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DATE

CAVE CREEK DRAINAGE MASTER PLAN

January 2008

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CAVE CREEK DRAINAGE MASTER PLAN

Recommended Report

January 2008

HDR

CAVE CREEK ARIZONA

Flood Control District of Maricopa County

CAVE CREEK DRAINAGE MASTER PLAN

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TABLE OF CONTENTS

Acknowledgements **v**
1. Introduction **1**
2. Purpose and Goals **2**
3. Description of Project Area **2**
4. Data Collection Summary **3**
Current Conditions 3
Areas of Potential Flooding and Problem Areas 3
Vehicular and Other Transportation Modes 6
Planning Efforts 6
Existing and Future Development Plans for the Town of Cave Creek 11
5. Public Involvement **11**
6. Environmental Overview **13**
Physical Environment 13
Vegetation 13
Wildlife 14
Alternatives Analysis - Environmental Considerations 14
Landscape Character and Visual Resources 16
7. Hazards Identification Summary **16**
Hydrology 16
8. Results **18**
Hydraulics 19
Geomorphic 22
Sediment Engineering 22
Flood and Erosion Hazard Zones 23
8. Potential Alternatives **23**
Potential Solutions 26
Alternative Descriptions 27
9. Master Plan Elements **27**
Identify Wash Corridors 27
Additional Floodplain Mapping 27
Drainage Guidelines 30
Wash Obstruction Removal/Code Enforcement 32
Floodprone Properties Acquisition Program (FPAP) 32
Erosion Hazard Setbacks 33
Education 33
Flood Response Plan 38
All-weather Access 40
Adopt "Grading and Drainage Guidelines for Town of Cave Creek 45
Realignment of 24th Street 45
10. Landscape, Aesthetic Treatment, and Multi-use Opportunities **45**

Landscape 46
Aesthetic Treatment 47
Multi-use Opportunities 51
Land 52
Rights-of-Way and Easement Requirements 52
Major Utilities and Utilities Conflicts 52
Conceptual Design Cost Estimates 52
11. Implementation Plan 53
Implementation Recommendations 53
Opportunities and Constraints 53
References 55
Glossary 56

Appendices

A - Data Collection
B - Hydrology
C - Hydraulics
D - Alternative Analysis
E - Floodplain Mapping
F - Improvement Plans and Cost Estimates
G - Drainage Guidelines

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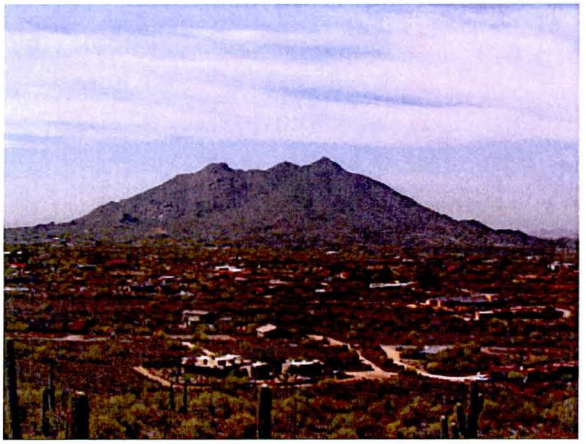
1. INTRODUCTION



A view of the Town of Cave Creek

Cave Creek is known for its rustic character, desert setting, and western, independent lifestyle. The landscape setting is predominantly hills and mountains, many with braided or sinuous washes. The scenic desert vegetation is one of many attractions for new and old residents alike.

Development pressures and recent damaging storm events prompted the Town of Cave Creek (Town) to request a *Drainage Master Plan* (DMP) to be initiated by the Flood Control District of Maricopa County (District). The DMP identifies drainage problems and develops solutions to alleviate or manage flooding in the Town area. The DMP is prepared under the authority of Arizona Revised Statutes (ARS) Title 48, Chapter 21. The District contracted with HDR Engineering, Inc. (HDR) to prepare the DMP for the Town. In turn, HDR worked with JE Fuller and LTM Engineering to complete the study as well as with District and Town personnel.

The District plans for regional flood control improvement in advance of development wherever possible. This allows flood control features, if needed, to be built into the context of the natural environment rather than becoming something appearing wedged or forced in. This approach is often more cost effective as well.

The DMP effort included survey and mapping; hydraulics, hydrology, geomorphic and sedimentation evaluation; environmental overview; landscape character resources overview; a series of public meetings and workshops; and the development of elements to minimize the risk of flood related damage. Several technical memoranda, listed below, were prepared over the course of the project; the content of which are summarized in the DMP.

- Survey Report
- Data Collection Report
- Major Wash Identification
- Hydrology Report
- Hydraulics Report
- Geomorphic and Sedimentation Engineering Report
- Ocotillo Wash Floodplain Redelineation and Technical Data Notebook
- Floodplain Delineation of Galloway Wash Tributaries, Willow Springs Wash Tributaries, and Cave Creek Tributaries and Technical Data Notebook
- Flood Response Plan
- Drainage Guidelines
- Scenery Resource Report
- Potential Alternatives Report

- Alternatives Formulation Report
- Manning's "n"-value Report
- Two-foot contour mapping

2. PURPOSE AND GOALS

During storms the residents of the Town are frequently stranded at home or prevented from getting home. Residents expect some level of protection from natural hazards, and while they are willing to wait an hour or two for the water to recede before crossing a wash, this delay could be very costly if emergency vehicles are unable to reach their destination. The purpose of the DMP is to identify flooding hazards in the Town and develop strategies to protect the public from these hazards.

The goals of the Cave Creek DMP are:

- Identify flooding issues
- Identify erosion hazard areas and how to protect residents
- Preserve the natural desert and western characteristics of the Town

Specific tasks to achieve these goals include:

- Identify the flooding hazards in the area and prepare the Federal Emergency Management Agency (FEMA) floodplain delineations for selected washes.
- Develop a plan that area floodplain managers, municipalities, and developers will use as a basis for drainage and watershed regulation, improvements, and design.
- Quantify the extent of existing and future potential flooding problems within the Town and develop alternative solutions to reduce flooding and to determine potential emergency access routes to as many residences as it is feasible.
- Conduct a Public Involvement Program to gather and disseminate information regarding flooding, sedimentation, and erosion problems, keeping the citizens of the Town informed on the progress of the study and to obtain acceptance of the study and its findings and recommendations.
- Perform a qualitative evaluation of the erosion and sedimentation patterns and characteristics within the Town and upstream contributing areas. Where appropriate, provide a tool for estimating the long-term benefits of proposed improvements.
- Identify cost-effective, sustainable flood and erosion control alternatives for the project area that may be implemented together or individually, based on scheduling, funding, and cost sharing.

3. DESCRIPTION OF PROJECT AREA

The project boundary encompasses the entire Town plus unincorporated portions of Maricopa County land and portions of land from the Arizona State Land Trust. The Town is located in portions of Township 5 North, Ranges 3 and 4 East and Township 6 North, Ranges 3 and 4 East. The Town is east of the Gila and Salt River Meridian within Maricopa County (*Figure 1* on page 2). The Town is bounded by Maricopa County unincorporated land, Tonto National Forest, Carefree, and the cities of Phoenix and Scottsdale. The study limits are shown in *Figure 2* on page 4.

Much of the study area is hilly terrain. Elevation ranges from approximately 1,750 feet to 3,850 feet, with slopes as steep as 15 percent to as flat as 0.2 percent. Many of the washes are deeply incised with vertical side slopes. Washes are predominantly ephemeral, as they are throughout Maricopa County.

There are several major washes transecting the study area, including Cave Creek, Willow Springs Wash, Ocotillo Wash, Rowe Wash, and Galloway Wash as shown in *Figure 3* on page 5. Approximately 90 linear miles of watercourses were considered for delineation in the preparation of the DMP.

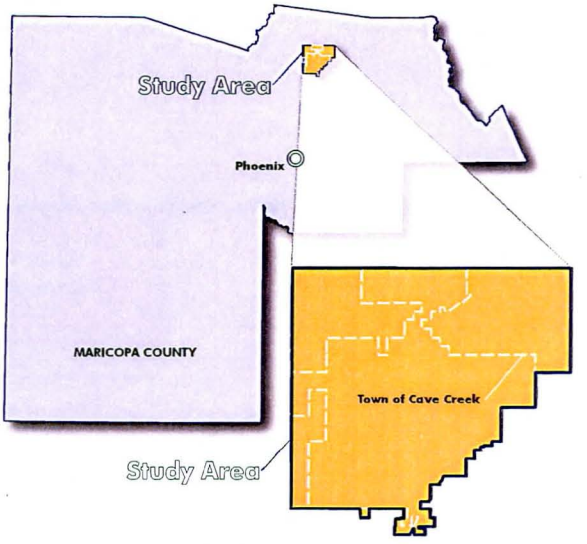


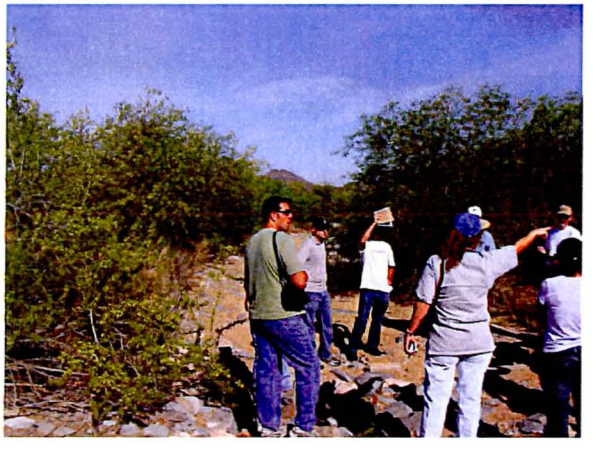
Figure 1. *Study area location of the Town of Cave Creek*

4. DATA COLLECTION SUMMARY

Information was obtained from a variety of sources, including the District, Maricopa County Department of Transportation (MCDOT), the Town, FEMA, the public, and field reconnaissance. Data were obtained from as-built plans, Geographic Information System (GIS), previous studies and reports, photos, and interviews. Research for the project was performed at the local library archives, newspaper databases, District databases, and flood gage records. Additionally, historical aerial photographs were obtained and reviewed.

Current Conditions

Several major drainage conveyances are located within the Town. Many are mapped as floodplains and/or floodways by FEMA and shown on the Flood Insurance Rate Maps (FIRM) for the study area. The Town's drainage scheme generally consists of culverts or at-grade crossings to cross roadways and washes. A comprehensive inventory of all drainage structures, such as culverts, bridges, bank protection, improved channels, and at-grade roadway crossings was obtained from as-built plans and field reconnaissance. The inventory is available in the Data Collection Report.



Field reconnaissance

Areas of Potential Flooding and Problem Areas

Areas of potential flooding were determined from published maps, studies, field reconnaissance, historic aerial photographs, and interviews with residents. General flooding can be expected in any of the washes throughout the

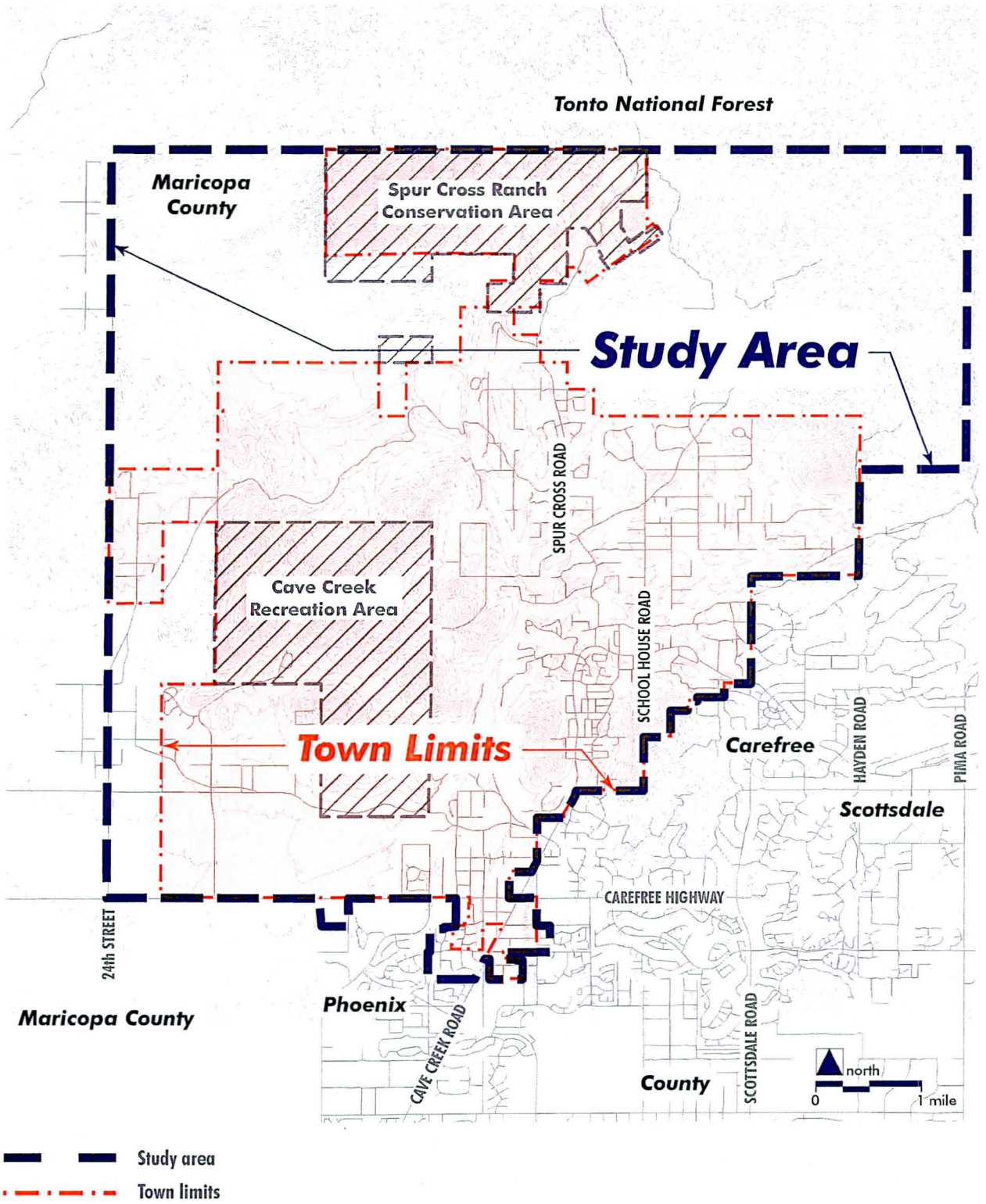


Figure 2. *Study area boundary*

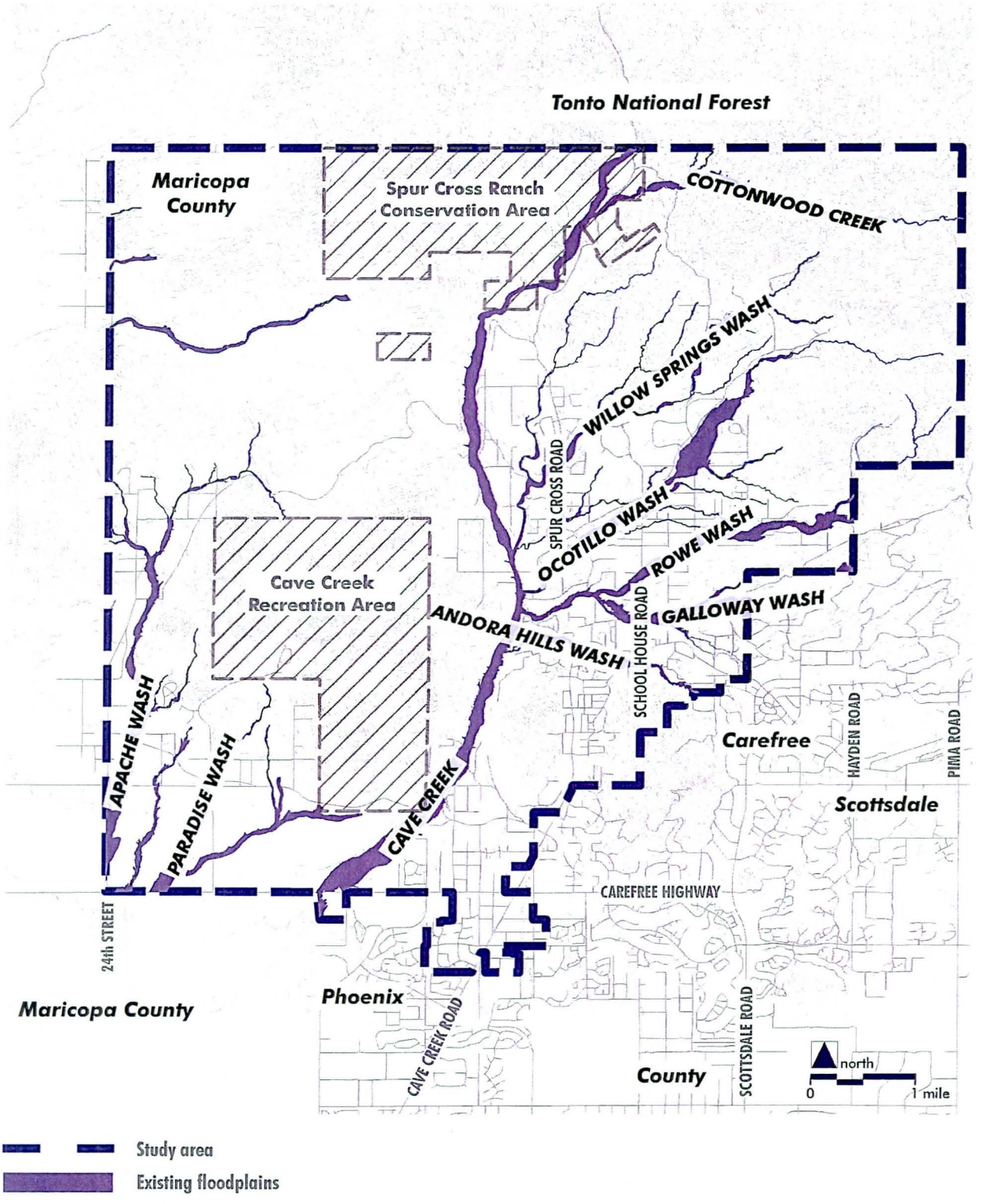
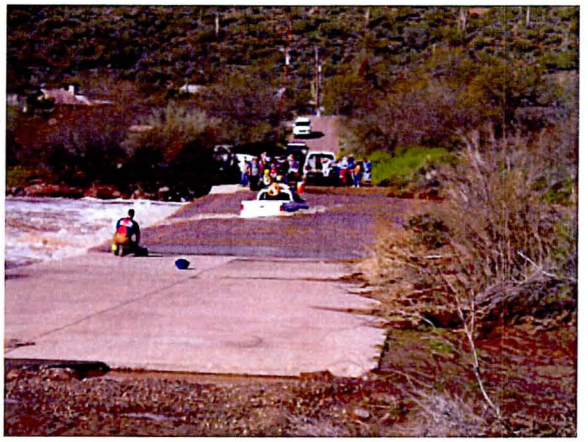


Figure 3. *Major washes in the study area*



Wash rescue

Washed out road

Town, with additional areas of localized flooding. Potential flooding and problem areas discovered as part of the project are included in Figure 1 of Appendix A.

Additionally, significant washes not currently mapped as floodplains were identified. This information is contained in the August 4, 2006 Technical Memorandum *Cave Creek DMP Major Wash Identification* by JE Fuller/Hydrology and Geomorphology, Inc. and shown later in Section 8 of this report, *Figure 7*. These drainage pathways are expected to convey water during runoff events.

Vehicular and Other Transportation Modes

The Town's road network is a combination of developments using the grid system and others following the topography. Numerous washes in the area result in a grid system whose roads are frequently in conflict with washes.

There is one main access road into Town - Cave Creek Road, which loops to the east through Carefree and continues on to Tom Darlington Road. The northern reaches of the Town are accessed from School House Road and Spur Cross Road, both accessible only from Cave Creek Road. Most of the roads in Town are two-lane asphalt; the rest are unpaved.

The Town has many residents who are equestrians. The Town of Cave Creek trails plan, *Figure 4* on page 7, indicates existing and proposed trail elements in the Town. Many of Town's washes are used as equestrian routes.

Planning Efforts

To provide relevant background information for the DMP, planning documents from the Town of Cave Creek, Town of Carefree, and Maricopa County were reviewed. The purpose was to determine the relevance of these documents to the Cave Creek DMP development process. Specifically, the planning document review examined relevant planning policies, recommendations, standards, and guidelines that potentially could have positive or negative impact on surface water drainage management within the study area. Residential, commercial, and industrial development is a key issue, having significant impact on surface drainage patterns and water quality. Other issues examined include policies effecting native vegetation and the natural topography of the study area.

The study area is generally developed with large-lot, single-family residences, with the exception of downtown which contains commercial and higher-density residential

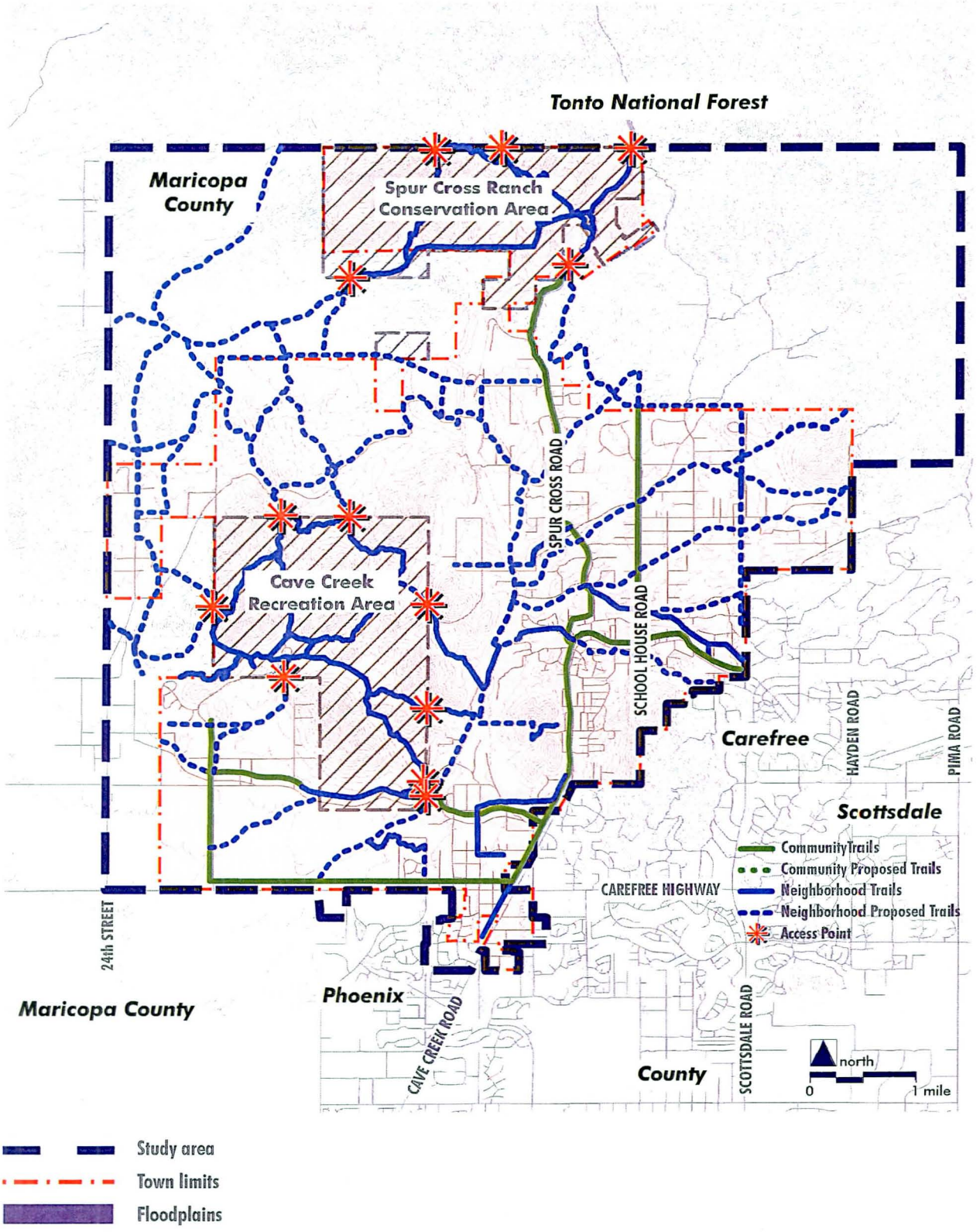


Figure 4. *Town of Cave Creek Trails Plan*
Source: *Town of Cave Creek General Plan*

development. Additionally, several parks and preserves are located within the study area, these are: Black Mountain Summit Recreation Area, Cave Creek Recreation Area, and Spur Cross Ranch Conservation Area.

Cave Creek General Plan

The *Town of Cave Creek General Plan (2005) (General Plan)* recognizes the importance of the natural features of the community including their importance to the community's high quality of life. The plan offers a vision of the Town that places high value on 'spaciousness', rural character, and associated high quality of life for its citizens. Surface drainage features are protected and enhanced by the *General Plan*, which encourages and proposes low-density development, inclusion of significant amounts of open space within new development, and preservation of existing open space features coupled with minimum disturbance to existing vegetation, wildlife, topography, and natural features of great value. These proposals would positively impact surface water drainage management within the study area.

