210.00  220.00  245.00  270.00  295.00
 332          RY 1266.0 1264.00 1262.00 1258.00 1258.00 1262.00 1265.50 1266.00
              *

 333          KK    W44BASIN
 334          KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 335          KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 336          BA  0.598
 337          LG   0.35    0.35    4.90    0.29       0
 338          UI      0      55      89     214     334     438     500     527     506     421
 339          UI    332     266     206     162     127      99      82      59      48      37
 340          UI     37      13      14      13      14      13      14       0       0       0
 341          UI      0       0       0       0       0       0       0       0       0       0
 342          UI      0       0       0       0       0       0       0       0       0       0
              *
1                                      HEC-1 INPUT                                      PAGE  9

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 343          KK  CPW44COMBINE
 344          HC      3   5.153
              *

 345          KK  W44W46ROUTE
 346          KM        Cross-section: Estimated 2' deep, side slopes and width based on aerial
 347          KM        and topo. Manning's N Value: earth w/ sparse trees and shrubs
 348          RS      1    FLOW
 349          RC  0.032   0.032   0.032    1706  0.0070    0.00
 350          RX 100.00  116.00  132.00  162.00  192.00  252.00  272.00  292.00
 351          RY 1216.0 1215.00 1214.00 1208.00 1208.10 1210.00 1211.00 1212.00
              *

 352          KK    W45BASIN
 353          KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 354          KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 355          BA  1.035
 356          LG   0.35    0.33    7.30    0.11       3
 357          UI      0     136     414     824    1120    1399     860     697     573     441
 358          UI    336     286     202     161     130     104      71      67      47      26
 359          UI     26      26      26      26       0       0       0       0       0       0
 360          UI      0       0       0       0       0       0       0       0       0       0
 361          UI      0       0       0       0       0       0       0       0       0       0
              *

 362          KK  W45W46ROUTE
 363          KM        Cross-section: Based on aerial and topo
 364          KM        Manning's N Value: natural desert wash w/ vegetation
 365          RS      4    FLOW
 366          RC  0.035   0.035   0.035    9372  0.0125    0.00
 367          RX 100.00  160.00  205.00  265.00  285.00  310.00  345.00  385.00
 368          RY 1274.0 1270.00 1268.00 1262.00 1262.10 1272.00 1275.50 1276.00
              *

 369          KK    W46BASIN
 370          KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 371          KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 372          BA  0.926
 373          LG   0.27    0.29    6.40    0.18      16
 374          UI      0      88     165     367     477     592     749    1082     916     727
 375          UI    580     459     331     180     148      97      75      27      27      27
 376          UI     28      27       0       0       0       0       0       0       0       0
 377          UI      0       0       0       0       0       0       0       0       0       0
 378          UI      0       0       0       0       0       0       0       0       0       0
              *

 379          KK  CPW46ACOMBINE
 380          HC      2   1.961
              *
1                                      HEC-1 INPUT                                      PAGE 10

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 381          KK  DW46REDIVERT
 382          KM        Master Drainage Plan for the Caterpillar Property (Basin #27)
 383          DT   RW46     0.0     0.0
 384          DI    0.0    35.0    98.0   179.0   276.0   520.0   888.0  1339.0  1859.0  2439.0
 385          DQ    0.0     0.0     0.0     0.0     0.0   135.0   382.0   701.0  1080.0  1509.0
              *

 386          KK  CPW46BCOMBINE
 387          HC      2   7.114
              *

 388          KK  W46W54ROUTE
 389          KM        Cross-section: side slopes, width based on aerial and topo
 390          KM        Manning's N Value: natural desert wash w/ vegetation
 391          RS      1    FLOW
 392          RC  0.035   0.035   0.035    3908  0.0397    0.00
 393          RX 100.00  112.00  124.00  140.00  160.00  190.00  220.00  240.00
 394          RY 1194.5 1194.00 1190.00 1184.00 1184.10 1186.00 1190.00 1190.50
              *

 395          KK    W47BASIN
 396          KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 397          KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 398          BA  0.666
 399          LG   0.35    0.35    3.95    0.40      20
 400          UI      0      96     349     638     936     788     540     432     340     243
 401          UI    202     142     111      83      66      47      43      19      19      18
 402          UI     19      18       0       0       0       0       0       0       0       0
 403          UI      0       0       0       0       0       0       0       0       0       0
 404          UI      0       0       0       0       0       0       0       0       0       0
              *

 405          KK    W48BASIN
 406          KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 407          KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 408          BA  0.353
 409          LG   0.35    0.35    3.95    0.40      20
 410          UI      0      57     232     395     573     367     281     216     157     124
 411          UI     85      65      48      36      28      20      10      11      11      11
 412          UI      0       0       0       0       0       0       0       0       0       0
 413          UI      0       0       0       0       0       0       0       0       0       0
 414          UI      0       0       0       0       0       0       0       0       0       0
              *

 415          KK  CPW47COMBINE
 416          HC      2   1.019
              *

 417          KK  W47W49ROUTE
 418          KM        Cross-section: Based on aerial and topo
 419          KM        Manning's N Value: natural desert wash w/ vegetation
 420          RS      1    FLOW
 421          RC  0.035   0.035   0.035    5077  0.0414    0.00
 422          RX 100.00  150.00  190.00  210.00  235.00  255.00  275.00  310.00
1                                      HEC-1 INPUT                                      PAGE 11

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 423          RY 1740.0 1720.00 1710.00 1707.00 1708.00 1714.00 1730.00 1740.00
              *

 424          KK    W50BASIN
 425          KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 426          KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 427          BA  1.345
 428          LG   0.35    0.35    4.25    0.42      19
 429          UI      0     122     193     458     725     898    1129    1321     842     706
 430          UI    619     546     461     378     312     278     240     189     156     135
 431          UI    120      93      88      60      60      59      35      24      23      24
 432          UI     23      24      24      23      23       0       0       0       0       0
 433          UI      0       0       0       0       0       0       0       0       0       0
              *

 434          KK    W49BASIN
 435          KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 436          KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 437          BA  0.385
 438          LG   0.35    0.35    3.95    0.40      20
 439          UI      0      67     265     450     633     398     302     232     166     129
 440          UI     89      70      48      35      31      16      12      12      12      11
 441          UI      0       0       0       0       0       0       0       0       0       0
 442          UI      0       0       0       0       0       0       0       0       0       0
 443          UI      0       0       0       0       0       0       0       0       0       0
```

```
                *

 444            KK   CPW49COMBINE
 445            HC        3   2.749
                *

 446            KK  W49W51ROUTE
 447            KM         Cross-section: side slopes, width based on aerial and topo
 448            KM         Manning's N Value: natural desert wash w/ vegetation
 449            RS      1     FLOW
 450            RC   0.035   0.035   0.035    5726  0.0253    0.00
 451            RX  100.00  150.00  220.00  236.00  286.00  300.00  340.00  380.00
 452            RY  1485.0 1482.00 1479.00 1476.00 1476.10 1479.00 1485.00 1490.00
                *

 453            KK     W51BASIN
 454            KM         BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 455            KM         WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 456            BA   0.149
 457            LG    0.35    0.35    3.85    0.43       1
 458            UI       0      21      74     140     188     200     165     113      79      55
 459            UI      38      26      18      14       5       5       5       5       0       0
 460            UI       0       0       0       0       0       0       0       0       0       0
 461            UI       0       0       0       0       0       0       0       0       0       0
 462            UI       0       0       0       0       0       0       0       0       0       0
                *
1                                     HEC-1 INPUT                                           PAGE 12

LINE            ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 463            KK   CPW51COMBINE
 464            HC        2   2.898
                *

 465            KK     W52BASIN
 466            KM         BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 467            KM         WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 468            BA   1.123
 469            LG    0.35    0.35    4.40    0.38       9
 470            UI       0     116     224     522     764     958    1288     824     673     577
 471            UI     489     413     317     275     240     179     147     128     100      88
 472            UI      67      57      56      35      22      22      22      22      22      22
 473            UI      22       0       0       0       0       0       0       0       0       0
 474            UI       0       0       0       0       0       0       0       0       0       0
                *

 475            KK   CPW52COMBINE
 476            HC        2   4.021
                *

 477            KK  W52W53ROUTE
 478            KM         Cross-section: Estimated 3' deep and 4:1 side slopes, width based on
 479            KM         aerial. Manning's N Value: natural desert wash w/ vegetation
 480            RS      1     FLOW
 481            RC   0.035   0.035   0.035    4917  0.0112    0.00
 482            RX  100.00  118.00  124.00  130.00  146.00  150.00  164.00  182.00
 483            RY  1375.0 1373.00 1370.00 1368.00 1368.00 1370.00 1373.00 1375.00
                *

 484            KK     W53BASIN
 485            KM         BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 486            KM         WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 487            BA   0.568
 488            LG    0.30    0.32    4.45    0.42       7
 489            UI       0     223     858    1219     946     528     288     161      89      32
 490            UI      31       0       0       0       0       0       0       0       0       0
 491            UI       0       0       0       0       0       0       0       0       0       0
 492            UI       0       0       0       0       0       0       0       0       0       0
 493            UI       0       0       0       0       0       0       0       0       0       0
                *

 494            KK   CPW53COMBINE
 495            HC        2   4.589
                *

 496            KK  DW53REDIVERT
 497            KM         Verrado - Planning Unti Drainage Plan for Portions of Planning Unit V
 498            KM         (2nd Submittal) (ESTIMATED FROM GOLF BASINS IN REPORT)
 499            DT    RW53     0.0     0.0
 500            DI     0.0  1000.0  1500.0  2000.0  2500.0  3000.0  3500.0  4000.0  4145.0  4500.0
 501            DQ     0.0    10.0   115.0   290.0   460.0   715.0   980.0  1100.0  1145.0  1260.0
                *
1                                     HEC-1 INPUT                                           PAGE 13

LINE            ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 502            KK  W53W54ROUTE
 503            KM         Cross-section: side slopes, width based on aerial and topo
 504            KM         Manning's N Value: natural desert wash w/ vegetation
 505            RS      2     FLOW
 506            RC   0.035   0.035   0.035    9900  0.0157    0.00
 507            RX  100.00  124.00  144.00  150.00  160.00  190.00  220.00  240.00
 508            RY  1194.5 1194.00 1190.00 1184.00 1184.10 1186.00 1190.00 1190.50
                *

 509            KK     W54BASIN
 510            KM         BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 511            KM         WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 512            BA   0.980
 513            LG    0.23    0.26    4.50    0.43      18
 514            UI       0     105     248     485     621     807    1191    1143     882     676
 515            UI     520     329     183     143     104      33      32      32      33       0
 516            UI       0       0       0       0       0       0       0       0       0       0
 517            UI       0       0       0       0       0       0       0       0       0       0
 518            UI       0       0       0       0       0       0       0       0       0       0
                *

 519            KK   CPW54COMBINE
 520            HC        3  12.683
                *

 521            KK  W54W57ROUTE
 522            KM         Cross-section: side slopes and width based on aerial
 523            KM         Manning's N Value: natural desert wash w/ vegetation
 524            RS      1     FLOW
 525            RC   0.035   0.035   0.035    5173  0.0151    0.00
 526            RX  100.00  124.00  144.00  156.00  180.00  204.00  216.00  228.00
 527            RY  1126.0 1125.00 1124.00 1114.00 1114.10 1117.00 1117.50 1118.00
                *

 528            KK     W56BASIN
 529            KM         BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 530            KM         WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 531            BA   0.448
 532            LG    0.17    0.28    4.20    0.61       5
 533            UI       0     143     474     812     956     583     279     126      47      28
 534            UI       0       0       0       0       0       0       0       0       0       0
 535            UI       0       0       0       0       0       0       0       0       0       0
 536            UI       0       0       0       0       0       0       0       0       0       0
 537            UI       0       0       0       0       0       0       0       0       0       0
                *

 538            KK  DW56REDIVERT
 539            KM         Sienna Hills (aka Tesota Hills) Preliminary Drainage Report
 540            DT    RW56    35.6     0.0
 541            DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
 542            DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
                *
1                                     HEC-1 INPUT                                           PAGE 14

LINE            ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 543            KK  W56W57ROUTE
 544            KM         Cross-section: Estimated 3' deep and 4:1 side slopes, width
 545            KM         based on aerial / Manning's N Value: clean straight earth
 546            RS      1     FLOW
 547            RC   0.022   0.022   0.022    4948  0.0038    0.00
 548            RX  100.00  108.00  116.00  128.00  131.00  143.00  153.00  163.00
 549            RY  1108.5 1108.25 1108.00 1105.00 1105.10 1108.00 1108.25 1108.50
                *

 550            KK     W55BASIN
 551            KM         BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 552            KM         WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 553            BA   0.496
 554            LG    0.32    0.33    4.00    0.50      17
 555            UI       0      80     326     555     806     516     393     304     221     173
```

```
 556          UI     120      92      67      51      38      29      15      15      15      15
 557          UI       0       0       0       0       0       0       0       0       0       0
 558          UI       0       0       0       0       0       0       0       0       0       0
 559          UI       0       0       0       0       0       0       0       0       0       0
              *

 560          KK  DW55REDIVERT
 561          KM        Verado GOB5
 562          DT   DW55S     0.0     0.0
 563          DI     0.0    55.0   101.0   537.0  1297.0  2269.0  4708.0  7684.0 11074.0     0.0
 564          DQ     0.0     0.0     0.0   382.0  1080.0  1984.0  4269.0  7072.0 10310.0     0.0
              *

 565          KK  W55W57ROUTE
 566          KM        Cross-section: Estimated 2' deep and 4:1 side slopes, width
 567          KM        based on aerial / Manning's N Value: natural desert wash w/ vegetation
 568          RS       4    FLOW
 569          RC   0.035   0.035   0.035    5747  0.0096    0.00
 570          RX  100.00  110.00  120.00  136.00  156.00  172.00  192.00  212.00
 571          RY  1136.5 1136.25 1136.00 1134.00 1134.10 1136.00 1136.25 1136.50
              *

 572          KK     W57BASIN
 573          KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 574          KM        WOOD/PATEL, 2006 MODIFIED SLIGHTLY TO MATCH NEW TOPO
 575          BA   1.161
 576          LG    0.27    0.29    4.65    0.37      19
 577          UI       0     138     388     695     889    1284    1641    1231     946     700
 578          UI     409     239     166     101      43      43      42       0       0       0
 579          UI       0       0       0       0       0       0       0       0       0       0
 580          UI       0       0       0       0       0       0       0       0       0       0
 581          UI       0       0       0       0       0       0       0       0       0       0
              *
1                                        HEC-1 INPUT                                         PAGE 15

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 582          KK  DW57REDIVERT
 583          KM        Master Drainage Plan for the Caterpillar Property (Basin #42)
 584          DT    RW57    21.6     0.0
 585          DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
 586          DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
              *

 587          KK   CPW57COMBINE
 588          HC       4  14.788
              *

 589          KK   SRW57STORAGE
 590          KM        Verrado SR42
 591          KO
 592          RS       1    STOR
 593          SV           24.40   29.60   35.70   42.00   48.50   55.20   62.20   69.30   76.70
 594          SQ                                   368.00 1040.00 1912.00 2944.00 4114.00 5410.00
 595          SE  1084.0 1090.00 1091.00 1092.00 1093.00 1094.00 1095.00 1096.00 1097.00 1098.00
 596          ST
              *

 597          KK  W57W58ROUTE
 598          KM        Cross-section: Taken from aerial and topo
 599          RS       1    FLOW
 600          RC   0.022   0.022   0.022    1236  0.0067    0.00
 601          RX  100.00  115.50  121.80  142.00  179.30  191.30  199.60  207.80
 602          RY  1072.0 1070.00 1064.00 1062.00 1061.90 1064.00 1065.00 1066.00
              *

 603          KK     W58BASIN
 604          KM        BASIN BOUNDARY VARIES FROM VERRADO DEVEL.COND.PLAN WOOD/PATEL 2006
 605          KM        NEW 2' CI TOPO OBTAINED 2008
 606          BA   0.131
 607          LG    0.30    0.33    4.65    0.35      18
 608          UI       0      25     101     176     208     180     117      75      48      32
 609          UI      19      14       5       5       6       0       0       0       0       0
 610          UI       0       0       0       0       0       0       0       0       0       0
 611          UI       0       0       0       0       0       0       0       0       0       0
 612          UI       0       0       0       0       0       0       0       0       0       0
              *

 613          KK   CPW58COMBINE
 614          HC       2  14.919
              *

 615          KK   SRW58STORAGE
 616          KM        Storage based on new topo section calculations
 617          KO
 618          RS       1    STOR
 619          SV            0.17    2.57    5.40   13.08   31.52   47.89   64.25  111.96  171.81
 620          SQ                  784.10 2217.60 3099.20 3799.80 4122.90 4540.00 6878.8012249.90
 621          SE  1084.0 1086.00 1088.00 1090.00 1092.00 1094.00 1095.00 1096.00 1098.00 1100.00
 622          ST
              *
1                                        HEC-1 INPUT                                         PAGE 16

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 623          KK  DW58SEDIVERT
 624          KM        Divert is stage storage on 4-10x8 boxes under I-10. Diverted flow goes s
 625          DT   DW58S     0.0     0.0
 626          DI     0.0   100.0  2000.0  4100.0  4200.0  5000.0  6000.0  7000.0  8000.0  9000.0
 627          DQ     0.0   100.0  2000.0  4100.0  4195.5  4606.7  4833.2  4983.7  5102.6  5203.3
              *

 628          KK     W38BASIN
 629          KM        BASIN BOUNDARY FORMED BY MCDOWELL, I-10, JACKRABBIT
 630          KM        AND TUTHILL, DETAILED I-10 TOPO AND CULVERT INFO
 631          BA   0.251
 632          LG    0.32    0.32    4.65    0.33       7
 633          UI       0      30      77     163     235     279     279     236     174     127
 634          UI      93      68      51      36      27      20      14       7       7       8
 635          UI       7       0       0       0       0       0       0       0       0       0
 636          UI       0       0       0       0       0       0       0       0       0       0
 637          UI       0       0       0       0       0       0       0       0       0       0
              *

 638          KK   CPW38COMBINE
 639          HC       2   15.17
              *

 640          KK  DW38SEDIVERT
 641          KM        Full flow capacity of culverts under I-10 is diverted flow
 642          DT   DW38S     0.0     0.0
 643          DI     0.0   100.0   200.0   300.0   400.0   467.0   500.0   800.0  1000.0 10000.0
 644          DQ     0.0   100.0   200.0   300.0   400.0   467.0   467.0   467.0   467.0   467.0
              *

 645          KK  W38W37ROUTE
 646          KM        Cross section based from 1990 topo, Manning's N Value: clean earth
 647          RS       3    FLOW
 648          RC   0.022   0.022   0.022    2849  0.0053    0.00
 649          RX  100.00  204.00  440.00  608.00  687.00  700.00  736.00  759.00
 650          RY  1083.0 1082.00 1080.00 1078.00 1078.00 1080.00 1082.00 1083.00
              *

 651          KK   CPW37COMBINE
 652          ZW   A=CIP B=CPW37 C=FLOW
 653          HC       3  19.291
              *
 654          ZZ
1
            SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE     (V) ROUTING         (--->) DIVERSION OR PUMP FLOW

   NO.     (.) CONNECTOR       (<---) RETURN OF DIVERTED OR PUMPED FLOW

   38        WT3
              .
              .
   43         .        W21A
              .          .
              .          .
   55      CPW21A...........
              V
              V
   58      21A28A
              .
              .
   65         .        W28A
```

```
               .          .
               .          .
   76     CPW28A...........
               V
               V
   79     W28A33
               .
               .
   86          .         W33
               .          .
               .          .
   97      CPW33...........
               V
               V
  100     W33W35
               .
               .
  107          .         W35
               .          .
               .          .
  117          .          .        W34
               .          .          V
               .          .          V
  127          .          .      SRW34
               .          .          V
               .          .          V
  135          .          .     W34W35
               .          .          .
               .          .          .
  142      CPW35......................
               V
               V
  145     W35W36
               .
               .
  152          .         W36
               .          .
               .          .
  163      CPW36...........
               V
               V
  166     W36W37
               .
               .
  173          .         W37
               .          .
               .          .
  183          .          .        W22
               .          .          V
               .          .          V
  193          .          .     W22W23
               .          .          .
               .          .          .
  200          .          .          .        W23
               .          .          .          .
               .          .          .          .
  210          .          .      CPW23...........
               .          .          V
               .          .          V
  212          .          .     W23W24
               .          .          .
               .          .          .
  219          .          .          .        W24
               .          .          .          .
               .          .          .          .
  229          .          .      CPW24...........
               .          .          V
               .          .          V
  231          .          .     W24W27
               .          .          .
               .          .          .
  238          .          .          .        W25
               .          .          .          V
               .          .          .          V
  248          .          .          .      SRW25
               .          .          .          V
               .          .          .          V
  256          .          .          .     W25W26
               .          .          .          .
               .          .          .          .
  263          .          .          .          .        W26
               .          .          .          .          .
               .          .          .          .          .
  273          .          .          .      CPW26...........
               .          .          .          V
               .          .          .          V
  275          .          .          .      SRW26
               .          .          .          V
               .          .          .          V
  283          .          .          .     W26W27
               .          .          .          .
               .          .          .          .
  290          .          .          .          .        W27
               .          .          .          .          .
               .          .          .          .          .
  300          .          .      CPW27......................
               .          .          V
               .          .          V
  302          .          .     W27W44
               .          .          .
               .          .          .
  308          .          .          .        W43
               .          .          .          V
               .          .          .          V
  318          .          .          .      SRW43
               .          .          .          V
               .          .          .          V
  326          .          .          .     W43W44
               .          .          .          .
               .          .          .          .
  333          .          .          .          .        W44
               .          .          .          .          .
               .          .          .          .          .
  343          .          .      CPW44......................
               .          .          V
               .          .          V
  345          .          .     W44W46
               .          .          .
               .          .          .
  352          .          .          .        W45
               .          .          .          V
               .          .          .          V
  362          .          .          .     W45W46
               .          .          .          .
               .          .          .          .
  369          .          .          .          .        W46
               .          .          .          .          .
               .          .          .          .          .
  379          .          .          .     CPW46A...........
               .          .          .          .
               .          .          .          .
  383          .          .          .          .------->    RW46
  381          .          .          .     DW46RE
               .          .          .          .
               .          .          .          .
  386          .          .     CPW46B...........
               .          .          V
               .          .          V
  388          .          .     W46W54
               .          .          .
               .          .          .
  395          .          .          .        W47
               .          .          .          .
               .          .          .          .
  405          .          .          .          .        W48
               .          .          .          .          .
               .          .          .          .          .
  415          .          .          .      CPW47...........
               .          .          .          V
               .          .          .          V
  417          .          .          .     W47W49
               .          .          .          .
               .          .          .          .
  424          .          .          .          .        W50
               .          .          .          .          .
               .          .          .          .          .
  434          .          .          .          .          .        W49
               .          .          .          .          .          .
               .          .          .          .          .          .
  444          .          .          .      CPW49......................
```

```
            .         .         .         V
            .         .         .         V
 446        .         .         .      W49W51
            .         .         .         .
            .         .         .         .
 453        .         .         .         .         W51
            .         .         .         .          .
            .         .         .         .          .
 463        .         .         .      CPW51...........
            .         .         .         .
            .         .         .         .
 465        .         .         .         .         W52
            .         .         .         .          .
            .         .         .         .          .
 475        .         .         .      CPW52...........
            .         .         .         V
            .         .         .         V
 477        .         .         .      W52W53
            .         .         .         .
            .         .         .         .
 484        .         .         .         .         W53
            .         .         .         .          .
            .         .         .         .          .
 494        .         .         .      CPW53...........
            .         .         .         .
            .         .         .         .
 499        .         .         .         .------->  RW53
 496        .         .         .      DW53RE
            .         .         .         V
            .         .         .         V
 502        .         .         .      W53W54
            .         .         .         .
            .         .         .         .
 509        .         .         .         .         W54
            .         .         .         .          .
            .         .         .         .          .
 519        .         .       CPW54.......................
            .         .         V
            .         .         V
 521        .         .       W54W57
            .         .         .
            .         .         .
 528        .         .         .        W56
            .         .         .         .
            .         .         .         .
 540        .         .         .         .------->  RW56
 538        .         .         .      DW56RE
            .         .         .         V
            .         .         .         V
 543        .         .         .      W56W57
            .         .         .         .
            .         .         .         .
 550        .         .         .         .         W55
            .         .         .         .          .
            .         .         .         .          .
 562        .         .         .         .          .------->  DW55S
 560        .         .         .         .       DW55RE
            .         .         .         .          V
            .         .         .         .          V
 565        .         .         .         .       W55W57
            .         .         .         .          .
            .         .         .         .          .
 572        .         .         .         .          .         W57
            .         .         .         .          .          .
            .         .         .         .          .          .
 584        .         .         .         .          .          .------->  RW57
 582        .         .         .         .          .       DW57RE
            .         .         .         .          .          .
            .         .         .         .          .          .
 587        .         .       CPW57.................................
            .         .         V
            .         .         V
 589        .         .       SRW57
            .         .         V
            .         .         V
 597        .         .       W57W58
            .         .         .
            .         .         .
 603        .         .         .        W58
            .         .         .         .
```