The *General Plan* additionally addresses trails and their potential impact on river washes. The *General Plan* policy states that trail crossings should be designed to cross the wash perpendicular to the bank, and should be sited so as to minimize negative impacts on river washes and associated vegetation.

The Environmental Planning Element of the *General Plan* specifically addresses surface drainage and recommends policies be implemented to limit disturbance of stream corridors. The plan further recommends wash corridors be delineated with ample open space buffering to protect washes and undesirable development that would impede drainage functions be discouraged. Special attention is given to Cave Creek and other important washes within the municipality. The *General Plan* emphasizes the importance of washes to the character and quality of life found in the Town. In addition to their importance in managing surface drainage, washes define the rural desert character of the community and function as critical wildlife and vegetation corridors. The Open Space Element of the *General Plan* recommends that the Cave Creek floodplain be protected with a 100-foot buffer zone on each side of the wash and its major tributaries, which will be designated as an open space resource in the *General Plan*. The *General Plan* recommends that as the Town grows, more open space be acquired in the amount of 1,300 acres per 1,000 population.

Town of Cave Creek Subdivision Ordinance, Chapters 1 and 5

Ordinance Chapter 1 Principles, Policies and Procedures (2003) Section 1.3 Subdivision Design Principles and Policies responds to the vision of the Town as expressed in the *General Plan*; to support developments that "respect the community's spacious character", in that they result in low-density land uses that are small scale and rural in character. Low-density, small scale development that respects the "spacious" character of the community will contribute positively to existing and future management of surface water drainage in developed areas of the Town. Low-density development which incorporates ample open space will reduce surface drainage volumes and intensity, minimizing negative environmental impacts. *Ordinance Chapter 5 Habitat, Environmentally Sensitive Areas, and Landscape Standards and Procedures* (2003) equally reinforces the vision of the *General Plan* by promoting developments that enhance surface water management practices through preservation and enhancement efforts.

Resolution No. R2005-04 Design Guidelines and Principles

The *Design Guidelines and Principles (2005)* ensures that new construction maintains a traditional scale, appropriate character, and preserves the heritage and environmental qualities of the existing Town core. This document emphasizes special consideration be given to preservation of washes during planning and implementation of new development within the Town core.

Other Town of Cave Creek Documents Reviewed

Town Core Plan and Implementation Program (Neill Vecchia and Associates [1998]), does not address surface drainage as an important element of the Town Core Plan. The *Sanitary Sewer Master Plan* (CH_2MHill, 2006), addresses the need for improvements to the Town's sanitary sewer system to address the increase in population and development in years 2010, 2015, and 2020. This document is related to, but does not directly impact, the DMP process.

Current and Pending Town of Cave Creek Development Plans

Annexation and rezoning of state lands are current issues of importance to the Town. According to the *General Plan* Annexation Map (Town of Cave Creek, March 2006), the Rodger Creek, Willow Springs Wash, and Apache Wash state lands are proposed for annexation by the Town in 2007. These areas include several washes including Rodger Creek and Cave Creek. The proposed annexation areas are planned to be rezoned as Desert Rural and Open Space. Desert Rural is defined by the *General Plan* as maximum one dwelling unit per 190,000 square feet of land.

Town of Carefree General Plan 2020 (June 2002)

The *Town of Carefree General Plan 2020 (Carefree General Plan)* does not directly address surface water management. The *Carefree General Plan* acknowledges that unofficial access to native desert and undeveloped wash areas is readily available to most residents. The plan also notes that drainage flows from the northeast to southwest across Carefree to the portion of Cave Creek that is located in the Town of Cave Creek. Portions of Galloway Wash and Fleming Springs Wash on the west side of Carefree are in the 100-year floodplain. Tributary washes drain the remainder of the Town.

The *Carefree General Plan* places emphasis on the issue of water. Carefree derives most of its drinking water from a local underground aquifer. According to the *Carefree General Plan* "the area aquifer was significantly reduced during the last 15 years and unless conservation measures are taken, will face depletion in 15 to 20 years." In an effort to address this critical issue, the *Carefree General Plan* recommends policies be put in place to encourage the reuse of retention and wastewater. The *Carefree General Plan* also recommends the Town continue to investigate methods for recharging the aquifer source. Surface water drainage is not addressed in this section of the *Carefree General Plan.*

Town of Carefree Community Standards and Guidelines (2004)

Community Standards and Guidelines addresses design standards and guidelines for major developments within the municipal boundaries of Carefree. Given that Carefree and the Town of Cave Creek have common issues and concerns related to surface water management, the relevance of these standards and guidelines is discussed as follows.

Mountainside (February, 2004)

Residential mountainside development is a reoccurring issue. The *Mountainside Standards and Guidelines* addresses standards and guidelines for on-site drainage, stating that natural drainage patterns should be identified and preserved as part of the desert ecosystems. Native vegetation is also addressed, stating that mature trees, shrubs, and cacti should be preserved "in accordance with the Town of Carefree community vision." The document also recommends that "in order to preserve natural dips and washes bisecting a site, structures may be suspended over these elements provided they do not impede natural drainage corridors."

Commercial (February, 2004)

Carefree Commercial Standards and Guidelines document directly addresses treatment of surface drainage features during commercial development, stating "Pursuant to the Zoning Ordinance, Article IX, Section 9.10 (4), washes that have a flow of fifty (50) cubic feet per second during a 100-year storm shall be maintained in their natural location. Additionally, the hydraulic properties of a wash may not be modified at the historical entry and exit point."

Single Family (February, 2004)

Carefree Single Family Residential Standards and Guidelines goes much further in addressing surface water management, stating "Pursuant to the Zoning Ordinance, Article IX, Section 9.10 (4), washes with a 100-year capacity of fifty (50) cubic feet per second or greater must be maintained in their natural state. Washes below this threshold may be manipulated; however, the hydraulic properties and historic entrance and/or exit points from the property must remain consistent with pre-construction conditions. Such modifications should incorporate larger boulders and plant material to stabilize the banks and convey a natural appearance. Bridging, rather than a wet crossing, for a driveway of a wash with a 100-year capacity of fifty (50) cubic feet per second or greater is encouraged."

Maricopa County 2020 Eye to the Future Comprehensive Plan (revised 2002)

Maricopa County *2020 Eye to the Future Comprehensive Plan* (revised 2002) directly addresses issues of water management in Maricopa County. The document states, "Since Maricopa County is located in an arid part of the state, water is a precious commodity. Surface water and groundwater are equally important suppliers for the region." The *Comprehensive Plan* highlights issues and problems related to water pollution in the county, and connects these issue with residential development, and industrial/commercial activities in the county.

The *Comprehensive Plan* makes broad suggestions related to surface drainage management issues. However, the *Comprehensive Plan* does not provide specific recommendations related to surface water drainage that would directly impact the DMP. Related to this, the *Comprehensive Plan* also calls for protection of environmentally sensitive areas, "including mountains and slopes; rivers and significant washes; historic, cultural, and archeological resources; view corridors; Sonoran desert; and wildlife habitat and ecosystems, all of which are interrelated elements." The County's Regional Trails Plan indicates a proposed multi-use regional trails connection north to the Town of Cave Creek; it is

unclear exactly where this connection will be located. Therefore, the implications of the development of this regional trails link on the DMP are unknown at this time.

Existing and Future Development Plans for the Town of Cave Creek

Existing developments are shown in the *Data Collection Report* including planned subdivisions and commercial developments. Planned development in the study area at the time of this report consisted of the following:

- Continental Mountain Estates – This residential development is planned east of 72nd Street and north of Continental Mountain Drive, with several potential future roadways and culverts. Final plans have not been submitted to the Town.
- Stagecoach Estates – This residential development is currently under construction. It is located north of Stagecoach Pass and northeast of Cave Creek Road. Field observations indicated that several culverts have been constructed in non-delineated washes.
- Stagecoach Village – This commercial development is planned at the northwest corner of Cave Creek Road and Galloway Drive. Field observations indicated improvements to a non-delineated Galloway Wash Tributary.
- Phoenix Mine Site Redevelopment – This former mine site located adjacent to Spur Cross Ranch Conservation Area was recently purchased by the Town for redevelopment. The planning effort for future development of this site as a public park and museum is currently underway.
- Northwest corner of Cave Creek Road and Carefree Highway (north of the existing CVS Pharmacy) – This property, although located in the Town of Carefree and outside the study area limits, is under construction with a commercial development.
- Cahava Springs – This large-lot residential development is within the Adobe Dam/ Desert Hills ADMP area. It is located northeast of the 32nd Street and Rockaway Hills Road intersection. Most off-site improvements have been constructed, but lot build-out has not yet occurred.

5. PUBLIC INVOLVEMENT

Public input was solicited at three public open house meetings or workshops held in the project study area. The first open house was held early in the process, July 26, 2006, to obtain historical information from the public. Information was also gathered from one-on-one conversations and interviews.

Flooding problems and issues discussed centered on what happens when washes that are normally dry flow to capacity. When washes become flooded due to severe runoff, the following situations have been observed to occur:

- When normally dry washes are flooded, vehicles can't get across resulting in one of the following situations;
    - People attempt to cross the flooded wash and get stuck (or worse swept away).
    - People are not able to get home and have to wait for the wash to recede.

- People have to go out of their way and take a different route home.
- People can't get out of their homes and are essentially stranded.

- The flooded washes erode laterally, causing movement and degradation of the wash banks, which endanger structures placed adjacent to the bank.
- Homes or outbuildings built in washes or low-lying areas perceived to be always dry become flooded, generally because the risk of building in or near a dry wash was not recognized by the builder.
- Flood water exceeds the capacity of the wash. Overtopping of the banks occurs and excess floodwaters sheet across the adjacent areas causing potential water damage to homes and personal property.

A complete range of potential solutions to these typical flooding situations was evaluated with the public at the Alternatives Formulation and Preliminary Analysis meeting, on October 12, 2006. This meeting was conducted as a public workshop and resulted in the recommendation of preliminary alternatives or combinations of alternatives to be studied later. At the conclusion of the brainstorming portion of the workshop, five presentations were made representing the efforts of the five community/agency/consultant teams. A number of the same concepts were developed by all the teams, including which techniques were or were not appropriate for the Town. Some teams arrived at unique concepts. Additionally, some of the flood management tools presented by the consultant team were not adopted by any of the community teams.

July 2007 public meeting

On July 10, 2007, a public meeting was held at the Christ Episcopal Church, located at 35500 North Cave Creek Road in the Town. A total of 46 individuals signed in at this meeting. The purpose of the meeting was to inform the public of the project progress, show the area's flooding and erosion problems, present the proposed alternatives to remedy the regional flooding and erosion problems, and request public input regarding the alternatives and any recommendations for other alternatives to be considered. In general, the comments from the public were supportive of the project.

The District used a variety of techniques to publicize the project and the public meetings. Information was announced through direct mailings, press releases, newspaper notices, and through the District's Web site <www.fcd.maricopa.gov>.

The meeting began in an open house format, followed by a PowerPoint presentation by the project team. During the presentation, a project team member gave a brief project update, described the project process, presented the identified drainage issues, detailed the proposed elements of the DMP, and addressed the next steps. Following the presentation, there was a brief question-and-answer session where the audience was able to have their questions answered in an open forum by project team members. After the question-and-answer session, the meeting returned to the open house format. Exhibit boards and handouts were available that illustrated the flooding and erosion problems

and the proposed alternatives. Representatives from the District, Town, and the project team were available to explain the displays and answer questions.

6. ENVIRONMENTAL OVERVIEW

Physical Environment

Topography

The DMP planning area falls within the Basin and Range physiographic province, which is characterized by arid valleys, sloping bajadas, and ephemeral washes. The project area is bordered to the north by the New River Mountains and is situated at an elevation range of approximately 1,750 to 3,850 feet above mean sea level (AMSL).

The project area geology consists of washes of surficial deposits of sand, gravel, and silt. The uplands geology consists of schist and gneiss metamorphosed over time from sedimentary and volcanic rock (Kamilli and Richard, 1998). The United States Department of Agriculture Natural Resources Conservations Service (USDA NCS) Web Soil Survey was used to determine soil characteristics within the project area. Several soil complexes exist The Pinaleno-Tres Hermanos complex is characterized by a well drained mixed alluvium. The alluvium is classified as a very gravelly clay loam with slopes ranging from 1 to 10 percent. Variations of the Eba complex are present and consist of very gravelly loam soil with varying slopes of 1 to 8 percent and 8 to 20 percent. They are located in both the braided washes and their uplands. The other prominent soil type found primarily in the washes is the Arizo cobbly sandy loam with slopes of 1 to 8 percent.

Cave Creek is an ephemeral wash flowing north to south and is the most prominent drainage in the project area. Small riparian woody plant species such as ironwood and palo verde grow in moderate to dense stands along wash corridor, with one exception - the area north of Cave Creek Road where vegetation is dense for approximately 1,200 feet along the creek corridor. Desertscrub is present outside of the active channel in the terraces. Cave Creek has three major tributaries joining it from the east; Willow Springs Wash, Ocotillo Wash, and Galloway Wash.

Vegetation

Biotic Community

The project areas fall within the Arizona Upland Subdivision of the Sonoran Desertscrub Biotic Community (Turner and Brown, 1994). Prominent vegetation within this biotic community includes scrub species, low woodland trees, and cacti. Scrub vegetation consisting of creosotebush *(Larrea tridentate)*, white bursage (*Ambrosia dumosa*), and brittlebush (*Encelia farinose*); among others, typically grow along the flats, valley edges, and disturbed areas. The

A typical Town wash

riparian vegetation along drainage ways includes mesquite (*Proposis spp.*), ironwood (*Olneya tesota*), and palo verde (*Cercidium spp.*); all of which can also be found upland of washes. Cacti are abundant, consisting of columnar cacti such as saguaro (*Carnegiea gigantean*) and fishhook barrel (*Ferocactus spp.*); as well as various species of prickly pear, silver and pencil chollas (*Opuntia spp.*). The project area is intermixed between an urban influence and cultivated environment with the native plant community. The community can be described as palo verde-mixed cacti-mixed scrub. Along drainage ways and atop small islands in active channels, dominant tree species include foothill palo verde (*Cercidium microphyllum*) and ironwood. The palo verde extend to the upland terraces and mix with mesquite. The desertscrub species of creosotebush and brittlebush dominate the ground cover with an understory of Indian ricegrass (*Achnatherum hymenoides*). Intermixed within the scrubland are various cacti species including saguaro, barrel, silver cholla (*Opuntia bigelovii*), and pencil cholla (*Opuntia arbuscula*).

Wildlife

Threatened and Endangered Species

The U.S. Fish and Wildlife Service's (USFWS) list of threatened and endangered (T&E) species for Maricopa County (Query dated August 10, 2007), was reviewed for the possible species presence in the project areas by an HDR biologist. Twelve threatened and endangered species and one candidate species are listed for Maricopa County. Of these species, suitable habitat exists for one of these federally listed species; the federally listed endangered lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*). Although the study area is north of its known historic range and is not known to occur, the nectar-loving lesser long-nosed bat forages on the flowers of saguaro, ocotillo (*Fouquieria splendens*), palo verde, prickly pear, and agave (*Agave spp.*) in desertscrub and grassland habitat. Foraging habitat is present. These bats are a migratory species and are usually not present in Arizona during the winter months (AGFD 2003). There is no listed critical habitat for any federally protected species within the study area.

The Arizona Game and Fish Department (AGFD) Heritage Data Management System was addressed via the on-line Environmental Tool to determine special status species occurrences within three miles of the project areas. The investigation listed the following species: lowland leopard frog (*Rana yavapaiensis*), the Sonoran population of the desert tortoise (*Gopherus agassizii*), and the California leaf-nosed bat (*Mactrotus californicus*). These species are listed both as State of Arizona wildlife species of concern (WSC) and species of concern (SC) under the Endangered Species Act.

Alternatives Analysis - Environmental Considerations

The project alternatives include the establishment of five all-weather access crossings of ephemeral washes and the enhancement of two existing culverts on Cave Creek Road.

Waters of the United States

Waters of the United States (WoUS) which are regulated by the U.S. Army Corps of Engineers (USACE) exist in the study area and consist of Cave Creek, Willow Springs Wash, Ocotillo Wash, Galloway Wash, and their tributaries. Impacts to these washes will require a Clean Water Act Section 404 (CWA 404) permit. The USACE regulates "fill"

at and below the determined presence of the Ordinary High Water Mark (OHWM) in these washes. The amount of impact will determine the type of permit required by the USACE. A Jurisdictional Delineation (JD) will determine the extent of regulatory authority and delineate the total area of impact associated with each bridge and/or culvert alternative. Most likely, the project alternatives fall under the nationwide program and will require a Nationwide Permit 14; for linear transportation crossings. The extent of impact to WoUS will be based on the engineering attributes of the crossings, the width or jurisdictional delineation of the wash, and extent of these impacts upstream/ downstream of the project footprint. If this project qualifies under the nationwide program, conditions to meet the State of Arizona water quality certification are included in the authorization.

In compliance with Section 402 of the Clean Water Act, a State of Arizona Pollutant Discharge Elimination System (AZPDES) General Construction Permit (AZG2003-001) and associated Storm Water Pollution Prevention Plan (SWPPP) will be required to construct the alternatives.

There are no wetlands known to occur in the study area, nor are wetlands adjacent to known WoUS present; therefore, no impacts are anticipated.

Threatened and Endangered Species and Special Status Species

Although foraging habitat supporting the lesser long-nosed bat is present in the study area, impacts to the upland cacti and plant species required to sustain and recover the species will not be impacted. Furthermore, the project will not remove potential nesting habitat and no nests are known to occur. For these reason, impacts to the species would not occur.

Impacts are not expected for the lowland leopard frog because it is unlikely to be present in the study areas. The ecology of leopard frogs requires the presence of a permanent water source. While leopard frogs can withstand periods of drought, they are typically found around permanent water sources which do not exist within the study area nor at the proposed crossing areas.

Marginal habitat required for the existence of the California leaf-nosed bat does occur in the uplands around the study area, but impacts to the vitality and sustainability of the species would not occur because the project would not remove suitable foraging and roosting habitat.

Marginal habitat exists for the Sonoran desert tortoise in the study area. Impacts to the vitality and sustainability of the species associated with the alternatives are not likely to occur because suitable habitat for foraging and burrowing exists in the surrounding area but not in the washes, the area of impact within the project footprints. It is recommended that desert tortoise clearance surveys are performed prior to any groundbreaking activities to assure the absence of the species.

Vegetation

Constructing the alternatives could result in impacts to riparian plant species if they were in the projected crossing and or culvert enhancement area. Highly Safeguarded and Salvage Restricted plants would be avoided or salvaged in accordance with Arizona Native Plant Law (ANPL). These plant species would be moved and re-established

within the project limits. Any other native plants would be replaced in-situ and in-kind as required by law. A native plant inventory would be required within the right-of-way for each alternative to identify these protected species.

Landscape Character and Visual Resources

The landscape character of the Town was reviewed to assess the scenic quality and integrity of the existing landscape and to aid in developing aesthetic guidelines to be used for any constructed flood management solutions.

The District prepared a draft *Scenery Resource Report* that included identification of two landscape character types (Tonto and Sonoran Desert), three character subtypes (Sonoran Arizona Uplands, Upper Tonto, and Sonoran Mountain Lands) and four cultural settings (natural, rural, suburban, and industrial). Field visits to the study area revealed that while there are man-made cultural settings, the natural desert still dominates.

The scenic quality and integrity of much of the study area are excellent. There are rock formations, rolling terrain, and patterns of desert vegetation and lush riparian growth. There is high integrity of the vividness, intactness, coherence, harmony, pattern, and balance. For much of the study area, the human caused derivation in form, line, color, and texture has been fairly unobtrusive.

7. HAZARDS IDENTIFICATION SUMMARY

Hydrology

Purpose of Study

The purpose of the hydrology task was to:

- Research existing hydrologic models and studies within the study area;
- Estimate existing and future runoff conditions for a 6- and 24-hour duration for the 100-year, 50-year, 10-year, and 2-year for the areas not covered by existing models or areas needing additional detail.

Hydrologic Study Limits

The hydrologic study limits are shown graphically in *Figure 5* on page 17 and generally consist of the Town of Cave Creek and a small portion the Town of Carefree. However, due to the presence of existing hydrology information, only portions of the study area were subject to new hydrologic modeling. The existing hydrologic models coverage for the remainder of the study area are included as Sheet 2 in Appendix B.

Hydrologic Methodology

The hydrologic methodology for this project was developed in accordance with the *Drainage Design Manual for Maricopa County* (DDMMC), *Volume I, Hydrology.*

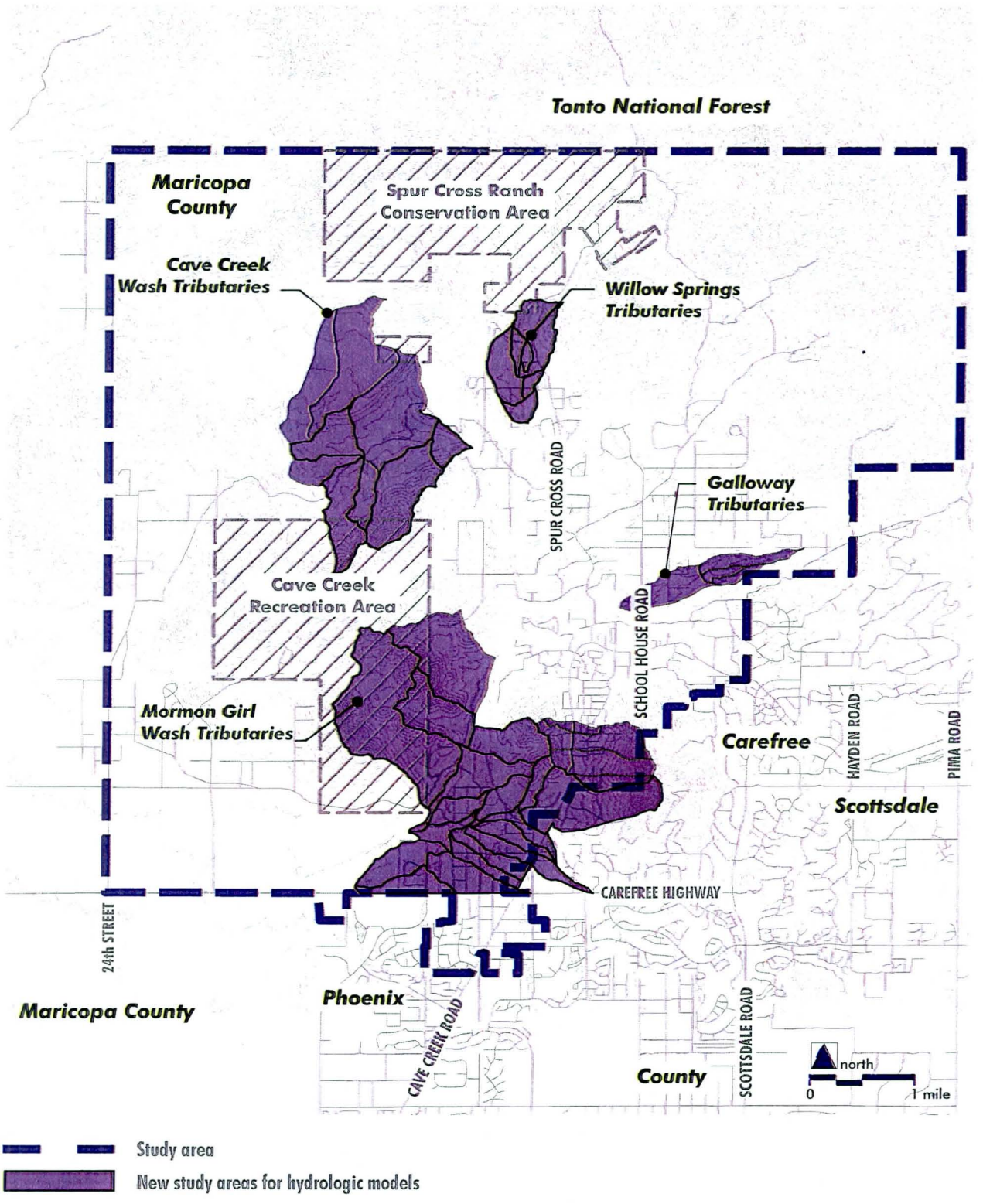


Figure 5. *Location of new hydrologic models*

Method Description

HEC-1 modeling was developed for existing and future conditions using rainfall depths for a 6- and 24-hour duration for the 100-year, 50-year, 10-year, and 2-year events. The rainfall distribution type is the SCS Type II distribution for the 100-year 24-hour event, and Maricopa County Pattern storms for the 6-hour duration events. HEC-1 rainfall losses were estimated using the Green and Ampt infiltration equation option. The Phoenix Mountain and Desert/Rangeland S-graphs, as defined in the DDMMC were used to generate hydrographs. The normal depth storage routing routine was used for all channel reaches. Representative 8-point cross sections were generated.