```
            .         .         .         .
 613        .         .       CPW58...........
            .         .         V
            .         .         V
 615        .         .       SRW58
            .         .         .
            .         .         .
 625        .         .         .------->  DW58S
 623        .         .       DW58SE
            .         .         .
            .         .         .
 628        .         .         .         W38
            .         .         .          .
            .         .         .          .
 638        .         .       CPW38...........
            .         .         .
            .         .         .
 642        .         .         .------->  DW38S
 640        .         .       DW38SE
            .         .         V
            .         .         V
 645        .         .       W38W37
            .         .         .
            .         .         .
 651      CPW37.......................
```

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

+	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	WT3	13.	27.33	12.	9.	3.	21.52		
+	HYDROGRAPH AT	W21A	54.	12.50	7.	2.	1.	.20		
+	2 COMBINED AT	CPW21A	54.	12.50	12.	9.	4.	.20		
+	ROUTED TO	21A28A	32.	13.17	12.	9.	4.	.20		
+	HYDROGRAPH AT	W28A	212.	12.42	25.	6.	2.	.64		
+	2 COMBINED AT	CPW28A	211.	12.42	31.	15.	6.	.84		
+	ROUTED TO	W28A33	155.	13.00	31.	15.	6.	.84		
+	HYDROGRAPH AT	W33	293.	12.42	34.	9.	3.	.84		
+	2 COMBINED AT	CPW33	293.	12.42	64.	23.	9.	1.68		
+	ROUTED TO	W33W35	251.	12.75	64.	23.	9.	1.68		
+	HYDROGRAPH AT	W35	96.	12.42	11.	3.	1.	.28		
+	HYDROGRAPH AT	W34	120.	12.25	14.	4.	1.	.23		
+	ROUTED TO	SRW34	0.	.00	0.	0.	0.	.23		
+	ROUTED TO	W34W35	0.	.00	0.	0.	0.	.23		
+	3 COMBINED AT	CPW35	294.	12.67	74.	25.	10.	2.19		
	ROUTED TO									

+		W35W36	256.	13.33	72.	25.	10.	2.19
+	HYDROGRAPH AT	W36	209.	12.50	29.	8.	3.	.72
+	2 COMBINED AT	CPW36	286.	13.33	99.	32.	13.	2.91
+	ROUTED TO	W36W37	265.	13.75	98.	31.	13.	2.91
+	HYDROGRAPH AT	W37	304.	12.58	47.	13.	4.	1.21
+	HYDROGRAPH AT	W22	434.	12.17	45.	14.	5.	.78
+	ROUTED TO	W22W23	426.	12.25	45.	14.	5.	.78
+	HYDROGRAPH AT	W23	486.	12.25	52.	16.	5.	.90
+	2 COMBINED AT	CPW23	906.	12.25	96.	29.	10.	1.68
+	ROUTED TO	W23W24	786.	12.33	96.	29.	10.	1.68
+	HYDROGRAPH AT	W24	260.	12.25	27.	8.	3.	.47
+	2 COMBINED AT	CPW24	1015.	12.33	123.	37.	12.	2.15
+	ROUTED TO	W24W27	894.	12.42	123.	37.	12.	2.15
+	HYDROGRAPH AT	W25	470.	12.33	54.	15.	5.	1.10
+	ROUTED TO	SRW25	0.	.00	0.	0.	0.	1.10
+	ROUTED TO	W25W26	0.	.00	0.	0.	0.	1.10
+	HYDROGRAPH AT	W26	355.	12.33	44.	13.	4.	.68
+	2 COMBINED AT	CPW26	353.	12.33	44.	13.	4.	1.78
+	ROUTED TO	SRW26	0.	.00	0.	0.	0.	1.78
+	ROUTED TO	W26W27	0.	.00	0.	0.	0.	1.78
+	HYDROGRAPH AT	W27	242.	12.25	24.	7.	2.	.41
+	3 COMBINED AT	CPW27	1041.	12.33	145.	44.	15.	4.34
+	ROUTED TO	W27W44	860.	12.50	145.	44.	15.	4.34
+	HYDROGRAPH AT	W43	273.	12.08	25.	8.	3.	.21
+	ROUTED TO	SRW43	0.	.00	0.	0.	0.	.21
+	ROUTED TO	W43W44	0.	.00	0.	0.	0.	.21
+	HYDROGRAPH AT	W44	185.	12.50	23.	6.	2.	.60
+	3 COMBINED AT	CPW44	1039.	12.50	168.	49.	16.	5.15
+	ROUTED TO	W44W46	1019.	12.58	167.	49.	16.	5.15
+	HYDROGRAPH AT	W45	573.	12.33	61.	16.	5.	1.03
+	ROUTED TO	W45W46	438.	12.67	61.	16.	5.	1.03
+	HYDROGRAPH AT	W46	484.	12.50	65.	19.	6.	.93
+	2 COMBINED AT	CPW46A	899.	12.58	125.	34.	11.	1.96
+	DIVERSION TO	RW46	390.	12.58	29.	7.	2.	1.96
+	HYDROGRAPH AT	DW46RE	509.	12.58	96.	27.	9.	1.96
+	2 COMBINED AT	CPW46B	1521.	12.58	262.	76.	25.	7.11
+	ROUTED TO	W46W54	1486.	12.67	262.	76.	25.	7.11
+	HYDROGRAPH AT	W47	326.	12.25	41.	13.	4.	.67
+	HYDROGRAPH AT	W48	185.	12.25	22.	7.	2.	.35
+	2 COMBINED AT	CPW47	507.	12.25	63.	19.	6.	1.02
+	ROUTED TO	W47W49	427.	12.42	63.	19.	6.	1.02
+	HYDROGRAPH AT	W50	441.	12.50	78.	24.	8.	1.35
+	HYDROGRAPH AT	W49	204.	12.25	24.	7.	2.	.38
+	3 COMBINED AT	CPW49	994.	12.42	163.	50.	17.	2.75
+	ROUTED TO	W49W51	893.	12.50	163.	50.	17.	2.75
+	HYDROGRAPH AT	W51	58.	12.33	5.	1.	0.	.15
+	2 COMBINED AT	CPW51	930.	12.50	168.	51.	17.	2.90
+	HYDROGRAPH AT	W52	370.	12.42	52.	15.	5.	1.12
+	2 COMBINED AT	CPW52	1264.	12.50	218.	66.	22.	4.02
+	ROUTED TO	W52W53	1174.	12.58	218.	66.	22.	4.02
+	HYDROGRAPH AT	W53	344.	12.17	25.	7.	2.	.57
+	2 COMBINED AT	CPW53	1212.	12.58	242.	72.	24.	4.59
+	DIVERSION TO	RW53	54.	12.58	4.	1.	0.	4.59
+	HYDROGRAPH AT	DW53RE	1157.	12.58	238.	71.	24.	4.59

ROUTED TO	+	W53W54	1055.	12.75	238.	71.	24.	4.59
HYDROGRAPH AT	+	W54	469.	12.50	61.	18.	6.	.98
3 COMBINED AT	+	CPW54	2777.	12.67	556.	164.	55.	12.68
ROUTED TO	+	W54W57	2667.	12.75	556.	164.	55.	12.68
HYDROGRAPH AT	+	W56	230.	12.25	16.	4.	1.	.45
DIVERSION TO	+	RW56	230.	12.25	16.	4.	1.	.45
HYDROGRAPH AT	+	DW56RE	0.	.00	0.	0.	0.	.45
ROUTED TO	+	W56W57	0.	.00	0.	0.	0.	.45
HYDROGRAPH AT	+	W55	226.	12.25	27.	8.	3.	.50
DIVERSION TO	+	DW55S	109.	12.25	5.	1.	0.	.50
HYDROGRAPH AT	+	DW55RE	116.	12.25	21.	7.	2.	.50
ROUTED TO	+	W55W57	105.	12.67	21.	7.	2.	.50
HYDROGRAPH AT	+	W57	614.	12.42	74.	22.	7.	1.16
DIVERSION TO	+	RW57	571.	12.33	39.	11.	4.	1.16
HYDROGRAPH AT	+	DW57RE	567.	12.50	42.	12.	4.	1.16
4 COMBINED AT	+	CPW57	2988.	12.75	615.	182.	61.	14.79
ROUTED TO	+	SRW57	2897.	12.83	606.	165.	55.	14.79
ROUTED TO	+	W57W58	2899.	12.83	605.	165.	55.	14.79
HYDROGRAPH AT	+	W58	80.	12.25	8.	2.	1.	.13
2 COMBINED AT	+	CPW58	2907.	12.83	611.	167.	56.	14.92
ROUTED TO	+	SRW58	2803.	12.92	611.	167.	56.	14.92
DIVERSION TO	+	DW58S	2803.	12.92	611.	167.	56.	14.92
HYDROGRAPH AT	+	DW58SE	0.	.00	0.	0.	0.	14.92
HYDROGRAPH AT	+	W38	106.	12.42	12.	3.	1.	.25
2 COMBINED AT	+	CPW38	102.	12.42	12.	3.	1.	15.17
DIVERSION TO	+	DW38S	102.	12.42	12.	3.	1.	15.17
HYDROGRAPH AT	+	DW38SE	0.	.00	0.	0.	0.	15.17
ROUTED TO	+	W38W37	0.	.00	0.	0.	0.	15.17
3 COMBINED AT	+	CPW37	346.	12.75	139.	42.	16.	19.29

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

APPENDIX D – CULVERT HYDRAULIC CALCULATIONS

ALTERNATIVE 9B – Earthen channel Reach 9

Worksheet for Reach 9 - 285cfs

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.00100	ft/ft
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	4.00	ft/ft (H:V)
Bottom Width	20.00	ft
Discharge	285.00	ft³/s

Results

Normal Depth	3.47	ft
Flow Area	117.75	ft²
Wetted Perimeter	48.65	ft
Top Width	47.79	ft
Critical Depth	1.65	ft
Critical Slope	0.01654	ft/ft
Velocity	2.42	ft/s
Velocity Head	0.09	ft
Specific Energy	3.57	ft
Froude Number	0.27	
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	3.47	ft
Critical Depth	1.65	ft
Channel Slope	0.00100	ft/ft
Critical Slope	0.01654	ft/ft

Bentley Systems, Inc. Haestad Methods Solution Center
Bentley FlowMaster [08.01.071.00]
12/14/2009 1:09:14 AM 27 Siemons Company Drive Suite 200 W Watertown, CT 06795 USA +1-203-755-1666 Page 1 of 1

ALTERNATIVE 9B – (1) 10'x6' CBC under emergency spillway

```
BOX CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

December 5, 2009

==========================================================================
                         PROGRAM INPUT DATA
DESCRIPTION                                                          VALUE
--------------------------------------------------------------------------
Culvert Span (ft)........................................          10.0
Culvert Rise (ft)........................................           6.0
FHWA Chart Number........................................           9
FHWA Scale Number (Type of Culvert Entrance).............           1
Manning's Roughness Coefficient (n-value)................           0.013
Entrance Loss Coefficient of Culvert Opening.............           0.2
Culvert Length (ft)......................................       1,320.0
Invert Elevation at Downstream end of Culvert (ft).......       1,182.97
Invert Elevation at Upstream end of Culvert (ft).........       1,185.61
Culvert Slope (ft/ft)....................................           0.002

Starting Flow Rate (cfs).................................         285.0
Incremental Flow Rate (cfs)..............................           0.0
Ending Flow Rate (cfs)...................................         285.0

Starting Tailwater Depth (ft)............................           4.0
Incremental Tailwater Depth (ft).........................           0.0
Ending Tailwater Depth (ft)..............................           4.0

==========================================================================

                         COMPUTATION RESULTS

   Flow Tailwater   Headwater (ft)     Normal  Critical  Depth at   Outlet
   Rate    Depth   Inlet     Outlet    Depth    Depth    Outlet   Velocity
  (cfs)    (ft)    Control   Control   (ft)     (ft)     (ft)     (fps)
--------------------------------------------------------------------------
  285.0     4.0      4.76      4.73     3.46     2.93     3.46      8.23

==========================================================================
HYDROCALC Hydraulics for Windows, Version 1.2a Copyright (c) 1996
Dodson & Associates, Inc., 5629 FM 1960 West, Suite 314, Houston, TX 77069
Phone:(281)440-3787, Fax:(281)440-4742, Email:software@dodson-hydro.com
All Rights Reserved.
```

Alternative 9C – (1) 72-inch Pipe (pressure flow)

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

December 14, 2009

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Diameter (ft)	6.0
FHWA Chart Number	2
FHWA Scale Number (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.01
Entrance Loss Coefficient of Culvert Opening	0.5
Culvert Length (ft)	4,800.0
Invert Elevation at Downstream end of Culvert (ft)	1,090.0
Invert Elevation at Upstream end of Culvert (ft)	1,094.8
Culvert Slope (ft/ft)	0.001
Starting Flow Rate (cfs)	285.0
Incremental Flow Rate (cfs)	0.0
Ending Flow Rate (cfs)	285.0
Starting Tailwater Depth (ft)	3.0
Incremental Tailwater Depth (ft)	0.0
Ending Tailwater Depth (ft)	3.0

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
285.0	3.0	7.99	14.11	6.0	4.62	4.62	12.2

HYDROCALC Hydraulics for Windows, Version 1.2a
Dodson & Associates, Inc., 5629 FM 1960 West, Suite 314, Houston, TX 77069
Phone:(281)440-3787, Fax:(281)440-4742, Email:software@dodson-hydro.com

Alternative 9D – (3) 60-inch Pipes

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

December 5, 2009

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Diameter (ft)	5.0
FHWA Chart Number	2
FHWA Scale Number (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.01
Entrance Loss Coefficient of Culvert Opening	0.5
Culvert Length (ft)	4,800.0
Invert Elevation at Downstream end of Culvert (ft)	1,090.0
Invert Elevation at Upstream end of Culvert (ft)	1,094.8
Culvert Slope (ft/ft)	0.001
Starting Flow Rate (cfs)	95.0
Incremental Flow Rate (cfs)	0.0
Ending Flow Rate (cfs)	95.0
Starting Tailwater Depth (ft)	3.0
Incremental Tailwater Depth (ft)	0.0
Ending Tailwater Depth (ft)	3.0

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
95.0	3.0	4.08	4.55	3.66	2.77	3.0	7.72

HYDROCALC Hydraulics for Windows, Version 1.2a
Dodson & Associates, Inc., 5629 FM 1960 West, Suite 314, Houston, TX 77069
Phone:(281)440-3787, Fax:(281)440-4742, Email:software@dodson-hydro.com

Alternative 9D – (2) 72-inch Pipes

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

December 5, 2009

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Diameter (ft)	6.0
FHWA Chart Number	2
FHWA Scale Number (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.01
Entrance Loss Coefficient of Culvert Opening	0.5
Culvert Length (ft)	4,800.0
Invert Elevation at Downstream end of Culvert (ft)	1,090.0
Invert Elevation at Upstream end of Culvert (ft)	1,094.8
Culvert Slope (ft/ft)	0.001
Starting Flow Rate (cfs)	143.0
Incremental Flow Rate (cfs)	0.0
Ending Flow Rate (cfs)	143.0
Starting Tailwater Depth (ft)	3.0
Incremental Tailwater Depth (ft)	0.0
Ending Tailwater Depth (ft)	3.0

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
143.0	3.0	4.75	5.24	4.14	3.25	3.25	9.16

HYDROCALC Hydraulics for Windows, Version 1.2a Copyright (c) 1996
Dodson & Associates, Inc., 5629 FM 1960 West, Suite 314, Houston, TX 77069
Phone:(281)440-3787, Fax:(281)440-4742, Email:software@dodson-hydro.com

Alternative 9E – Pipe Under Emergency Spillway, (3) 60-inch Pipes

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

December 5, 2009

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Diameter (ft)	5.0
FHWA Chart Number	1
FHWA Scale Number (Type of Culvert Entrance)	2
Manning's Roughness Coefficient (n-value)	0.013
Entrance Loss Coefficient of Culvert Opening	0.5
Culvert Length (ft)	1,320.0
Invert Elevation at Downstream end of Culvert (ft)	1,182.97
Invert Elevation at Upstream end of Culvert (ft)	1,185.61
Culvert Slope (ft/ft)	0.002
Starting Flow Rate (cfs)	95.0
Incremental Flow Rate (cfs)	0.0
Ending Flow Rate (cfs)	95.0
Starting Tailwater Depth (ft)	3.0
Incremental Tailwater Depth (ft)	0.0
Ending Tailwater Depth (ft)	3.0

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
95.0	3.0	4.07	4.45	3.43	2.77	3.0	7.72

HYDROCALC Hydraulics for Windows, Version 1.2a Copyright (c) 1996
Dodson & Associates, Inc., 5629 FM 1960 West, Suite 314, Houston, TX 77069
Phone:(281)440-3787, Fax:(281)440-4742, Email:software@dodson-hydro.com

Alternative 9E – Pipe Under Emergency Spillway, (2) 72-inch Pipes

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

December 5, 2009

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Diameter (ft)	6.0
FHWA Chart Number	1
FHWA Scale Number (Type of Culvert Entrance)	2
Manning's Roughness Coefficient (n-value)	0.013
Entrance Loss Coefficient of Culvert Opening	0.5
Culvert Length (ft)	1,320.0
Invert Elevation at Downstream end of Culvert (ft)	1,182.97
Invert Elevation at Upstream end of Culvert (ft)	1,185.61
Culvert Slope (ft/ft)	0.002
Starting Flow Rate (cfs)	143.0
Incremental Flow Rate (cfs)	0.0
Ending Flow Rate (cfs)	143.0
Starting Tailwater Depth (ft)	3.0
Incremental Tailwater Depth (ft)	0.0
Ending Tailwater Depth (ft)	3.0

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
143.0	3.0	4.74	5.16	3.89	3.25	3.25	9.16

HYDROCALC Hydraulics for Windows, Version 1.2a Copyright (c) 1996
Dodson & Associates, Inc., 5629 FM 1960 West, Suite 314, Houston, TX 77069
Phone:(281)440-3787, Fax:(281)440-4742, Email:software@dodson-hydro.com

Alternative 9F – (1) 60-inch Pipe Across Dam or Under Emergency Spillway

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

December 14, 2009

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Diameter (ft)	5.0
FHWA Chart Number	2
FHWA Scale Number (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.01
Entrance Loss Coefficient of Culvert Opening	0.5
Culvert Length (ft)	1,900.0
Invert Elevation at Downstream end of Culvert (ft)	1,183.0
Invert Elevation at Upstream end of Culvert (ft)	1,200.0
Culvert Slope (ft/ft)	0.0089
Starting Flow Rate (cfs)	15.0
Incremental Flow Rate (cfs)	30.0
Ending Flow Rate (cfs)	285.0
Starting Tailwater Depth (ft)	3.0
Incremental Tailwater Depth (ft)	0.0
Ending Tailwater Depth (ft)	3.0

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
15.0	3.0	1.42	0.0	0.74	1.07	0.74	8.33
45.0	3.0	2.59	0.0	1.27	1.88	1.27	11.52
75.0	3.0	3.5	0.0	1.65	2.45	1.65	13.32
105.0	3.0	4.33	0.0	1.97	2.92	1.97	14.61
135.0	3.0	5.14	0.0	2.27	3.33	2.27	15.61
165.0	3.0	6.19	0.0	2.54	3.68	2.54	16.43
195.0	3.0	7.17	0.0	2.82	3.99	2.82	17.11
225.0	3.0	8.4	0.0	3.09	4.25	3.09	17.66
255.0	3.0	9.82	0.0	3.37	4.45	3.37	18.1
285.0	3.0	11.41	0.0	3.67	4.61	3.67	18.43

HYDROCALC Hydraulics for Windows, Version 1.2a Copyright (c) 1996
Dodson & Associates, Inc., 5629 FM 1960 West, Suite 314, Houston, TX 77069
Phone:(281)440-3787, Fax:(281)440-4742, Email:software@dodson-hydro.com

Alternative 6/7A – (2) 8'X6' CBC to receive side drainage (Q100=556cfs) from SF14

BOX CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

December 11, 2009

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Span (ft)	8.0
Culvert Rise (ft)	6.0
FHWA Chart Number	9
FHWA Scale Number (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.013
Entrance Loss Coefficient of Culvert Opening	0.2
Culvert Length (ft)	200.0
Invert Elevation at Downstream end of Culvert (ft)	1,177.14
Invert Elevation at Upstream end of Culvert (ft)	1,178.14
Culvert Slope (ft/ft)	0.005
Starting Flow Rate (cfs)	278.0
Incremental Flow Rate (cfs)	0.0
Ending Flow Rate (cfs)	278.0
Starting Tailwater Depth (ft)	4.0
Incremental Tailwater Depth (ft)	0.0
Ending Tailwater Depth (ft)	4.0

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
278.0	4.0	5.43	0.0	3.0	3.35	3.0	11.58

HYDROCALC Hydraulics for Windows, Version 1.2a Copyright (c) 1996
Dodson & Associates, Inc., 5629 FM 1960 West, Suite 314, Houston, TX 77069
Phone:(281)440-3787, Fax:(281)440-4742, Email:software@dodson-hydro.com

Alternative 6/7B – (1) 12'X8' CBC for Reaches 6 and 7 with a 2-foot drop inlet

BOX CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

December 11, 2009

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Span (ft)	12.0
Culvert Rise (ft)	8.0
FHWA Chart Number	9
FHWA Scale Number (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.013
Entrance Loss Coefficient of Culvert Opening	0.2
Culvert Length (ft)	5,360.0
Invert Elevation at Downstream end of Culvert (ft)	1,160.24
Invert Elevation at Upstream end of Culvert (ft)	1,178.14
Culvert Slope (ft/ft)	0.0033
Starting Flow Rate (cfs)	700.0
Incremental Flow Rate (cfs)	0.0
Ending Flow Rate (cfs)	700.0
Starting Tailwater Depth (ft)	4.0
Incremental Tailwater Depth (ft)	0.0
Ending Tailwater Depth (ft)	4.0

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
700.0	4.0	7.67	0.0	4.65	4.73	4.65	12.55

HYDROCALC Hydraulics for Windows, Version 1.2a Copyright (c) 1996
Dodson & Associates, Inc., 5629 FM 1960 West, Suite 314, Houston, TX 77069
Phone:(281)440-3787, Fax:(281)440-4742, Email:software@dodson-hydro.com

Alternative 6/7C – (2) 8'X6' CBC Reaches 6 and 7 with a 2-foot drop inlet

BOX CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

December 12, 2009

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Span (ft)	8.0
Culvert Rise (ft)	6.0
FHWA Chart Number	9
FHWA Scale Number (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.013
Entrance Loss Coefficient of Culvert Opening	0.2
Culvert Length (ft)	300.0
Invert Elevation at Downstream end of Culvert (ft)	1,172.91
Invert Elevation at Upstream end of Culvert (ft)	1,174.41
Culvert Slope (ft/ft)	0.005
Starting Flow Rate (cfs)	350.0
Incremental Flow Rate (cfs)	0.0
Ending Flow Rate (cfs)	350.0
Starting Tailwater Depth (ft)	4.0
Incremental Tailwater Depth (ft)	0.0
Ending Tailwater Depth (ft)	4.0

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
350.0	4.0	6.33	0.0	3.55	3.9	3.55	12.32

HYDROCALC Hydraulics for Windows, Version 1.2a Copyright (c) 1996
Dodson & Associates, Inc., 5629 FM 1960 West, Suite 314, Houston, TX 77069
Phone:(281)440-3787, Fax:(281)440-4742, Email:software@dodson-hydro.com

Alternative 6/7C – (2) 8'X6' CBC at Reach 7, west of Jackrabbit Trail, with a 2.5-foot drop inlet

BOX CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

December 12, 2009

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Span (ft)	8.0
Culvert Rise (ft)	6.0
FHWA Chart Number	9
FHWA Scale Number (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.013
Entrance Loss Coefficient of Culvert Opening	0.2
Culvert Length (ft)	900.0
Invert Elevation at Downstream end of Culvert (ft)	1,160.24
Invert Elevation at Upstream end of Culvert (ft)	1,162.74
Culvert Slope (ft/ft)	0.0028
Starting Flow Rate (cfs)	400.0
Incremental Flow Rate (cfs)	0.0
Ending Flow Rate (cfs)	400.0
Starting Tailwater Depth (ft)	4.0
Incremental Tailwater Depth (ft)	0.0
Ending Tailwater Depth (ft)	4.0

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
400.0	4.0	6.92	6.84	4.9	4.27	4.9	10.2

HYDROCALC Hydraulics for Windows, Version 1.2a Copyright (c) 1996
Dodson & Associates, Inc., 5629 FM 1960 West, Suite 314, Houston, TX 77069
Phone:(281)440-3787, Fax:(281)440-4742, Email:software@dodson-hydro.com

Alternative 6/7D – (2) 10'X8' CBC for Reach 7 with a 2-foot drop inlet

```
                    BOX CULVERT ANALYSIS
            COMPUTATION OF CULVERT PERFORMANCE CURVE

                      December 11, 2009

================================================================================
                       PROGRAM INPUT DATA
DESCRIPTION                                                            VALUE
--------------------------------------------------------------------------------
Culvert Span (ft)........................................          10.0
Culvert Rise (ft)........................................           6.0
FHWA Chart Number........................................           9
FHWA Scale Number (Type of Culvert Entrance).............           1
Manning's Roughness Coefficient (n-value)................           0.013
Entrance Loss Coefficient of Culvert Opening.............           0.2
Culvert Length (ft)......................................       2,746.0
Invert Elevation at Downstream end of Culvert (ft).......       1,174.41
Invert Elevation at Upstream end of Culvert (ft).........       1,178.14
Culvert Slope (ft/ft)....................................           0.0014

Starting Flow Rate (cfs).................................         350.0
Incremental Flow Rate (cfs)..............................           0.0
Ending Flow Rate (cfs)...................................         350.0

Starting Tailwater Depth (ft)............................           4.0
Incremental Tailwater Depth (ft).........................           0.0
Ending Tailwater Depth (ft)..............................           4.0

================================================================================

                      COMPUTATION RESULTS

  Flow Tailwater   Headwater (ft)     Normal  Critical  Depth at   Outlet
  Rate    Depth   Inlet     Outlet    Depth    Depth     Outlet   Velocity
 (cfs)    (ft)    Control   Control   (ft)     (ft)      (ft)      (fps)
--------------------------------------------------------------------------------
 350.0     4.0     5.46      5.7      4.63     3.36      4.0       8.75