Concentration points were included at the limits of the study, at significant tributaries, and at road crossings or culverts. Additional consideration was given to the washes subject to future floodplain mapping under Phase II of this project. Sheet 15 in Appendix F of the study prepared by JE Fuller as part of Phase I analysis has been updated by HDR and depicts the Recommended Phase II Delineations of this report.

The modeling is divided into four groupings based on downstream terminus:

- Willow Springs Wash Tributaries
- Galloway Tributaries
- Mormon Girl Wash Tributaries
- Cave Creek Tributaries

8. RESULTS

A summary of the results are shown in *Table 8.1*

TABLE 8.1: Hydrologic Summary

Storm Event	Concentration Point*	Existing 6-hour Flow (cfs)	Existing 24-hour Flow (cfs)	Future 6-hour Flow (cfs)	Future 24-hour Flow (cfs)
2-year	C-37	560	896	547	878
	C-36	144	230	143	229
	C-47	54	95	54	95
	C-64	303	2106	384	2165
10-year	C-37	1335	1959	1315	1902
	C-36	322	513	321	512
	C-47	161	245	161	245
	C-64	874	2702	959	2751
50-year	C-37	2326	3493	2300	3436
	C-36	506	808	506	806
	C-47	280	411	280	411
	C-64	1496	3534	1566	3596

TABLE 8.1: Hydrologic Summary

Storm Event	Concentration Point*	Existing 6-hour Flow (cfs)	Existing 24-hour Flow (cfs)	Future 6-hour Flow (cfs)	Future 24-hour Flow (cfs)
100-year	C-37	2711	4102	2680	4028
	C-36	585	942	584	940
	C-47	330	491	330	491
	C-64	1765	3852	1830	3898

** Concentration points are discussed and shown in detail in* Hydrology Report *for the Cave Creek Drainage Master Plan, July 2007. Maps of the watershed concentration points are also included in Appendix B of this report.*
C12A is located at confluence of Cave Creek Trib 1 at Cave Creek
C33A is located at confluence of Willow Springs Wash Trib 6 at Willow Springs Wash
C47 is located at confluence of Galloway Wash Trib 2 at Galloway Wash
C64 is located at confluence of Mormon Girl Wash Trib 1 at Cave Creek

Verification

The results of the HEC-1 model were compared to two sources:

- Regression Equations
- Unit discharges (cfs /square mile) comparison with previous studies in the area

Hydraulics

Hydraulic analysis was completed for the project to determine the physical characteristics of the study area watercourses during a rainfall/runoff event. Computer modeling shows the extent of flooding, water surface elevations, depth of flow, and velocity of flow for given events. The hydraulic methodology for this project was in accordance with the DDMMC, Volume II, Hydraulics.

Unnamed Central Tributary to Cave Creek (UCT) and Mormon Girl Wash

A portion of the project area contains a wash which is subject to variable flow conditions resulting from an upstream flow split condition. The wash, designated the Unnamed Central Tributary to Cave Creek (UCT), splits into two tributaries near Carefree Highway and Terravita Way in the Town of Carefree. The northern branch flows through the Town of Carefree and crosses Cave Creek Road between New River Road and Canyon Ridge Drive. Historically, this branch of the wash has been called "Mormon Girl Wash", and flows through the Town of Cave Creek north of New River Road and eventually discharges into Cave Creek. The southern branch of the UCT crosses Cave Creek Road approximately 1,000 feet north of Carefree Highway and rejoins the north branch near the intersection of 50th Street and New River Road.

The southern branch crossing of Cave Creek Road has been studied as part of two separate studies:

- Carefree Drainage Master Plan Update: 100-year, 24-hour 2-D Floodplain Model (JE Fuller, August 2005) (referred to as "Carefree DMPU")
- Drainage Report for Lowe's Home Improvement Warehouse (Shephard Wesnitzer, April 2007) (referred to as "Lowe's")

The results of both models are discussed below. It is important to note that the Lowe's study used the results of the Carefree DMPU study upstream of the roadway, where 1,348 cfs arrives from the southern branch of the UCT. However, the results of the detailed study at the roadway between the two studies differ slightly.

Carefree Drainage Master Plan Update 100-year, 24-hour 2-D Floodplain Model

This study was limited to the portions of the wash in the Town of Carefree, up to and including Cave Creek Road. The original study did not provide results at the roadway; therefore, in order to determine the distribution of flow at Cave Creek Road, the electronic model was obtained and new cross sections were cut within the FLO-2D model. No other changes were made to the original model.

The results indicate that flow attenuation (i.e. ponding) occurs upstream of Cave Creek Road, resulting in 847 cfs crossing the road and 127 cfs breaking out to the south. However, this model does not take the conveyance capacity of the culverts into account, so this flow summary does not include flows that may cross the road in the existing culverts. The amount of flow that may be conveyed by the culverts is unknown, due to the large amount of sediment accumulation that has occurred inside and upstream of the structures.

As previously mentioned, a total of 1,348 cfs approaches the road. At the road, according to this model, 847 cfs crosses the road and 127 cfs goes south. The difference between the two totals (1,348 cfs minus 847 cfs minus 127 cfs) is 374 cfs, which is either detained upstream or conveyed across the Cave Creek Road in the existing culverts. Appendix C contains copies of the results of the FLO-2D modeling.

Drainage Report for Lowe's Home Improvement Warehouse

This study used the results of the Carefree Drainage Master Plan Update immediately upstream of Cave Creek Road. However, the study used the more conservative assumption that roadway overtopping instead of attenuation due to ponding would occur. The results indicate that 1,059 cfs crosses the road and 289 cfs breaks out to the south. Additionally, a floodplain was mapped through the Lowe's site using 911 cfs (the difference between the 1,059 cfs and the 911 cfs is retained on-site).

The net difference between the two models at the Cave Creek Road crossing is relatively small, with the Carefree DMPU report at 847cfs (which does not include culvert conveyance, if any) and the Lowe's report at 911 cfs. It is recommended that the flows from the Lowe's report are used when designing improvements to the wash crossing of the south branch of the UCT, which is 911 cfs across Cave Creek Road and 289 cfs to the south.

Considerations must be given to both the upstream and downstream properties when designing improvements. It appears that the flows in the UCT/Mormon Girl Wash system have been poorly understood in the past, before detailed studies were commissioned on the area in the early 2000s. It is unknown what flows were used when designing the residential development along the wash that pre-dates the detailed studies. As part of the Cave Creek Drainage Master Plan report prepared as part of this project, a recommendation exists for mapping the floodplain generated from this wash. The

mapping will be beneficial to surrounding properties to determine the potential flooding risks for both the pre- and post-crossing improvement scenarios using the latest flow information contained in the detailed reports referenced above.

Documentation on the modeling and output is contained with the *Cave Creek Drainage Master Plan Final Hydraulics Report* created as part of this project. Supporting calculations have been provided in Appendix C.

TABLE 8.2: 100-year Flow Amounts at Cave Creek Crossings

Improvement Location	Flow (cfs) 100-year event
Cave Creek Road at UCT, North Branch (Mormon Girl Wash)	1,252
Cave Creek Road at UCT, South Branch	784

Floodprone Properties

The area was examined for residential structures that may be located within floodways. The presence of floodways on properties was determined from existing FEMA mapped floodways, or new floodways identified and mapped as part of this project. Four residences were identified within new or existing floodways in the study limits:

Ocotillo Wash – 40647 N. Fleming Springs Road

Ocotillo Wash – 6914 E. Continental Mountain Drive

Ocotillo Wash – 6447 E. Lone Mountain Road

Willow Springs Wash, Tributary 6.1 – 5515 E. Honda Bow Road

Two additional structures were previously identified as a result of the Adobe Dam/ Desert Hills ADMP study. Both structures are located within the floodway study limits and are located upon a single residence:

Apache Wash – 39416 N. 28th Street

Table 8.3, below, summarizes the hydraulics characteristics associated with the properties, and Appendix B contains exhibits illustrating the hydraulic characteristics for new residences identified within this study.

TABLE 8.3: Hydraulic Characteristics of Floodprone Properties

Address	Water Surface Elevation (100-year)	Velocity (100-year), fps	Depth (100-year), ft	Critical Travel Time (hours)
40647 N. Fleming Springs Road	2242.93	7.07	4.38	1.5*
6914 E. Continental Mountain Drive	2323.65	4.56	2.32	1.3*

TABLE 8.3: Hydraulic Characteristics of Floodprone Properties

Address	Water Surface Elevation (100-year)	Velocity (100-year), fps	Depth (100-year), ft	Critical Travel Time (hours)
6447 E. Lone Mountain Road	2220.70	8.30	—(2)	—(2)
5515 E. Honda Bow Road	2200.12	7.66	3.58	4.1
39416 N. 28th Street, Structure 1(1)	1989.70	3.2	—(2)	—(2)
39416 N. 28th Street, Structure 2(1)	1988.00	3.1	—(2)	—(2)

**Estimated (pro-rated) from original HEC-1 model "CVCRK43R", 1990 Cave Creek/Carefree FDS.*
(1) Property information provided from the Adobe Dam Floodway Structure Risk Assessment from within the Adobe Dam/Desert Hills ADMP.
(2) Not available in final report during data collection.

Geomorphic

Geomorphic mapping identifies and classifies differences in the physical characteristics of land surfaces. The physical characteristics of a geomorphic surface provide clues as to its depositional history, stability, and flood potential. In the study of watercourses, geomorphic evaluation reviews the landforms and lateral stability of the watercourses, and documents change over time and into the future.

Sediment Engineering

Sediment can be delivered to the washes in the study area from hillslopes, channel banks, or channel beds. Field observations indicate that many of the smaller drainages in the steeper headwaters of the various washes show large areas of bedrock outcrops. This means that hillslope erosion is not a predominant source of sediment supply in the area. Rather, channel banks and channel beds provide the source of most of the sediment available for transport and deposition.

The sediment evaluation revealed a predominantly degrading fluvial system where the washes are confined between steep bedrock slopes or old alluvial terraces. Flooding and erosion are generally limited to the geologic floodplain between these more resistant surfaces. Long-term effects of urbanization are expected to increase the magnitude and frequency of storm water runoff and decrease sediment delivery to the watercourses. However, current sediment supply is predominantly coming from the channel bed and banks. Therefore, the long-term result is an increased potential for lateral and vertical erosion of channels in the study area and some increase in stream instability. On the other hand, many reaches have channel beds and banks that are composed of relatively resistant bedrock and/or caliche that limit the reach and extent of lateral and vertical erosion in the future.

Flood and Erosion Hazard Zones

The purpose of an erosion hazard zone (EHZ) is to provide the floodplain manager a tool to identify areas that have the potential to be adversely impacted by channel migration and/or changes in channel geometry. The EHZs delineated for the Cave Creek DMP were based on field observations, comparison of historical and recent aerials, the SS 5-96 Level 1 and Level 2, and the equilibrium slope analyses. It is possible that with more detailed, site-specific analysis, the EHZ delineations could be refined in some locations. It should be noted that more detailed, site-specific investigations may still reveal the need for engineered erosion protection measures in order for construction of proposed facilities to be approved by the Town within a delineated EHZ.

The EHZs were established using a combination of data sources and analytic approaches. The methods included field investigation, interpretation of current and historical aerial photographs, topographic map data, Arizona Geological Survey geologic map data, Natural Resources Conservation Service Soil Survey data, data from previous studies in the area, the hydraulic modeling results from the floodplain delineation studies of the study reaches, consideration of the State Standards Level 1 setbacks and Level 2 allowable velocity results, and the equilibrium slope analysis.

The recommended EHZs shown on the next page in *Figure 6* are intended to identify the areas likely impacted by futures lateral erosion, or the areas for which more detailed analysis is warranted prior to future development. The EHZs from the Adobe ADMP (JEF, 2004) and Rodger Creek EHZ (JEF, 2001b) studies are also included on the maps. All of the recommended EHZs are based on the engineering judgement and experience of the project engineer/geomorphologist, and therefore cannot be reduced to a single formula or series of equations. In general, the recommended EHZs are conservative. *Figure 6* on page 24 is intended for illustrative purposes only. The EHZ boundaries are also provided in digital format for incorporation into the District's and Town's GIS systems. It is anticipated that the GIS data will be used by Town staff in the evaluation of future building permits.

The recommended best management practice for the EHZs is to prohibit construction of permanent or habitable structures within any delineated EHZ. If development is to occur within established EHZs, a detailed analysis is recommended as part of the design process.

8. POTENTIAL ALTERNATIVES

The following issues summarize the most prevalent flooding concerns noted by residents and the Town. These are fully covered in the *Potential Alternatives Report*:

- Erosion
- Access
- Wash obstructions
- Floodway encroachments
- Sedimentation
- Damaged storm drains

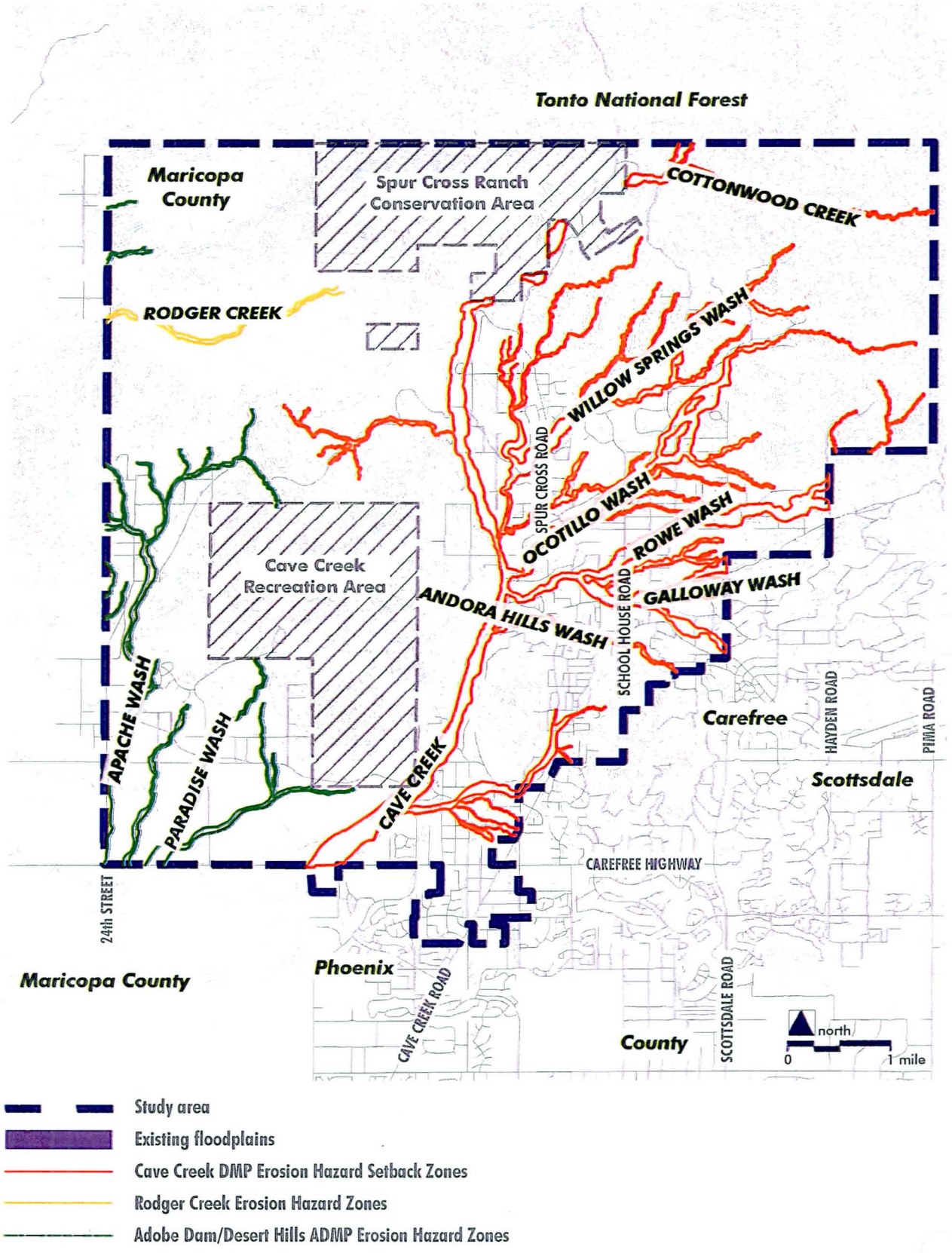


Figure 6. *Erosion hazard setbacks*

CAVE CREEK DRAINAGE MASTER PLAN

Recommended Alternative Elements

Identify Wash Corridors	**Description**	Although not covered by 100-year floodplain and floodway delineations, washes exist throughout the Town that may pose a flooding hazard and are necessary for local and regional drainage. **Product:** A wash corridor map was prepared as part of the DMP.
Additional Floodplain and Floodway Mapping	**Description**	Additional 100-year floodplain and floodway maps will help keep people from building in floodplains and floodways, avoid property damage and loss of life, and be usable for updating flood insurance coverage. **Product:** Floodplain and floodway mapping was prepared as part of the DMP for portions of Ocotillo Wash and for tributaries of Cave Creek, Willow Springs Wash, and Galloway Wash.
Drainage Guidelines	**Description**	A collection of guidelines were developed to assist property owners and developers in making improvements or in new construction. They provide user-friendly guidance for development to ensure safety and preserve the integrity of existing washes. **Product:** A collection of best management practices was prepared as part of the DMP. Additionally, finalizing and adopting the Draft Grading and Drainage Guidelines for the Town of Cave Creek has been recommended.
Obstruction Removal and Code Enforcement	**Description**	Several locations were identified where obstructions were placed across washes. **Product:** Locations were identified as part of the DMP. It is recommended that the Town enforce the code and have property owners remove obstructions from washes.
Floodprone Properties Acquisition Program (FPAP)	**Description**	FPAP is an existing District program that provides limited funding for voluntary property acquisition. **Product:** Properties eligible for the FPAP program were identified within the study area as part of the DMP.
Erosion Hazard Setback Delineations	**Description**	Setback delineations can be used to prevent homes or businesses from being built within an area subject to potential erosion attributable to natural changes in the location of the wash over time. **Product:** Erosion hazard setbacks were determined for the study area as part of the DMP.
Flood Response Plan	**Description**	A plan was created to document notifications, tasks, and training for responding to flood events. **Product:** A flood response plan was prepared as part of the DMP—future recommendations for improvements have been made.
All-Weather Access Improvements	**Description**	Improvements that allow access across washes during 100-year flooding were identified. **Product:** Recommendations for improvements at several locations on Cave Creek, School House, and Spur Cross roads were made as part of the DMP. Conceptual-level design plans and an implementation strategy are included.
Education Program	**Description**	A program was created to provide public education regarding flooding and erosion hazards. Components of the education program include erosion hazards, motorist, and wash continuity education. **Product:** A suggested program was prepared as part of the DMP for the Town's implementation.

Potential Solutions

Possible solutions to the identified flooding problems were discussed and evaluated with the team. While certain preferences were held by various individuals as to the appropriateness of the solutions to specific locations, it was agreed that the identified possible solutions can be categorized as follows:

Constructed

- Bridges
- Culverts
- Low water crossings (with grade control)
- Bank protection
- Cut banks
- Channelization
- Basins

Non-structural

- Early flood warning
- Education
- Conservation easements
- Erosion hazard setbacks
- Floodplain delineations

Combinations of these solutions were used to assemble comprehensive alternatives addressing the flooding concerns of the Town. They are acceptable from an aesthetic point of view because they are non-structural, soft, and semi-soft structural options (*Cave Creek Drainage Master Plan Scenery Resource Report*).

Evaluation Criterion

Several criterion were used to evaluate the alternatives. A rating system similar to Consumer Reports' was used to indicate relative differences rather than assigning point values.

- Safety
- Number of people impacted
- Environmental impact
- Relative cost
- Multi-use capabilities
- Degree of improvement
- Context sensitive aesthetics
- Public acceptance
- Agency acceptance

Alternative Descriptions

Rather than one or more distinct alternatives this project focused on possible solutions for specific locations identified as having existing flooding, erosion, or other related problems. These were reviewed by the team at a June 12, 2007 workshop and were reduced to several proposed recommendations. A matrix of the results is attached in Appendix D.

9. MASTER PLAN ELEMENTS

The Alternatives Evaluation Workshop resulted in a combination of recommended structural and non-structural elements, with an emphasis on the latter. Much of the study area is still developing, all be it quickly, and some of the non-structural recommendations can be used to prevent development from occurring in or near the washes, thus allowing continued unobstructed flow.

The following elements (also shown on the following page) were identified as the preferred methods of minimizing losses, hazards, and adversely impacting the public safety and welfare due to flooding.

- Identify wash corridors
- Additional floodplain mapping
- Drainage guidelines
- Wash obstruction removal/code enforcement
- Floodprone Properties Acquisition Program (FPAP)
- Education
- Identify erosion hazard setbacks
- Flood response plan and associated improvement recommendation
- All-weather access
- Adopt and finalize draft grading and drainage guidelines for the Town
- Realign 24th Street

Identify Wash Corridors

The project team identified smaller wash corridors not covered by 100-year delineations (see *Figure 7,* on page 28). These were defined using geomorphic and topographic mapping and field reconnaissance. The Town can use these corridor maps as a tool for enforcing laws related to parcel development and keeping habitable structures out of washes and flooding danger.

Additional Floodplain Mapping

As part of the scope of work for this project, several additional wash floodplains and floodways were delineated for the detailed 100-year floodplain (*Figure 8,* on page 29). They included Ocotillo Wash, Cave Creek tributaries, Galloway Wash tributaries, and Willow Springs Wash tributaries. The previous delineation showed only Zone A or no zone label. The new delineations show zones A, AE, or X.

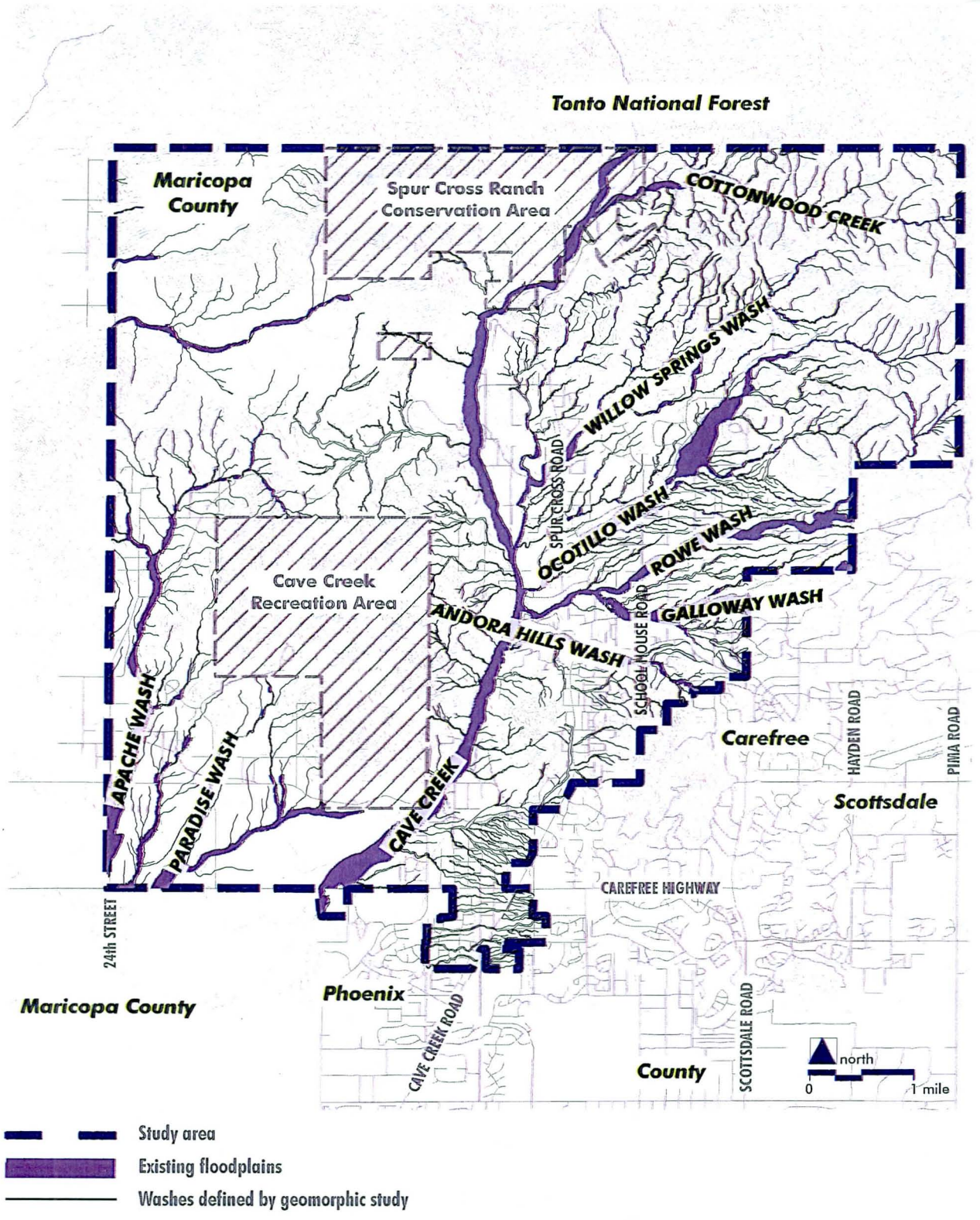


Figure 7. *Major wash locations in the Town of Cave Creek*

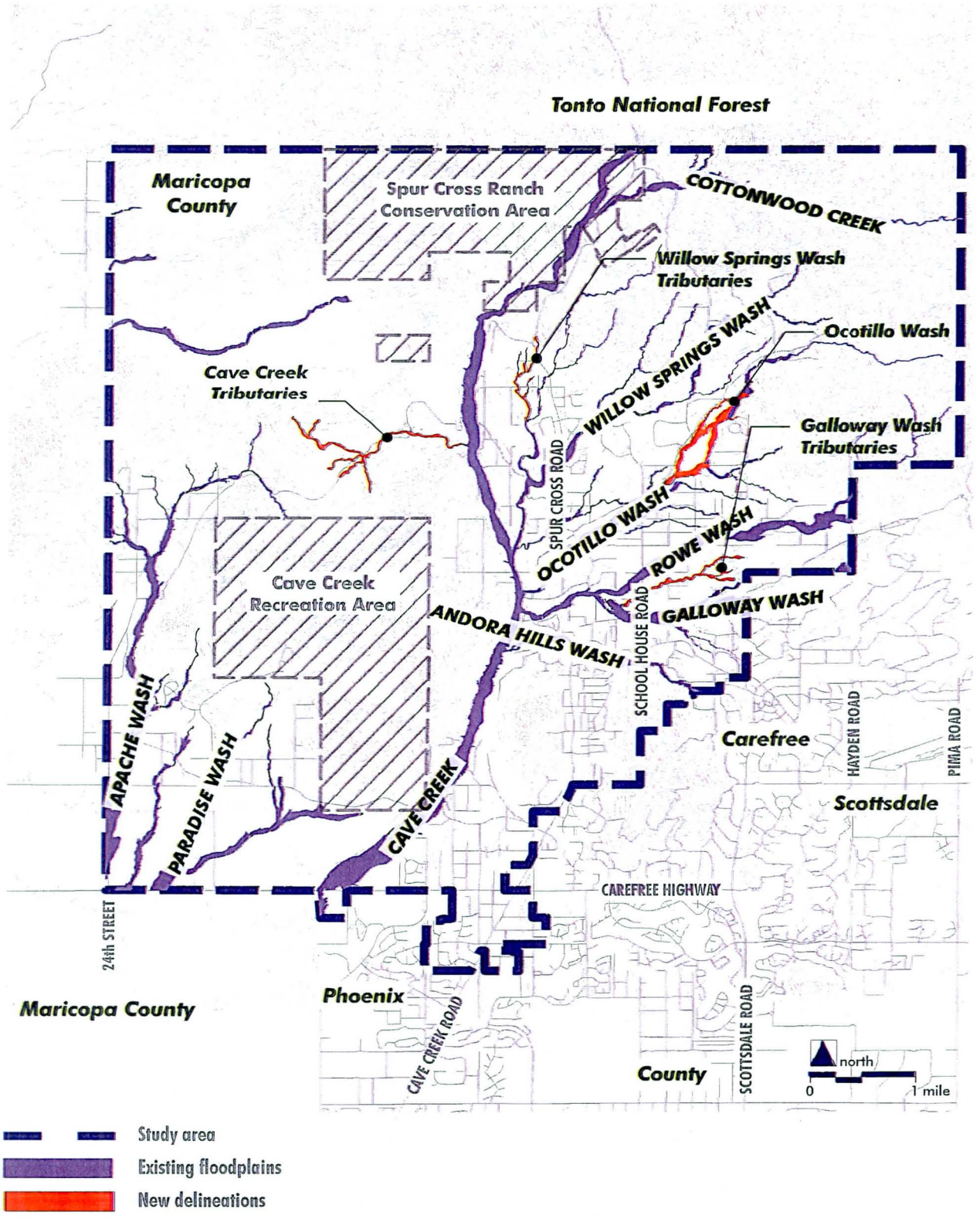


Figure 8. *New delineations*

The specific reaches mapped in this DMP are:

- Ocotillo Wash Zone A Redelineation
- Galloway Wash Tributaries 2, 2A, and 2B
- Willow Springs Wash Tributaries 6, 6A, 6B, and 6C
- Cave Creek Tributaries 1, 1A, 1B, 1C, and 1D

The new delineations were completed at the request of the Town. The new maps will be used by the Town to keep people from building within floodways, helping to avoid loss of life or property from flooding, and can be used by property owners to update their flood insurance. Appendix E of this report contains reduced copies of the work maps and summaries of the hydraulic models.

Additionally, a recommendation for future floodplain delineation is included as part of this DMP. The area known as Unnamed Central Tributary to Cave Creek, or Mormon Girl Wash, does not currently have FEMA-designated floodplains. The area is shown in *Figure 9* on page 31.

As part of the major wash identification and hydrology tasks of this DMP, the area was noted to contain the potential for a significant amount of flow between the two major branches of the wash. Additionally, several minor channels exist that may convey flow.

The area is subdivided with large-lot residential development and associated roadways. This development has, in some instances, impacted the washes with occasional obstructions by fences and structures. Several lots remain undeveloped, and therefore expedient floodplain mapping will help ensure that future development will not adversely impact the floodplain.

The flow amounts in each branch of the wash are subject to upstream conditions. At Terravita Way in the Town of Carefree, a flow split occurs that forms the northern and southern branch as it enters the Town of Cave Creek. This flow split was studied in detail in the Carefree DMP Update (previously discussed). Additionally, upstream improvements are occurring as a result of the recommendations of the Carrefree DMP.

It is recommended that floodplain mapping of the UCT/Mormon Girl Wash branches occur after the following has taken place:

- The completion of construction by the Town of Carefree on an upstream floodwall project
- Enforcement activities to remove existing obstructions within the active conveyance channels (see Wash Obstruction Removal/Code Enforcement" section below)
- Culvert improvements at Cave Creek Road (see All-weather Crossings section below)

Drainage Guidelines

The Town requested the District provide drainage guidelines to assist homeowners and developers in developing their properties. The guidelines are a user friendly document summarizing some of the issues and solutions surrounding flood protection measures. Two major features of the guidelines are that it guides development to ensure safety and it preserves integrity of existing washes. The guidelines address problems associated

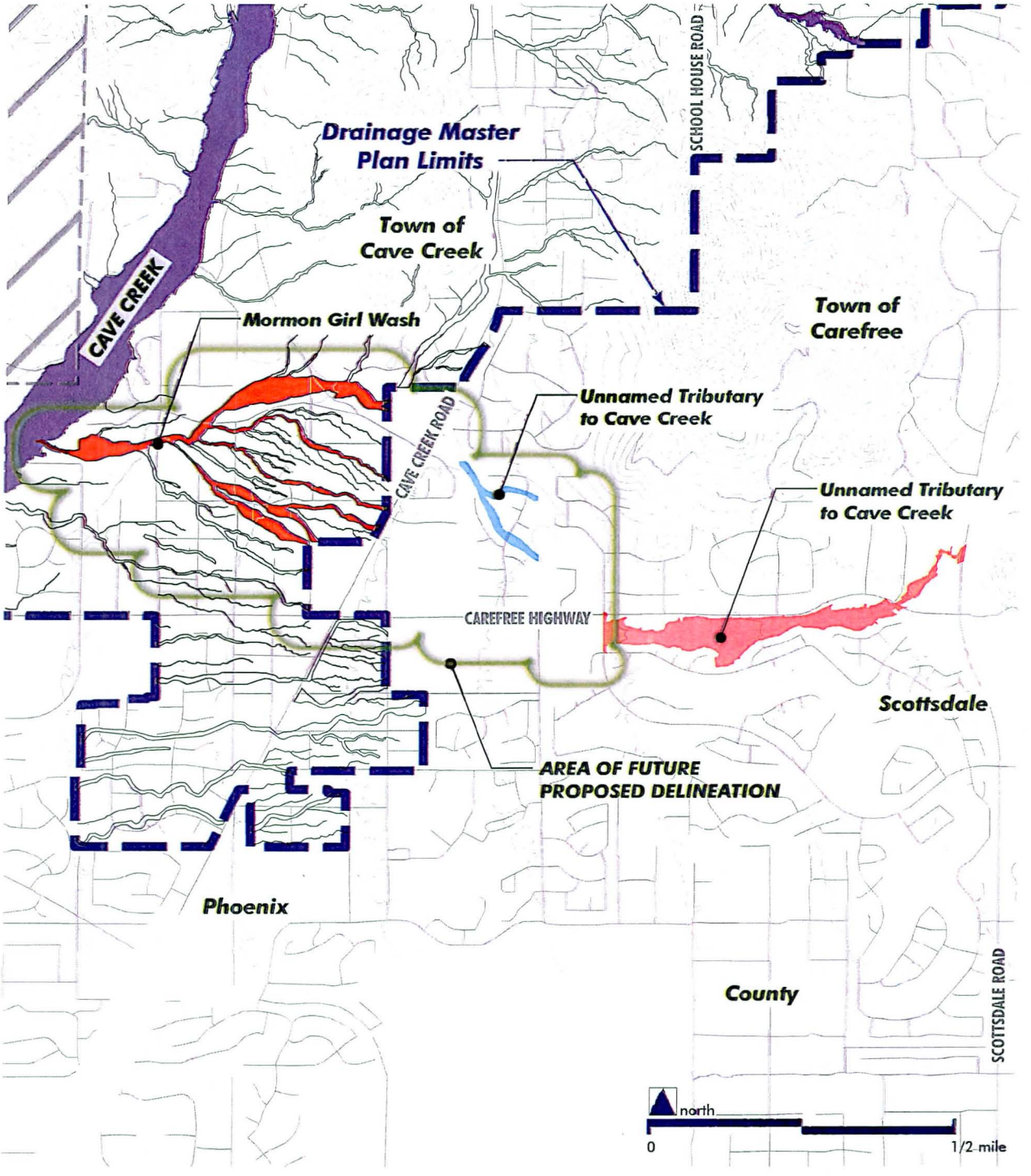
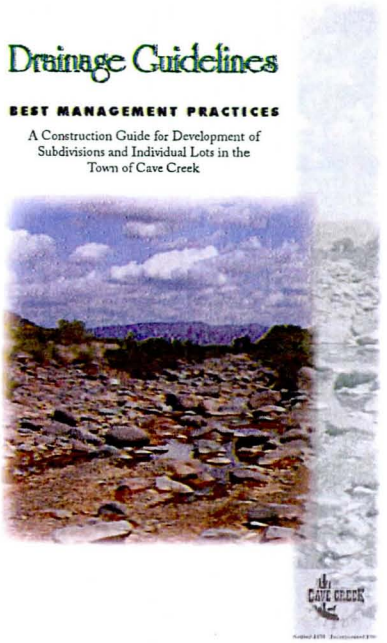


Figure 9. *Area of recommended mapping for Unnamed Central Tributary*



Drainage Guidelines

with development impacts and erosion hazards while adhering to the Town's adopted Technical Grading and Drainage Guidelines.

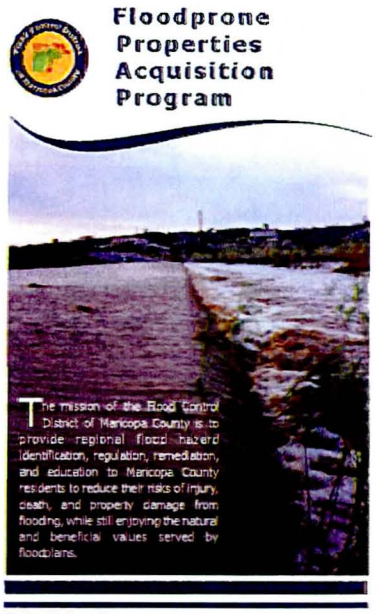
Wash Obstruction Removal/Code Enforcement

There are currently several locations where obstructions have been placed across washes potentially diverting flows onto neighboring properties. It is proposed that these obstructions be removed or modified so that the natural wash flows will not be adversely diverted. The Town has concurred with this recommendation and will be responsible for contacting homeowners and enforcing the changes.

To preserve the function and natural beauty of the drainage system within the Town it is critical that drainage regulations be enforced. There are a number of documented locations within the study area where washes have been partially filled and where obstructions such as concrete masonry walls have been placed. Rapid growth in the area has created significant staffing challenges for the Town to keep abreast of building inspection and code compliance.

Floodprone Properties Acquisition Program (FPAP)

To reduce the occurrence of repetitive property loss, the District works with property owners on projects to remove them from harm's way. Regional structural projects are not always feasible, therefore, the District has developed a proactive Floodprone Proprieties Acquisition Program (FPAP) to provide limited funding for voluntary, non-structural mitigation measures. The FPAP provides a method for acquiring properties in floodprone areas to protect the public from flooding hazards. The funding comes from the District's Capital Improvement Program on an annual basis.



FPAP brochure

The program is purely voluntary but the property must meet one or both of the following criteria:

- The property is an inhabited residential structure located in a delineated 100-year floodway, or floodplain if no floodway designation exists, and was built prior to such designation
- The inhabited residential structure located in the delineated 100-year floodplain has experienced documented flood damage.

Commercial properties, vacant parcels, and agricultural and ranching lands do not qualify for the FPAP.

The DMP recommends notifying homeowners within FEMA delineated floodplains that they have the option to be voluntarily relocated under the FPAP, as described in the District's brochure.

Two residences were identified within new or existing floodways:

- Ocotillo Wash - 40647 N. Fleming Springs Road
- Ocotillo Wash - 6914 E. Continental Mountain Drive
- Willow Springs Wash Tributary 6.1 - 5515 E. Honda Bow Road

In addition, two structures located on a single property were identified by others as part of the Adobe Dam/Desert Hills ADMP:

- Apache Wash - 39416 N. 28th Street (Structure 1 and Structure 2)

These five residences are eligible for FPAP.

Erosion Hazard Setbacks

A watercourse may erode laterally over an extended period of time or as a result of a single flood event. To assess the potential and possible magnitude of channel lateral migration, JE Fuller documented hydrologic, hydraulic, and geologic existing and historic conditions for watercourses within the study area that have detailed or approximate floodplain delineations.

The purpose of identifying erosion hazard zones is to provide the floodplain manager a tool to identify areas that have the potential to be adversely impacted by channel migration and/or changes in channel geometry. The erosion hazards zones delineated for the DMP (see previous *Figure 6*) were based on field observations, comparison of historical and recent aerial, the SS 5-96 Level 1 and Level 2, and the equilibrium slope analyses. Cave Creek is exempted from these hazard setbacks due to the volume of the wash. Cave Creek has erosion hazard setbacks and it is recommended by the Town that a Registered Arizona Civil Engineer do a more detailed analysis to determine a site specific hazard level for properties in consideration of development.

The study found a predominantly degrading fluvial system where flooding and erosion are generally limited to the geologic floodplain between higher, more resistant surfaces. Urbanization has had some adverse affects on sediment transport continuity due to channel encroachments and roadway drainage crossings. Additionally, drainage patterns have been locally obscured or redirected. Long-term effects of urbanization are expected to increase the magnitude and frequency of storm water runoff and decrease sediment delivery to the watercourses.

With the hazard setbacks defined, the Town can educate homeowners in monitoring erosion hazards where existing homes are in or near the defined setback lines and can prevent homes or businesses from being built within the setback lines in the future. Persons wishing to build in or near any of these areas should be required to perform some level of engineering analyses in support of their development plan.

Education

Public education is an important on-going effort that will be critical to the success of the DMP. Education of new residents who may be unfamiliar with flood risks and mitigation practices is a particular concern. Information can be disseminated through the Town's Web site, brochures and posters at the Town Complex and other public places, through

schools, and local news media. At a minimum, education campaigns should be launched before the start of each monsoon season.

The three components of the education program are:

- Erosion Hazards Education Program
- Motorist Education Program
- Wash Continuity Education Program

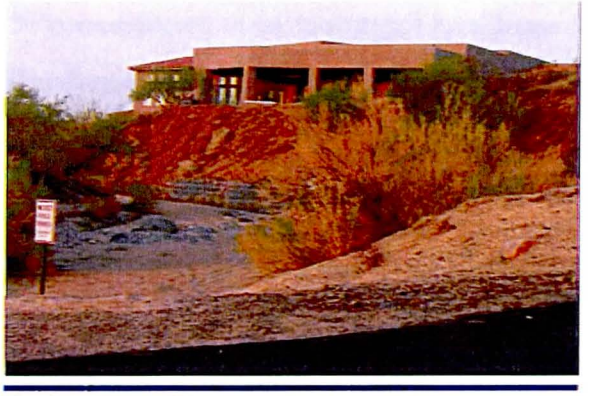
The education program components are described in detail below. The Town will be the primary entity responsible for execution of the education program.

Component #1 - Educate property owners about potential erosion hazards

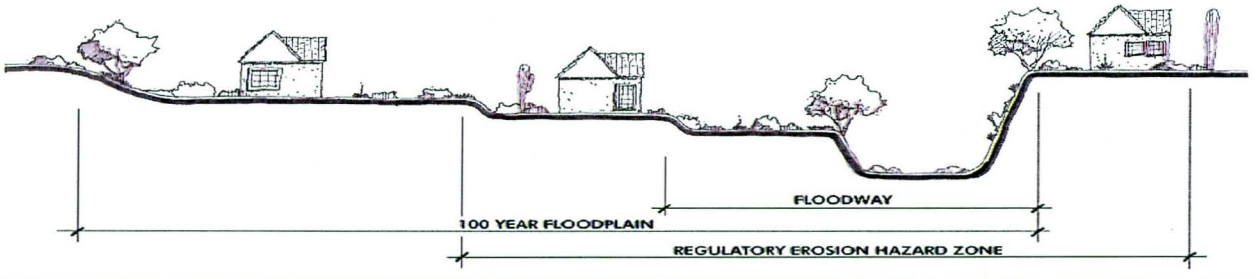
The Town sits on a landform in the foothills region of the Sonoran high elevation desert characterized by steep slopes, rock outcroppings, and vegetation. The soil and rock stability is not well established and is subject to movement during small to moderate storms.

Erosion hazard setback limits (EHSL) are areas adjacent to or within major washes where the placement of structures is prohibited due to the potential for instability. These limits are established to protect structures from erosion-related damages. Existing structures determined to be inside the EHSL should be protected by structural erosion control measures. Examples of structural erosion control measures include loose or grouted riprap, retaining walls, gravity walls, roller compacted concrete, etc. General design guidelines for erosion control structures are found in the *Drainage Design Guidelines* prepared for the Town of Cave Creek.

Sever erosion damage



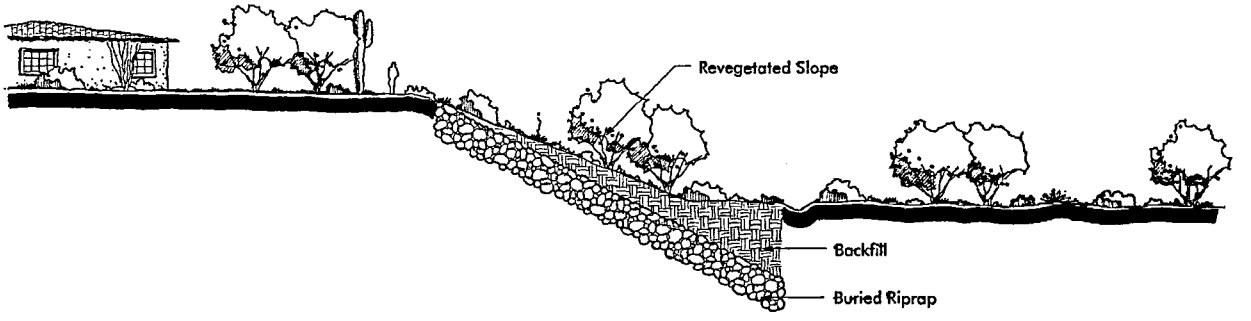
Erosion encroaching on structure



Erosion hazard setback limits can be beyond what appears to be the edge of the wash

This education program will include a flier for the property owners. Suggested flier language:

> "The Town of Cave Creek sits on a landform in the foothills region of the Sonoran high-elevation desert characterized by steep slopes, rock outcroppings, and vegetation. The soil and rock stability is not well established and is subject to movement during small to moderate storms.
>
> The *Cave Creek Drainage Master Plan* project prepared erosion hazard setback limits (EHSL) for major watercourses within the Town. For the purposes of the EHSLs, a major watercourse is defined as a FEMA designated floodplain. This includes both existing FEMA washes and those prepared for future FEMA submittal.
>
> There are tools you can use to minimize risk to your property. They include monitoring and structural erosion control measures.
>
> - **Monitoring**. Erosion can take place slowly over time, or during a single flow event. Measuring top of bank movement in relation to the at-risk structure can give a general indication of the rate of erosion. However, since a large amount of erosion can occur during a single flow event, this is not a guaranteed indicator of future erosion rates. Additionally, although erosion is monitored, the risk to structures remains.
> - **Structural erosion control measures.** Existing structures determined to be inside the EHSL should be protected by some form of structural erosion control measures. Examples of structural erosion control measures include loose or grouted riprap, retaining walls, gravity walls, roller compacted concrete, etc. General design guidelines for erosion control structures are found in the *Design Guidelines* prepared for the Town of Cave Creek.
>
> If you have any questions about protecting your property from erosion hazards, please contact the Town of Cave Creek Engineering Department at:



Buried riprap, a structural erosion control measure, can be concealed with backfill and desert plants

480-488-1400, or in person at 37622 N. Cave Creek Road, Cave Creek, AZ 85331."

The Program: Send out fliers to identified property owners upon conclusion of the DMP study. Since new development shall be placed outside of the newly-identified EHSL, future notifications are not necessary. However, should existing properties change ownership, the flier should be sent to the new owners.

Who	**Property owners with structures inside EHSL area**
What	**Erosion Hazards Education Program**
When	**Send out flier to identified property owners upon completion of the DMP. New development shall be placed outside of the EHSL; therefore, no new notifications are necessary**
Where	**A list of addresses was given to the Town**
How	**Flier, post flier on Town's Web site and mail to identified property owners**

Component #2 - Educate drivers about not driving in low-water crossings when water is present

Most of the wash crossings in the Town are "at-grade" crossings; meaning they allow water flowing in the wash to pass over the roadway. This is true for wash crossings on both publicly-owned and privately-owned land.

At-grade crossings are effective in the Town due to the low, initial expense and their ability to function during dry periods, which are most days of the year. Those infrequent occasions when washes are flowing, they should not be crossed due to the hazards of becoming stranded or swept downstream.

Newscast regarding 'stupid motorist law'

Galloway Wash at School House Road, July 23, 2007

Most vehicles attempting to cross the road will lose grip in less than 6 inches of flowing water, and most vehicles can become buoyant in 2 feet of water or less. Nearly half of flash flood fatalities are automobile related. The State of Arizona has instituted the "stupid motorist law" (Arizona Revised Statues Section 28-910) — individuals who become trapped after driving around barricades or failing to observe posted warnings could be held liable for the cost of their own rescue, as well as the potential additional fines.

Flash floods, producing swift-moving rushes of water several feet high, can occur at any time without warning. Do not cross rain-swollen roads or washes; floodwaters can easily sweep your vehicle away. During flash floods, water in flooded roadways is muddy and often deeper and faster-moving than it appears. Because of this, it is almost impossible for a motorist to see when a flooded roadway has been weakened or destroyed

or if debris is hidden beneath the surface. It does not take much water to undermine and wash away asphalt.

Pay attention to hazard signs and roadblocks; never drive around barricades to cross a flooded roadway or wash. If caught in a flash flood stay with your vehicle, if possible, and do not attempt to make it to shore on your own. Call 911, and, if possible, climb onto the roof and wait to be rescued. Pay attention to, and cooperate with, rescuers when they arrive.

The Program: Fliers should be mailed out to every resident in the Town at the beginning of monsoon season. At this time, also post information/flier at Town Hall and at popular hang-outs that have bulletin boards (coffee houses, feed stores, etc.). The Town should determine locations and execute mailings and postings.

Additionally, the District has commercials which discusses driving during monsoons. The Town's Web site should be updated to contain a link to the District's Web site, ALERT gages, and "driving during storms" videos. People who are already on the Town's e-mail distribution list could have items e-mailed to them as well.

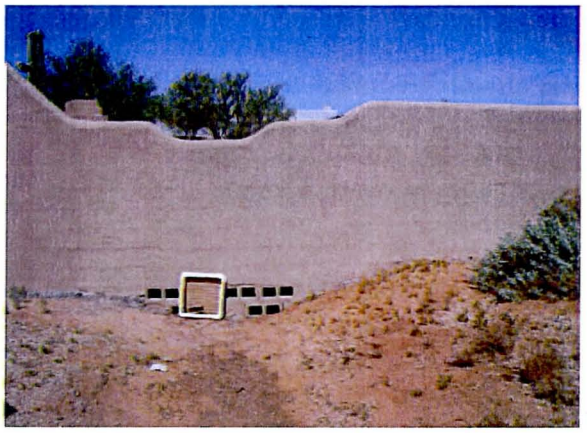
Who	**All drivers**
What	**Motorist Education Program**
When	**Every year at the start of monsoon season**
Where	**Town Hall, local bulletin boards, Web site, e-mails**
How	**Fliers, Web sites (post fliers on Town Web site), in water bills**

Component #3 - Educate property owners about not diverting water in washes

The manner is which water leaves a property that has been altered by grading can adversely affect downstream properties. Therefore, when grading alters the natural drainage of a property, historical drainage must be maintained at the parcel and or property boundary. This includes drainage location, volume, velocity, sediment yield, and the direction of flow from the parcel or property.