================================================================================
HYDROCALC Hydraulics for Windows, Version 1.2a Copyright (c) 1996
Dodson & Associates, Inc., 5629 FM 1960 West, Suite 314, Houston, TX 77069
Phone:(281)440-3787, Fax:(281)440-4742, Email:software@dodson-hydro.com
All Rights Reserved.
```

Alternative 6/7E – Concrete channel Reach 7

Worksheet for Reach 7 Concrete Channel

Project Description

Friction Method	Manning Formula	
Solve For	Normal Depth	

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00100	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	15.00	ft
Discharge	700.00	ft³/s

Results

Normal Depth	4.13	ft
Flow Area	95.94	ft²
Wetted Perimeter	33.45	ft
Top Width	31.50	ft
Critical Depth	3.47	ft
Critical Slope	0.00192	ft/ft
Velocity	7.30	ft/s
Velocity Head	0.83	ft
Specific Energy	4.95	ft
Froude Number	0.74	
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	4.13	ft
Critical Depth	3.47	ft
Channel Slope	0.00100	ft/ft
Critical Slope	0.00192	ft/ft

Bentley Systems, Inc. Haestad Methods Solution Center
Bentley FlowMaster [08.01.071.00]
12/11/2009 4:03:17 PM 27 Siemons Company Drive Suite 200 W Watertown, CT 06795 USA +1-203-755-1666 Page 1 of 1

APPENDIX E – EQUILIBRIUM SLOPE CALCULATION

WT03
Equilibrium Slopes

Reference: The Flood Control District of Maricopa County, River Mechanics Manual for DDMSW (Draft), September 2009

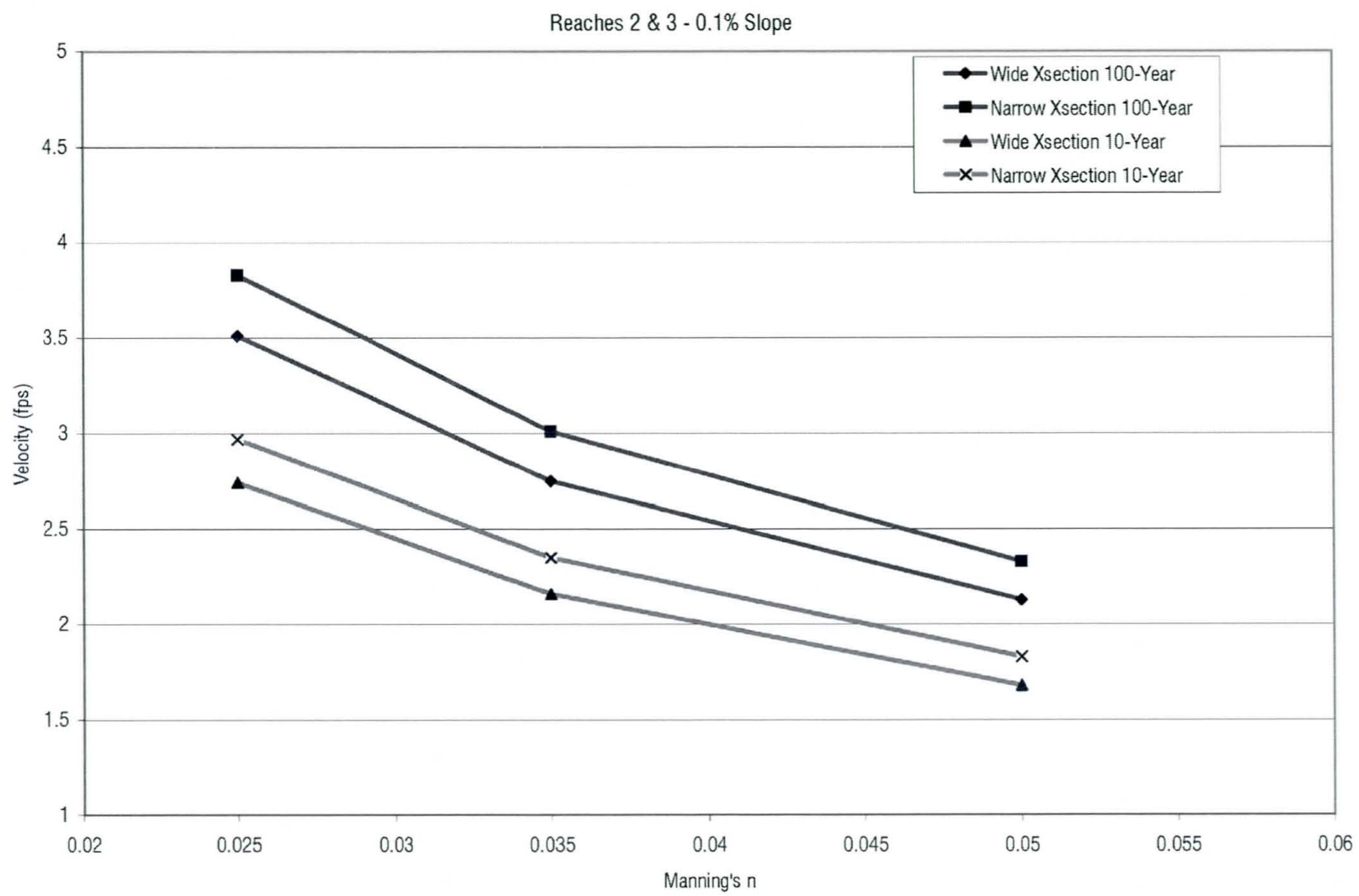
Clear-Water Flow

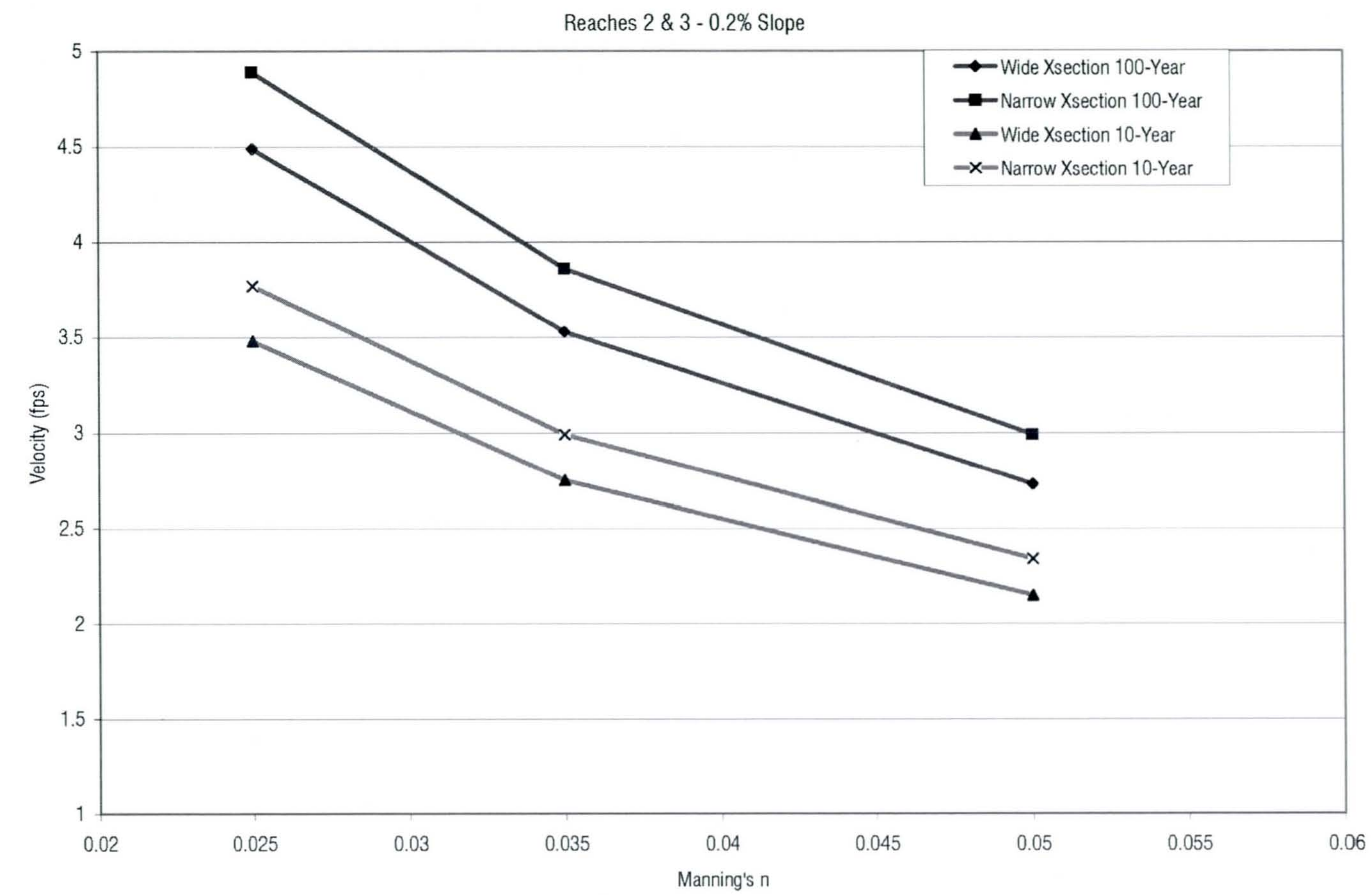
The Schoklitsch equation was used for the equilibrium slope for clear-water flow.

$$S_L = K\left(\frac{DB}{Q}\right)^{3/4}$$

where, S_L is equilibrium slope (ft/ft), K = 0.00174, Q is 10-year event discharge (cfs), D = D_{50} (mm), and B is channel width (ft).

Reach 9	Trapezoidal Channel			Bottom Width =	20 ft	Side Slope=	4 :1	n=	0.025		
PMF		Q=	285 cfs	D_{50}=	1.2 mm	B=A/h=	33.1 ft	h=	3.3 ft	S_L =	0.0004 ft/ft
Reach 8	Trapezoidal Channel			Bottom Width =	30 ft	Side Slope=	4 :1	n=	0.025		
PMF		Q=	285 cfs	D_{50}=	1.2 mm	B=A/h=	41 ft	h=	2.8 ft	S_L =	0.0005 ft/ft
Reach 7	Trapezoidal Channel			Bottom Width =	30 ft	Side Slope=	4 :1	n=	0.025		
PMF		Q=	285 cfs	D_{50}=	1.2 mm	B=A/h=	41 ft	h=	2.8 ft	S_L =	0.0005 ft/ft
Reach 6	Trapezoidal Channel			Bottom Width =	40 ft	Side Slope=	4 :1	n=	0.025		
Future Condition		Q_{10}=	360 cfs	D_{50}=	1.2 mm	B=A/h=	51.1 ft	h=	2.8 ft	S_L =	0.0005 ft/ft
Existing Condition		Q_{10}=	293 cfs	D_{50}=	1.2 mm	B=A/h=	49.6 ft	h=	2.4 ft	S_L =	0.0005 ft/ft
Reach 5	Trapezoidal Channel			Bottom Width =	40 ft	Side Slope=	4 :1	n=	0.025		
Future Condition		Q_{10}=	360 cfs	D_{50}=	1.2 mm	B=A/h=	51.1 ft	h=	2.8 ft	S_L =	0.0005 ft/ft
Existing Condition		Q_{10}=	293 cfs	D_{50}=	1.2 mm	B=A/h=	49.6 ft	h=	2.4 ft	S_L =	0.0005 ft/ft
Reach 4	Trapezoidal Channel			Bottom Width =	50 ft	Side Slope=	4 :1	n=	0.025		
Future Condition		Q_{10}=	302 cfs	D_{50}=	1.2 mm	B=A/h=	58.6 ft	h=	2.1 ft	S_L =	0.0006 ft/ft
Existing Condition		Q_{10}=	294 cfs	D_{50}=	1.2 mm	B=A/h=	58.4 ft	h=	2.1 ft	S_L =	0.0006 ft/ft
Reach 3	Trapezoidal Channel			Bottom Width =	30 ft	Side Slope=	4 :1	n=	0.025		
Future Condition		Q_{10}=	241 cfs	D_{50}=	1.2 mm	B=A/h=	39.8 ft	h=	2.5 ft	S_L =	0.0005 ft/ft
Existing Condition		Q_{10}=	286 cfs	D_{50}=	1.2 mm	B=A/h=	41 ft	h=	2.8 ft	S_L =	0.0005 ft/ft
Reach 2	Trapezoidal Channel			Bottom Width =	30 ft	Side Slope=	4 :1	n=	0.025		
Future Condition		Q_{10}=	222 cfs	D_{50}=	1.2 mm	B=A/h=	39.3 ft	h=	2.3 ft	S_L =	0.0005 ft/ft
Existing Condition		Q_{10}=	286 cfs	D_{50}=	1.2 mm	B=A/h=	41 ft	h=	2.8 ft	S_L =	0.0005 ft/ft


Reaches 2 & 3 - 0.1% Slope
Wide Xsection 100-Year
Narrow Xsection 100-Year
Wide Xsection 10-Year
Narrow Xsection 10-Year
Velocity (fps)
Manning's n
5
4.5
4
3.5
3
2.5
2
1.5
1
0.02
0.025
0.03
0.035
0.04
0.045
0.05
0.055
0.06


Reaches 2 & 3 - 0.2% Slope
Wide Xsection 100-Year
Narrow Xsection 100-Year
Wide Xsection 10-Year
Narrow Xsection 10-Year
Velocity (fps)
Manning's n
5
4.5
4
3.5
3
2.5
2
1.5
1
0.02
0.025
0.03
0.035
0.04
0.045
0.05
0.055
0.06

APPENDIX F – COST ESTIMATE

WHITE TANKS FRS#3 OUTLET CHANNEL - COST ESTIMATE BY REACH, USING 30% DESIGN REPORT LAND COSTS 1/27/2010

ALTERNATIVE 6/7A AND 9A (30% DESIGN)

FCD 2009C012 HOSKIN-RYAN CONSULTANTS, INC.

PCN 470.04.32 HRC 09-077-01

QUANTITY SUMMARY										
ITEM NO.	ITEM DESCRIPTION	UNIT	REACH 6	REACH 7	REACH 8	REACH 9	LUMP SUM ITEMS	TOTAL QUANTITY	UNIT PRICE	TOTAL AMOUNT
	GENERAL CONDITIONS									
105-1	PARTNERING ALLOWANCE	LS					1	1	$15,000.00	$15,000
107-1	AZDPES/SWPPP PERMITS	LS					1	1	$100,000.00	$100,000
107-2	PUBLIC INFORMATION & NOTIFICATION ALLOWANCE	LS					1	1	$20,000.00	$20,000
107-3	PROJECT SIGNS ALLOWANCE	EA					1	1	$5,000.00	$5,000
107-4	WATER MANAGEMENT	LS					1	1	$55,884.74	$55,885
107-5	VANDALISM ALLOWANCE	LS					1	1	$25,000.00	$25,000
							$220,885			
	EARTHWORK									
201-1	CLEARING AND GRUBBING	LS					1	1	$288,562.50	$288,563
202-1	MOBILIZATION	LS					1	1	$110,034.84	$110,035
211-1	FILL CONSTRUCTION (DITCHES, FARM ROAD AND OVERBANK)	CY	1,864	150	625	57,639		109,234	$7.00	$764,638
211-2	FINAL AESTHETIC GRADING	LS					1	1	$227,496.40	$227,496
215-1	CHANNEL EXCAVATION	CY	46,736	63,919	92,535	68,038		470,589	$3.00	$1,411,767
220-1	PLAIN RIPRAP (D_{50} =2")	CY	20	0	151	0		459	$45.00	$20,655
220-2	PLAIN RIPRAP (D_{50} =12")	CY	324	196	1,311	20		3,038	$70.00	$212,660
220-3	PLAIN RIPRAP (D_{50} =15")	CY	562	0	748			6,017	$75.00	$451,275
230-1	GRAVEL MULCH	SY	37,711	27,513	44,512	31,284		251,884	$4.00	$1,007,535
230-2	HYDROSEEDING	AC	9	7.29	10.97	11.23		69	$6,000.00	$412,630
			$426,044	$360,338	$680,485	$801,502	$626,094			
	STREETS & RELATED WORK									
310-1	ABC MAINTENANCE ROAD & RAMP (4-INCH)	SY	7,504	3,077	8,098	6,535		49,082	$4.63	$227,252
336-1	TEMPORARY PAVEMENT REPLACEMENT (2" A.C.)	SY	0	0	0	0		996	$20.00	$19,924
336-2	PERMANENT PAVEMENT REPLACEMENT (3" A.C.)	SY	274	322	0	0		682	$30.00	$20,467
340-1	CONCRETE VERTICAL CURB & GUTTER, MAG STD DET 220, TYPE 'A'	LF	0	36	0	0		36	$19.00	$684
340-2	CONCRETE ROLL CURB & GUTTER, MAG STD DET 220, TYPE 'C'	LF	0	80	0	0		80	$17.00	$1,360
340-3	CONCRETE SIDEWALK, MAG STD DET 230	SF	0	1,004	0	0		1,004	$15.00	$15,060
340-4	CONCRETE DRIVEWAY ENTRANCE, MAG STD DET 250-1	SF	0	144	0	0		144	$15.00	$2,160
340-5	CONCRETE DRIVEWAY ENTRANCE, MAG STD DET 250-2	SF	0	576	0	0		576	$15.00	$8,640
350-1	REMOVE EXISTING WIRE FENCE	LF	0	0	0	175		3,832	$1.00	$3,832
350-2	REMOVE PAVEMENT	SY	0	0	0	0		1,739	$7.00	$12,171
350-3	BURIED TRASH REMOVAL ALLOWANCE	LS					1	1	$50,000.00	$50,000
350-4	REMOVE CONCRETE CURB & GUTTER	LF	0	236	0	0		236	$6.00	$1,416
350-5	REMOVE GROUTED RIPRAP	SY	0	0	0	0		4,597	$18.92	$86,952
350-6	REMOVE EXISTING BLOCK WALL, RETAINIGN WALL	LF	0	3,711	0	0		4,057	$8.00	$32,456
350-7	REMOVE EXISTING CONCRETE LINED CHANNEL	SY	0	0	0	0		2,920	$18.92	$55,232
350-8	REMOVE EXISTING CONCRETE SIDEWALK	SY	0	112	0	0		112	$18.92	$2,110
			$42,977	$85,014	$37,495	$30,432	$50,000			
	RIGHT-OF-WAY AND TRAFFIC CONTROL									
401-1	MISCELLANEOUS TRAFFIC CONTROL	LS					1	1	$100,000.00	$100,000
412-1	4 STRAND SMOOTH WIRE FENCE	LF	3,488	4,460	4,714	3,471		35,902	$5.00	$179,510
421-1	INSTALL GATE	EA	0	0	0	1		1	$1,000.00	$1,000
			$17,440	$22,300	$23,570	$18,355	$100,000			
	STRUCTURES									
505-1	CONCRETE CHANNEL LINING (7" THICK)	SF	0	0	0	0		17,476	$10.80	$188,784
505-2	CONCRETE BOX CULVERT TYPE A (2 BARREL 8' x 6'), ADOT B-02.20	LF	826	85	0	0		911	$1,121.25	$1,021,459
505-3	CONCRETE BOX CULVERT TYPE B (3 BARREL 8' x 6'), ADOT B-02.30	LF	0	58	393	0		721	$1,604.20	$1,156,628
505-4	CONCRETE BOX CULVERT TYPE E (1 BARREL 10' x 6'), ADOT B-02.20	LF	0	0	0	1,320		1,320	$1,475.50	$1,947,660
505-5	CONCRETE BOX CULVERT INLET HEADWALL, ADOT B-04.30	EA	1	2	1	1		10	$8,801.00	$88,010

WHITE TANKS FRS#3 OUTLET CHANNEL - COST ESTIMATE BY REACH, USING 30% DESIGN REPORT LAND COSTS
ALTERNATIVE 6/7A AND 9A (30% DESIGN)

1/27/2010

FCD 2009C012
PCN 470.04.32

HOSKIN-RYAN CONSULTANTS, INC.
HRC 09-077-01

			QUANTITY SUMMARY							
ITEM NO.	ITEM DESCRIPTION	UNIT	REACH 6	REACH 7	REACH 8	REACH 9	LUMP SUM ITEMS	TOTAL QUANTITY	UNIT PRICE	TOTAL AMOUNT
505-6	CONCRETE BOX CULVERT OUTLET HEADWALL, ADOT B-04.30	EA	1	2	2	0		10	$14,768.00	$147,680
505-7	CONCRETE GRADE CONTROL STRUCTURE, (30'-10' BOTTOM WIDTH TRANSITION) TYPE 1	CY	0	0	0	0		951	$500.00	$475,500
505-8	CONCRETE GRADE CONTROL STRUCTURE, (40'-20' BOTTOM WIDTH TRANSITION) TYPE 2	CY	168	0	0	0		252	$500.00	$126,000
505-9	CONCRETE GRADE CONTROL STRUCTURE, (50'-30' BOTTOM WIDTH TRANSITION) TYPE 3	CY	0	0	0	0		154	$500.00	$77,000
505-10	CONCRETE TEST PANELS - 10' x 10' x 6"	EA					3	3	$1,851.85	$5,556
505-11	CONCRETE SIDE FLOW SPILLWAY, (10' BOTTOM WIDTH) TYPE1	CY	0	0	0	0		35	$500.00	$17,500
505-12	CONCRETE SIDE FLOW SPILLWAY, (20' BOTTOM WIDTH) TYPE2	CY	0	0	0	0		80	$500.00	$40,000
505-13	CONCRETE SIDE FLOW SPILLWAY, (30' BOTTOM WIDTH) TYPE3	CY	0	0	0	0		65	$500.00	$32,500
505-14	CONCRETE SIDE FLOW SPILLWAY, (40' BOTTOM WIDTH) TYPE4	CY	0	0	0	0		63	$500.00	$31,500
505-15	CONCRETE SIDE FLOW SPILLWAY, (50' BOTTOM WIDTH) TYPE5	CY	0	0	140	0		140	$500.00	$70,000
505-16	CONCRETE SIDE FLOW SPILLWAY, (80' BOTTOM WIDTH) TYPE6	CY	0	0	251	0		251	$500.00	$125,500
505-17	CONCRETE DROP INLET STRUCTURE, (3-8'X6' BOX CULVERT) TYPE 1	CY	0	0	0	0		80	$500.00	$40,000
505-18	CONCRETE DROP INLET STRUCTURE, (2-8'X6' BOX CULVERT) TYPE 2	CY	14	14	0	0		28	$500.00	$14,000
505-19	WASTEWAY STRUCTURE	CY	0	0	0	202		202	$500.00	$101,000
505-20	FLOW JUNCTION STRUCTURE	CY	137	0	0	0		137	$500.00	$68,500
505-21	SLIDE GATE STRUCTURE	EA	0	0	0	3		3	$50,000.00	$150,000
505-22	GROUTED RIPRAP DOWNDRAIN	EA	0	6	4	0		27	$1,630.00	$44,010
505-23	ALLOWANCE FOR HARDENED STRUCTURE WITHIN FISSURE ZONE	LS					1	1	$2,225,826.96	$2,225,827
510-1	RETAINING WALL, 2' TO 3'	LF	0	300	100	0		400	$40.00	$16,000
515-1	BOLLARDS, MAG STD DET 140, TYPE 2 REMOVABLE	EA	12	21	9	3		96	$1,000.00	$96,000
520-1	STEEL SAFETY RAIL, MAG STD DET 145, TYPE 1	LF	617	415	220	118		2,398	$75.00	$179,850
			$1,167,497	$316,393	$900,308	$2,219,311	$2,231,383			
	SUBTOTAL CONSTRUCTION ITEMS		**$1,653,958**	**$784,045**	**$1,641,857**	**$3,069,600**	**$3,228,361**			**$14,434,827**
	Relocation and/or Removal of Existing Utilities		$82,698	$39,202	$82,093	$153,480	$161,418		5%	$721,741
	Engineering Contingencies for Unknown Items		$82,698	$39,202	$82,093	$153,480	$161,418		5%	$721,741
	TOTAL CONSTRUCTION COST		**$1,819,353**	**$862,450**	**$1,806,043**	**$3,376,560**	**$3,551,197**			**$15,878,310**
	Landscaping as Aesthetic Treatment		$155,829	$113,690	$183,934	$129,275	$0	52	$20,000	$1,040,842
	Non-Landscaping Aesthetic Treatment		$72,774	$34,498	$72,242	$135,062	$142,048		4%	$635,132
	TOTAL CONSTRUCTION AND LANDSCAPE COST		**$2,047,957**	**$1,010,637**	**$2,062,218**	**$3,640,897**	**$3,693,245**			**$17,554,284**
	Engineering and Landscape Design		$204,796	$101,064	$206,222	$364,090	$369,324		10%	$1,755,428
	Construction Administration		$122,877	$60,638	$123,733	$218,454	$221,595		6%	$1,053,257
	TOTAL CONSTRUCTION, LANDSCAPE, AND CONTINGENCIES COST		**$2,375,630**	**$1,172,339**	**$2,392,173**	**$4,223,440**	**$4,284,164**			**$20,362,969**
	Required FCDMC Right-of-Way Acquisition - Undeveloped Property	AC	10.08	0.00	13.11	0.00	0.00	23.19	$152,500.00	$3,536,547
	Required FCDMC Right-of-Way Acquisition - Platted Property	AC	0.00	0.00	0.00	0.00	0.00	12.51	$205,000.00	$2,565,195
		AC	**10.08**	**0.00**	**13.11**	**0.00**	**0.00**	**35.70**		
	TOTAL REQUIRED RIGHT-OF-WAY ACQUISITION		**$1,537,440**	**$0**	**$1,999,107**	**$0**	**$0**			**$6,101,742**
	TOTAL PROJECT COST		**$3,913,070**	**$1,172,339**	**$4,391,280**	**$4,223,440**	**$4,284,164**			**$26,464,711**

WHITE TANKS FRS#3 OUTLET CHANNEL - COST ESTIMATE BY REACH, USING 30% DESIGN REPORT LAND COSTS 1/27/2010
ALTERNATIVE 6/7B AND 9B (BASELINE)
FCD 2009C012 HOSKIN-RYAN CONSULTANTS, INC.
PCN 470.04.32 HRC 09-077-01

QUANTITY SUMMARY

ITEM NO.	ITEM DESCRIPTION	UNIT	REACH 6	REACH 7	REACH 8	REACH 9	LUMP SUM ITEMS	TOTAL QUANTITY	UNIT PRICE	TOTAL AMOUNT
	GENERAL CONDITIONS									
105-1	PARTNERING ALLOWANCE	LS					1	1	$15,000.00	$15,000
107-1	AZDPES/SWPPP PERMITS	LS					1	1	$100,000.00	$100,000
107-2	PUBLIC INFORMATION & NOTIFICATION ALLOWANCE	LS					1	1	$20,000.00	$20,000
107-3	PROJECT SIGNS ALLOWANCE	EA					1	1	$5,000.00	$5,000
107-4	WATER MANAGEMENT	LS					1	1	$55,884.74	$55,885
107-5	VANDALISM ALLOWANCE	LS					1	1	$25,000.00	$25,000
							$220,885			
	EARTHWORK									
201-1	CLEARING AND GRUBBING	LS					1	1	$288,562.50	$288,563
202-1	MOBILIZATION	LS					1	1	$110,034.84	$110,035
211-1	FILL CONSTRUCTION (DITCHES, FARM ROAD AND OVERBANK)	CY	1,864	150	625	57,639		109,234	$7.00	$764,638
211-2	FINAL AESTHETIC GRADING	LS					1	1	$227,496.40	$227,496
215-1	CHANNEL EXCAVATION	CY	46,736	63,919	92,535	68,038		470,589	$3.00	$1,411,767
220-1	PLAIN RIPRAP (D_{50} =2")	CY	20	0	151	0		459	$45.00	$20,655
220-2	PLAIN RIPRAP (D_{50} =12")	CY	324	196	1,311	20		3,038	$70.00	$212,660
220-3	PLAIN RIPRAP (D_{50} =15")	CY	562	0	748			6,017	$75.00	$451,275
230-1	GRAVEL MULCH	SY	37,711	27,513	44,512	31,284		251,884	$4.00	$1,007,535
230-2	HYDROSEEDING	AC	9	7.29	10.97	11.23		69	$6,000.00	$412,630
			$426,044	$360,338	$680,485	$801,502	$626,094			
	STREETS & RELATED WORK									
310-1	ABC MAINTENANCE ROAD & RAMP (4-INCH)	SY	7,504	3,077	8,098	6,535		49,082	$4.63	$227,252
336-1	TEMPORARY PAVEMENT REPLACEMENT (2" A.C.)	SY	0	0	0	0		996	$20.00	$19,924
336-2	PERMANENT PAVEMENT REPLACEMENT (3" A.C.)	SY	274	322	0	0		682	$30.00	$20,467
340-1	CONCRETE VERTICAL CURB & GUTTER, MAG STD DET 220, TYPE 'A'	LF	0	36	0	0		36	$19.00	$684
340-2	CONCRETE ROLL CURB & GUTTER, MAG STD DET 220, TYPE 'C'	LF	0	80	0	0		80	$17.00	$1,360
340-3	CONCRETE SIDEWALK, MAG STD DET 230	SF	0	1,004	0	0		1,004	$15.00	$15,060
340-4	CONCRETE DRIVEWAY ENTRANCE, MAG STD DET 250-1	SF	0	144	0	0		144	$15.00	$2,160
340-5	CONCRETE DRIVEWAY ENTRANCE, MAG STD DET 250-2	SF	0	576	0	0		576	$15.00	$8,640
350-1	REMOVE EXISTING WIRE FENCE	LF	0	0	0	175		3,832	$1.00	$3,832
350-2	REMOVE PAVEMENT	SY	0	0	0	0		1,739	$7.00	$12,171
350-3	BURIED TRASH REMOVAL ALLOWANCE	LS					1	1	$50,000.00	$50,000
350-4	REMOVE CONCRETE CURB & GUTTER	LF	0	236	0	0		236	$6.00	$1,416
350-5	REMOVE GROUTED RIPRAP	SY	0	0	0	0		4,597	$18.92	$86,952
350-6	REMOVE EXISTING BLOCK WALL, RETAINIGN WALL	LF	0	3,711	0	0		4,057	$8.00	$32,456
350-7	REMOVE EXISTING CONCRETE LINED CHANNEL	SY	0	0	0	0		2,920	$18.92	$55,232
350-8	REMOVE EXISTING CONCRETE SIDEWALK	SY	0	112	0	0		112	$18.92	$2,110
			$42,977	$85,014	$37,495	$30,432	$50,000			
	RIGHT-OF-WAY AND TRAFFIC CONTROL									
401-1	MISCELLANEOUS TRAFFIC CONTROL	LS					1	1	$100,000.00	$100,000
412-1	4 STRAND SMOOTH WIRE FENCE	LF	3,488	4,460	4,714	3,471		35,902	$5.00	$179,510
421-1	INSTALL GATE	EA	0	0	0	1		1	$1,000.00	$1,000
			$17,440	$22,300	$23,570	$18,355	$100,000			
	STRUCTURES									
505-1	CONCRETE CHANNEL LINING (7" THICK)	SF	0	0	0	0		17,476	$10.80	$188,784
505-2	CONCRETE BOX CULVERT TYPE A (2 BARREL 8' x 6'), ADOT B-02.20	LF	1,026	85	0	0		1,111	$1,121.25	$1,245,709
505-3	CONCRETE BOX CULVERT TYPE B (3 BARREL 8' x 6'), ADOT B-02.30	LF	0	58	393	0		721	$1,604.20	$1,156,628
505-4	CONCRETE BOX CULVERT TYPE E (1 BARREL 10' x 6'), ADOT B-02.20	LF	0	0	0	1,320		1,320	$737.75	$973,830
505-5	CONCRETE BOX CULVERT INLET HEADWALL, ADOT B-04.30	EA	2	2	1	1		11	$8,801.00	$96,811

WHITE TANKS FRS#3 OUTLET CHANNEL - COST ESTIMATE BY REACH, USING 30% DESIGN REPORT LAND COSTS
ALTERNATIVE 6/7B AND 9B (BASELINE)

1/27/2010

FCD 2009C012
PCN 470.04.32

HOSKIN-RYAN CONSULTANTS, INC.
HRC 09-077-01

QUANTITY SUMMARY

ITEM NO.	ITEM DESCRIPTION	UNIT	REACH 6	REACH 7	REACH 8	REACH 9	LUMP SUM ITEMS	TOTAL QUANTITY	UNIT PRICE	TOTAL AMOUNT
505-6	CONCRETE BOX CULVERT OUTLET HEADWALL, ADOT B-04.30	EA	2	2	2	0		11	$14,768.00	$162,448
505-7	CONCRETE GRADE CONTROL STRUCTURE, (30'-10' BOTTOM WIDTH TRANSITION) TYPE 1	CY	0	0	0	0		951	$500.00	$475,500
505-8	CONCRETE GRADE CONTROL STRUCTURE, (40'-20' BOTTOM WIDTH TRANSITION) TYPE 2	CY	168	0	0	0		252	$500.00	$126,000
505-9	CONCRETE GRADE CONTROL STRUCTURE, (50'-30' BOTTOM WIDTH TRANSITION) TYPE 3	CY	0	0	0	0		154	$500.00	$77,000
505-10	CONCRETE TEST PANELS - 10' x 10' x 6"	EA					3	3	$1,851.85	$5,556
505-11	CONCRETE SIDE FLOW SPILLWAY, (10' BOTTOM WIDTH) TYPE1	CY	0	0	0	0		35	$500.00	$17,500
505-12	CONCRETE SIDE FLOW SPILLWAY, (20' BOTTOM WIDTH) TYPE2	CY	0	0	0	0		80	$500.00	$40,000
505-13	CONCRETE SIDE FLOW SPILLWAY, (30' BOTTOM WIDTH) TYPE3	CY	0	0	0	0		65	$500.00	$32,500
505-14	CONCRETE SIDE FLOW SPILLWAY, (40' BOTTOM WIDTH) TYPE4	CY	0	0	0	0		63	$500.00	$31,500
505-15	CONCRETE SIDE FLOW SPILLWAY, (50' BOTTOM WIDTH) TYPE5	CY	0	0	140	0		140	$500.00	$70,000
505-16	CONCRETE SIDE FLOW SPILLWAY, (80' BOTTOM WIDTH) TYPE6	CY	0	0	251	0		251	$500.00	$125,500
505-17	CONCRETE DROP INLET STRUCTURE, (3-8'X6' BOX CULVERT) TYPE 1	CY	0	0	0	0		80	$500.00	$40,000
505-18	CONCRETE DROP INLET STRUCTURE, (2-8'X6' BOX CULVERT) TYPE 2	CY	14	14	0	0		28	$500.00	$14,000
505-19	WASTEWAY STRUCTURE	CY	0	0	0	0		0	$500.00	$0
505-20	FLOW JUNCTION STRUCTURE	CY	137	0	0	0		137	$500.00	$68,500
505-21	SLIDE GATE STRUCTURE	EA	0	0	0	0		0	$50,000.00	$0
505-22	GROUTED RIPRAP DOWNDRAIN	EA	0	6	4	0		27	$1,630.00	$44,010
505-23	ALLOWANCE FOR HARDENED STRUCTURE WITHIN FISSURE ZONE	LS					0	0	$2,225,826.96	$0
510-1	RETAINING WALL, 2' TO 3'	LF	0	300	100	0		400	$40.00	$16,000
515-1	BOLLARDS, MAG STD DET 140, TYPE 2 REMOVABLE	EA	12	21	9	3		96	$1,000.00	$96,000
520-1	STEEL SAFETY RAIL, MAG STD DET 145, TYPE 1	LF	617	415	220	118		2,398	$75.00	$179,850
			$1,415,316	$316,393	$900,308	$994,481	$5,556			
	SUBTOTAL CONSTRUCTION ITEMS		$1,901,777	$784,045	$1,641,857	$1,844,770	$1,002,534			$11,231,989
	Relocation and/or Removal of Existing Utilities		$95,089	$39,202	$82,093	$92,238	$50,127		5%	$561,599
	Engineering Contingencies for Unknown Items		$95,089	$39,202	$82,093	$92,238	$50,127		5%	$561,599
	TOTAL CONSTRUCTION COST		$2,091,954	$862,450	$1,806,043	$2,029,247	$1,102,787			$12,355,188
	Landscaping as Aesthetic Treatment		$155,829	$113,690	$183,934	$129,275	$0	52	$20,000	$1,040,842
	Non-Landscaping Aesthetic Treatment		$83,678	$34,498	$72,242	$81,170	$44,111		4%	$494,208
	TOTAL CONSTRUCTION AND LANDSCAPE COST		$2,331,462	$1,010,637	$2,062,218	$2,239,691	$1,146,899			$13,890,237
	Engineering and Landscape Design		$233,146	$101,064	$206,222	$223,969	$114,690		10%	$1,389,024
	Construction Administration		$139,888	$60,638	$123,733	$134,381	$68,814		6%	$833,414
	TOTAL CONSTRUCTION, LANDSCAPE, AND CONTINGENCIES COST		$2,704,496	$1,172,339	$2,392,173	$2,598,042	$1,330,403			$16,112,675
	Required FCDMC Right-of-Way Acquisition - Undeveloped Property	AC	10.08	0.00	13.11	0.00	0.00	23.19	$152,500.00	$3,536,547
	Required FCDMC Right-of-Way Acquisition - Platted Property	AC	0.00	0.00	0.00	0.00	0.00	12.51	$205,000.00	$2,565,195
		AC	10.08	0.00	13.11	0.00	0.00	35.70		
	TOTAL REQUIRED RIGHT-OF-WAY ACQUISITION		$1,537,440	$0	$1,999,107	$0	$0			$6,101,742
	TOTAL PROJECT COST		$4,241,936	$1,172,339	$4,391,280	$2,598,042	$1,330,403			$22,214,417