Diverting water or placing fill in a wash is a violation of Arizona Revised Statute (ARS) 48-3615, which states:

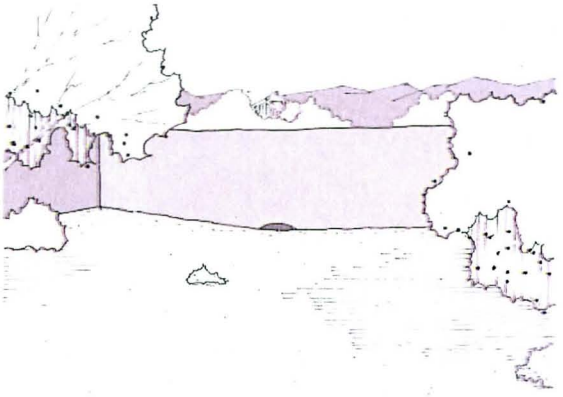
> "It is unlawful for a person to engage in any development or to divert, retard or obstruct the flow of waters in a water course if it creates a hazard to life or property without securing the written authorization required by Section 48-3613. Where the watercourse is a delineated floodplain it is unlawful to engage in any development affecting the flow of waters without securing written authorization by Section 48-3613."
>
> No property wall shall be constructed as to prevent the discharge from the 100-year storm event through any parcel within the Town. Any property walls constructed within or across a wash shall utilize a system to provide adequate conveyance of water. Additionally, all walls are subject to approval by the Town Engineer and should be constructed under permit from the Town of Cave Creek.



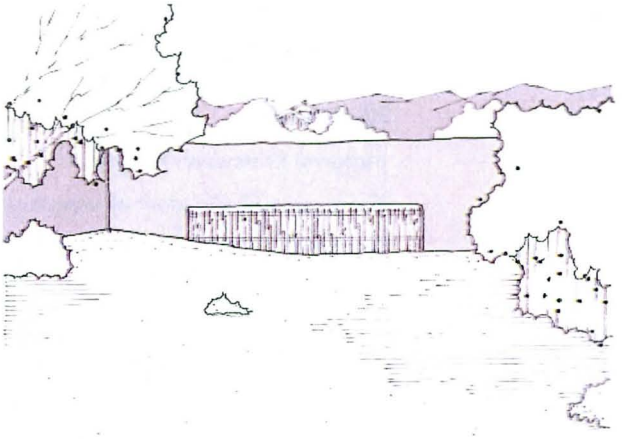
Small drainage openings will restrict natural flows.

If a wall was not constructed under permit and is found to inhibit drainage, the owner may be required to remove or alter the wall. Additionally, sub-standard or blocked openings i.e. openings that may restrict location, volume, velocity, sediment yield, or direction of flow; or that have been blocked, may require reconstruction at the expense of the property owner.

The Program: Send out fliers to all property owners in the Town upon conclusion of the DMP study. Post the *Drainage Guidelines* document on the Town's Web site. The Town



A wall shown with improper openings.



A wall shown with proper openings. Openings shall be sized for proper capacity by an Arizona registered Civil Engineer and approved by the Town Engineer.

is to contact property owners at the recommended addresses for potential enforcement activities (Town to research permit status first).

Who	All property owners
What	Wash Continuity Education Program
When	Immediately for areas determined to be in violation during applications for development (as part of Drainage Guidelines, which should be distributed immediately upon interest to develop)
Where	A list of addresses has been provided to the Town
How	Flier and Drainage Guidelines should be posted on Town's Web site.

Flood Response Plan

A Flood Response Plan (FRP) was completed for the Town and has been implemented by both the District and the Town. Refer to the *Final Technical Memorandum Cave Creek DMP Flood Response Plan*, dated February 15, 2007, prepared by LTM Engineering,

Inc. The plan identifies ALERT gages and recommends additional stage gages, public education tools, and lines of communication during storms.

Cave Creek and its tributaries make up an ephemeral drainage system that collects stormwater, provides habitat for numerous desert and riparian species, and is an important passive recreation resource for residents. However, the system is also subject to flash flooding, causing flooding problems at the numerous at-grade road crossings of the washes. The FRP was developed for the following watercourse delineated segments within the Town boundaries:

- Cave Creek
- Willow Springs Wash and Tributaries 1, 2, 2A, 4, and 5
- Ocotillo Wash
- Rowe Wash
- Galloway Wash and North Tributary
- Andora Hills Wash

Several other washes in the study area were not included in the FRP because they were addressed in the Adobe Dam/Desert Hills FRP. They are Paradise Wash and its tributaries, Apache Wash and Ranieri Tank Wash (west of Cave Creek, east of Apache Wash, and north of Carefree Highway).

Several features of the Town are vulnerable to flooding: major roadway crossings, local and collector street crossings, occupied structures, and recreational activities. The major transportation routes within the Town are Spur Cross, School House, and Cave Creek roads, most of which have at-grade crossings at the washes. Nearly all the wash crossings at the local and collector streets are at-grade. There are a few occupied structures at risk, concentrated in the Ocotillo Wash Zone A portion of the delineated floodplain and along the Willow Springs Wash Tributary 6. Recreational activities within the floodprone areas are predominantly hiking and equestrian trails, both along the roadways and in the washes. The same vulnerabilities on recreational trails coincide with the locations identified for roadways.

The FRP recommends:

- Early notifications so the Town can mobilize if needed prior to the start of significant rainfall
- Specific tasks to be undertaken by the District and the Town for routine operations, flood conditions, and post-flood conditions
- On-going training and exercises in FRP procedures
- Reviewing the FRP annually and updating as needed
- Future improvements such as additional ALERT gages, installing crest gages at selected roadways, increased public education, expanding the notification list, and continued close coordination among participants. These future improvements are important to the success of the FRP.

Active flood warning methods specifically rejected during the October 2006 workshop were:

- Automated telephone notification system. This was viewed as unnecessary and ineffective. If residents are at home and receive the phone call, they will stay at home to avoid flooded areas. If they are not at home, then the call will be unanswered.
- Flashing amber lights with automated crossing arms to warn of flooded low-water crossings. While these would be effective, they would also be visually distractive when not in use and would detrimentally affect the character of the area. They are also undesirable because they would require electrical power, radio or telephone telemetry, calibration, and maintenance. Flashing lights may be acceptable at major crossings such as Spur Cross Road or School House Road. However, automated barriers were rejected by residents and Town staff.
- Manual Gates. Manual closure gates were not supported due to the intrusion on the landscape when not in use. Further, they do not reduce emergency response activities of the Town staff since they must be manually closed and opened.

All-weather Access

All-weather Crossings

Roadway improvements are recommended at several locations as part of the *Drainage Master Plan* to provide all-weather crossings (see *Figures 10a* and *10b* on the next page 40 and 41):

- Culvert improvements on Cave Creek Road (two locations)
- All-weather crossing improvements on School House and Spur Cross roads (five locations)

The improved crossing locations were determined during the alternative analysis phase of the project. Initial locations for improvements were determined through recommendations for access pathways for emergency response from the FRP. The FRP included a determination of the number of residents who were not able to leave or return to their homes during runoff events.

From the list of potential improved crossing locations, an Alternative Development Workshop was held with members of the District, Town, and consultant team. During this workshop, routes of access were compared for different improvement scenarios. The proposed all-weather crossing improvement locations were developed to allow the most access for the least number of improvements. Additionally, traffic patterns and right-of-way ownership were considered.

The access shown by the post-Drainage Master Plan improvements has been prepared under the assumption that traffic will be able to access the Carefree Highway or the Cave Creek Road from south of the DMP study area.

School House Road vs. Spur Cross Road Improvements

During examination of access routes it was determined that approximately the same access to the north could be gained by either improving the major wash crossings on School House Road or Spur Cross Road. A combination of improvements, some on each road, were proposed.

Three improvement locations are necessary for School House Road for the alignment between Cave Creek Road and Ocotillo Wash. School House Road was identified as the

main access road to the northern properties. This is because Spur Cross Road traverses through residential neighborhoods, with a narrower right-of-way and many jogs and curves. Spur Cross Road was additionally selected due to the potential for increased traffic as development continues based on the current open space. Entry to School House Road from Cave Creek Road is from a four-way stop intersection, unlike Spur Cross Road which has an uncontrolled intersection off Cave Creek Road.

North of Ocotillo Wash, School House Road terminates in a residential development. To continue to provide access to the north, the suggested route of travel from School House Road to Spur Cross Road is by Fleming Springs Road. Two crossing improvements on Willow Springs Wash and Willow Springs Wash Tributary 5 are recommended, would provide an enhanced level of public safety by providing routes in and out of the northern portion of the Town.

Table 9.1, indicates the 100-year flow volumes at each proposed improvement location. Although several regulatory agencies allow a lesser design event, the 100-year flow event is recommended for use at these locations. This is because:

- They span existing regulated 100-year floodplains and floodways,
- Constricted openings would cause the floodplain elevations to rise, necessitating re-mapping and potential compensation to affected property owners,
- Constricted openings could cause sediment accumulation and disruption to the natural sediment balance of the wash, and
- The need for all-weather emergency access.

Conceptual design plans for the proposed improvements are included in Appendix F.

TABLE 9.1: 100-year Flow Amounts

Improvement Location	Source	Event	Flow (cfs) 100-year event
Cave Creek Road at UCT, North Branch (Mormon Girl Wash)	JEF, 2005	100-yr	1,252
Cave Creek Road at UCT, South Branch	Shephard Wesnitzer, 2007	100-yr	911
Cave Creek Road immediately north of Carefree Highway	Shephard Wesnitzer, 2007	100-yr	289
School House Road at Galloway Wash	JEF, 2000	100-yr, 24-hr 100-yr, 6-hr	10,908 9,070
School House Road at Rowe Wash	JEF, 2000	100-yr, 24-hr 100-yr, 6-hr	5,094 4,898
School House Road at Ocotillo Wash	FIS, 2005	100-yr	4,630
Spur Cross Road at Willow Springs Wash	FIS, 2005	100-yr	4,800
Spur Cross Road at Willow Springs Wash Tributary 5	CH2M Hill, 1990	100-yr	631

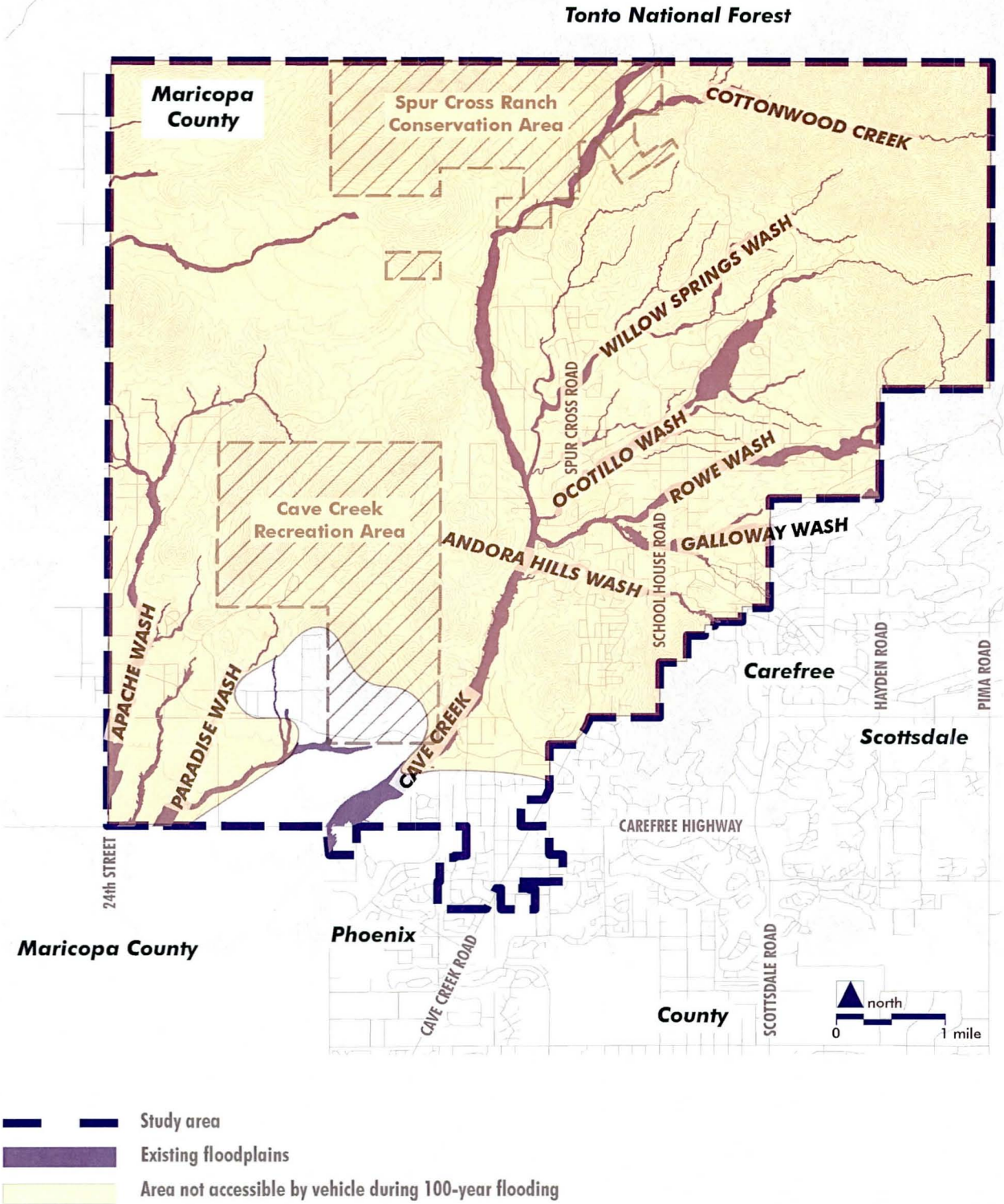
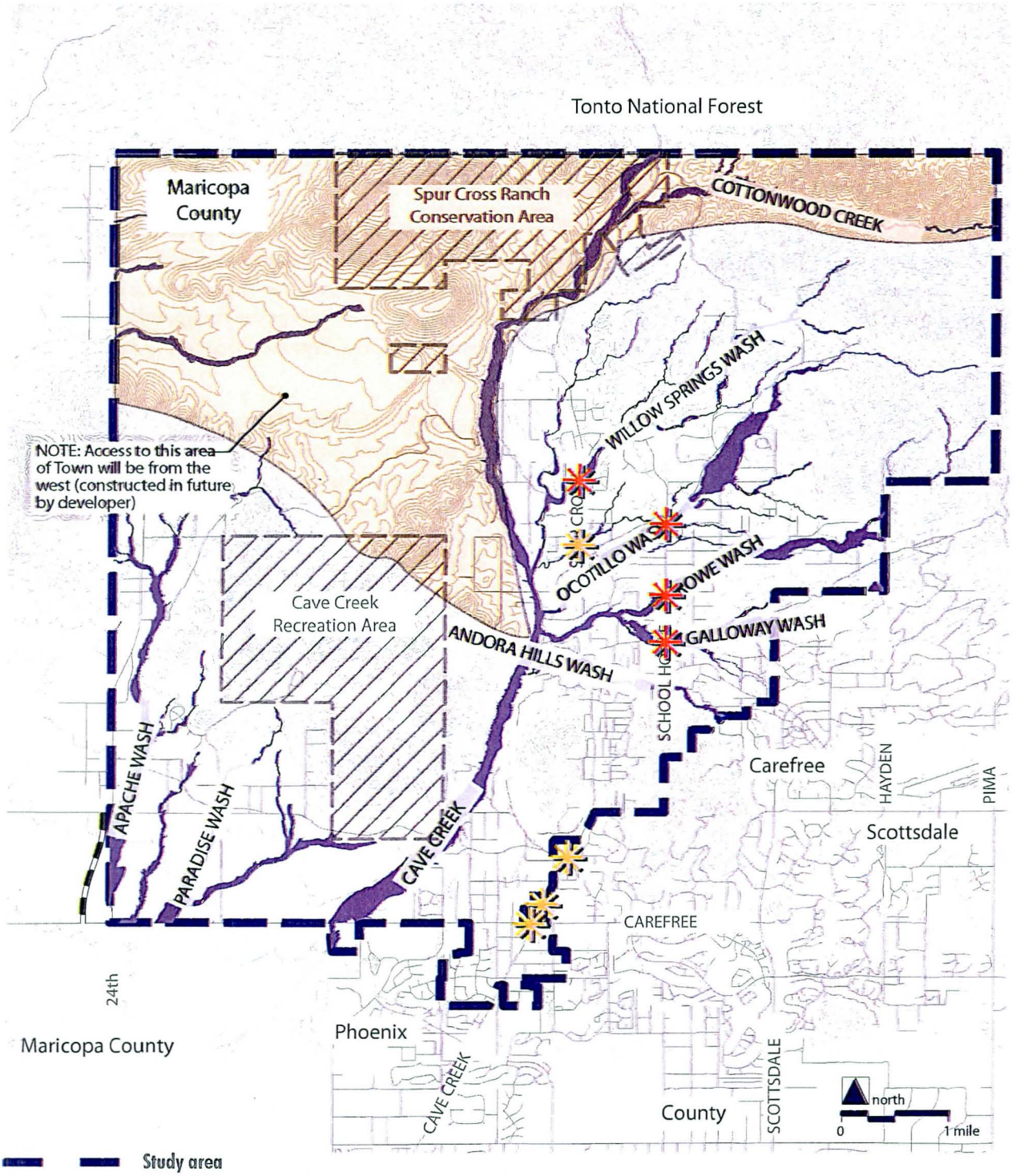


Figure 10a. *All-weather access locations — pre-Drainage Master Plan improvements*



Study area

Existing floodplains

Roadway realignment (24th Street at Apache Wash)

Culvert improvements

Bridge improvements

Area not accessible by vehicle during 100-year flooding

Figure 10b. *All-weather access locations — post-Drainage Master Plan improvements*

Culvert Improvements

Improvements to the culverts crossing Cave Creek Road at the UCT to Cave Creek, North and South Branches, are part of the recommended plan. The northern branch of the wash has been historically referred to as the Mormon Girl Wash. Currently, the culverts at both crossing locations are undersized and filled with sediment. Roadway flooding is expected during larger runoff events.

Sediment filled culvert.

These wash crossing locations are within the Town of Carefree. However, the Town of Cave Creek is responsible for maintenance of the roadway. Crossing improvements will benefit the residents of the Town by providing access to the north.

The *Carefree Drainage Master Plan* previously recommended improvements at this location. Conceptual design was completed as part of that DMP; however, the flows used to size the proposed improvements were updated as part of the *Carefree Drainage Master Plan* Update. The Update developed a 2-dimensional model to better characterize the effects of an upstream flow split. The crossings were redesigned in this DMP to reflect the updated flow information.

Additionally, an improvement of the existing 18-inch culvert across Cave Creek Road immediately north of Carefree Highway is recommended to accommodate the break out flow from the UCT southern branch. Based on the break out flow amounts, it is recommended that this culvert is upsized to handle 289 cfs.

A detailed design of this crossing was not completed as the ultimate configuration of the intersection and Carefree Highway is not known. Improvements are planned as part of a Maricopa County Department of Transportation project to widen Carefree Highway, and the design of the crossing should be coordinated with that project. Additionally, improvements along the north side of Carefree Highway between Cave Creek Road and Cave Creek should be developed in order to convey the 289 cfs along the north side of the roadway to Cave Creek.

An additional culvert improvement is located at Spur Cross Road and Willow Springs Wash, Tributary 5. The existing triple 42-inch-diameter corrugated metal pipes are proposed to be replaced with triple 8-foot by 3-foot reinforced concrete box culverts. This improvement would eliminate the impassible roadway flow overtopping which currently occurs during 100-year runoff events.

Aesthetic treatments, discussed in subsequent sections of this report, should be applied to all culverts. Additionally, several commercial manufacturers of pipe arch products are available that may be substituted for standard box culverts and are generally aesthetically pleasing. Current cost estimates indicate that these products are more expensive for the relatively small sizes proposed in this plan; however, during final design, these products may still be considered.

All-weather Crossing Improvements

All-weather access crossings are proposed at three locations on School House Road (at Galloway, Rowe, and Ocotillo wash crossings). One all-weather crossing is proposed on Spur Cross Road at Willow Springs Wash (see *Table 9.2*).

TABLE 9.2: All-weather Crossing Improvements

Location	Crossing Length (ft)
School House Road at Galloway Wash	400
School House Road at Rowe Wash	650
School House Road at Ocotillo Wash	400
Spur Cross Road at Willow Springs Wash	450
Spur Cross Road at Willow Springs Wash Tributary 5	N/A*

*Due to the small size needed at this location, this crossing is proposed as a culvert; see discussion.

The lengths listed in the table include sufficient length to span the existing regulatory floodways. During final design, these lengths may be refined based on type of structure and abutment design. Aesthetic treatments and multi-use considerations are discussed in the subsequent sections of this report, and should be applied to all crossings.

Adopt "Grading and Drainage Guidelines for Town of Cave Creek

JE Fuller has prepared the "Town of Cave Creek Technical Design Guidelines, Grading and Drainage." These guidelines contain important recommendations for drainage design within the Town. These guidelines were submitted to the Town Council on October 15, 2007 and are pending approval.

Realignment of 24th Street

The Adobe Dam/Desert Hills ADMP recommended the realignment of 24th Street to remove it from the active floodplain/floodway of Apache Wash. This has not been implemented to date, and is an important component to allow access to the residents in the western portion of the study area. Refer to Figure 10b for a graphic illustration of the Proposed 24th Street roadway realignment. Implementation is recommended.

10. LANDSCAPE, AESTHETIC TREATMENT, AND MULTI-USE OPPORTUNITIES

One objective of the DMP is to incorporate aesthetics and multi-use opportunities into flood control solutions for the study area. Flood control solutions can greatly benefit the

community when they successfully blend engineering, aesthetics, and multiple uses. This section describes existing landscape conditions and the proposed landscape, aesthetics, and multi-use opportunities which are recommended for the study area

Landscape

The landform in the Town is rugged with canyons and steep slopes. Washes in the higher elevations are v-shaped and narrow becoming wider and u-shaped in the lower reaches of the watersheds (*Figure 11*). The rugged nature of the landscape provides visual interest in the variety of rock types and colors (*Figure 12*).

Overlaid on the natural landscape are the cultural or man-made impacts. Much of the Town is rural, large-lot development (*Figure 13*) maintaining some of the natural desert vegetation and providing wide open vistas. The Town core is a small urban component with a western character (*Figure 14*), mainly adjacent to Cave Creek Road between Spur Cross Road and School House Road. There are a few suburban subdivisions with grid street systems laid over the braided wash system.

Vegetation

Revegetation shall blend with the native surrounding, native vegetation in species and density (*Figure 15*). Existing vegetation, especially specimen trees and large shrubs should be preserved in place.

The natural vegetation is typical Sonoran Desert, specifically Arizona Upland Sonoran. The Sonoran Desert is distinguished by its diversity in plant species, particularly cactus. The Town's slightly higher elevation and precipitation rate make it more lush than the lower metropolitan valley and tends to remain greener throughout the summer months. The dominant plants are palo verde, ironwood, saguaro, and bursage (*Figure 16*). At the highest elevations of the Town of Cave Creek, the palo verde-bursage vegetation begins to give way to piñon-juniper. Washes in the Town can also have lush riparian vegetation characterized by the abundance of cottonwoods (*Figure 17*).

Figure 11: *Wash with dense vegetation and rocky bottom*

Figure 12: *Rock outcrop*

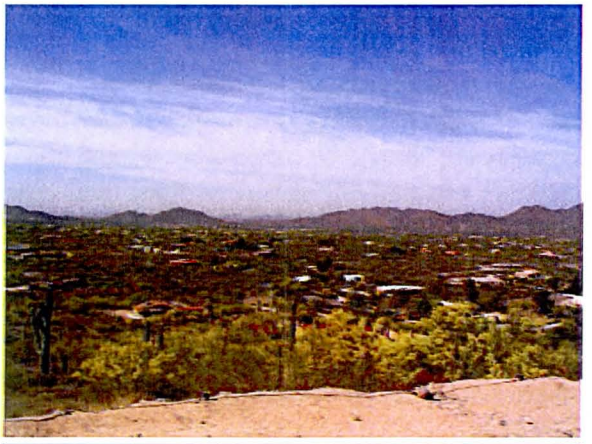


Figure 13: *Large-lot development dominates the Town of Cave Creek*

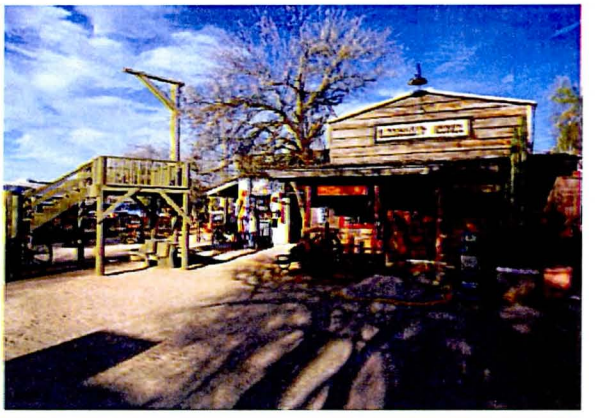


Figure 14: *Western Character in downtown*

Figure 15 *A natural vegetated wash*

Figure 16: *Saguaro and palo verdes*

Desired Landscape Character

Since the study area is dominated by natural desert, the recommended landscape theme is maintaining the natural Sonoran Desert. The preferred elements are recommended to have vegetation and colors that blend with the natural surroundings.

Figure 17: *Cave Creek with cottonwoods*

Aesthetic Treatment

The two constructed elements proposed for the Town are all-weather crossings and improved culverts. The other Master Plan elements are non-physical such as mapping of floodplains/ floodways and erosion hazard setback, FRP, wash obstruction removal plan, and education. Aesthetic guidelines for the constructed elements are outlined below.

All-weather Crossings

All-weather crossings can be an aesthetic addition to the landscape — consider the appeal of the covered bridges in the east and mid-west. Crossings in the Town, however, should have a western desert character. The aesthetics should be three-dimensional in that the detailing is pleasing to those traveling over the crossing as well as those under or near the sides.

The overall form of the crossing is most important and should be simple and uncomplicated. Second, and as important, it should fit visually into the context of the site. Elements to consider are proportion, rhythm, balance, and unity. Timeless design and quality materials and construction will maintain the attractiveness of the bridge for its anticipated life.

All-weather crossings would be low profile, with rustic detailing and stone or dark colored concrete supports as suggested in *Figure 18*.

An open rail design can create a more refined crossing with a lighter appearing span as suggested in *Figure 19*. Avoid large, flat concrete surfaces by adding shadow lines and patterns to break up the blankness. Crossing support column shape must account for scour.

Balance aesthetics with function, constructability, and future maintenance. Aesthetic design does not have to increase the cost of long-term maintenance.

Provide bike lanes and sidewalks across bridges to provide all-weather crossing ability for several modes of travel.

Crossings should provide for trail and equestrian access over or around the feature rather than through.

Culverts

Culverts should not incorporate plain, gray concrete or concrete masonry unit headwalls, wingwalls, or aprons, but should instead have stained concrete (*Figure 20*), native rock veneer (*Figure 21* and *Figures 22* and *23* on next page) gabion mattresses, or other types of treatments. Culverts should allow for continuity of trails by realigning the trails around and over culverts, not through them.

Figure 18: *A simulated crossing in Cave Creek*

Figure 19: *An all-weather crossing with rustic detailing*

Figure 20: *Stained concrete headwall*

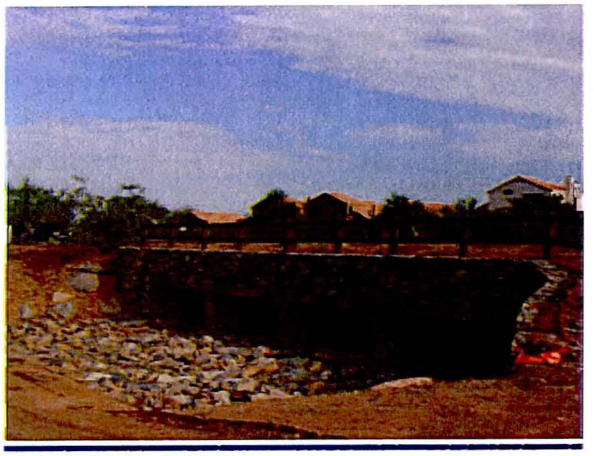


Figure 21: *Stone headwall*

Figure 22: *Stone culvert*

Figure 23 *Culvert with rustic detailing*

Culverts should be designed so that they cause the least visual intrusion or physical obstruction while providing adequate conveyance capacity. Keeping vertical extensions to no more than 6 inches above the proposed grade helps limit visual interruptions. However, this guideline does not apply to barriers needed for pedestrians and bicycles. Appropriate vegetation screening can minimize any visual intrusion. Using rocks and boulders can also help especially where there are natural rocks and boulders occurring.

Like the all-weather crossings, the culverts will be designed with stone and/or dark colored or stained concrete and rustic detailing.

Construction materials should complement the surrounding scenic resources in color, form, and texture.

Low-Water Crossings

Low water crossings generally do not visually impact the landscape setting. Sometimes the paving over the culverts differs from the roadway paving, but they are generally flush with the existing roadway pavement. The paving color can be matched to the surrounding landscape. The structural component on the downstream side can be constructed of colored concrete or stone.

Figure 24: *Buried bank protection after construction.*

Bank Protection

The least intrusive bank protection is buried bank. Once installed and the landscape revegetated, it is no longer visible (see *Figure 24*). The revegetation should be designed to match the surrounding natural landscape in species and density.

Cut Banks

Bank protection for natural cut banks can be buried between the bank edge and the buildings (see *Figure 25*). When backfilled and revegetated, they are not visible. Revegetation should be designed to match the surrounding natural landscape in species and density.

Grade Control Structures

Grade control structures can blend with the landscape setting if they are built of materials native to the site (*Figure 26*) rather than engineered out of grey concrete.

Colors

Colors for all constructed features should blend into the background. The use of medium to dark earth tones (browns and greens) will help (*Figure 27*). Staining is preferable to painting.

Grading

Grading should restore the topography to as close to natural contours as possible. Embankments, basins, and channels should meander so they feather into the landscape. Avoid paved embankments by providing 4:1 slopes that can be revegetated. Rock mulches or stone riprap also help to stabilize slopes and should have a random "desert paving" appearance (*Figure 28*), not the uniform, 2 inches of decomposed granite often used in commercial development.

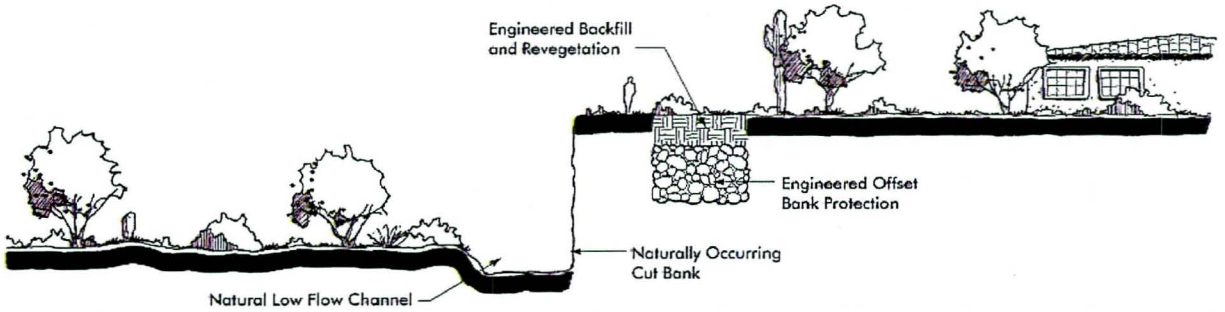


Figure 25: *Cut bank*

Minimize alterations to natural land forms. Basins and channels should appear as naturally formed elements of the environment rather than as engineered structures.

Refer to the draft *Scenery Resource Report* for specific grading guidelines for basins and channels.

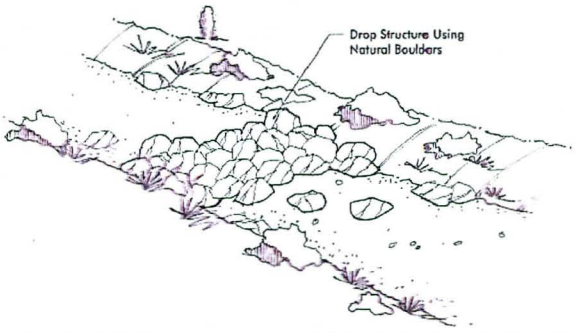


Figure 26. *Grade control structure using on-site materials.*

Multi-use Opportunities

Flood control alternatives can often offer multiple-use opportunities complementing the recreation and open space needs of the local community. At minimum, they should not hinder or detract from the recreation desires of the residents. The Town is predominantly an outdoor, passive recreation community. The Town's vision for trails is "to create accessible, non-motorized trail connections to recreational open spaces throughout the Town that do not affect the overall quality or integrity of the natural environment for the enjoyment of our citizens and future generations." Equestrian facilities, in particular, are important to Town residents. There is less emphasis on open, turf active play areas and ball fields.

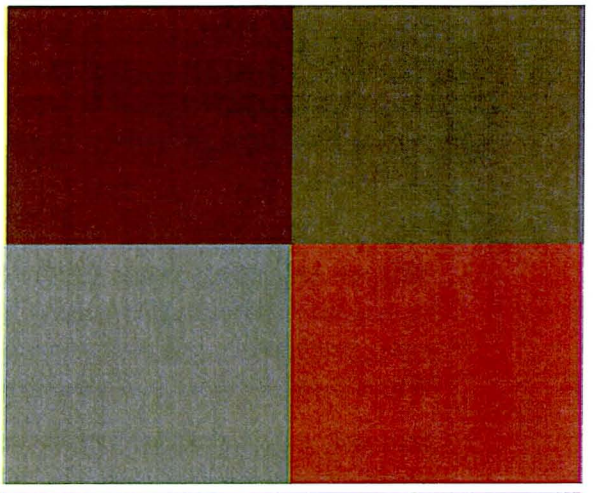


Figure 27: *Desert colors*

Figure 28: *Natural desert paving*

There are two large passive recreation areas within the study area - Cave Creek Recreation Area (2,922 acres) and Spur Cross Ranch Conservation Area (2,235 acres). Both areas are predominantly used for trail related activities such as hiking, mountain biking, and equestrian. The Cave Creek Recreation Area additionally offers camping facilities. Spur Cross Ranch is new to the Maricopa County Parks system and is under development. There are also several other small open spaces: Black Mountain Preserve, Gateway Desert Awareness Park, Go John Mountain, Saguaro Hill, and Brenner's Hill. The Town's trail system (refer back to *Figure 4*) was designed to tie into many of these recreation areas and is heavily focused around the abundant washes. Maintaining access along the washes and across the various roadways will be key in the DMP.

Proposed constructed options for the DMP are all-weather crossings and culverts. In both cases, if the location of these features intersects one of the identified trails,

accommodations should be made in the design to route trail traffic around the crossing and over the road. The trail route should be clearly visible and signs added as needed.

Land

Parcel Ownership

Parcel ownership within the study area is generally held either privately, as part of a park or conservation area, or as State of Arizona Trust Lands. For detailed maps on land ownership for the project area refer to Appendix B of this report.

Rights-of-Way and Easement Requirements

Obtaining rights-of-way and temporary construction easements will be necessary to construct the proposed all-weather access crossings and culvert improvements. Proposed conceptual rights-of-way are shown on the improvement plans contained in Appendix A of this report.

Major Utilities and Utilities Conflicts

In general, utilities present within the right-of-way may include water, sewer, gas, fiber optic, storm drain, telephone, and cable. Water service in the Town is provided by Global Water Company with occasional well sites and storage tanks within the Town.

Research was performed through the Town and Blue Stake to determine specific utilities present at each site. The results of the research are shown on the conceptual improvement plans contained in Appendix A of this report.

Notable utilities include the presence of a relatively deep-gravity PVC sewer line in Cave Creek Road, a sewage lift station adjacent to the proposed northern culvert crossing improvement on Cave Creek Road, and buried or overhead fiber optic lines at most crossings.

Conceptual Design Cost Estimates

Cost estimates were prepared for the recommended all-weather access crossings and culvert crossing improvements. A conceptual estimate is shown in *Table 9.3*; detailed information on each estimate is included in Appendix E of this report. Estimates are prepared in 2008 dollar projections and include design and construction estimates and contingencies.

TABLE 9.3: Conceptual Cost Estimate

Improvement Location	Cost* (2008 dollars)
Cave Creek Road at UCT, North Branch (Mormon Girl Wash)	$965,000
Cave Creek Road at UCT, South Branch	$616,000
School House Road at Galloway Wash	$4,196,000

TABLE 9.3: Conceptual Cost Estimate

Improvement Location	Cost* (2008 dollars)
School House Road at Rowe Wash	$7,005,000
School House Road at Ocotillo Wash	$4,436,000
Spur Cross Road at Willow Springs Wash	$4,420,000
Spur Cross Road at Willow Springs Wash Tributary 5	$458,000

*includes design and construction costs

11. IMPLEMENTATION PLAN

Implementation Recommendations

Successful implementation of the *Drainage Master Plan* will result after completion of several important elements:

Adopt the Recommended Plan. The plan must be adopted by both the Cave Creek Town Council and the Maricopa County Board of Directors.

Solicit Public and Stakeholder Support. An understanding of the plan elements and agreement by the stakeholders (Maricopa County, State Land Trust, Town of Cave Creek) to support the plan is key to successful implementation.

Secure Funding. Funding sources should be pursued as soon as possible, especially construction elements such as all-weather and culvert improvements.

Acquire Land. Easements and rights-of-way would need to be acquired for elements requiring construction. Because of the area's rapid growth, opportunities for managing and mitigating flooding are rapidly diminishing and land cost are rising.

Proceed with Design Phase. Several elements of the recommended plan will require preparation of design plans and specifications. These projects should proceed as soon as possible to reduce current flood and erosion risks to property and lives.

Opportunities and Constraints

Opportunities to implement the *Drainage Master Plan* include:

Partner with the development community to preserve and protect the Town's natural drainage system and provide all-weather access.

Adopt the *Cave Creek Drainage Master Plan* and the Town's *Drainage Guidelines* and enforce existing drainage regulations.

Take advantage of the District's expertise in installing flood detection equipment. The District currently operates a very sophisticated flood detection system throughout Maricopa County, including the Town of Cave Creek, and is an excellent resource. Additionally, the District has been willing to operate and maintain equipment purchased by a local community.

- Enhance the Town's Web site to include education on flood and erosion risks and mitigation strategies.

Potential constraints to implementing the *Drainage Master Plan* include:

- Lack of funding
- Insufficient staff resources to inspect new development and remediate code violations.
- The District's FPAP is strictly voluntary. If eligible residents decline to pursue a buy-out, they remain at high risk for flooding.

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GLOSSARY

100-year (or base) Flood	A flood event that statistically has a 1 out of 100 (or one percent) chance of being equaled or exceeded on a specific watercourse in any given year. A flood event of this magnitude is often used to determine if flood insurance is either advisable or required on a property.
ADMP	A plan which identifies the preferred alternatives of those identified in an ADMS. An ADMP provides minimum criteria and standards for flood control and drainage relating to land use and development.
Braided	A braided watercourse is one flowing in several dividing and reuniting channels resembling the strands of a braid.
CFS	The measuring unit of cubic feet per second (cfs), which is used to quantify the amount of flow in a wash. A cubic foot is equivalent to 7.5 gallons of water. Thus, 1 cfs is 7.5 gallons of water passing by you every second..
Channel	An open conveyance of surface stormwater having a bottom and sides in a linear configuration. Channels can be natural or man-made. Channels may have levees or dikes along their sides to build up their depth. Constructed channels can be plain earth, landscaped, or lined with concrete, stone, or any other hard surface to resist erosion and scour.
Culvert	A hydraulically short conduit which conveys surface water runoff through a roadway embankment or through some other type of flow obstruction.
Degradation	A deepening of a channel over time or in a single storm event due to erosion processes.
Delineation	Defining the physical boundaries of a stream, floodplain, jurisdictional wash, etc.
Development	A man-made change to property, such as buildings or other structures, mining, dredging, filling, grading, paving, excavation, or drilling operations..
Discharge	The amount of water that passes a specific point on a watercourse over a given period of time. Rates of discharge are usually measured in cubic feet per second (cfs).
Ephemeral	A watercourse or portion of a watercourse that flows only in direct response to rainfall.
Erosion	The wearing away of land by the flow of water.
FCDMC	Acronym for Flood Control District of Maricopa County.

FEMA	An independent federal agency established to respond to major emergencies that state and local agencies don't have the resources to handle. FEMA seeks to reduce the loss of life and protect property against all types of hazards through a comprehensive, risk-based emergency management program. Visit the FEMA web site at www.fema.gov..
FIRM	Acronym for Flood Insurance Rate Map
Flood Insurance Rate Map (FIRM).	Issued by FEMA, these maps show special hazard areas, including the 100-year floodplain. They also show flood insurance risk zones and other flood-related information applicable to a community.
Flood Response Plan	A plan developed for a particular waterway, watershed or jurisdiction that identifies flood hazards and defines methods for avoiding them and for minimizing losses to property.
Floodplain (100-year)	The area adjoining a watercourse that may be covered by floodwater during a flood. Storm runoff and flood events may cause alterations in the floodplain in certain areas. .
Floodway	The floodway is that portion of the floodplain reserved by FEMA for the conveyance of floodwaters during a 100-year flood. Buildings and/or structures that would obstruct flow are not allowed within the floodway boundaries.
Gabion	Gabions are rock-filled wire baskets or mattresses that can be a structural form of erosion protection.
Hydraulics	A field of study dealing with the flow pattern and rate of water movement based on the principles of fluid mechanics.
Hydrology	A field of study concerned with the distribution and circulation of surface water, as well as water dynamics below the ground and in the atmosphere.
Inhabited Residential Structure	A house, townhouse, condominium, apartment complex of four units or less, manufactured home, or mobile home designed to be used as a permanent structure, used principally for residence, and that is actually occupied by the owner or a tenant as a residence. The associated lot, up to 10 acres, is also included.
Scour	Erosion due to the mechanical process of water removing earthen material from a channel bottom or banks.
Sediment	Soil particles, sand, and minerals washed from the land into aquatic systems as a result of natural and human activities.
Sedimentation	A large-scale process where sediment is transported by water and deposited downstream.
Setback	The minimum distance required between a man-made structure and a watercourse. This distance is measured from the top edge of the highest channel bank or the edge of the 100-year flood water surface elevation.

Storage The volume of water stored in a basin or behind a dam – usually expressed in acre-feet. It differs from capacity, which is the volume of water stored at the emergency spillway elevation.

Watercourse Any minor or major lake, river, creek, stream, wash, arroyo, channel or other topographic feature on or over which waters flow at least periodically. Watercourse includes specifically designated areas in which substantial flood damage may occur.

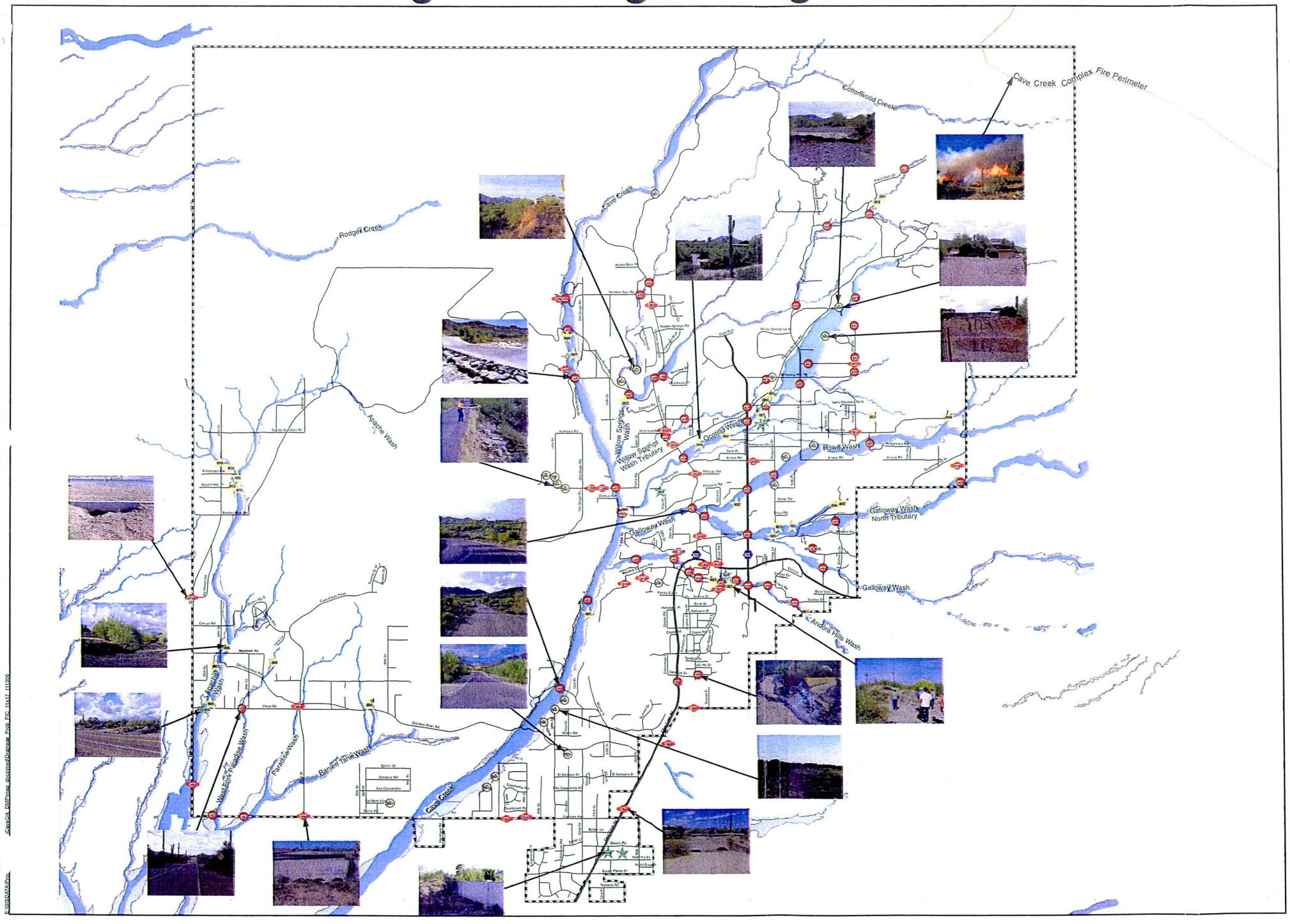
Watershed An area from which water drains into a lake, stream or other body of water. A watershed is also often referred to as a basin, with the basin boundary defined by a high ridge or divide, and with a wash, river or lake located at a lower point.