2.598
- .974 (10x6 RCB)
1.524
+ .370
1.894

1320x2x140

WHITE TANKS FRS#3 OUTLET CHANNEL - COST ESTIMATE BY REACH, USING 30% DESIGN REPORT LAND COSTS

1/27/2010

ALTERNATIVE 6/7C

FCD 2009C012
PCN 470.04.32

HOSKIN-RYAN CONSULTANTS, INC.
HRC 09-077-01

QUANTITY SUMMARY										
ITEM NO.	ITEM DESCRIPTION	UNIT	REACH 6	REACH 7	REACH 8	REACH 9	LUMP SUM ITEMS	TOTAL QUANTITY	UNIT PRICE	TOTAL AMOUNT
505-6	CONCRETE BOX CULVERT OUTLET HEADWALL, ADOT B-04.30	EA	1	0	1	0		7	$14,768.00	$103,376
505-7	CONCRETE GRADE CONTROL STRUCTURE, (30'-10' BOTTOM WIDTH TRANSITION) TYPE 1	CY	0	0	0	0		951	$500.00	$475,500
505-8	CONCRETE GRADE CONTROL STRUCTURE, (40'-20' BOTTOM WIDTH TRANSITION) TYPE 2	CY	168	0	0	0		252	$500.00	$126,000
505-9	CONCRETE GRADE CONTROL STRUCTURE, (50'-30' BOTTOM WIDTH TRANSITION) TYPE 3	CY	0	0	0	0		154	$500.00	$77,000
505-10	CONCRETE TEST PANELS - 10' x 10' x 6"	EA					3	3	$1,851.85	$5,556
505-11	CONCRETE SIDE FLOW SPILLWAY, (10' BOTTOM WIDTH) TYPE1	CY	0	0	0	0		35	$500.00	$17,500
505-12	CONCRETE SIDE FLOW SPILLWAY, (20' BOTTOM WIDTH) TYPE2	CY	0	0	0	0		80	$500.00	$40,000
505-13	CONCRETE SIDE FLOW SPILLWAY, (30' BOTTOM WIDTH) TYPE3	CY	0	0	0	0		65	$500.00	$32,500
505-14	CONCRETE SIDE FLOW SPILLWAY, (40' BOTTOM WIDTH) TYPE4	CY	0	0	0	0		63	$500.00	$31,500
505-15	CONCRETE SIDE FLOW SPILLWAY, (50' BOTTOM WIDTH) TYPE5	CY	0	0	140	0		140	$500.00	$70,000
505-16	CONCRETE SIDE FLOW SPILLWAY, (80' BOTTOM WIDTH) TYPE6	CY	0	0	251	0		251	$500.00	$125,500
505-17	CONCRETE DROP INLET STRUCTURE, (3-8'X6' BOX CULVERT) TYPE 1	CY	0	0	0	0		80	$500.00	$40,000
505-18	CONCRETE DROP INLET STRUCTURE, (2-8'X6' BOX CULVERT) TYPE 2	CY	14	14	0	0		28	$500.00	$14,000
505-19	WASTEWAY STRUCTURE	CY	0	0	0	0		0	$500.00	$0
505-20	FLOW JUNCTION STRUCTURE	CY	137	0	0	0		137	$500.00	$68,500
505-21	SLIDE GATE STRUCTURE	EA	0	0	0	0		0	$50,000.00	$0
505-22	GROUTED RIPRAP DOWNDRAIN	EA	0	6	4	0		27	$1,630.00	$44,010
505-23	ALLOWANCE FOR HARDENED STRUCTURE WITHIN FISSURE ZONE	LS					0	0	$2,225,826.96	$0
510-1	RETAINING WALL, 2' TO 3'	LF	0	300	100	0		400	$40.00	$16,000
515-1	BOLLARDS, MAG STD DET 140, TYPE 2 REMOVABLE	EA	12	21	9	3		96	$1,000.00	$96,000
520-1	STEEL SAFETY RAIL, MAG STD DET 145, TYPE 1	LF	617	415	220	118		2,398	$75.00	$179,850
			$3,019,802	$2,643,914	$885,540	$994,481	$5,556			
	SUBTOTAL CONSTRUCTION ITEMS		**$3,093,266**	**$2,752,278**	**$1,627,089**	**$1,844,770**	**$1,002,534**			**$14,376,943**
	Relocation and/or Removal of Existing Utilities		$154,663	$137,614	$81,354	$92,238	$50,127		5%	$718,847
	Engineering Contingencies for Unknown Items		$154,663	$137,614	$81,354	$92,238	$50,127		5%	$718,847
	TOTAL CONSTRUCTION COST		**$3,402,593**	**$3,027,505**	**$1,789,798**	**$2,029,247**	**$1,102,787**			**$15,814,637**
	Landscaping as Aesthetic Treatment		$0	$0	$183,934	$129,275	$0	39	$20,000	$771,323
	Non-Landscaping Aesthetic Treatment		$136,104	$121,100	$71,592	$81,170	$44,111		4%	$632,585
	TOTAL CONSTRUCTION AND LANDSCAPE COST		**$3,538,697**	**$3,148,606**	**$2,045,324**	**$2,239,691**	**$1,146,899**			**$17,218,546**
	Engineering and Landscape Design		$353,870	$314,861	$204,532	$223,969	$114,690		10%	$1,721,855
	Construction Administration		$212,322	$188,916	$122,719	$134,381	$68,814		6%	$1,033,113
	TOTAL CONSTRUCTION, LANDSCAPE, AND CONTINGENCIES COST		**$4,104,888**	**$3,652,382**	**$2,372,576**	**$2,598,042**	**$1,330,403**			**$19,973,513**
	Required FCDMC Right-of-Way Acquisition - Undeveloped Property	AC	0.00	0.00	13.11	0.00	0.00	13.11	$152,500.00	$1,999,107
	Required FCDMC Right-of-Way Acquisition - Platted Property	AC	0.00	0.00	0.00	0.00	0.00	12.51	$205,000.00	$2,565,195
		AC	**0.00**	**0.00**	**13.11**	**0.00**	**0.00**	**25.62**		
	TOTAL REQUIRED RIGHT-OF-WAY ACQUISITION		**$0**	**$0**	**$1,999,107**	**$0**	**$0**			**$4,564,302**
	TOTAL PROJECT COST		**$4,104,888**	**$3,652,382**	**$4,371,682**	**$2,598,042**	**$1,330,403**			**$24,537,815**

WHITE TANKS FRS#3 OUTLET CHANNEL - COST ESTIMATE BY REACH, USING 30% DESIGN REPORT LAND COSTS 1/27/2010

ALTERNATIVE 6/7D

FCD 2009C012 HOSKIN-RYAN CONSULTANTS, INC.

PCN 470.04.32 HRC 09-077-01

QUANTITY SUMMARY										
ITEM NO.	ITEM DESCRIPTION	UNIT	REACH 6	REACH 7	REACH 8	REACH 9	LUMP SUM ITEMS	TOTAL QUANTITY	UNIT PRICE	TOTAL AMOUNT
	GENERAL CONDITIONS									
105-1	PARTNERING ALLOWANCE	LS					1	1	$15,000.00	$15,000
107-1	AZDPES/SWPPP PERMITS	LS					1	1	$100,000.00	$100,000
107-2	PUBLIC INFORMATION & NOTIFICATION ALLOWANCE	LS					1	1	$20,000.00	$20,000
107-3	PROJECT SIGNS ALLOWANCE	EA					1	1	$5,000.00	$5,000
107-4	WATER MANAGEMENT	LS					1	1	$55,884.74	$55,885
107-5	VANDALISM ALLOWANCE	LS					1	1	$25,000.00	$25,000
							$220,885			
	EARTHWORK									
201-1	CLEARING AND GRUBBING	LS					1	1	$288,562.50	$288,563
202-1	MOBILIZATION	LS					1	1	$110,034.84	$110,035
211-1	FILL CONSTRUCTION (DITCHES, FARM ROAD AND OVERBANK)	CY	1,864	150	625	57,639		109,234	$7.00	$764,638
211-2	FINAL AESTHETIC GRADING	LS					1	1	$227,496.40	$227,496
215-1	CHANNEL EXCAVATION	CY	32,715	63,919	92,535	68,038		456,568	$3.00	$1,369,705
220-1	PLAIN RIPRAP (D_{50}=2")	CY	20	0	151	0		459	$45.00	$20,655
220-2	PLAIN RIPRAP (D_{50}=12")	CY	324	196	1,311	20		3,038	$70.00	$212,660
220-3	PLAIN RIPRAP (D_{50}=15")	CY	562	0	748			6,017	$75.00	$451,275
230-1	GRAVEL MULCH	SY	26,397	27,513	44,512	31,284		240,570	$4.00	$962,282
230-2	HYDROSEEDING	AC	7	7.29	10.97	11.23		66	$6,000.00	$395,765
			$321,864	$360,338	$680,485	$801,502	$626,094			
	STREETS & RELATED WORK									
310-1	ABC MAINTENANCE ROAD & RAMP (4-INCH)	SY	7,504	3,077	8,098	6,535		49,082	$4.63	$227,252
336-1	TEMPORARY PAVEMENT REPLACEMENT (2" A.C.)	SY	0	0	0	0		996	$20.00	$19,924
336-2	PERMANENT PAVEMENT REPLACEMENT (3" A.C.)	SY	274	322	0	0		682	$30.00	$20,467
340-1	CONCRETE VERTICAL CURB & GUTTER, MAG STD DET 220, TYPE 'A'	LF	0	36	0	0		36	$19.00	$684
340-2	CONCRETE ROLL CURB & GUTTER, MAG STD DET 220, TYPE 'C'	LF	0	80	0	0		80	$17.00	$1,360
340-3	CONCRETE SIDEWALK, MAG STD DET 230	SF	0	1,004	0	0		1,004	$15.00	$15,060
340-4	CONCRETE DRIVEWAY ENTRANCE, MAG STD DET 250-1	SF	0	144	0	0		144	$15.00	$2,160
340-5	CONCRETE DRIVEWAY ENTRANCE, MAG STD DET 250-2	SF	0	576	0	0		576	$15.00	$8,640
350-1	REMOVE EXISTING WIRE FENCE	LF	0	0	0	175		3,832	$1.00	$3,832
350-2	REMOVE PAVEMENT	SY	0	0	0	0		1,739	$7.00	$12,171
350-3	BURIED TRASH REMOVAL ALLOWANCE	LS					1	1	$50,000.00	$50,000
350-4	REMOVE CONCRETE CURB & GUTTER	LF	0	236	0	0		236	$6.00	$1,416
350-5	REMOVE GROUTED RIPRAP	SY	0	0	0	0		4,597	$18.92	$86,952
350-6	REMOVE EXISTING BLOCK WALL, RETAINIGN WALL	LF	0	3,711	0	0		4,057	$8.00	$32,456
350-7	REMOVE EXISTING CONCRETE LINED CHANNEL	SY	0	0	0	0		2,920	$18.92	$55,232
350-8	REMOVE EXISTING CONCRETE SIDEWALK	SY	0	112	0	0		112	$18.92	$2,110
			$42,977	$85,014	$37,495	$30,432	$50,000			
	RIGHT-OF-WAY AND TRAFFIC CONTROL									
401-1	MISCELLANEOUS TRAFFIC CONTROL	LS					1	1	$100,000.00	$100,000
412-1	4 STRAND SMOOTH WIRE FENCE	LF	3,488	4,460	4,714	3,471		35,902	$5.00	$179,510
421-1	INSTALL GATE	EA	0	0	0	1		1	$1,000.00	$1,000
			$17,440	$22,300	$23,570	$18,355	$100,000			
	STRUCTURES									
505-1	CONCRETE CHANNEL LINING (7" THICK)	SF	0	0	0	0		17,476	$10.80	$188,784
505-2	CONCRETE BOX CULVERT TYPE A (2 BARREL 8' x 6'), ADOT B-02.20	LF	1,200	85	0	0		1,285	$1,121.25	$1,440,806
505-3	CONCRETE BOX CULVERT TYPE B (3 BARREL 8' x 6'), ADOT B-02.30	LF	0	58	393	0		721	$1,604.20	$1,156,628
505-4	CONCRETE BOX CULVERT TYPE E (1 BARREL 10' x 6'), ADOT B-02.20	LF	0	0	0	1,320		1,320	$737.75	$973,830
505-5	CONCRETE BOX CULVERT INLET HEADWALL, ADOT B-04.30	EA	1	2	1	1		10	$8,801.00	$88,010

WHITE TANKS FRS#3 OUTLET CHANNEL - COST ESTIMATE BY REACH, USING 30% DESIGN REPORT LAND COSTS
ALTERNATIVE 6/7D
FCD 2009C012
PCN 470.04.32

1/27/2010
HOSKIN-RYAN CONSULTANTS, INC.
HRC 09-077-01

QUANTITY SUMMARY										
ITEM NO.	ITEM DESCRIPTION	UNIT	REACH 6	REACH 7	REACH 8	REACH 9	LUMP SUM ITEMS	TOTAL QUANTITY	UNIT PRICE	TOTAL AMOUNT
505-6	CONCRETE BOX CULVERT OUTLET HEADWALL, ADOT B-04.30	EA	1	2	1	0		9	$14,768.00	$132,912
505-7	CONCRETE GRADE CONTROL STRUCTURE, (30'-10' BOTTOM WIDTH TRANSITION) TYPE 1	CY	0	0	0	0		951	$500.00	$475,500
505-8	CONCRETE GRADE CONTROL STRUCTURE, (40'-20' BOTTOM WIDTH TRANSITION) TYPE 2	CY	168	0	0	0		252	$500.00	$126,000
505-9	CONCRETE GRADE CONTROL STRUCTURE, (50'-30' BOTTOM WIDTH TRANSITION) TYPE 3	CY	0	0	0	0		154	$500.00	$77,000
505-10	CONCRETE TEST PANELS - 10' x 10' x 6"	EA					3	3	$1,851.85	$5,556
505-11	CONCRETE SIDE FLOW SPILLWAY, (10' BOTTOM WIDTH) TYPE1	CY	0	0	0	0		35	$500.00	$17,500
505-12	CONCRETE SIDE FLOW SPILLWAY, (20' BOTTOM WIDTH) TYPE2	CY	0	0	0	0		80	$500.00	$40,000
505-13	CONCRETE SIDE FLOW SPILLWAY, (30' BOTTOM WIDTH) TYPE3	CY	0	0	0	0		65	$500.00	$32,500
505-14	CONCRETE SIDE FLOW SPILLWAY, (40' BOTTOM WIDTH) TYPE4	CY	0	0	0	0		63	$500.00	$31,500
505-15	CONCRETE SIDE FLOW SPILLWAY, (50' BOTTOM WIDTH) TYPE5	CY	0	0	140	0		140	$500.00	$70,000
505-16	CONCRETE SIDE FLOW SPILLWAY, (80' BOTTOM WIDTH) TYPE6	CY	0	0	251	0		251	$500.00	$125,500
505-17	CONCRETE DROP INLET STRUCTURE, (3-8'X6' BOX CULVERT) TYPE 1	CY	0	0	0	0		80	$500.00	$40,000
505-18	CONCRETE DROP INLET STRUCTURE, (2-8'X6' BOX CULVERT) TYPE 2	CY	14	14	0	0		28	$500.00	$14,000
505-19	WASTEWAY STRUCTURE	CY	0	0	0	0		0	$500.00	$0
505-20	FLOW JUNCTION STRUCTURE	CY	137	0	0	0		137	$500.00	$68,500
505-21	SLIDE GATE STRUCTURE	EA	0	0	0	0		0	$50,000.00	$0
505-22	GROUTED RIPRAP DOWNDRAIN	EA	0	6	4	0		27	$1,630.00	$44,010
505-23	ALLOWANCE FOR HARDENED STRUCTURE WITHIN FISSURE ZONE	LS					0	0	$2,225,826.96	$0
510-1	RETAINING WALL, 2' TO 3'	LF	0	300	100	0		400	$40.00	$16,000
515-1	BOLLARDS, MAG STD DET 140, TYPE 2 REMOVABLE	EA	12	21	9	3		96	$1,000.00	$96,000
520-1	STEEL SAFETY RAIL, MAG STD DET 145, TYPE 1	LF	617	415	220	118		2,398	$75.00	$179,850
			$1,586,844	$316,393	$885,540	$994,481	$5,556			
	SUBTOTAL CONSTRUCTION ITEMS		$1,969,125	$784,045	$1,627,089	$1,844,770	$1,002,534			$11,284,570
	Relocation and/or Removal of Existing Utilities		$98,456	$39,202	$81,354	$92,238	$50,127		5%	$564,228
	Engineering Contingencies for Unknown Items		$98,456	$39,202	$81,354	$92,238	$50,127		5%	$564,228
	TOTAL CONSTRUCTION COST		$2,166,038	$862,450	$1,789,798	$2,029,247	$1,102,787			$12,413,027
	Landscaping as Aesthetic Treatment		$109,080	$113,690	$183,934	$129,275	$0	50	$20,000	$994,093
	Non-Landscaping Aesthetic Treatment		$86,642	$34,498	$71,592	$81,170	$44,111		4%	$496,521
	TOTAL CONSTRUCTION AND LANDSCAPE COST		$2,361,760	$1,010,637	$2,045,324	$2,239,691	$1,146,899			$13,903,641
	Engineering and Landscape Design		$236,176	$101,064	$204,532	$223,969	$114,690		10%	$1,390,364
	Construction Administration		$141,706	$60,638	$122,719	$134,381	$68,814		6%	$834,218
	TOTAL CONSTRUCTION, LANDSCAPE, AND CONTINGENCIES COST		$2,739,641	$1,172,339	$2,372,576	$2,598,042	$1,330,403			$16,128,223
	Required FCDMC Right-of-Way Acquisition - Undeveloped Property	AC	5.72	0.00	13.11	0.00	0.00	18.83	$152,500.00	$2,871,407
	Required FCDMC Right-of-Way Acquisition - Platted Property	AC	0.00	0.00	0.00	0.00	0.00	12.51	$205,000.00	$2,565,195
		AC	5.72	0.00	13.11	0.00	0.00	31.34		
	TOTAL REQUIRED RIGHT-OF-WAY ACQUISITION		$872,300	$0	$1,999,107	$0	$0			$5,436,602
	TOTAL PROJECT COST		$3,611,941	$1,172,339	$4,371,682	$2,598,042	$1,330,403			$21,564,825

WHITE TANKS FRS#3 OUTLET CHANNEL - COST ESTIMATE BY REACH, USING 2010 LAND COST ESTIMATES 1/29/2010

ALTERNATIVE 6/7E

FCD 2009C012
PCN 470.04.32

HOSKIN-RYAN CONSULTANTS, INC.
HRC 09-077-01

QUANTITY SUMMARY										
ITEM NO.	ITEM DESCRIPTION	UNIT	REACH 6	REACH 7	REACH 8	REACH 9	LUMP SUM ITEMS	TOTAL QUANTITY	UNIT PRICE	TOTAL AMOUNT
	GENERAL CONDITIONS									
105-1	PARTNERING ALLOWANCE	LS					1	1	$15,000.00	$15,000
107-1	AZDPES/SWPPP PERMITS	LS					1	1	$100,000.00	$100,000
107-2	PUBLIC INFORMATION & NOTIFICATION ALLOWANCE	LS					1	1	$20,000.00	$20,000
107-3	PROJECT SIGNS ALLOWANCE	EA					1	1	$5,000.00	$5,000
107-4	WATER MANAGEMENT	LS					1	1	$55,884.74	$55,885
107-5	VANDALISM ALLOWANCE	LS					1	1	$25,000.00	$25,000
							$220,885			
	EARTHWORK									
201-1	CLEARING AND GRUBBING	LS					1	1	$288,562.50	$288,563
202-1	MOBILIZATION	LS					1	1	$110,034.84	$110,035
211-1	FILL CONSTRUCTION (DITCHES, FARM ROAD AND OVERBANK)	CY	1,864	150	625	57,639		109,234	$7.00	$764,638
211-2	FINAL AESTHETIC GRADING	LS					1	1	$227,496.40	$227,496
215-1	CHANNEL EXCAVATION	CY	46,736	0	92,535	68,038		406,670	$3.00	$1,220,010
220-1	PLAIN RIPRAP (D_{50} =2")	CY	20	0	151	0		459	$45.00	$20,655
220-2	PLAIN RIPRAP (D_{50} =12")	CY	324	196	1,311	20		3,038	$70.00	$212,660
220-3	PLAIN RIPRAP (D_{50} =15")	CY	562	0	748			6,017	$75.00	$451,275
230-1	GRAVEL MULCH	SY	37,711	0	44,512	31,284		224,371	$4.00	$897,483
230-2	HYDROSEEDING	AC	9	0	10.97	11.23		61	$6,000.00	$368,870
			$426,044	$14,770	$680,485	$801,502	$626,094			
	STREETS & RELATED WORK									
310-1	ABC MAINTENANCE ROAD & RAMP (4-INCH)	SY	7,504	3,077	8,098	6,535		49,082	$4.63	$227,252
336-1	TEMPORARY PAVEMENT REPLACEMENT (2" A.C.)	SY	0	0	0	0		996	$20.00	$19,924
336-2	PERMANENT PAVEMENT REPLACEMENT (3" A.C.)	SY	274	322	0	0		682	$30.00	$20,467
340-1	CONCRETE VERTICAL CURB & GUTTER, MAG STD DET 220, TYPE 'A'	LF	0	36	0	0		36	$19.00	$684
340-2	CONCRETE ROLL CURB & GUTTER, MAG STD DET 220, TYPE 'C'	LF	0	80	0	0		80	$17.00	$1,360
340-3	CONCRETE SIDEWALK, MAG STD DET 230	SF	0	1,004	0	0		1,004	$15.00	$15,060
340-4	CONCRETE DRIVEWAY ENTRANCE, MAG STD DET 250-1	SF	0	144	0	0		144	$15.00	$2,160
340-5	CONCRETE DRIVEWAY ENTRANCE, MAG STD DET 250-2	SF	0	576	0	0		576	$15.00	$8,640
350-1	REMOVE EXISTING WIRE FENCE	LF	0	0	0	175		3,832	$1.00	$3,832
350-2	REMOVE PAVEMENT	SY	0	0	0	0		1,739	$7.00	$12,171
350-3	BURIED TRASH REMOVAL ALLOWANCE	LS					1	1	$50,000.00	$50,000
350-4	REMOVE CONCRETE CURB & GUTTER	LF	0	236	0	0		236	$6.00	$1,416
350-5	REMOVE GROUTED RIPRAP	SY	0	0	0	0		4,597	$18.92	$86,952
350-6	REMOVE EXISTING BLOCK WALL, RETAINIGN WALL	LF	0	3,711	0	0		4,057	$8.00	$32,456
350-7	REMOVE EXISTING CONCRETE LINED CHANNEL	SY	0	0	0	0		2,920	$18.92	$55,232
350-8	REMOVE EXISTING CONCRETE SIDEWALK	SY	0	112	0	0		112	$18.92	$2,110
			$42,977	$85,014	$37,495	$30,432	$50,000			
	RIGHT-OF-WAY AND TRAFFIC CONTROL									
401-1	MISCELLANEOUS TRAFFIC CONTROL	LS					1	1	$100,000.00	$100,000
412-1	4 STRAND SMOOTH WIRE FENCE	LF	3,488	4,460	4,714	3,471		35,902	$5.00	$179,510
421-1	INSTALL GATE	EA	0	0	0	1		1	$1,000.00	$1,000
			$17,440	$22,300	$23,570	$18,355	$100,000			
	STRUCTURES									
505-1	CONCRETE CHANNEL LINING (7" THICK)	SF	0	0	0	0		17,476	$10.80	$188,784
505-2	CONCRETE BOX CULVERT TYPE A (2 BARREL 8' x 6'), ADOT B-02.20	LF	1,026	0	0	0		1,026	$1,121.25	$1,150,403
505-3	CONCRETE BOX CULVERT TYPE B (3 BARREL 8' x 6'), ADOT B-02.30	LF	0	0	393	0		663	$1,604.20	$1,063,585
505-4	CONCRETE BOX CULVERT TYPE E (2 BARREL 10' x 6'), ADOT B-02.20	LF	0	2,746	0	0		2,746	$1,475.50	$4,051,723
	CONCRETE BOX CULVERT TYPE E (1 BARREL 10' x 6'), ADOT B-02.20	LF	0	0		1,320		1,320	$737.75	$973,830
505-5	CONCRETE BOX CULVERT INLET HEADWALL, ADOT B-04.30	EA	2	0	1	1		9	$8,801.00	$79,209

WHITE TANKS FRS#3 OUTLET CHANNEL - COST ESTIMATE BY REACH, USING 2010 LAND COST ESTIMATES

1/29/2010

ALTERNATIVE 6/7E

FCD 2009C012
PCN 470.04.32

HOSKIN-RYAN CONSULTANTS, INC.
HRC 09-077-01

			QUANTITY SUMMARY							
ITEM NO.	ITEM DESCRIPTION	UNIT	REACH 6	REACH 7	REACH 8	REACH 9	LUMP SUM ITEMS	TOTAL QUANTITY	UNIT PRICE	TOTAL AMOUNT
505-6	CONCRETE BOX CULVERT OUTLET HEADWALL, ADOT B-04.30	EA	2	0	2	0		9	$14,768.00	$132,912
505-7	CONCRETE GRADE CONTROL STRUCTURE, (30'-10' BOTTOM WIDTH TRANSITION) TYPE 1	CY	0	0	0	0		951	$500.00	$475,500
505-8	CONCRETE GRADE CONTROL STRUCTURE, (40'-20' BOTTOM WIDTH TRANSITION) TYPE 2	CY	168	0	0	0		252	$500.00	$126,000
505-9	CONCRETE GRADE CONTROL STRUCTURE, (50'-30' BOTTOM WIDTH TRANSITION) TYPE 3	CY	0	0	0	0		154	$500.00	$77,000
505-10	CONCRETE TEST PANELS - 10' x 10' x 6"	EA					3	3	$1,851.85	$5,556
505-11	CONCRETE SIDE FLOW SPILLWAY, (10' BOTTOM WIDTH) TYPE1	CY	0	0	0	0		35	$500.00	$17,500
505-12	CONCRETE SIDE FLOW SPILLWAY, (20' BOTTOM WIDTH) TYPE2	CY	0	0	0	0		80	$500.00	$40,000
505-13	CONCRETE SIDE FLOW SPILLWAY, (30' BOTTOM WIDTH) TYPE3	CY	0	0	0	0		65	$500.00	$32,500
505-14	CONCRETE SIDE FLOW SPILLWAY, (40' BOTTOM WIDTH) TYPE4	CY	0	0	0	0		63	$500.00	$31,500
505-15	CONCRETE SIDE FLOW SPILLWAY, (50' BOTTOM WIDTH) TYPE5	CY	0	0	140	0		140	$500.00	$70,000
505-16	CONCRETE SIDE FLOW SPILLWAY, (80' BOTTOM WIDTH) TYPE6	CY	0	0	251	0		251	$500.00	$125,500
505-17	CONCRETE DROP INLET STRUCTURE, (3-8'X6' BOX CULVERT) TYPE 1	CY	0	0	0	0		80	$500.00	$40,000
505-18	CONCRETE DROP INLET STRUCTURE, (2-8'X6' BOX CULVERT) TYPE 2	CY	14	14	0	0		28	$500.00	$14,000
505-19	WASTEWAY STRUCTURE	CY	0	0	0	0		0	$500.00	$0
505-20	FLOW JUNCTION STRUCTURE	CY	137	0	0	0		137	$500.00	$68,500
505-21	SLIDE GATE STRUCTURE	EA	0	0	0	0		0	$50,000.00	$0
505-22	GROUTED RIPRAP DOWNDRAIN	EA	0	6	4	0		27	$1,630.00	$44,010
505-23	ALLOWANCE FOR HARDENED STRUCTURE WITHIN FISSURE ZONE	LS					0	0	$2,225,826.96	$0
510-1	RETAINING WALL, 2' TO 3'	LF	0	300	100	0		400	$40.00	$16,000
515-1	BOLLARDS, MAG STD DET 140, TYPE 2 REMOVABLE	EA	12	21	9	3		96	$1,000.00	$96,000
520-1	STEEL SAFETY RAIL, MAG STD DET 145, TYPE 1	LF	617	415	220	118		2,398	$75.00	$179,850
			$1,415,316	$4,132,628	$900,308	$994,481	$5,556			
	SUBTOTAL CONSTRUCTION ITEMS		**$1,901,777**	**$4,254,712**	**$1,641,857**	**$1,844,770**	**$1,002,534**			**$14,702,656**
	Relocation and/or Removal of Existing Utilities		$95,089	$212,736	$82,093	$92,238	$50,127		5%	$735,133
	Engineering Contingencies for Unknown Items		$95,089	$212,736	$82,093	$92,238	$50,127		5%	$735,133
	TOTAL CONSTRUCTION COST		**$2,091,954**	**$4,680,183**	**$1,806,043**	**$2,029,247**	**$1,102,787**			**$16,172,922**
	Landscaping as Aesthetic Treatment		$155,829	$0	$183,934	$129,275	$0	46	$20,000	$927,152
	Non-Landscaping Aesthetic Treatment		$83,678	$187,207	$72,242	$81,170	$44,111		4%	$646,917
	TOTAL CONSTRUCTION AND LANDSCAPE COST		**$2,331,462**	**$4,867,391**	**$2,062,218**	**$2,239,691**	**$1,146,899**			**$17,746,990**
	Engineering and Landscape Design		$233,146	$486,739	$206,222	$223,969	$114,690		10%	$1,774,699
	Construction Administration		$139,888	$292,043	$123,733	$134,381	$68,814		6%	$1,064,819
	TOTAL CONSTRUCTION, LANDSCAPE, AND CONTINGENCIES COST		**$2,704,496**	**$5,646,173**	**$2,392,173**	**$2,598,042**	**$1,330,403**			**$20,586,509**
	Required FCDMC Right-of-Way Acquisition - Undeveloped Property	AC	10.08	0.00	13.11	0.00	0.00	23.19	$40,000.00	$927,619
	Required FCDMC Right-of-Way Acquisition - Platted Property	AC	0.00	0.00	0.00	0.00	0.00	12.51	$60,000.00	$750,789
		AC	**10.08**	**0.00**	**13.11**	**0.00**	**0.00**	**35.70**		
	TOTAL REQUIRED RIGHT-OF-WAY ACQUISITION		**$403,263**	**$0**	**$524,356**	**$0**	**$0**			**$1,678,408**
	TOTAL PROJECT COST		**$3,107,759**	**$5,646,173**	**$2,916,529**	**$2,598,042**	**$1,330,403**			**$22,264,916**

WHITE TANKS FRS#3 OUTLET CHANNEL - COST ESTIMATE BY REACH, USING 30% DESIGN REPORT LAND COSTS

1/27/2010

ALTERNATIVE 6/7F

FCD 2009C012
PCN 470.04.32

HOSKIN-RYAN CONSULTANTS, INC.
HRC 09-077-01

QUANTITY SUMMARY

ITEM NO.	ITEM DESCRIPTION	UNIT	REACH 6	REACH 7	REACH 8	REACH 9	LUMP SUM ITEMS	TOTAL QUANTITY	UNIT PRICE	TOTAL AMOUNT
	GENERAL CONDITIONS									
105-1	PARTNERING ALLOWANCE	LS					1	1	$15,000.00	$15,000
107-1	AZDPES/SWPPP PERMITS	LS					1	1	$100,000.00	$100,000
107-2	PUBLIC INFORMATION & NOTIFICATION ALLOWANCE	LS					1	1	$20,000.00	$20,000
107-3	PROJECT SIGNS ALLOWANCE	EA					1	1	$5,000.00	$5,000
107-4	WATER MANAGEMENT	LS					1	1	$55,884.74	$55,885
107-5	VANDALISM ALLOWANCE	LS					1	1	$25,000.00	$25,000
							$220,885			
	EARTHWORK									
201-1	CLEARING AND GRUBBING	LS					1	1	$288,562.50	$288,563
202-1	MOBILIZATION	LS					1	1	$110,034.84	$110,035
211-1	FILL CONSTRUCTION (DITCHES, FARM ROAD AND OVERBANK)	CY	1,864	150	625	57,639		109,234	$7.00	$764,638
211-2	FINAL AESTHETIC GRADING	LS					1	1	$227,496.40	$227,496
215-1	CHANNEL EXCAVATION	CY	46,736	63,919	92,535	68,038		470,589	$3.00	$1,411,767
220-1	PLAIN RIPRAP (D_{50} =2")	CY	20	0	151	0		459	$45.00	$20,655
220-2	PLAIN RIPRAP (D_{50} =12")	CY	324	196	1,311	20		3,038	$70.00	$212,660
220-3	PLAIN RIPRAP (D_{50} =15")	CY	562	0	748			6,017	$75.00	$451,275
230-1	GRAVEL MULCH	SY	37,711	0	44,512	31,284		224,371	$4.00	$897,483
230-2	HYDROSEEDING	AC	9	0	10.97	11.23		61	$6,000.00	$368,870
			$426,044	$206,527	$680,485	$801,502	$626,094			
	STREETS & RELATED WORK									
310-1	ABC MAINTENANCE ROAD & RAMP (4-INCH)	SY	7,504	3,077	8,098	6,535		49,082	$4.63	$227,252
336-1	TEMPORARY PAVEMENT REPLACEMENT (2" A.C.)	SY	0	0	0	0		996	$20.00	$19,924
336-2	PERMANENT PAVEMENT REPLACEMENT (3" A.C.)	SY	274	322	0	0		682	$30.00	$20,467
340-1	CONCRETE VERTICAL CURB & GUTTER, MAG STD DET 220, TYPE 'A'	LF	0	36	0	0		36	$19.00	$684
340-2	CONCRETE ROLL CURB & GUTTER, MAG STD DET 220, TYPE 'C'	LF	0	80	0	0		80	$17.00	$1,360
340-3	CONCRETE SIDEWALK, MAG STD DET 230	SF	0	1,004	0	0		1,004	$15.00	$15,060
340-4	CONCRETE DRIVEWAY ENTRANCE, MAG STD DET 250-1	SF	0	144	0	0		144	$15.00	$2,160
340-5	CONCRETE DRIVEWAY ENTRANCE, MAG STD DET 250-2	SF	0	576	0	0		576	$15.00	$8,640
350-1	REMOVE EXISTING WIRE FENCE	LF	0	0	0	175		3,832	$1.00	$3,832
350-2	REMOVE PAVEMENT	SY	0	0	0	0		1,739	$7.00	$12,171
350-3	BURIED TRASH REMOVAL ALLOWANCE	LS					1	1	$50,000.00	$50,000
350-4	REMOVE CONCRETE CURB & GUTTER	LF	0	236	0	0		236	$6.00	$1,416
350-5	REMOVE GROUTED RIPRAP	SY	0	0	0	0		4,597	$18.92	$86,952
350-6	REMOVE EXISTING BLOCK WALL, RETAINIGN WALL	LF	0	3,711	0	0		4,057	$8.00	$32,456
350-7	REMOVE EXISTING CONCRETE LINED CHANNEL	SY	0	0	0	0		2,920	$18.92	$55,232
350-8	REMOVE EXISTING CONCRETE SIDEWALK	SY	0	112	0	0		112	$18.92	$2,110
			$42,977	$85,014	$37,495	$30,432	$50,000			
	RIGHT-OF-WAY AND TRAFFIC CONTROL									
401-1	MISCELLANEOUS TRAFFIC CONTROL	LS					1	1	$100,000.00	$100,000
412-1	4 STRAND SMOOTH WIRE FENCE	LF	3,488	4,460	4,714	3,471		35,902	$5.00	$179,510
421-1	INSTALL GATE	EA	0	0	0	1		1	$1,000.00	$1,000
			$17,440	$22,300	$23,570	$18,355	$100,000			
	STRUCTURES									
505-1	CONCRETE CHANNEL LINING (7" THICK)	SF	0	140,400	0	0		157,876	$10.80	$1,705,451
505-2	CONCRETE BOX CULVERT TYPE A (2 BARREL 8' x 6'), ADOT B-02.20	LF	1,026	85	0	0		1,111	$1,121.25	$1,245,709
505-3	CONCRETE BOX CULVERT TYPE B (3 BARREL 8' x 6'), ADOT B-02.30	LF	0	58	393	0		721	$1,604.20	$1,156,628
505-4	CONCRETE BOX CULVERT TYPE E (1 BARREL 10' x 6'), ADOT B-02.20	LF	0	0	0	1,320		1,320	$737.75	$973,830
505-5	CONCRETE BOX CULVERT INLET HEADWALL, ADOT B-04.30	EA	2	2	1	1		11	$8,801.00	$96,811

WHITE TANKS FRS#3 OUTLET CHANNEL - COST ESTIMATE BY REACH, USING 30% DESIGN REPORT LAND COSTS 1/27/2010

ALTERNATIVE 6/7F

FCD 2009C012 HOSKIN-RYAN CONSULTANTS, INC.

PCN 470.04.32 HRC 09-077-01

QUANTITY SUMMARY											
ITEM NO.	ITEM DESCRIPTION	UNIT	REACH 6	REACH 7	REACH 8	REACH 9	LUMP SUM ITEMS	TOTAL QUANTITY	UNIT PRICE	TOTAL AMOUNT
505-6	CONCRETE BOX CULVERT OUTLET HEADWALL, ADOT B-04.30	EA	2	2	2	0		11	$14,768.00	$162,448
505-7	CONCRETE GRADE CONTROL STRUCTURE, (30'-10' BOTTOM WIDTH TRANSITION) TYPE 1	CY	0	0	0	0		951	$500.00	$475,500
505-8	CONCRETE GRADE CONTROL STRUCTURE, (40'-20' BOTTOM WIDTH TRANSITION) TYPE 2	CY	168	0	0	0		252	$500.00	$126,000
505-9	CONCRETE GRADE CONTROL STRUCTURE, (50'-30' BOTTOM WIDTH TRANSITION) TYPE 3	CY	0	0	0	0		154	$500.00	$77,000
505-10	CONCRETE TEST PANELS - 10' x 10' x 6"	EA					3	3	$1,851.85	$5,556
505-11	CONCRETE SIDE FLOW SPILLWAY, (10' BOTTOM WIDTH) TYPE1	CY	0	0	0	0		35	$500.00	$17,500
505-12	CONCRETE SIDE FLOW SPILLWAY, (20' BOTTOM WIDTH) TYPE2	CY	0	0	0	0		80	$500.00	$40,000
505-13	CONCRETE SIDE FLOW SPILLWAY, (30' BOTTOM WIDTH) TYPE3	CY	0	0	0	0		65	$500.00	$32,500
505-14	CONCRETE SIDE FLOW SPILLWAY, (40' BOTTOM WIDTH) TYPE4	CY	0	0	0	0		63	$500.00	$31,500
505-15	CONCRETE SIDE FLOW SPILLWAY, (50' BOTTOM WIDTH) TYPE5	CY	0	0	140	0		140	$500.00	$70,000
505-16	CONCRETE SIDE FLOW SPILLWAY, (80' BOTTOM WIDTH) TYPE6	CY	0	0	251	0		251	$500.00	$125,500
505-17	CONCRETE DROP INLET STRUCTURE, (3-8'X6' BOX CULVERT) TYPE 1	CY	0	0	0	0		80	$500.00	$40,000
505-18	CONCRETE DROP INLET STRUCTURE, (2-8'X6' BOX CULVERT) TYPE 2	CY	14	14	0	0		28	$500.00	$14,000
505-19	WASTEWAY STRUCTURE	CY	0	0	0	0		0	$500.00	$0
505-20	FLOW JUNCTION STRUCTURE	CY	137	0	0	0		137	$500.00	$68,500
505-21	SLIDE GATE STRUCTURE	EA	0	0	0	0		0	$50,000.00	$0
505-22	GROUTED RIPRAP DOWNDRAIN	EA	0	6	4	0		27	$1,630.00	$44,010
505-23	ALLOWANCE FOR HARDENED STRUCTURE WITHIN FISSURE ZONE	LS					0	0	$2,225,826.96	$0
510-1	RETAINING WALL, 2' TO 3'	LF	0	300	100	0		400	$40.00	$16,000
515-1	BOLLARDS, MAG STD DET 140, TYPE 2 REMOVABLE	EA	12	21	9	3		96	$1,000.00	$96,000
520-1	STEEL SAFETY RAIL, MAG STD DET 145, TYPE 1	LF	617	415	220	118		2,398	$75.00	$179,850
			$1,415,316	$1,833,060	$900,308	$994,481	$5,556			
	SUBTOTAL CONSTRUCTION ITEMS		**$1,901,777**	**$2,146,901**	**$1,641,857**	**$1,844,770**	**$1,002,534**			**$12,594,844**
	Relocation and/or Removal of Existing Utilities		$95,089	$107,345	$82,093	$92,238	$50,127		5%	$629,742
	Engineering Contingencies for Unknown Items		$95,089	$107,345	$82,093	$92,238	$50,127		5%	$629,742
	TOTAL CONSTRUCTION COST		**$2,091,954**	**$2,361,591**	**$1,806,043**	**$2,029,247**	**$1,102,787**			**$13,854,329**
	Landscaping as Aesthetic Treatment		$155,829	$0	$183,934	$129,275	$0	46	$20,000	$927,152
	Non-Landscaping Aesthetic Treatment		$83,678	$94,464	$72,242	$81,170	$44,111		4%	$554,173
	TOTAL CONSTRUCTION AND LANDSCAPE COST		**$2,331,462**	**$2,456,054**	**$2,062,218**	**$2,239,691**	**$1,146,899**			**$15,335,654**
	Engineering and Landscape Design		$233,146	$245,605	$206,222	$223,969	$114,690		10%	$1,533,565
	Construction Administration		$139,888	$147,363	$123,733	$134,381	$68,814		6%	$920,139
	TOTAL CONSTRUCTION, LANDSCAPE, AND CONTINGENCIES COST		**$2,704,496**	**$2,849,023**	**$2,392,173**	**$2,598,042**	**$1,330,403**			**$17,789,359**
	Required FCDMC Right-of-Way Acquisition - Undeveloped Property	AC	10.08	0.00	13.11	0.00	0.00	23.19	$152,500.00	$3,536,547
	Required FCDMC Right-of-Way Acquisition - Platted Property	AC	0.00	0.00	0.00	0.00	0.00	12.51	$205,000.00	$2,565,195
		AC	**10.08**	**0.00**	**13.11**	**0.00**	**0.00**	**35.70**		
	TOTAL REQUIRED RIGHT-OF-WAY ACQUISITION		**$1,537,440**	**$0**	**$1,999,107**	**$0**	**$0**			**$6,101,742**
	TOTAL PROJECT COST		$4,241,936	$2,849,023	$4,391,280	$2,598,042	$1,330,403			$23,891,101

WHITE TANKS FRS#3 OUTLET CHANNEL - COST ESTIMATE BY REACH, USING 30% DESIGN REPORT LAND COSTS 1/27/2010

ALTERNATIVE 9D

FCD 2009C012
PCN 470.04.32

HOSKIN-RYAN CONSULTANTS, INC.
HRC 09-077-01

QUANTITY SUMMARY

ITEM NO.	ITEM DESCRIPTION	UNIT	REACH 6	REACH 7	REACH 8	REACH 9	LUMP SUM ITEMS	TOTAL QUANTITY	UNIT PRICE	TOTAL AMOUNT
	GENERAL CONDITIONS									
105-1	PARTNERING ALLOWANCE	LS					1	1	$15,000.00	$15,000
107-1	AZDPES/SWPPP PERMITS	LS					1	1	$100,000.00	$100,000
107-2	PUBLIC INFORMATION & NOTIFICATION ALLOWANCE	LS					1	1	$20,000.00	$20,000
107-3	PROJECT SIGNS ALLOWANCE	EA					1	1	$5,000.00	$5,000
107-4	WATER MANAGEMENT	LS					1	1	$55,884.74	$55,885
107-5	VANDALISM ALLOWANCE	LS					1	1	$25,000.00	$25,000
							$220,885			
	EARTHWORK									
201-1	CLEARING AND GRUBBING	LS					1	1	$288,562.50	$288,563
202-1	MOBILIZATION	LS					1	1	$110,034.84	$110,035
211-1	FILL CONSTRUCTION (DITCHES, FARM ROAD AND OVERBANK)	CY	1,864	150	625	42,772		94,367	$7.00	$660,571
211-2	FINAL AESTHETIC GRADING	LS					1	1	$227,496.40	$227,496
215-1	CHANNEL EXCAVATION	CY	46,736	63,919	92,535	10,886		413,437	$3.00	$1,240,311
220-1	PLAIN RIPRAP (D_{50} =2")	CY	20	0	151	0		459	$45.00	$20,655
220-2	PLAIN RIPRAP (D_{50} =12")	CY	324	196	1,311	0		3,018	$70.00	$211,260
220-3	PLAIN RIPRAP (D_{50} =15")	CY	562	0	748			6,017	$75.00	$451,275
230-1	GRAVEL MULCH	SY	37,711	27,513	44,512	5,006		225,605	$4.00	$902,419
230-2	HYDROSEEDING	AC	9	7.29	10.97	0.58		58	$6,000.00	$348,750
			$426,044	$360,338	$680,485	$355,583	$626,094			
	STREETS & RELATED WORK									
310-1	ABC MAINTENANCE ROAD & RAMP (4-INCH)	SY	7,504	3,077	8,098	6,535		49,082	$4.63	$227,252
336-1	TEMPORARY PAVEMENT REPLACEMENT (2" A.C.)	SY	0	0	0	0		996	$20.00	$19,924
336-2	PERMANENT PAVEMENT REPLACEMENT (3" A.C.)	SY	274	322	0	0		682	$30.00	$20,467
340-1	CONCRETE VERTICAL CURB & GUTTER, MAG STD DET 220, TYPE 'A'	LF	0	36	0	0		36	$19.00	$684
340-2	CONCRETE ROLL CURB & GUTTER, MAG STD DET 220, TYPE 'C'	LF	0	80	0	0		80	$17.00	$1,360
340-3	CONCRETE SIDEWALK, MAG STD DET 230	SF	0	1,004	0	0		1,004	$15.00	$15,060
340-4	CONCRETE DRIVEWAY ENTRANCE, MAG STD DET 250-1	SF	0	144	0	0		144	$15.00	$2,160
340-5	CONCRETE DRIVEWAY ENTRANCE, MAG STD DET 250-2	SF	0	576	0	0		576	$15.00	$8,640
350-1	REMOVE EXISTING WIRE FENCE	LF	0	0	0	175		3,832	$1.00	$3,832
350-2	REMOVE PAVEMENT	SY	0	0	0	0		1,739	$7.00	$12,171
350-3	BURIED TRASH REMOVAL ALLOWANCE	LS				0	1	1	$50,000.00	$50,000
350-4	REMOVE CONCRETE CURB & GUTTER	LF	0	236	0	0		236	$6.00	$1,416
350-5	REMOVE GROUTED RIPRAP	SY	0	0	0	0		4,597	$18.92	$86,952
350-6	REMOVE EXISTING BLOCK WALL, RETAINIGN WALL	LF	0	3,711	0	0		4,057	$8.00	$32,456
350-7	REMOVE EXISTING CONCRETE LINED CHANNEL	SY	0	0	0	0		2,920	$18.92	$55,232
350-8	REMOVE EXISTING CONCRETE SIDEWALK	SY	0	112	0	0		112	$18.92	$2,110
			$42,977	$85,014	$37,495	$30,432	$50,000			
	RIGHT-OF-WAY AND TRAFFIC CONTROL									
401-1	MISCELLANEOUS TRAFFIC CONTROL	LS				0	1	1	$100,000.00	$100,000
412-1	4 STRAND SMOOTH WIRE FENCE	LF	3,488	4,460	4,714	3,471		35,902	$5.00	$179,510
421-1	INSTALL GATE	EA	0	0	0	0		0	$1,000.00	$0
			$17,440	$22,300	$23,570	$17,355	$100,000			
	STRUCTURES									
505-1	CONCRETE CHANNEL LINING (7" THICK)	SF	0	0	0	0		17,476	$10.80	$188,784
505-2	CONCRETE BOX CULVERT TYPE A (2 BARREL 8' x 6'), ADOT B-02.20	LF	1,026	85	0	0		1,111	$1,121.25	$1,245,709
505-3	CONCRETE BOX CULVERT TYPE B (3 BARREL 8' x 6'), ADOT B-02.30	LF	0	58	393	0		721	$1,604.20	$1,156,628
505-4	2-72" DUROMAXX HDPE PIPES TO REPLACE CONCRETE BOX CULVERT	LF	0	0	0	9,600		9,600	$140.00	$1,344,000
505-5	CONCRETE BOX CULVERT INLET HEADWALL, ADOT B-04.30	EA	2	2	1	1		11	$8,801.00	$96,811
505-6	CONCRETE BOX CULVERT OUTLET HEADWALL, ADOT B-04.30	EA	2	2	2	0		11	$14,768.00	$162,448

WHITE TANKS FRS#3 OUTLET CHANNEL - COST ESTIMATE BY REACH, USING 30% DESIGN REPORT LAND COSTS

1/27/2010

ALTERNATIVE 9D

FCD 2009C012
PCN 470.04.32

HOSKIN-RYAN CONSULTANTS, INC.
HRC 09-077-01

QUANTITY SUMMARY										
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**REACH 6**	**REACH 7**	**REACH 8**	**REACH 9**	**LUMP SUM ITEMS**	**TOTAL QUANTITY**	**UNIT PRICE**	**TOTAL AMOUNT**
505-7	CONCRETE GRADE CONTROL STRUCTURE, (30'-10' BOTTOM WIDTH TRANSITION) TYPE 1	CY	0	0	0	0		951	$500.00	$475,500
505-8	CONCRETE GRADE CONTROL STRUCTURE, (40'-20' BOTTOM WIDTH TRANSITION) TYPE 2	CY	168	0	0	0		252	$500.00	$126,000
505-9	CONCRETE GRADE CONTROL STRUCTURE, (50'-30' BOTTOM WIDTH TRANSITION) TYPE 3	CY	0	0	0	0		154	$500.00	$77,000
505-10	CONCRETE TEST PANELS - 10' x 10' x 6"	EA					3	3	$1,851.85	$5,556
505-11	CONCRETE SIDE FLOW SPILLWAY, (10' BOTTOM WIDTH) TYPE1	CY	0	0	0	0		35	$500.00	$17,500
505-12	CONCRETE SIDE FLOW SPILLWAY, (20' BOTTOM WIDTH) TYPE2	CY	0	0	0	0		80	$500.00	$40,000
505-13	CONCRETE SIDE FLOW SPILLWAY, (30' BOTTOM WIDTH) TYPE3	CY	0	0	0	0		65	$500.00	$32,500
505-14	CONCRETE SIDE FLOW SPILLWAY, (40' BOTTOM WIDTH) TYPE4	CY	0	0	0	0		63	$500.00	$31,500
505-15	CONCRETE SIDE FLOW SPILLWAY, (50' BOTTOM WIDTH) TYPE5	CY	0	0	140	0		140	$500.00	$70,000
505-16	CONCRETE SIDE FLOW SPILLWAY, (80' BOTTOM WIDTH) TYPE6	CY	0	0	251	0		251	$500.00	$125,500
505-17	CONCRETE DROP INLET STRUCTURE, (3-8'X6' BOX CULVERT) TYPE 1	CY	0	0	0	0		80	$500.00	$40,000
505-18	CONCRETE DROP INLET STRUCTURE, (2-8'X6' BOX CULVERT) TYPE 2	CY	14	14	0	0		28	$500.00	$14,000
505-19	WASTEWAY STRUCTURE	CY	0	0	0	0		0	$500.00	$0
	MANHOLES	EA				8		8	$4,160.00	$33,280
505-20	FLOW JUNCTION STRUCTURE	CY	137	0	0	0		137	$500.00	$68,500
505-21	SLIDE GATE STRUCTURE	EA	0	0	0	0		0	$50,000.00	$0
505-22	GROUTED RIPRAP DOWNDRAIN	EA	0	6	4	0		27	$1,630.00	$44,010
505-23	ALLOWANCE FOR HARDENED STRUCTURE WITHIN FISSURE ZONE	LS					0	0	$2,225,826.96	$0
510-1	RETAINING WALL, 2' TO 3'	LF	0	300	100	0		400	$40.00	$16,000
515-1	BOLLARDS, MAG STD DET 140, TYPE 2 REMOVABLE	EA	12	21	9	3		96	$1,000.00	$96,000
520-1	STEEL SAFETY RAIL, MAG STD DET 145, TYPE 1	LF	617	415	220	118		2,398	$75.00	$179,850
			$1,415,316	$316,393	$900,308	$1,397,931	$5,556			
	SUBTOTAL CONSTRUCTION ITEMS		**$1,901,777**	**$784,045**	**$1,641,857**	**$1,801,301**	**$1,002,534**			**$11,188,520**
	Relocation and/or Removal of Existing Utilities		$95,089	$39,202	$82,093	$90,065	$50,127		5%	$559,426
	Engineering Contingencies for Unknown Items		$95,089	$39,202	$82,093	$90,065	$50,127		5%	$559,426
	TOTAL CONSTRUCTION COST		**$2,091,954**	**$862,450**	**$1,806,043**	**$1,981,431**	**$1,102,787**			**$12,307,372**
	Landscaping as Aesthetic Treatment		$155,829	$113,690	$183,934	$20,684	$0	47	$20,000	$932,251
	Non-Landscaping Aesthetic Treatment		$83,678	$34,498	$72,242	$79,257	$44,111		4%	$492,295
	TOTAL CONSTRUCTION AND LANDSCAPE COST		**$2,331,462**	**$1,010,637**	**$2,062,218**	**$2,081,372**	**$1,146,899**			**$13,731,918**
	Engineering and Landscape Design		$233,146	$101,064	$206,222	$208,137	$114,690		10%	$1,373,192
	Construction Administration		$139,888	$60,638	$123,733	$124,882	$68,814		6%	$823,915
	TOTAL CONSTRUCTION, LANDSCAPE, AND CONTINGENCIES COST		**$2,704,496**	**$1,172,339**	**$2,392,173**	**$2,414,391**	**$1,330,403**			**$15,929,025**
	Required FCDMC Right-of-Way Acquisition - Undeveloped Property	AC	10.08	0.00	13.11	0.00	0.00	23.19	$152,500.00	$3,536,547
	Required FCDMC Right-of-Way Acquisition - Platted Property	AC	0.00	0.00	0.00	0.00	0.00	12.51	$205,000.00	$2,565,195
		AC	**10.08**	**0.00**	**13.11**	**0.00**	**0.00**	**35.70**		
	TOTAL REQUIRED RIGHT-OF-WAY ACQUISITION		**$1,537,440**	**$0**	**$1,999,107**	**$0**	**$0**			**$6,101,742**
	TOTAL PROJECT COST		**$4,241,936**	**$1,172,339**	**$4,391,280**	**$2,414,391**	**$1,330,403**			**$22,030,767**

P39 says $21,400,771

WHITE TANKS FRS#3 OUTLET CHANNEL - COST ESTIMATE BY REACH, USING 30% DESIGN REPORT LAND COSTS
ALTERNATIVE 9E

1/27/2010

FCD 2009C012
PCN 470.04.32

HOSKIN-RYAN CONSULTANTS, INC.
HRC 09-077-01

QUANTITY SUMMARY										
ITEM NO.	ITEM DESCRIPTION	UNIT	REACH 6	REACH 7	REACH 8	REACH 9	LUMP SUM ITEMS	TOTAL QUANTITY	UNIT PRICE	TOTAL AMOUNT
505-6	CONCRETE BOX CULVERT OUTLET HEADWALL, ADOT B-04.30	EA	2	2	2	0		11	$14,768.00	$162,448
505-7	CONCRETE GRADE CONTROL STRUCTURE, (30'-10' BOTTOM WIDTH TRANSITION) TYPE 1	CY	0	0	0	0		951	$500.00	$475,500
505-8	CONCRETE GRADE CONTROL STRUCTURE, (40'-20' BOTTOM WIDTH TRANSITION) TYPE 2	CY	168	0	0	0		252	$500.00	$126,000
505-9	CONCRETE GRADE CONTROL STRUCTURE, (50'-30' BOTTOM WIDTH TRANSITION) TYPE 3	CY	0	0	0	0		154	$500.00	$77,000
505-10	CONCRETE TEST PANELS - 10' x 10' x 6"	EA					3	3	$1,851.85	$5,556
505-11	CONCRETE SIDE FLOW SPILLWAY, (10' BOTTOM WIDTH) TYPE1	CY	0	0	0	0		35	$500.00	$17,500
505-12	CONCRETE SIDE FLOW SPILLWAY, (20' BOTTOM WIDTH) TYPE2	CY	0	0	0	0		80	$500.00	$40,000
505-13	CONCRETE SIDE FLOW SPILLWAY, (30' BOTTOM WIDTH) TYPE3	CY	0	0	0	0		65	$500.00	$32,500
505-14	CONCRETE SIDE FLOW SPILLWAY, (40' BOTTOM WIDTH) TYPE4	CY	0	0	0	0		63	$500.00	$31,500
505-15	CONCRETE SIDE FLOW SPILLWAY, (50' BOTTOM WIDTH) TYPE5	CY	0	0	140	0		140	$500.00	$70,000
505-16	CONCRETE SIDE FLOW SPILLWAY, (80' BOTTOM WIDTH) TYPE6	CY	0	0	251	0		251	$500.00	$125,500
505-17	CONCRETE DROP INLET STRUCTURE, (3-8'X6' BOX CULVERT) TYPE 1	CY	0	0	0	0		80	$500.00	$40,000
505-18	CONCRETE DROP INLET STRUCTURE, (2-8'X6' BOX CULVERT) TYPE 2	CY	14	14	0	0		28	$500.00	$14,000
505-19	WASTEWAY STRUCTURE	CY	0	0	0	0		0	$500.00	$0
505-20	FLOW JUNCTION STRUCTURE	CY	137	0	0	0		137	$500.00	$68,500
505-21	SLIDE GATE STRUCTURE	EA	0	0	0	0		0	$50,000.00	$0
505-22	GROUTED RIPRAP DOWNDRAIN	EA	0	6	4	0		27	$1,630.00	$44,010
505-23	ALLOWANCE FOR HARDENED STRUCTURE WITHIN FISSURE ZONE	LS					0	0	$2,225,826.96	$0
510-1	RETAINING WALL, 2' TO 3'	LF	0	300	100	0		400	$40.00	$16,000
515-1	BOLLARDS, MAG STD DET 140, TYPE 2 REMOVABLE	EA	12	21	9	3		96	$1,000.00	$96,000
520-1	STEEL SAFETY RAIL, MAG STD DET 145, TYPE 1	LF	617	415	220	118		2,398	$75.00	$179,850
			$1,415,316	$316,393	$900,308	$994,481	$5,556			
	SUBTOTAL CONSTRUCTION ITEMS		**$1,901,777**	**$784,045**	**$1,641,857**	**$2,090,656**	**$1,002,534**			**$11,477,875**
	Relocation and/or Removal of Existing Utilities		$95,089	$39,202	$82,093	$104,533	$50,127		5%	$573,894
	Engineering Contingencies for Unknown Items		$95,089	$39,202	$82,093	$104,533	$50,127		5%	$573,894
	TOTAL CONSTRUCTION COST		**$2,091,954**	**$862,450**	**$1,806,043**	**$2,299,721**	**$1,102,787**			**$12,625,663**
	Landscaping as Aesthetic Treatment		$155,829	$113,690	$183,934	$129,275	$0	52	$20,000	$1,040,842
	Non-Landscaping Aesthetic Treatment		$83,678	$34,498	$72,242	$91,989	$44,111		4%	$505,027
	TOTAL CONSTRUCTION AND LANDSCAPE COST		**$2,331,462**	**$1,010,637**	**$2,062,218**	**$2,520,985**	**$1,146,899**			**$14,171,531**
	Engineering and Landscape Design		$233,146	$101,064	$206,222	$252,098	$114,690		10%	$1,417,153
	Construction Administration		$139,888	$60,638	$123,733	$151,259	$68,814		6%	$850,292
	TOTAL CONSTRUCTION, LANDSCAPE, AND CONTINGENCIES COST		**$2,704,496**	**$1,172,339**	**$2,392,173**	**$2,924,342**	**$1,330,403**			**$16,438,976**
	Required FCDMC Right-of-Way Acquisition - Undeveloped Property	AC	10.08	0.00	13.11	0.00	0.00	23.19	$152,500.00	$3,536,547
	Required FCDMC Right-of-Way Acquisition - Platted Property	AC	0.00	0.00	0.00	0.00	0.00	12.51	$205,000.00	$2,565,195
		AC	**10.08**	**0.00**	**13.11**	**0.00**	**0.00**	**35.70**		
	TOTAL REQUIRED RIGHT-OF-WAY ACQUISITION		**$1,537,440**	**$0**	**$1,999,107**	**$0**	**$0**			**$6,101,742**
	TOTAL PROJECT COST		**$4,241,936**	**$1,172,339**	**$4,391,280**	**$2,924,342**	**$1,330,403**			**$22,540,718**

WHITE TANKS FRS#3 OUTLET CHANNEL - COST ESTIMATE BY REACH, USING 30% DESIGN REPORT LAND COSTS

1/27/2010

ALTERNATIVE 9E

FCD 2009C012
PCN 470.04.32

HOSKIN-RYAN CONSULTANTS, INC.
HRC 09-077-01