APPENDIX A DATA COLLECTION

Flooding and Existing Drainage Problems Map (Figure 1, Data Collection Report)

Existing Facilities (Figure 2, Data Collection Report)

Cave Creek Flooding & Existing Drainage Problems with Photos



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Legend

- Erosion Problems
- Access Problems
- Wash Obstructions
- Floodway Encroachments
- Sediments Problems
- Damaged Storm Drains
- Photographic Reference
- Streets
- CC DMP Boundary
- FEMA Zone X
- FEMA Zone AE
- FEMA Zone A
- FEMA Zone AO
- FEMA Floodway

Flood Control District of Maricopa County

CAVE CREEK ARIZONA

SETTLED 1870 · INCORPORATED 1986

HDR

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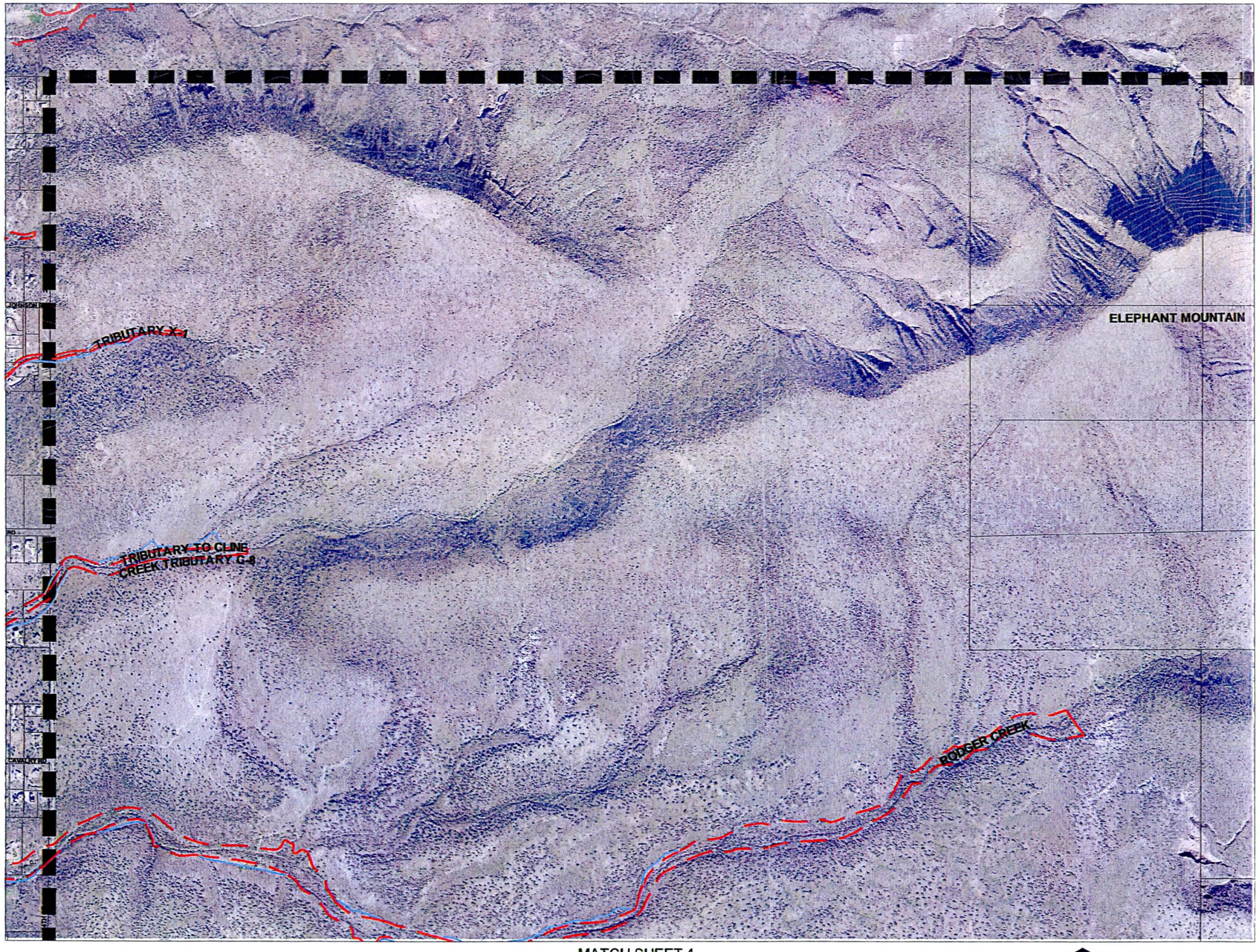
Figure 1



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LEGEND

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- BRIDGE
- 100-YR FLOODPLAIN BOUNDARY
- FLOODWAY BOUNDARY
- CULVERTS FROM PLANS — 223
- CULVERTS FIELD LOCATED — 223
- AT-GRADE CROSSING

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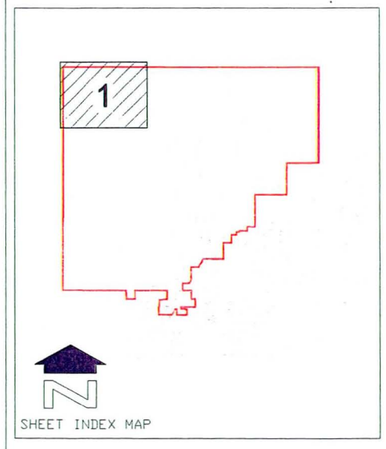

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 69O.02.20
CONTRACT NUMBER: FCD 2004C072

(EXISTING FACILITIES WITH AERIAL PHOTOGRAPHY)

PRELIMINARY NOT FOR CONSTRUCTION

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

	BY	DATE
DESIGN	–	–
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FIGURE 2

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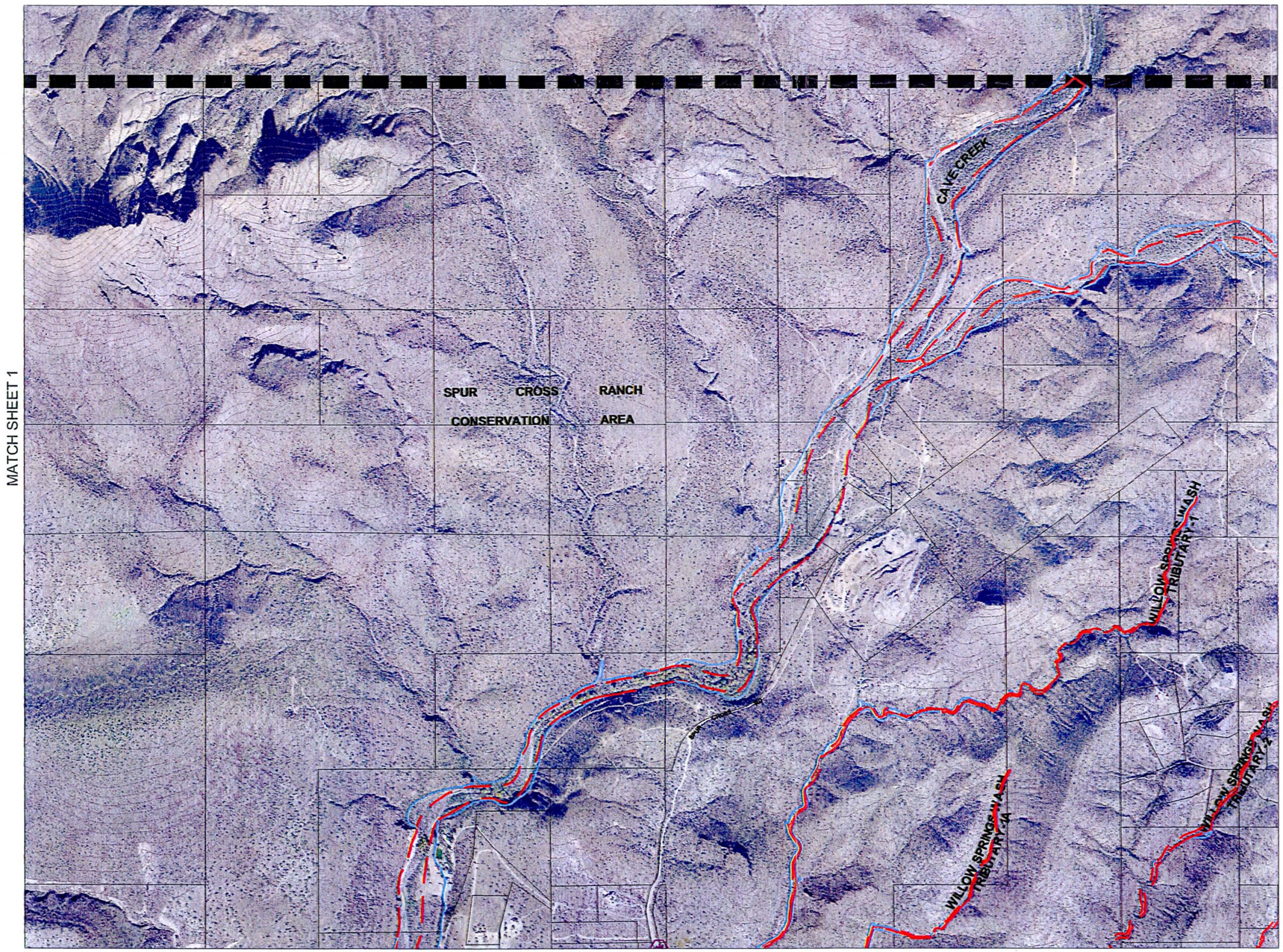

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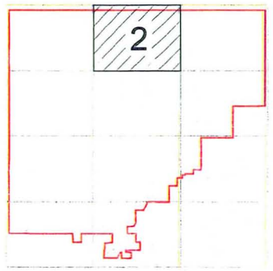

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
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CONTRACT NUMBER: FCD 2004C072

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PHOENIX, ARIZONA 85018-2311
(602) 522-7700

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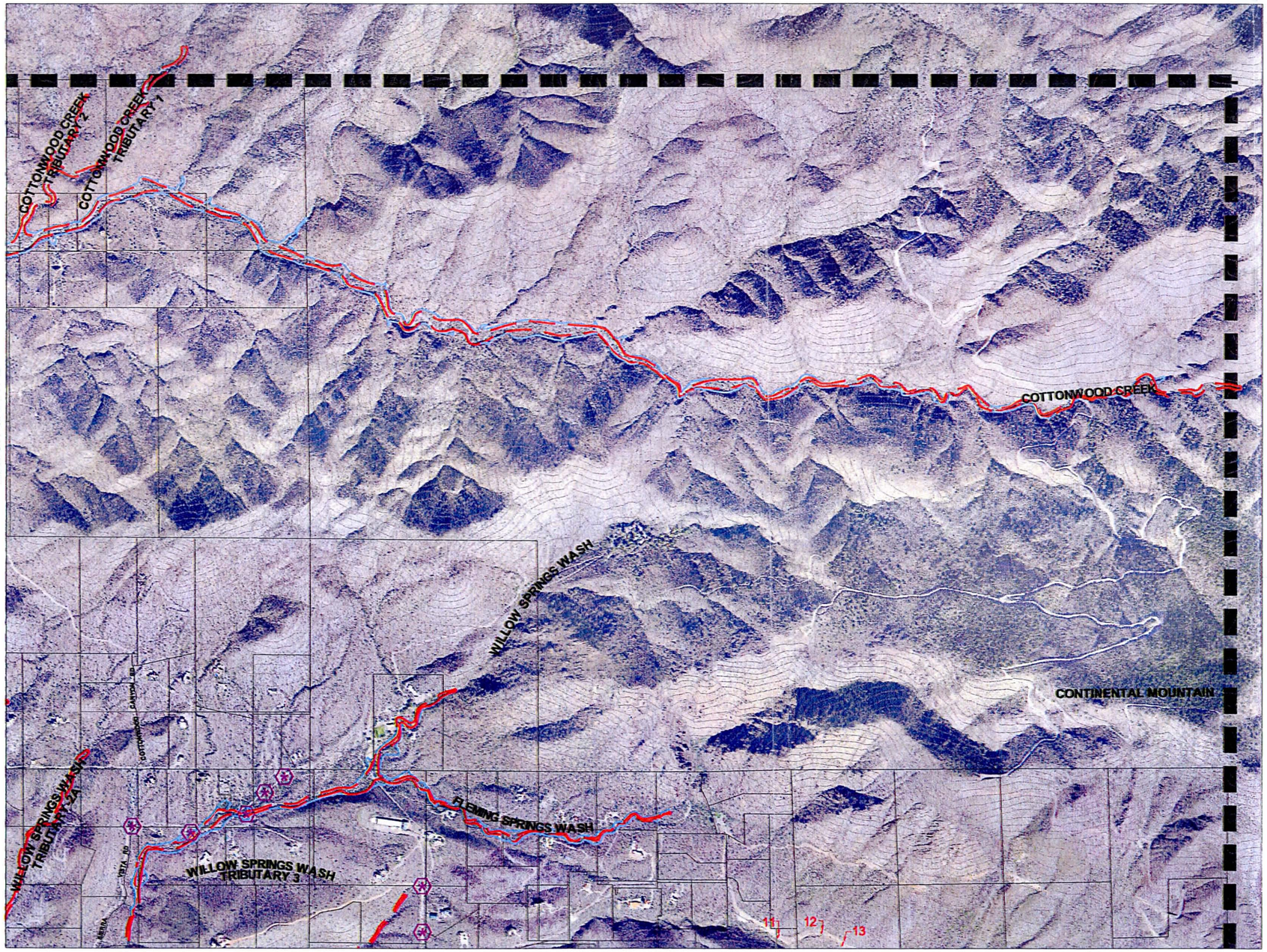

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- BRIDGE
- 100-YR FLOODPLAIN BOUNDARY
- FLOODWAY BOUNDARY
- CULVERTS FROM PLANS — 223
- CULVERTS FIELD LOCATED — 223
- AT-GRADE CROSSING

Flood Control District of Maricopa County

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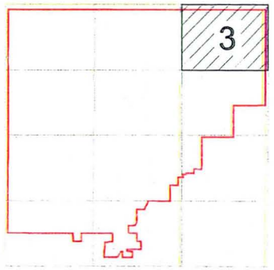

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
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CONTRACT NUMBER: FCD 2004C072

(EXISTING FACILITIES WITH AERIAL PHOTOGRAPHY)

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

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FIGURE 2

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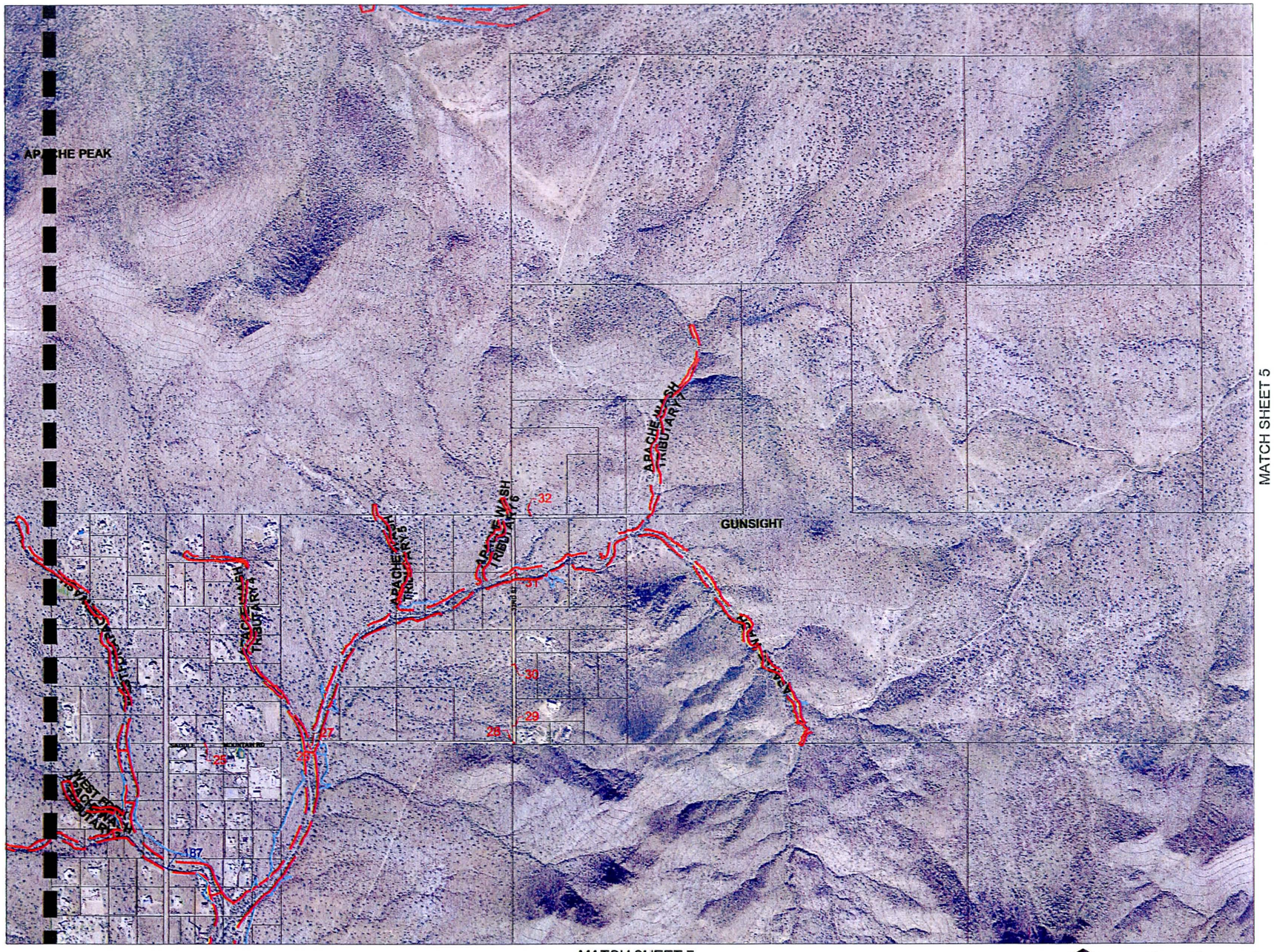

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100-YR FLOODPLAIN BOUNDARY
FLOODWAY BOUNDARY
CULVERTS FROM PLANS 223
CULVERTS FIELD LOCATED 223
AT-GRADE CROSSING

Flood Control District of Maricopa County

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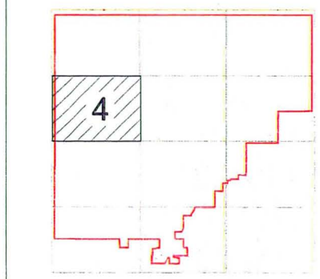

SHEET INDEX MAP

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

(EXISTING FACILITIES WITH AERIAL PHOTOGRAPHY)

PRELIMINARY NOT FOR CONSTRUCTION

HDR ENGINEERING, INC.
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PHOENIX, ARIZONA 85018-2311
(602) 522-7700

	BY	DATE
DESIGN	–	–
DESIGN CHK.	–	–
PLANS	–	–
PLANS CHK.	–	–

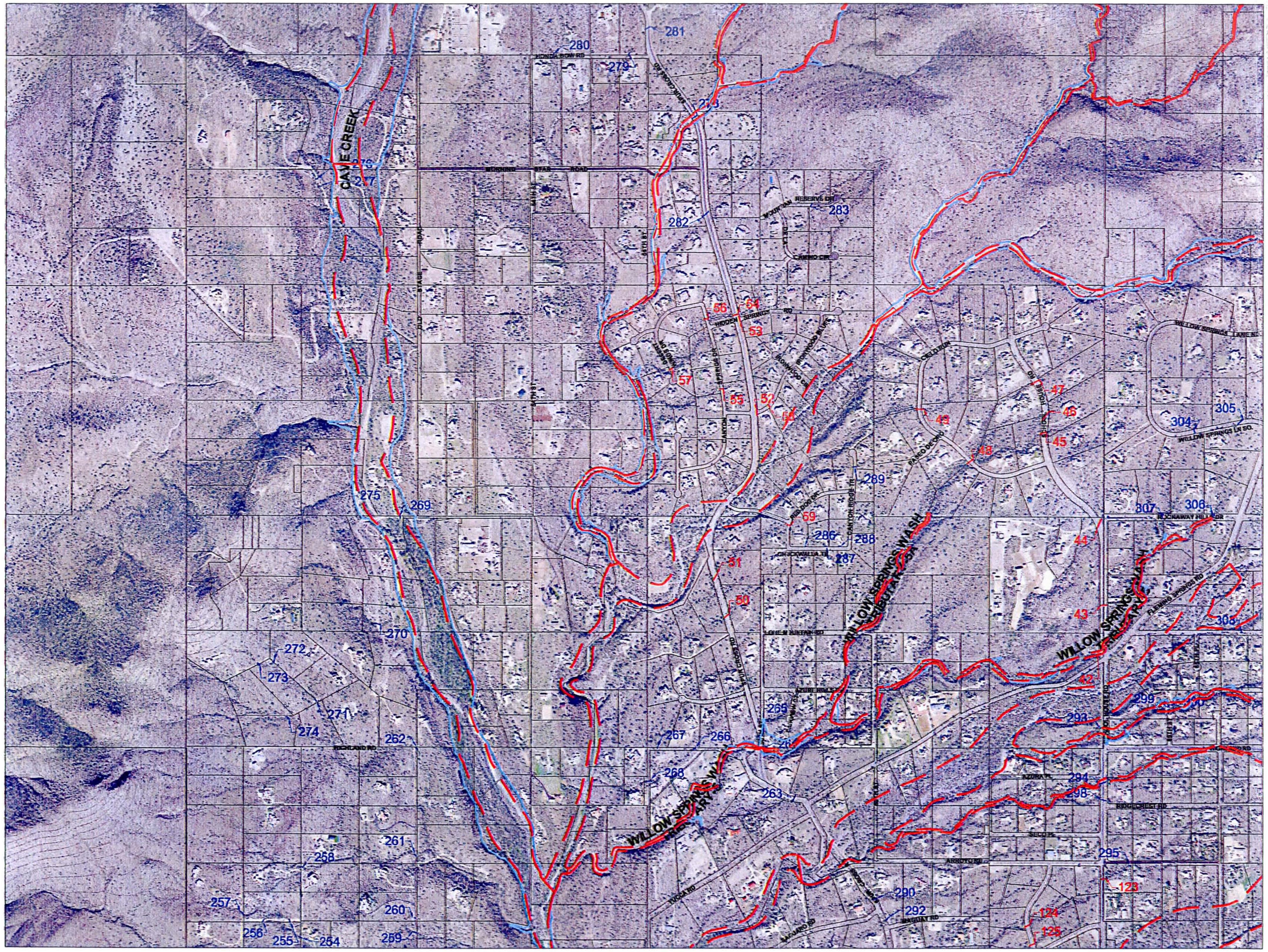
FIGURE 2

SHEET 4 OF 12

C:\PWworking\PHX\jcarm\dms24504\Ex-Fig2-04.dwg, jcarm, Nov 16, 2006, 3:05:29pm

MATCH SHEET 2

MATCH SHEET 4



MATCH SHEET 8

MATCH SHEET 6

LEGEND

DMP BOUNDARY	
BRIDGE	
100-YR FLOODPLAIN BOUNDARY	
FLOODWAY BOUNDARY	
CULVERTS FROM PLANS	223
CULVERTS FIELD LOCATED	223
AT-GRADE CROSSING	

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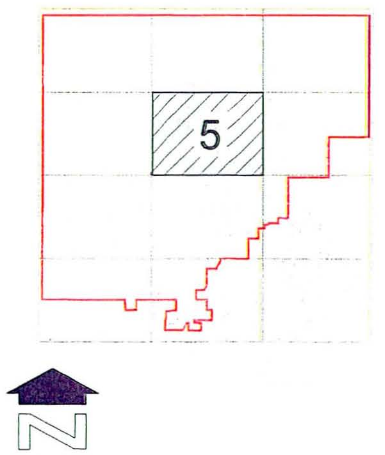

SHEET INDEX MAP

600' 0' 600' 1200'

SCALE: 1"= 600 FEET

CONTOUR INTERVAL = 10 FEET

FLIGHT DATES: 01/04/01-12/02/04

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

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DESIGN CHK.	–	–
PLANS	–	–
PLANS CHK.	–	–

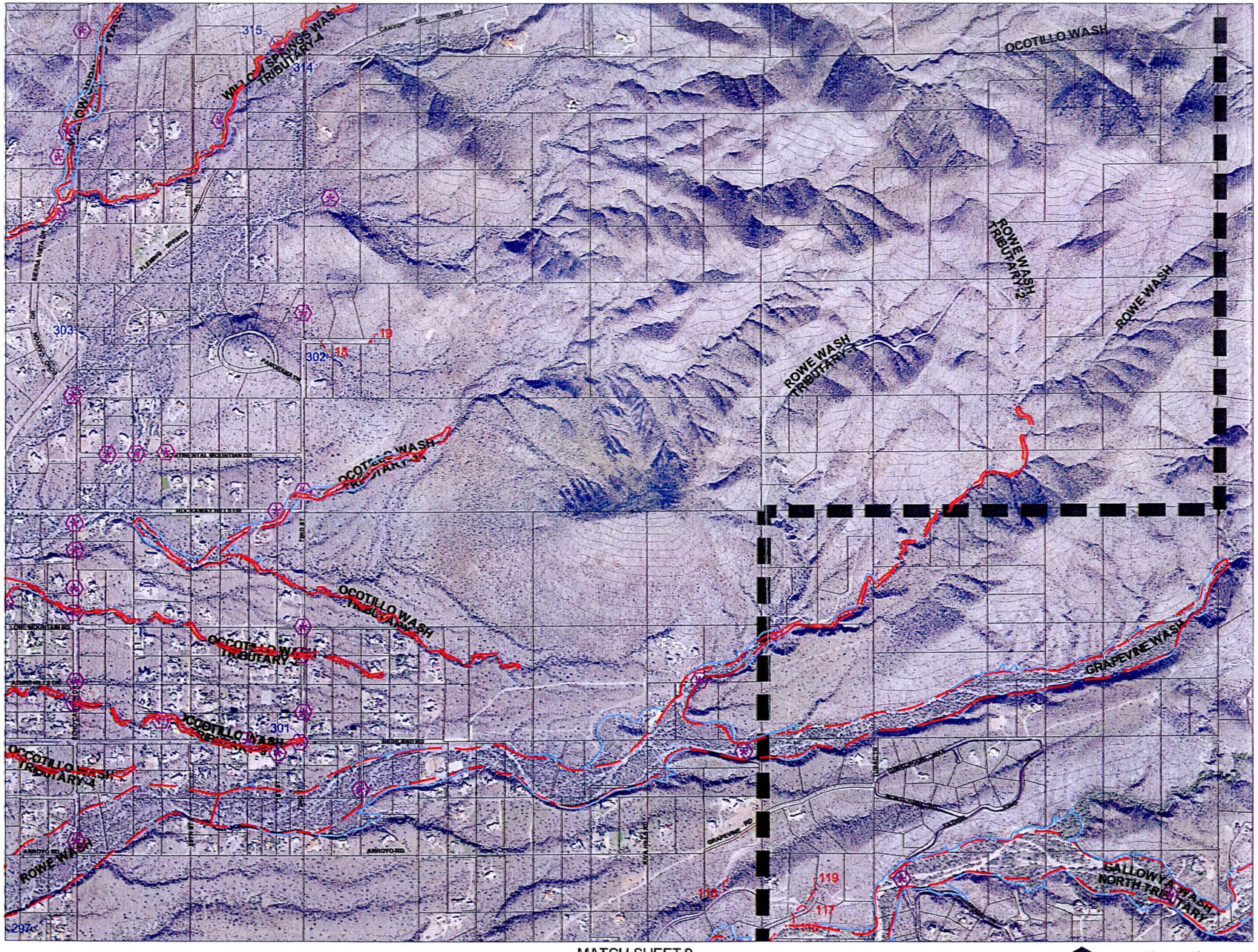
FIGURE 2

SHEET 5 OF 12

C:\PWworking\PHX\aperry\dms24504\ExFacil-05.dwg aperry Nov 16, 2006 3:35:12pm

MATCH SHEET 3

MATCH SHEET 5



MATCH SHEET 9

600' 0' 600' 1200'