QUANTITY SUMMARY										
ITEM NO.	ITEM DESCRIPTION	UNIT	REACH 6	REACH 7	REACH 8	REACH 9	LUMP SUM ITEMS	TOTAL QUANTITY	UNIT PRICE	TOTAL AMOUNT
505-6	CONCRETE BOX CULVERT OUTLET HEADWALL, ADOT B-04.30	EA	2	2	2	0		11	$14,768.00	$162,448
505-7	CONCRETE GRADE CONTROL STRUCTURE, (30'-10' BOTTOM WIDTH TRANSITION) TYPE 1	CY	0	0	0	0		951	$500.00	$475,500
505-8	CONCRETE GRADE CONTROL STRUCTURE, (40'-20' BOTTOM WIDTH TRANSITION) TYPE 2	CY	168	0	0	0		252	$500.00	$126,000
505-9	CONCRETE GRADE CONTROL STRUCTURE, (50'-30' BOTTOM WIDTH TRANSITION) TYPE 3	CY	0	0	0	0		154	$500.00	$77,000
505-10	CONCRETE TEST PANELS - 10' x 10' x 6"	EA					3	3	$1,851.85	$5,556
505-11	CONCRETE SIDE FLOW SPILLWAY, (10' BOTTOM WIDTH) TYPE1	CY	0	0	0	0		35	$500.00	$17,500
505-12	CONCRETE SIDE FLOW SPILLWAY, (20' BOTTOM WIDTH) TYPE2	CY	0	0	0	0		80	$500.00	$40,000
505-13	CONCRETE SIDE FLOW SPILLWAY, (30' BOTTOM WIDTH) TYPE3	CY	0	0	0	0		65	$500.00	$32,500
505-14	CONCRETE SIDE FLOW SPILLWAY, (40' BOTTOM WIDTH) TYPE4	CY	0	0	0	0		63	$500.00	$31,500
505-15	CONCRETE SIDE FLOW SPILLWAY, (50' BOTTOM WIDTH) TYPE5	CY	0	0	140	0		140	$500.00	$70,000
505-16	CONCRETE SIDE FLOW SPILLWAY, (80' BOTTOM WIDTH) TYPE6	CY	0	0	251	0		251	$500.00	$125,500
505-17	CONCRETE DROP INLET STRUCTURE, (3-8'X6' BOX CULVERT) TYPE 1	CY	0	0	0	0		80	$500.00	$40,000
505-18	CONCRETE DROP INLET STRUCTURE, (2-8'X6' BOX CULVERT) TYPE 2	CY	14	14	0	0		28	$500.00	$14,000
505-19	WASTEWAY STRUCTURE	CY	0	0	0	0		0	$500.00	$0
505-20	FLOW JUNCTION STRUCTURE	CY	137	0	0	0		137	$500.00	$68,500
505-21	SLIDE GATE STRUCTURE	EA	0	0	0	0		0	$50,000.00	$0
505-22	GROUTED RIPRAP DOWNDRAIN	EA	0	6	4	0		27	$1,630.00	$44,010
505-23	ALLOWANCE FOR HARDENED STRUCTURE WITHIN FISSURE ZONE	LS					0	0	$2,225,826.96	$0
510-1	RETAINING WALL, 2' TO 3'	LF	0	300	100	0		400	$40.00	$16,000
515-1	BOLLARDS, MAG STD DET 140, TYPE 2 REMOVABLE	EA	12	21	9	3		96	$1,000.00	$96,000
520-1	STEEL SAFETY RAIL, MAG STD DET 145, TYPE 1	LF	617	415	220	118		2,398	$75.00	$179,850
			$1,415,316	$316,393	$900,308	$994,481	$5,556			
	SUBTOTAL CONSTRUCTION ITEMS		$1,901,777	$784,045	$1,641,857	$2,090,656	$1,002,534			$11,477,875
	Relocation and/or Removal of Existing Utilities		$95,089	$39,202	$82,093	$104,533	$50,127		5%	$573,894
	Engineering Contingencies for Unknown Items		$95,089	$39,202	$82,093	$104,533	$50,127		5%	$573,894
	TOTAL CONSTRUCTION COST		$2,091,954	$862,450	$1,806,043	$2,299,721	$1,102,787			$12,625,663
	Landscaping as Aesthetic Treatment		$155,829	$113,690	$183,934	$129,275	$0	52	$20,000	$1,040,842
	Non-Landscaping Aesthetic Treatment		$83,678	$34,498	$72,242	$91,989	$44,111		4%	$505,027
	TOTAL CONSTRUCTION AND LANDSCAPE COST		$2,331,462	$1,010,637	$2,062,218	$2,520,985	$1,146,899			$14,171,531
	Engineering and Landscape Design		$233,146	$101,064	$206,222	$252,098	$114,690		10%	$1,417,153
	Construction Administration		$139,888	$60,638	$123,733	$151,259	$68,814		6%	$850,292
	TOTAL CONSTRUCTION, LANDSCAPE, AND CONTINGENCIES COST		$2,704,496	$1,172,339	$2,392,173	$2,924,342	$1,330,403			$16,438,976
	Required FCDMC Right-of-Way Acquisition - Undeveloped Property	AC	10.08	0.00	13.11	0.00	0.00	23.19	$152,500.00	$3,536,547
	Required FCDMC Right-of-Way Acquisition - Platted Property	AC	0.00	0.00	0.00	0.00	0.00	12.51	$205,000.00	$2,565,195
		AC	10.08	0.00	13.11	0.00	0.00	35.70		
	TOTAL REQUIRED RIGHT-OF-WAY ACQUISITION		$1,537,440	$0	$1,999,107	$0	$0			$6,101,742
	TOTAL PROJECT COST		$4,241,936	$1,172,339	$4,391,280	$2,924,342	$1,330,403			$22,540,718

duplicates F-16?

Project Cost with CBC versus Arch Culverts

CONCRETE BOX CULVERTS THROUGHOUT PROJECT

ITEM NO.	ITEM DESCRIPTION	UNIT	REACH 1	REACH 2	REACH 3	REACH 4	REACH 5	REACH 6	REACH 7	REACH 8	REACH 9	LUMP SUM ITEMS	TOTAL QUANTITY	UNIT PRICE	TOTAL AMOUNT
505-2	CONCRETE BOX CULVERT TYPE A (2 BARREL 8' x 6'), ADOT B-02.20	LF	0	0	0	0	0	826	85	0	0		911	$1,121.25	$1,021,459
505-3	CONCRETE BOX CULVERT TYPE B (3 BARREL 8' x 6'), ADOT B-02.30	LF	0	162	50	0	58	0	58	393	0		721	$1,604.20	$1,156,628
505-4	CONCRETE BOX CULVERT TYPE E (2 BARREL 10' x 6'), ADOT B-02.20	LF	0	0	0	0	0	0	0	0	1,320		1,320	$1,475.50	$1,947,660
	SUBTOTAL CONSTRUCTION ITEMS		$255,148	$1,757,019	$825,242	$336,568	$883,030	$1,653,958	$784,045	$1,641,857	$3,069,600	$3,228,361			$14,434,827
	Relocation and/or Removal of Existing Utilities		$12,757	$87,851	$41,262	$16,828	$44,152	$82,698	$39,202	$82,093	$153,480	$161,418		5%	$721,741
	Engineering Contingencies for Unknown Items		$12,757	$87,851	$41,262	$16,828	$44,152	$82,698	$39,202	$82,093	$153,480	$161,418		5%	$721,741
	TOTAL CONSTRUCTION COST		$280,663	$1,932,721	$907,766	$370,225	$971,333	$1,819,353	$862,450	$1,806,043	$3,376,560	$3,551,197			$15,878,310
	Landscaping as Aesthetic Treatment		$6,175	$160,292	$87,381	$30,207	$174,060	$155,829	$113,690	$183,934	$129,275	$0	52	$20,000	$1,040,842
	Non-Landscaping Aesthetic Treatment		$11,227	$77,309	$36,311	$14,809	$38,853	$72,774	$34,498	$72,242	$135,062	$142,048		4%	$635,132
	TOTAL CONSTRUCTION AND LANDSCAPE COST		$298,064	$2,170,322	$1,031,457	$415,240	$1,184,246	$2,047,957	$1,010,637	$2,062,218	$3,640,897	$3,693,245			$17,554,284
	Engineering and Landscape Design		$29,806	$217,032	$103,146	$41,524	$118,425	$204,796	$101,064	$206,222	$364,090	$369,324		10%	$1,755,428
	Construction Administration		$17,884	$130,219	$61,887	$24,914	$71,055	$122,877	$60,638	$123,733	$218,454	$221,595		6%	$1,053,257
	TOTAL CONSTRUCTION, LANDSCAPE, AND CONTINGENCIES COST		$345,755	$2,517,573	$1,196,490	$481,679	$1,373,725	$2,375,630	$1,172,339	$2,392,173	$4,223,440	$4,284,164			$20,362,969
	Required FCDMC Right-of-Way Acquisition - Undeveloped Property	AC	0.00	0.00	0.00	0.00	0.00	10.08	0.00	13.11	0.00	0.00	23.19	$152,500.00	$3,536,547
	Required FCDMC Right-of-Way Acquisition - Platted Property	AC	0.00	0.00	0.00	0.00	12.51	0.00	0.00	0.00	0.00	0.00	12.51	$205,000.00	$2,565,195
		AC	**0.00**	**0.00**	**0.00**	**0.00**	**12.51**	**10.08**	**0.00**	**13.11**	**0.00**	**0.00**	**35.70**		
	TOTAL REQUIRED RIGHT-OF-WAY ACQUISITION		$0	$0	$0	$0	$2,565,195	$1,537,440	$0	$1,999,107	$0	$0			$6,101,742
	TOTAL PROJECT COST		$345,755	$2,517,573	$1,196,490	$481,679	$3,938,921	$3,913,070	$1,172,339	$4,391,280	$4,223,440	$4,284,164			$26,464,711

CONSPAN ARCH CULVERTS THROUGHOUT PROJECT

ITEM NO.	ITEM DESCRIPTION	UNIT	REACH 1	REACH 2	REACH 3	REACH 4	REACH 5	REACH 6	REACH 7	REACH 8	REACH 9	LUMP SUM ITEMS	TOTAL QUANTITY	UNIT PRICE	TOTAL AMOUNT
505-2	CONCRETE BOX CULVERT TYPE A (2 BARREL 8' x 6'), ADOT B-02.20	LF	0	0	0	0	0	826	85	0	0		911	$670.00	$610,370
505-3	CONCRETE BOX CULVERT TYPE B (3 BARREL 8' x 6'), ADOT B-02.30	LF	0	162	50	0	58	0	58	393	0		721	$754.00	$543,634
505-4	CONCRETE BOX CULVERT TYPE E (2 BARREL 10' x 6'), ADOT B-02.20	LF	0	0	0	0	0	0	0	0	1,320		1,320	$1,475.50	$1,947,660
	SUBTOTAL CONSTRUCTION ITEMS		$255,148	$1,619,287	$782,732	$336,568	$833,718	$1,281,225	$696,377	$1,307,729	$3,069,600	$3,228,361			$13,410,744
	Relocation and/or Removal of Existing Utilities		$12,757	$80,964	$39,137	$16,828	$41,686	$64,061	$34,819	$65,386	$153,480	$161,418		5%	$670,537
	Engineering Contingencies for Unknown Items		$12,757	$80,964	$39,137	$16,828	$41,686	$64,061	$34,819	$65,386	$153,480	$161,418		5%	$670,537
	TOTAL CONSTRUCTION COST		$280,663	$1,781,215	$861,005	$370,225	$917,090	$1,409,348	$766,015	$1,438,501	$3,376,560	$3,551,197			$14,751,819
	Landscaping as Aesthetic Treatment		$6,175	$160,292	$87,381	$30,207	$174,060	$155,829	$113,690	$183,934	$129,275	$0	52	$20,000	$1,040,842
	Non-Landscaping Aesthetic Treatment		$11,227	$71,249	$34,440	$14,809	$36,684	$56,374	$30,641	$57,540	$135,062	$142,048		4%	$590,073
	TOTAL CONSTRUCTION AND LANDSCAPE COST		$298,064	$2,012,756	$982,826	$415,240	$1,127,834	$1,621,551	$910,345	$1,679,975	$3,640,897	$3,693,245			$16,382,733
	Engineering and Landscape Design		$29,806	$201,276	$98,283	$41,524	$112,783	$162,155	$91,035	$167,998	$364,090	$369,324		10%	$1,638,273
	Construction Administration		$17,884	$120,765	$58,970	$24,914	$67,670	$97,293	$54,621	$100,799	$218,454	$221,595		6%	$982,964
	TOTAL CONSTRUCTION, LANDSCAPE, AND CONTINGENCIES COST		$345,755	$2,334,797	$1,140,078	$481,679	$1,308,287	$1,880,999	$1,056,001	$1,948,771	$4,223,440	$4,284,164			$19,003,970
	Required FCDMC Right-of-Way Acquisition - Undeveloped Property	AC	0.00	0.00	0.00	0.00	0.00	10.08	0.00	13.11	0.00	0.00	23.19	$152,500.00	$3,536,547
	Required FCDMC Right-of-Way Acquisition - Platted Property	AC	0.00	0.00	0.00	0.00	12.51	0.00	0.00	0.00	0.00	0.00	12.51	$205,000.00	$2,565,195
		AC	**0.00**	**0.00**	**0.00**	**0.00**	**12.51**	**10.08**	**0.00**	**13.11**	**0.00**	**0.00**	**35.70**		
	TOTAL REQUIRED RIGHT-OF-WAY ACQUISITION		$0	$0	$0	$0	$2,565,195	$1,537,440	$0	$1,999,107	$0	$0			$6,101,742
	TOTAL PROJECT COST		$345,755	$2,334,797	$1,140,078	$481,679	$3,873,482	$3,418,439	$1,056,001	$3,947,878	$4,223,440	$4,284,164			$25,105,712

Project Cost with RipRap and Concrete Grade Control Structures versus ArmorFlex Grade Control Structures

RIPRAP AT GRADE CONTROL STRUCTURES															
ITEM NO.	ITEM DESCRIPTION	UNIT	REACH 1	REACH 2	REACH 3	REACH 4	REACH 5	REACH 6	REACH 7	REACH 8	REACH 9	LUMP SUM ITEMS	TOTAL QUANTITY	UNIT PRICE	TOTAL AMOUNT
220-1	PLAIN RIPRAP (D_{50} =2")	CY	0	170	60	42	16	20	0	151	0		459	$45.00	$20,655
220-3	PLAIN RIPRAP (D_{50} =15")	CY	0	2,619	1,285	522	281	562	0	748			6,017	$75.00	$451,275
505-7	CONCRETE GRADE CONTROL STRUCTURE, (30'-10' BOTTOM WIDTH TRANSITION) TYPE 1	CY	0	609	342	0	0	0	0	0	0		951	$500.00	$475,500
505-8	CONCRETE GRADE CONTROL STRUCTURE, (40'-20' BOTTOM WIDTH TRANSITION) TYPE 2	CY	0	0	0	0	84	168	0	0	0		252	$500.00	$126,000
505-9	CONCRETE GRADE CONTROL STRUCTURE, (50'-30' BOTTOM WIDTH TRANSITION) TYPE 3	CY	0	0	0	154	0	0	0	0	0		154	$500.00	$77,000
	SUBTOTAL CONSTRUCTION ITEMS		**$255,148**	**$1,757,019**	**$825,242**	**$336,568**	**$883,030**	**$1,653,958**	**$784,045**	**$1,641,857**	**$3,069,600**	**$3,228,361**			**$14,434,827**
	Relocation and/or Removal of Existing Utilities		$12,757	$87,851	$41,262	$16,828	$44,152	$82,698	$39,202	$82,093	$153,480	$161,418		5%	$721,741
	Engineering Contingencies for Unknown Items		$12,757	$87,851	$41,262	$16,828	$44,152	$82,698	$39,202	$82,093	$153,480	$161,418		5%	$721,741
	TOTAL CONSTRUCTION COST		**$280,663**	**$1,932,721**	**$907,766**	**$370,225**	**$971,333**	**$1,819,353**	**$862,450**	**$1,806,043**	**$3,376,560**	**$3,551,197**			**$15,878,310**
	Landscaping as Aesthetic Treatment		$6,175	$160,292	$87,381	$30,207	$174,060	$155,829	$113,690	$183,934	$129,275	$0	52	$20,000	$1,040,842
	Non-Landscaping Aesthetic Treatment		$11,227	$77,309	$36,311	$14,809	$38,853	$72,774	$34,498	$72,242	$135,062	$142,048		4%	$635,132
	TOTAL CONSTRUCTION AND LANDSCAPE COST		**$298,064**	**$2,170,322**	**$1,031,457**	**$415,240**	**$1,184,246**	**$2,047,957**	**$1,010,637**	**$2,062,218**	**$3,640,897**	**$3,693,245**			**$17,554,284**
	Engineering and Landscape Design		$29,806	$217,032	$103,146	$41,524	$118,425	$204,796	$101,064	$206,222	$364,090	$369,324		10%	$1,755,428
	Construction Administration		$17,884	$130,219	$61,887	$24,914	$71,055	$122,877	$60,638	$123,733	$218,454	$221,595		6%	$1,053,257
	TOTAL CONSTRUCTION, LANDSCAPE, AND CONTINGENCIES COST		**$345,755**	**$2,517,573**	**$1,196,490**	**$481,679**	**$1,373,725**	**$2,375,630**	**$1,172,339**	**$2,392,173**	**$4,223,440**	**$4,284,164**			**$20,362,969**
	Required FCDMC Right-of-Way Acquisition - Undeveloped Property	AC	0.00	0.00	0.00	0.00	0.00	10.08	0.00	13.11	0.00	0.00	23.19	$152,500.00	$3,536,547
	Required FCDMC Right-of-Way Acquisition - Platted Property	AC	0.00	0.00	0.00	0.00	12.51	0.00	0.00	0.00	0.00	0.00	12.51	$205,000.00	$2,565,195
		AC	**0.00**	**0.00**	**0.00**	**0.00**	**12.51**	**10.08**	**0.00**	**13.11**	**0.00**	**0.00**	**35.70**		
	TOTAL REQUIRED RIGHT-OF-WAY ACQUISITION		**$0**	**$0**	**$0**	**$0**	**$2,565,195**	**$1,537,440**	**$0**	**$1,999,107**	**$0**	**$0**			**$6,101,742**
	TOTAL PROJECT COST		**$345,755**	**$2,517,573**	**$1,196,490**	**$481,679**	**$3,938,921**	**$3,913,070**	**$1,172,339**	**$4,391,280**	**$4,223,440**	**$4,284,164**			**$26,464,711**

ARMORFLEX AT GRADE CONTROL STRUCTURES															
ITEM NO.	ITEM DESCRIPTION	UNIT	REACH 1	REACH 2	REACH 3	REACH 4	REACH 5	REACH 6	REACH 7	REACH 8	REACH 9	LUMP SUM ITEMS	TOTAL QUANTITY	UNIT PRICE	TOTAL AMOUNT
220-1	ARMORFLEX TO REPLACE RIPRAP	SF	0	9,105	3,230	2,270	836	1,672	0	8,132	0		25,245	$9.04	$228,215
220-3	ARMORFLEX TO REPLACE RIPRAP	SF	0	28,239	13,860	5,640	3,033	6,066	0	8,132			64,970	$9.04	$587,329
505-7	ARMORFLEX TO REPLACE GRADE CONTROL STRUCTURE	SF	0	16,794	9,330	0	0	0	0	0	0		26,124	$9.04	$236,161
505-8	ARMORFLEX TO REPLACE GRADE CONTROL STRUCTURE	SF	0	0	0	0	2,262	4,524	0	0	0		6,786	$9.04	$61,345
505-9	ARMORFLEX TO REPLACE GRADE CONTROL STRUCTURE	SF	0	0	0	4,294	0	0	0	0	0		4,294	$9.04	$38,818
	CONCRETE GRADE CONTROL STRUCTURE CUTOFF WALL	CY	0	195	112	46	28	56	0	0			437	$500.00	$218,500
	SUBTOTAL CONSTRUCTION ITEMS		**$255,148**	**$1,835,352**	**$850,003**	**$351,852**	**$888,659**	**$1,665,756**	**$784,045**	**$1,725,989**	**$3,069,600**	**$3,228,361**			**$14,654,765**
	Relocation and/or Removal of Existing Utilities		$12,757	$91,768	$42,500	$17,593	$44,433	$83,288	$39,202	$86,299	$153,480	$161,418		5%	$732,738
	Engineering Contingencies for Unknown Items		$12,757	$91,768	$42,500	$17,593	$44,433	$83,288	$39,202	$86,299	$153,480	$161,418		5%	$732,738
	TOTAL CONSTRUCTION COST		**$280,663**	**$2,018,887**	**$935,004**	**$387,037**	**$977,525**	**$1,832,332**	**$862,450**	**$1,898,588**	**$3,376,560**	**$3,551,197**			**$16,120,241**
	Landscaping as Aesthetic Treatment		$6,175	$160,292	$87,381	$30,207	$174,060	$155,829	$113,690	$183,934	$129,275	$0	52	$20,000	$1,040,842
	Non-Landscaping Aesthetic Treatment		$11,227	$80,755	$37,400	$15,481	$39,101	$73,293	$34,498	$75,944	$135,062	$142,048		4%	$644,810
	TOTAL CONSTRUCTION AND LANDSCAPE COST		**$298,064**	**$2,259,934**	**$1,059,785**	**$432,725**	**$1,190,686**	**$2,061,454**	**$1,010,637**	**$2,158,465**	**$3,640,897**	**$3,693,245**			**$17,805,893**
	Engineering and Landscape Design		$29,806	$225,993	$105,978	$43,273	$119,069	$206,145	$101,064	$215,846	$364,090	$369,324		10%	$1,780,589
	Construction Administration		$17,884	$135,596	$63,587	$25,964	$71,441	$123,687	$60,638	$129,508	$218,454	$221,595		6%	$1,068,354
	TOTAL CONSTRUCTION, LANDSCAPE, AND CONTINGENCIES COST		**$345,755**	**$2,621,524**	**$1,229,350**	**$501,961**	**$1,381,196**	**$2,391,287**	**$1,172,339**	**$2,503,819**	**$4,223,440**	**$4,284,164**			**$20,654,835**
	Required FCDMC Right-of-Way Acquisition - Undeveloped Property	AC	0.00	0.00	0.00	0.00	0.00	10.08	0.00	13.11	0.00	0.00	23.19	$152,500.00	$3,536,547
	Required FCDMC Right-of-Way Acquisition - Platted Property	AC	0.00	0.00	0.00	0.00	12.51	0.00	0.00	0.00	0.00	0.00	12.51	$205,000.00	$2,565,195
		AC	**0.00**	**0.00**	**0.00**	**0.00**	**12.51**	**10.08**	**0.00**	**13.11**	**0.00**	**0.00**	**35.70**		
	TOTAL REQUIRED RIGHT-OF-WAY ACQUISITION		**$0**	**$0**	**$0**	**$0**	**$2,565,195**	**$1,537,440**	**$0**	**$1,999,107**	**$0**	**$0**			**$6,101,742**
	TOTAL PROJECT COST		**$345,755**	**$2,621,524**	**$1,229,350**	**$501,961**	**$3,946,391**	**$3,928,727**	**$1,172,339**	**$4,502,926**	**$4,223,440**	**$4,284,164**			**$26,756,577**

APPENDIX G – VALUE ENGINEERING MEMORANDUM BY JACOBS

Memorandum

JACOBS

101 North First Avenue
Suite 3100
Phoenix, AZ 85003-1902 USA
602.253.1200 Fax 602.253.1202

Date	November 2, 2009 - Draft, *Revised November 11, 2009*
To	Paul Hoskin (HRC), Kristyn Van Meter (HRC)
From	Chris Miranda (JEG)
Cc:	Brad Olbert (JEG), File
Subject	Update on review of White Tanks FRS No. 3 Outfall Channel - 30% Plans

As per our scope of work, I want to update you on our progress on the review of the 30% plans. Through our review we have developed a few questions and that we believe would need to be reviewed and revised either in the Design Report or within the plans.

The items summarized below are based on our review of the 30% plans and the design report.

- Drop structure review
  - The design report states that the grades shall be a maximum of 20%, Volume I, P. 18. However, our review of the plans show the some drop structures having grades from 23% to 55%. All of the locations are located upstream and adjacent to proposed Box Culverts. If the grades at these locations are to be excluded the text should state so. Will users of the channel bottom be expecting a 20% grade at each location? Can using a deeper Box Culvert pass maintenance vehicles and avoid many of the channel ramps?
- Adverse Grades
  - The adverse grade proposed for the drop structures has a 20% grade on the downstream side and a 12.5% adverse grade on the upstream side. The total grade break is 32.5%. Initially maintenance vehicles may hang up on the crest. Suggest backfilling upstream to flatten the slope. This will happen eventually with sediment buildup. At that point the channel will have an adverse grade to it other than the low flow channel. The adverse crest is there to reduce the velocity of the channel flow to prevent channel erosion. Are we doubling up with protection? The upstream riprap provides a similar function. Would removing the adverse crest reduce the cost of the structure?
- Channel velocities
  - Within Vol. I, p.15, 16, and 18 of the design report, the channel velocities are stated to be above 3 fps, 3.5 fps, and 4 fps. However, the report discusses a maximum velocity of 3.0 fps for earth channels of sandy loam soils with vegetation. Midpoint sections might show velocities consistently above 3.0 fps. Need to check sediment transport equations for the sediment in the area to best determine the channel size.
- Gravel Mulch vs. Aggregate Base Course
  - Within Vol. I, p.19 of the design report, it states that the O&M road shall have gravel mulch but on sheet 51of 55 within the plans shows the O&M road having 4-inches of ABC. ABC should be used in lieu of gravel mulch.

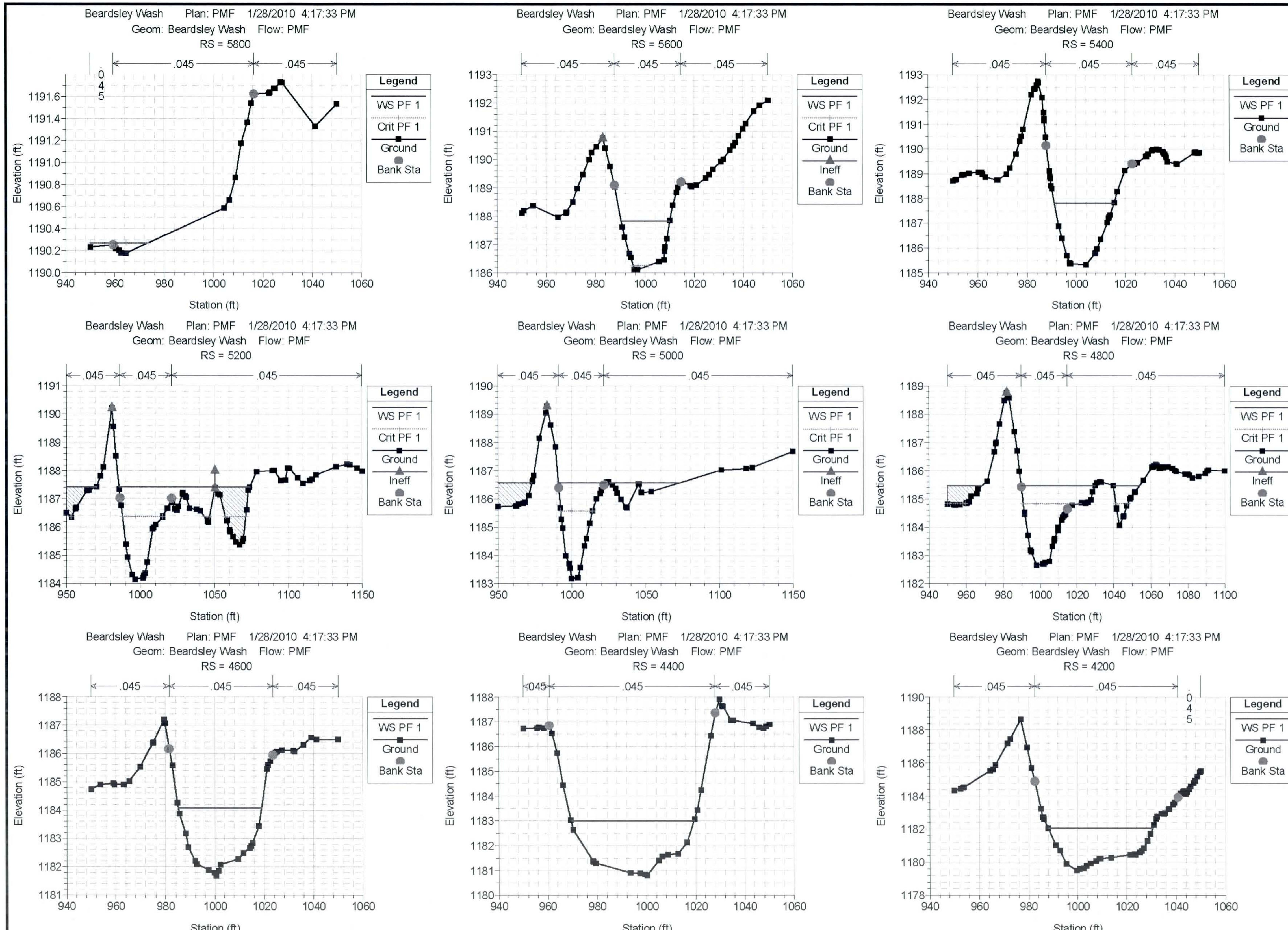
- Gravel Mulch
  Gravel Mulch on sheet 5of 55 within the plans is shown being used on the top of the banks as well as the sideslopes of the channel. This may not be a very aesthetic use of materials.

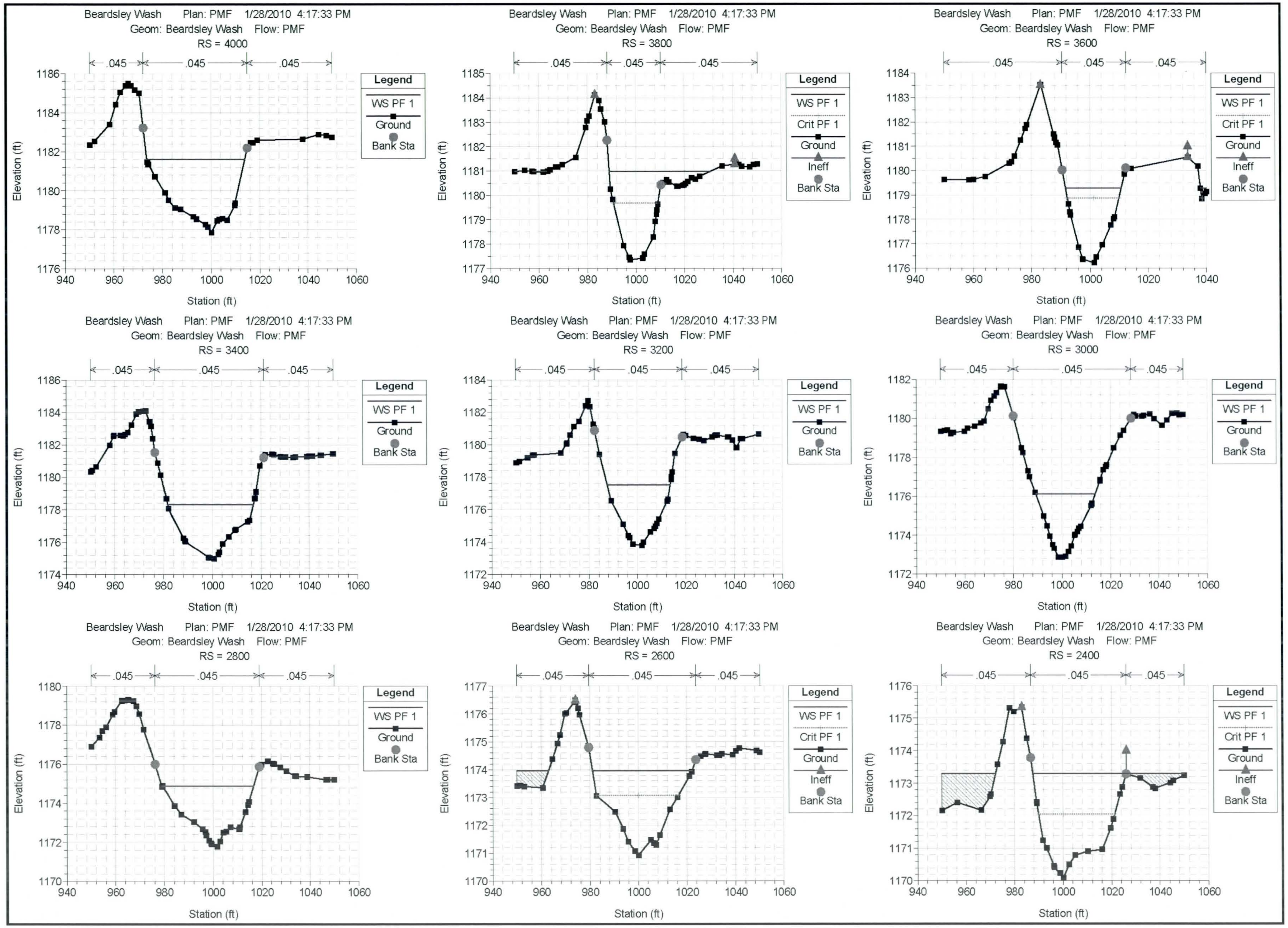
Additionally, through our review we have looked at a few items that can be discussed within the Value Engineering Meetings, set for November 3rd – 5th.

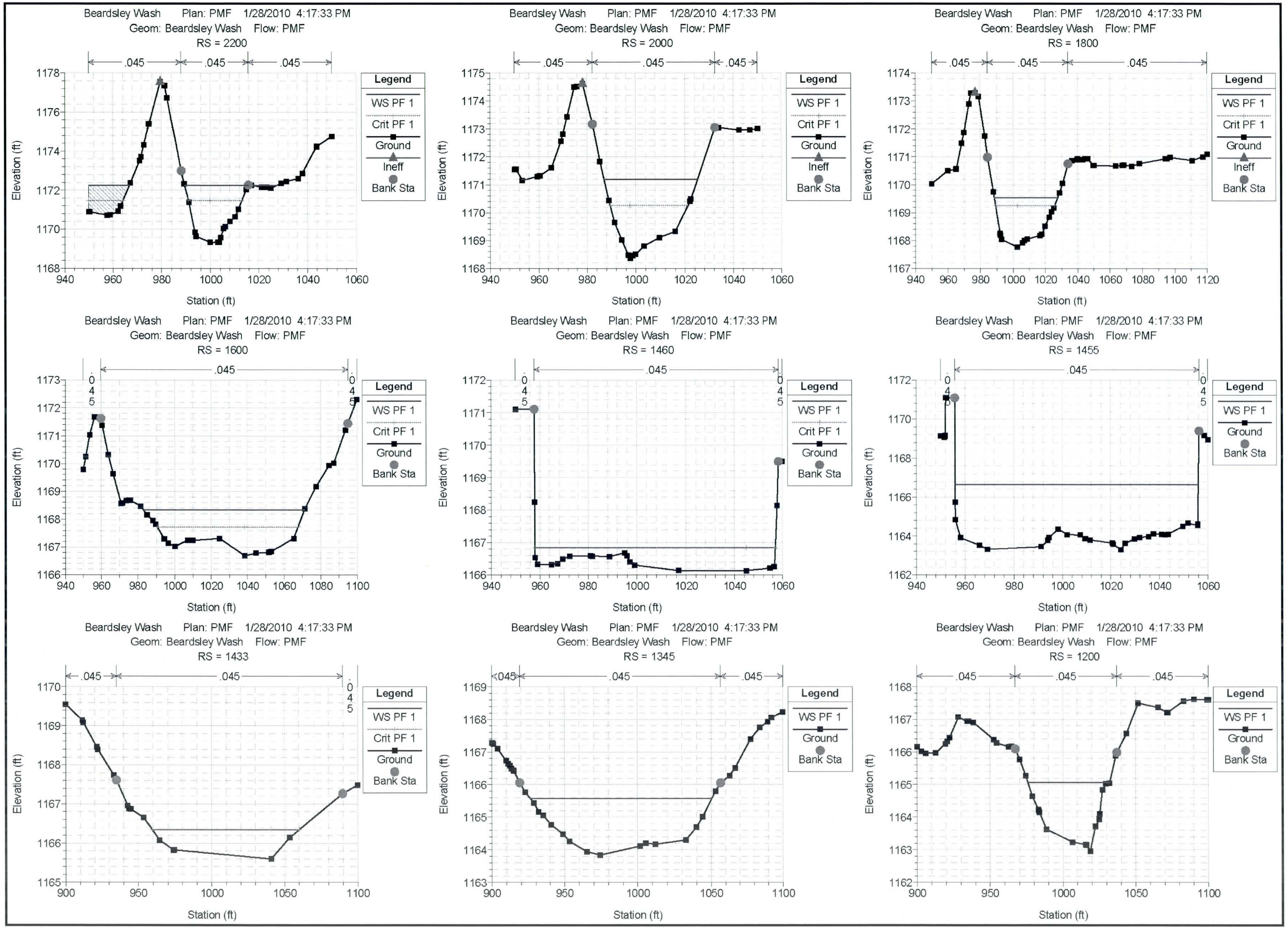
- Closed conduit HDPE pipe through Reach 9.
  - Please find the attached information from Contech and ISCO within Appendix A.
- Closed conduit from a portion of Reach 8 through Reach 6.
  - Please find the attached information on Conspan, from Contech and a Reinforced Concrete Box Culvert within Appendix B.
- Use of sediment traps to reduce the sediment bed load.
- Review of O&M needs for channel and type of vehicles to be used.

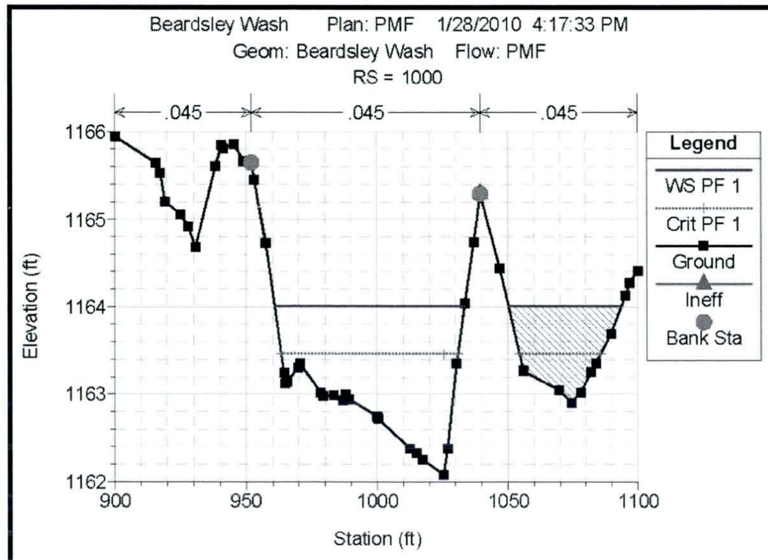
APPENDIX H – WASTEWAY FLOW HEC-RAS MODEL

```
                    HEC-RAS Version 4.0.0 March 2008
                      U.S. Army Corps of Engineers
                     Hydrologic Engineering Center
                           609 Second Street
                           Davis, California

       X     X  XXXXXX    XXXX        XXXX       XX      XXXX
       X     X  X        X    X       X   X     X  X    X
       X     X  X        X            X   X    X    X   X
       XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
       X     X  X        X            X  X     X    X        X
       X     X  X        X    X       X   X    X    X        X
       X     X  XXXXXX    XXXX        X    X   X    X   XXXXX

********************************************************************************

PROJECT DATA
Project Title: Beardsley Wash
Project File : Beardsley.prj
Run Date and Time: 1/28/2010 4:17:33 PM

Project in English units

Project Description:
Project: Beardsley Wash PMF Floodplain
Hoskin Ryan
Consultants
12/28/2009

Cross-section geometries obtained from the aerial
mapping prepared by Cooper Aerial on 12/22/2009
Wash center line lies on
Station 1000 at each cross-section
Datum: NAVD 88


********************************************************************************

PLAN DATA

Plan Title: PMF
Plan File : G:\Projects\09\09-077 WTO3 Final\01 - 30% Design\Hydro\HEC-RAS\Beardsley.p01

           Geometry Title: Beardsley Wash
           Geometry File : G:\Projects\09\09-077 WTO3 Final\01 - 30% Design\Hydro\HEC-RAS\Beardsley.g01

           Flow Title    : PMF
           Flow File     : G:\Projects\09\09-077 WTO3 Final\01 - 30% Design\Hydro\HEC-RAS\Beardsley.f01

Plan Summary Information:
Number of:  Cross Sections =   28    Multiple Openings  =    0
            Culverts       =    0    Inline Structures  =    0
            Bridges        =    0    Lateral Structures =    0

Computational Information
    Water surface calculation tolerance  =  0.01
    Critical depth calculation tolerance =  0.01
    Maximum number of iterations         =  20
    Maximum difference tolerance         =  0.3
    Flow tolerance factor                =  0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method:          Average Conveyance
    Computational Flow Regime:      Subcritical Flow

********************************************************************************

FLOW DATA

Flow Title: PMF
Flow File : G:\Projects\09\09-077 WTO3 Final\01 - 30% Design\Hydro\HEC-RAS\Beardsley.f01

Flow Data (cfs)
*************************************************************
* River           Reach              RS       *        PF 1 *
* Beardsley Wash  9                  5800     *           1 *
* Beardsley Wash  9                  5200     *         221 *
*************************************************************

Boundary Conditions
**********************************************************************************************************
* River           Reach             Profile           *          Upstream                 Downstream     *
**********************************************************************************************************
* Beardsley Wash  9                 PF 1              *                                Normal S = 0.005 *
**********************************************************************************************************

********************************************************************************

SUMMARY OF MANNING'S N VALUES

River:Beardsley Wash
*****************************************************************
*     Reach      *   River Sta.   *   n1    *   n2   *   n3    *
*****************************************************************
*9               *    5800        *     .045*    .045*     .045*
*9               *    5600        *     .045*    .045*     .045*
*9               *    5400        *     .045*    .045*     .045*
*9               *    5200        *     .045*    .045*     .045*
*9               *    5000        *     .045*    .045*     .045*
*9               *    4800        *     .045*    .045*     .045*
*9               *    4600        *     .045*    .045*     .045*
*9               *    4400        *     .045*    .045*     .045*
*9               *    4200        *     .045*    .045*     .045*
*9               *    4000        *     .045*    .045*     .045*
*9               *    3800        *     .045*    .045*     .045*
*9               *    3600        *     .045*    .045*     .045*
*9               *    3400        *     .045*    .045*     .045*
*9               *    3200        *     .045*    .045*     .045*
*9               *    3000        *     .045*    .045*     .045*
*9               *    2800        *     .045*    .045*     .045*
*9               *    2600        *     .045*    .045*     .045*
*9               *    2400        *     .045*    .045*     .045*
*9               *    2200        *     .045*    .045*     .045*
*9               *    2000        *     .045*    .045*     .045*
*9               *    1800        *     .045*    .045*     .045*
*9               *    1600        *     .045*    .045*     .045*
*9               *    1460        *     .045*    .045*     .045*
*9               *    1455        *     .045*    .045*     .045*
*9               *    1433        *     .045*    .045*     .045*
*9               *    1345        *     .045*    .045*     .045*
*9               *    1200        *     .045*    .045*     .045*
*9               *    1000        *     .045*    .045*     .045*
*****************************************************************

********************************************************************************
```


Beardsley Wash Plan: PMF 1/28/2010 4:17:33 PM
Geom: Beardsley Wash Flow: PMF
RS = 5800
Legend
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Beardsley Wash Plan: PMF 1/28/2010 4:17:33 PM
Geom: Beardsley Wash Flow: PMF
RS = 5600
Legend
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Beardsley Wash Plan: PMF 1/28/2010 4:17:33 PM
Geom: Beardsley Wash Flow: PMF
RS = 5400
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Beardsley Wash Plan: PMF 1/28/2010 4:17:33 PM
Geom: Beardsley Wash Flow: PMF
RS = 5200
Legend
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Beardsley Wash Plan: PMF 1/28/2010 4:17:33 PM
Geom: Beardsley Wash Flow: PMF
RS = 5000
Legend
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Beardsley Wash Plan: PMF 1/28/2010 4:17:33 PM
Geom: Beardsley Wash Flow: PMF
RS = 4800
Legend
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Beardsley Wash Plan: PMF 1/28/2010 4:17:33 PM
Geom: Beardsley Wash Flow: PMF
RS = 4600
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Beardsley Wash Plan: PMF 1/28/2010 4:17:33 PM
Geom: Beardsley Wash Flow: PMF
RS = 4400
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Beardsley Wash Plan: PMF 1/28/2010 4:17:33 PM
Geom: Beardsley Wash Flow: PMF
RS = 4200
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Beardsley Wash Plan: PMF 1/28/2010 4:17:33 PM
Geom: Beardsley Wash Flow: PMF
RS = 4000
Legend
WS PF 1
Ground
Bank Sta
Beardsley Wash Plan: PMF 1/28/2010 4:17:33 PM
Geom: Beardsley Wash Flow: PMF
RS = 3800
Legend
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Beardsley Wash Plan: PMF 1/28/2010 4:17:33 PM
Geom: Beardsley Wash Flow: PMF
RS = 3600
Legend
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Beardsley Wash Plan: PMF 1/28/2010 4:17:33 PM
Geom: Beardsley Wash Flow: PMF
RS = 3400
Legend
WS PF 1
Ground
Bank Sta
Beardsley Wash Plan: PMF 1/28/2010 4:17:33 PM
Geom: Beardsley Wash Flow: PMF
RS = 3200
Legend
WS PF 1
Ground
Bank Sta
Beardsley Wash Plan: PMF 1/28/2010 4:17:33 PM
Geom: Beardsley Wash Flow: PMF
RS = 3000
Legend
WS PF 1
Ground
Bank Sta
Beardsley Wash Plan: PMF 1/28/2010 4:17:33 PM
Geom: Beardsley Wash Flow: PMF
RS = 2800
Legend
WS PF 1
Ground
Bank Sta
Beardsley Wash Plan: PMF 1/28/2010 4:17:33 PM
Geom: Beardsley Wash Flow: PMF
RS = 2600
Legend
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Beardsley Wash Plan: PMF 1/28/2010 4:17:33 PM
Geom: Beardsley Wash Flow: PMF
RS = 2400
Legend
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Beardsley Wash Plan: PMF 1/28/2010 4:17:33 PM
Geom: Beardsley Wash Flow: PMF
RS = 2200
RS = 2000
RS = 1800
RS = 1600
RS = 1460
RS = 1455
RS = 1433
RS = 1345
RS = 1200
.045
Legend
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Beardsley Wash Plan: PMF 1/28/2010 4:17:33 PM
Geom: Beardsley Wash Flow: PMF
RS = 1000
.045
.045
.045
Legend
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
1166
1165
1164
1163
1162
900
950
1000
1050
1100
Station (ft)

APPENDIX J – COMPARISON OF FLO2D GRID VS. AERIAL MAPPING