SCALE: 1"= 600 FEET
CONTOUR INTERVAL = 10 FEET
FLIGHT DATES: 01/04/01-12/02/04

LEGEND

DMP BOUNDARY
BRIDGE
100-YR FLOODPLAIN BOUNDARY
FLOODWAY BOUNDARY
CULVERTS FROM PLANS 223
CULVERTS FIELD LOCATED 223
AT-GRADE CROSSING

Flood Control District of Maricopa County

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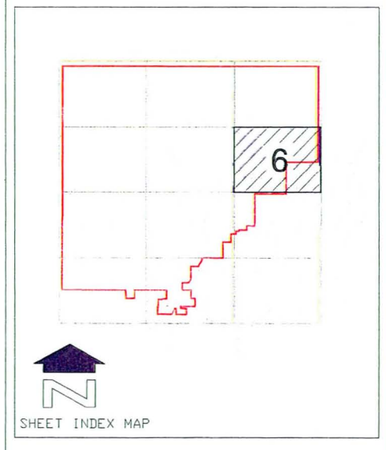

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

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	BY	DATE
DESIGN	–	–
DESIGN CHK.	–	–
PLANS	–	–
PLANS CHK.	–	–

FIGURE 2

SHEET 6 OF 12

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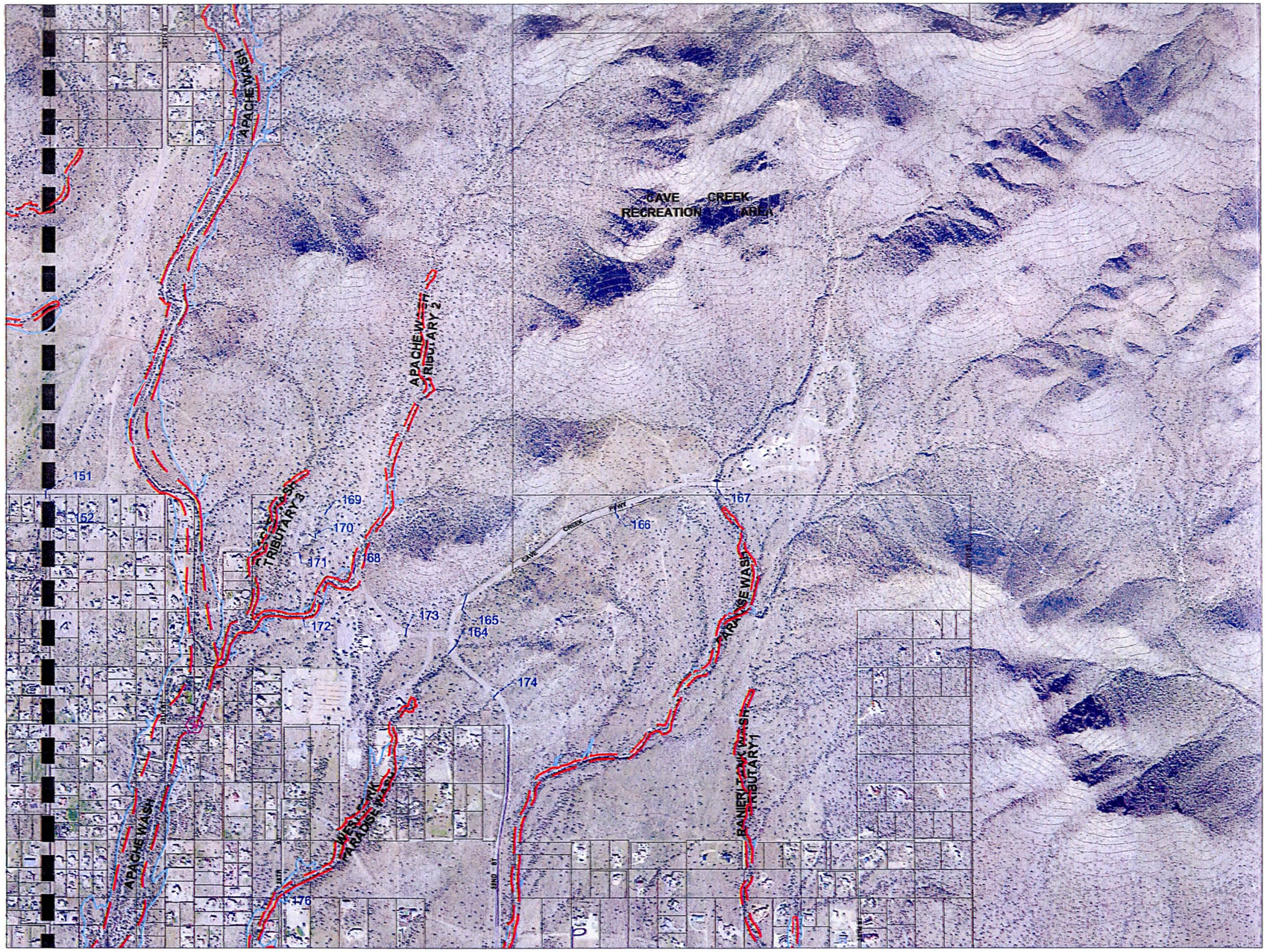
MATCH SHEET 4



MATCH SHEET 10

MATCH SHEET 8

600' 0' 600' 1200'

SCALE: 1"= 600 FEET
CONTOUR INTERVAL = 10 FEET
FLIGHT DATES: 01/04/01-12/02/04

LEGEND

DMP BOUNDARY	
BRIDGE	
100-YR FLOODPLAIN BOUNDARY	
FLOODWAY BOUNDARY	
CULVERTS FROM PLANS	223
CULVERTS FIELD LOCATED	223
AT-GRADE CROSSING	

Flood Control District of Maricopa County

CAVE CREEK ARIZONA
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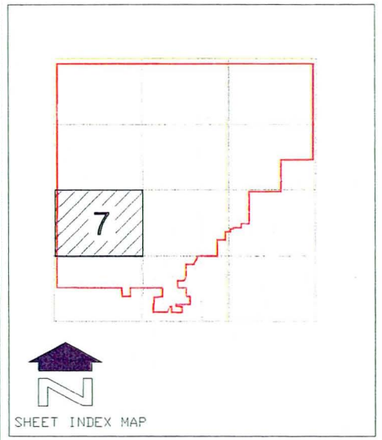

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

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	BY	DATE
DESIGN	–	–
DESIGN CHK.	–	–
PLANS	–	–
PLANS CHK.	–	–

FIGURE 2

SHEET 7 OF 12

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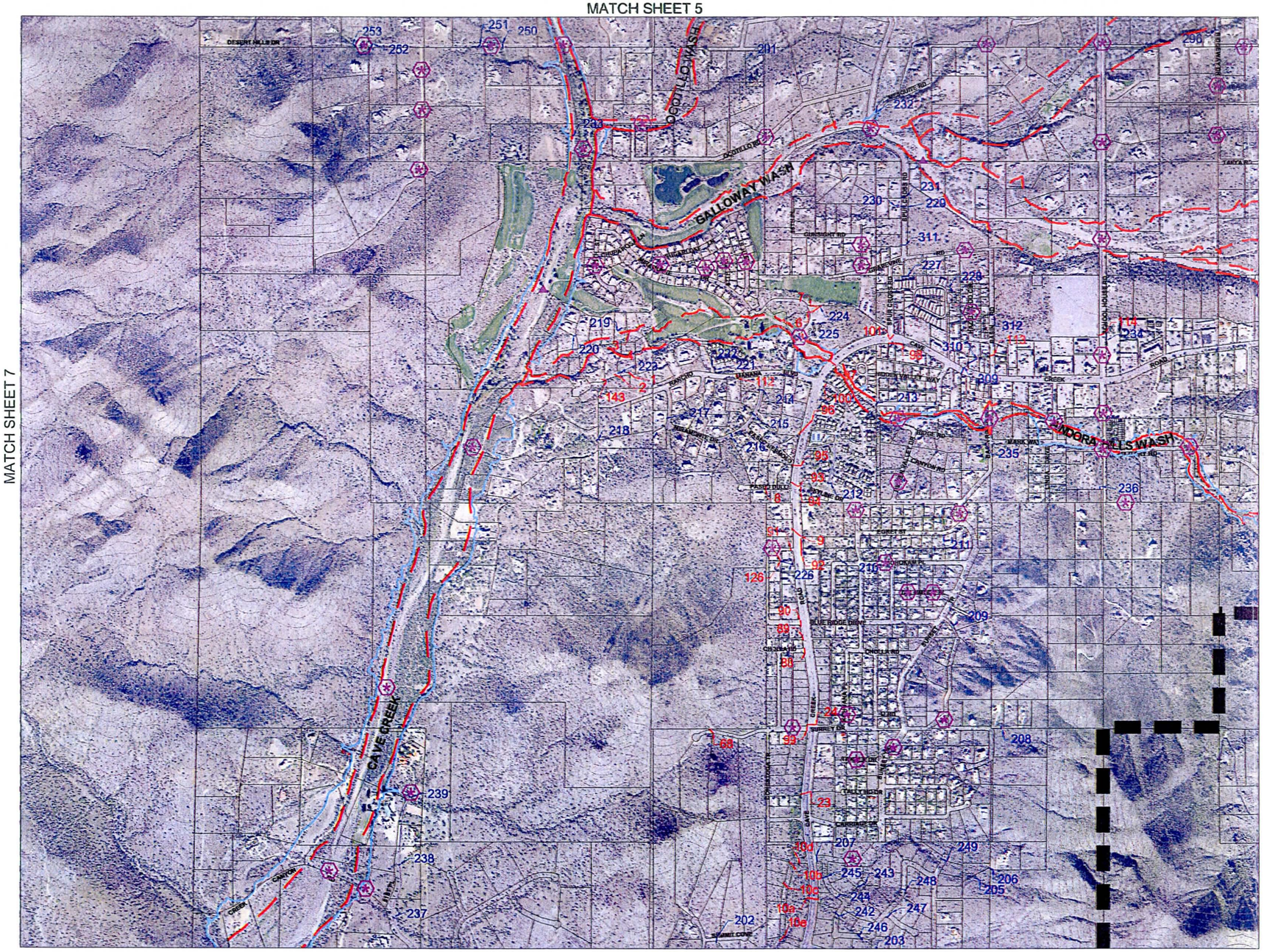
MATCH SHEET 5

MATCH SHEET 7



MATCH SHEET 9

MATCH SHEET 11

600' 0' 600' 1200'

SCALE: 1"= 600 FEET
CONTOUR INTERVAL = 10 FEET
FLIGHT DATES: 01/04/01-12/02/04

LEGEND

- DMP BOUNDARY
- BRIDGE
- 100-YR FLOODPLAIN BOUNDARY
- FLOODWAY BOUNDARY
- CULVERTS FROM PLANS — 223
- CULVERTS FIELD LOCATED — 223
- AT-GRADE CROSSING

Flood Control District of Maricopa County

CAVE CREEK ARIZONA
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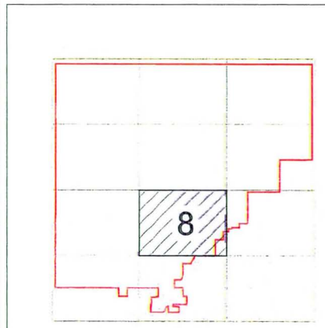

SHEET INDEX MAP

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

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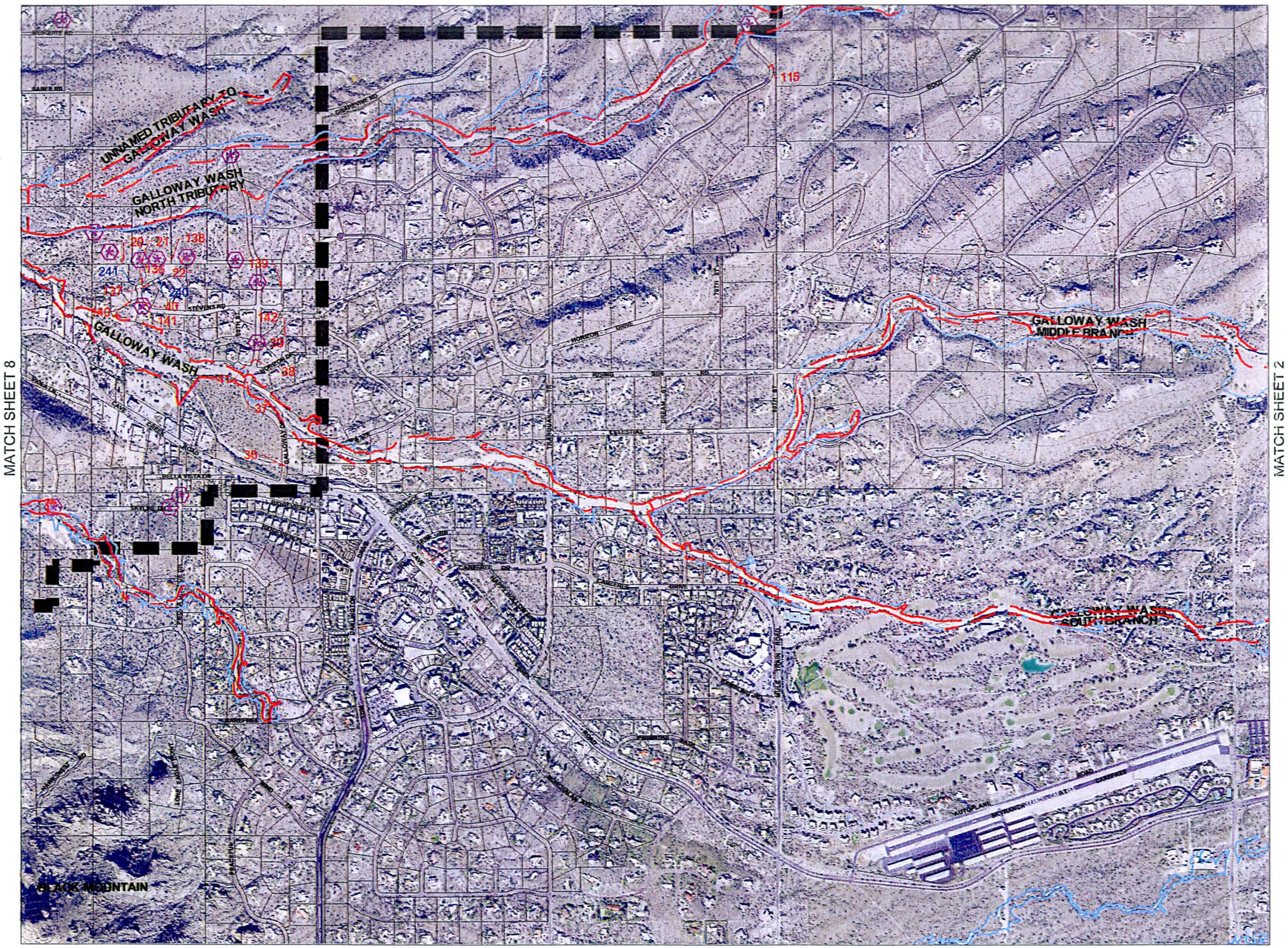
	BY	DATE
DESIGN	–	–
DESIGN CHK.	–	–
PLANS	–	–
PLANS CHK.	–	–

FIGURE 2

MATCH SHEET 6

MATCH SHEET 8



MATCH SHEET 2

MATCH SHEET 12

600' 0' 600' 1200'

SCALE: 1"= 600 FEET
CONTOUR INTERVAL = 10 FEET
FLIGHT DATES: 01/04/01-12/02/04

LEGEND

DMP BOUNDARY
BRIDGE
100-YR FLOODPLAIN BOUNDARY
FLOODWAY BOUNDARY
CULVERTS FROM PLANS 223
CULVERTS FIELD LOCATED 223
AT-GRADE CROSSING

Flood Control District of Maricopa County

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SHEET INDEX MAP

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

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	BY	DATE
DESIGN	--	--
DESIGN CHK.	--	--
PLANS	--	--
PLANS CHK.	--	--

FIGURE 2

SHEET 9 OF 12

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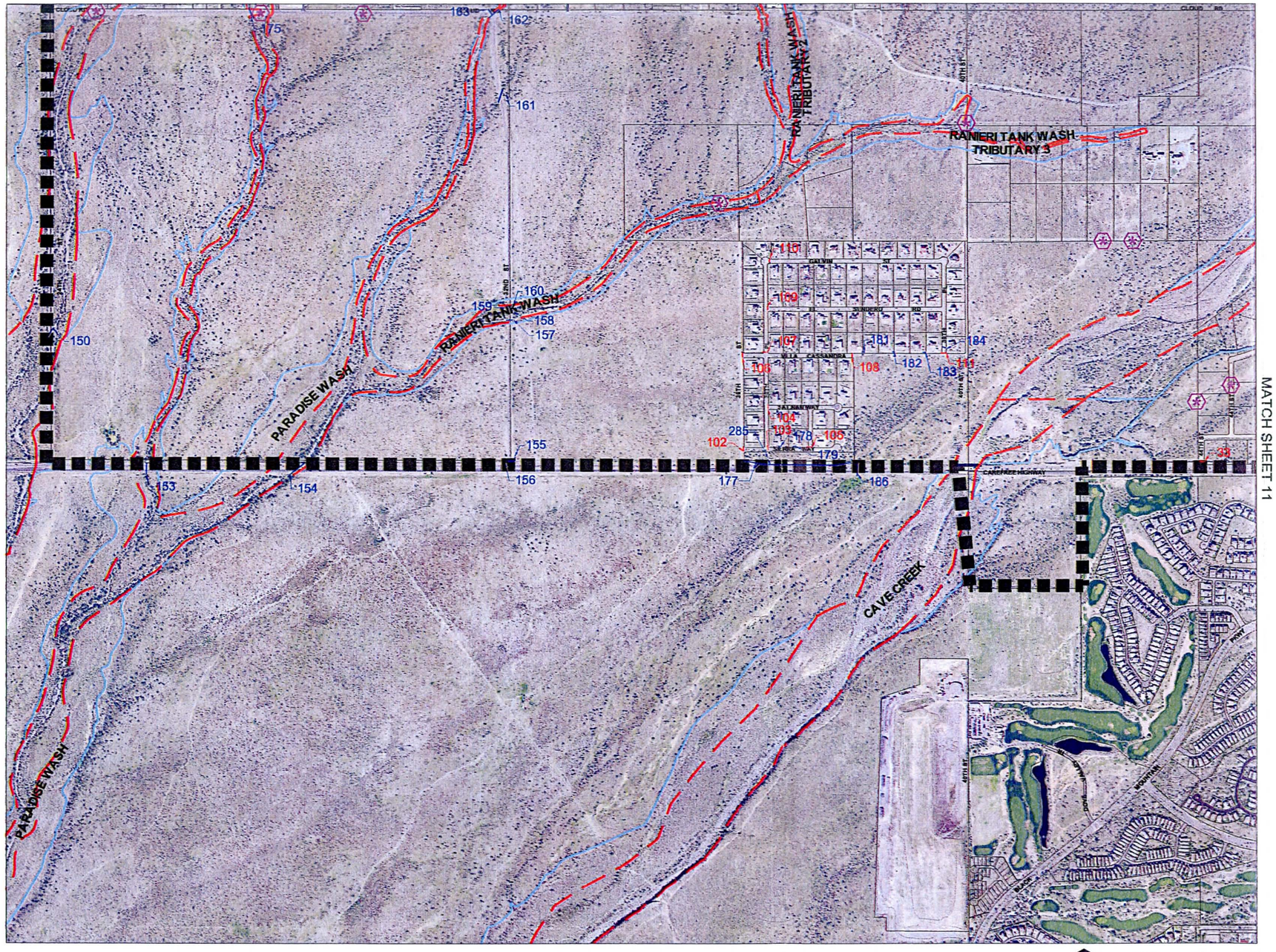
MATCH SHEET 7



MATCH SHEET 11

LEGEND

DMP BOUNDARY

BRIDGE

100-YR FLOODPLAIN BOUNDARY

FLOODWAY BOUNDARY

CULVERTS FROM PLANS 223

CULVERTS FIELD LOCATED 223

AT-GRADE CROSSING

Flood Control District of Maricopa County

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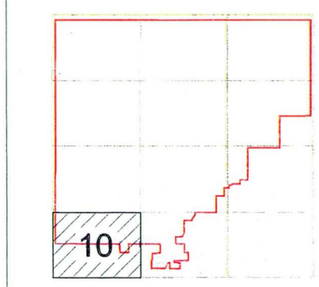

SHEET INDEX MAP

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

(EXISTING FACILITIES WITH AERIAL PHOTOGRAPHY)

600' 0' 600' 1200'

SCALE: 1"= 600 FEET
CONTOUR INTERVAL = 10 FEET
FLIGHT DATES: 01/04/01–12/02/04

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	BY	DATE
DESIGN	–	–
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PLANS	–	–
PLANS CHK.	–	–

FIGURE 2

SHEET 10 OF 12

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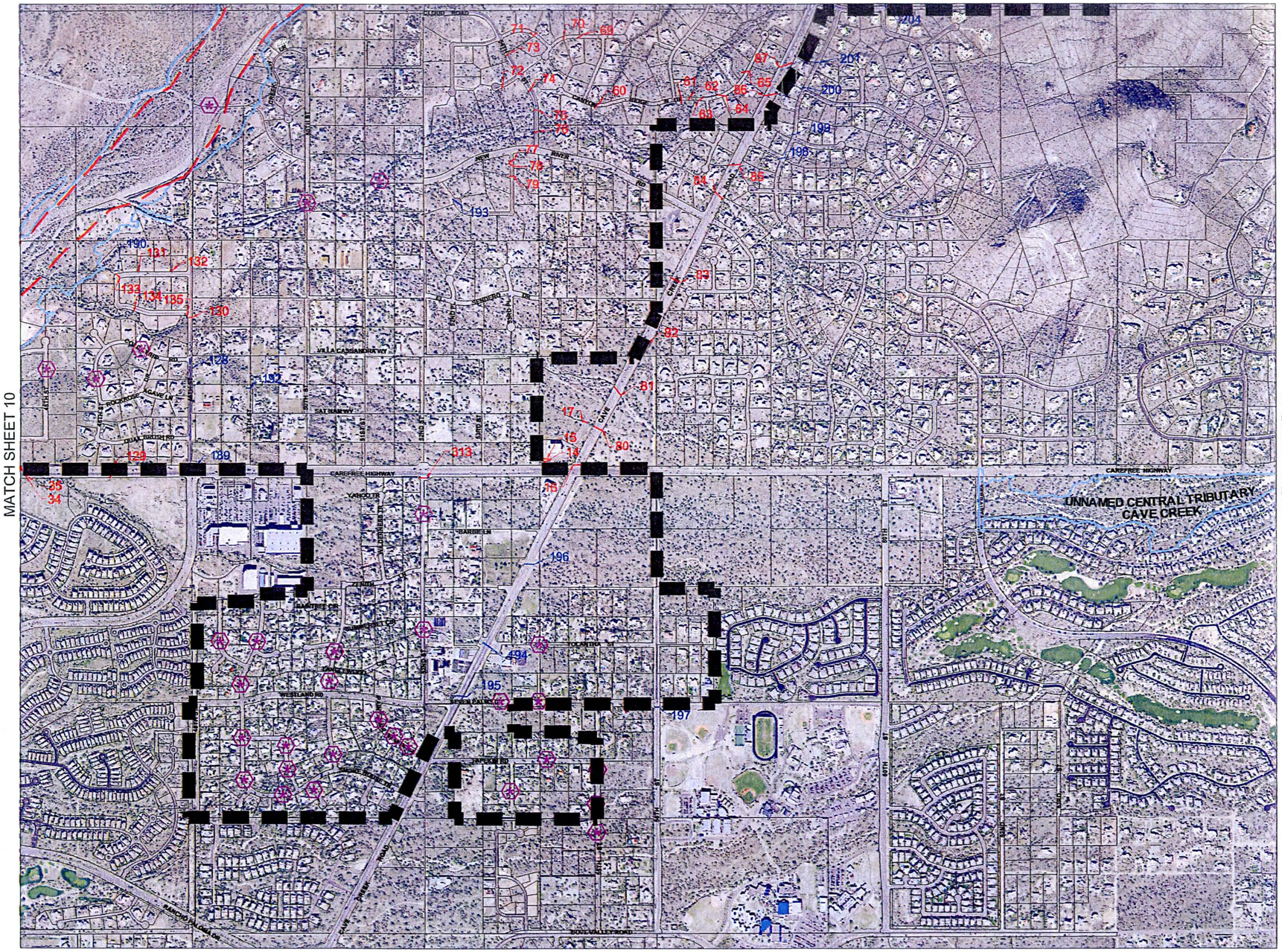
MATCH SHEET 8

MATCH SHEET 10



MATCH SHEET 12

600' 0' 600' 1200'

SCALE: 1"= 600 FEET
CONTOUR INTERVAL = 10 FEET
FLIGHT DATES: 01/04/01–12/02/04

LEGEND

- DMP BOUNDARY
- BRIDGE
- 100-YR FLOODPLAIN BOUNDARY
- FLOODWAY BOUNDARY
- CULVERTS FROM PLANS — 223
- CULVERTS FIELD LOCATED — 223
- AT-GRADE CROSSING

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SHEET INDEX MAP

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

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	BY	DATE
DESIGN	–	–
DESIGN CHK.	–	–
PLANS	–	–
PLANS CHK.	–	–

FIGURE 2

SHEET 11 OF 12

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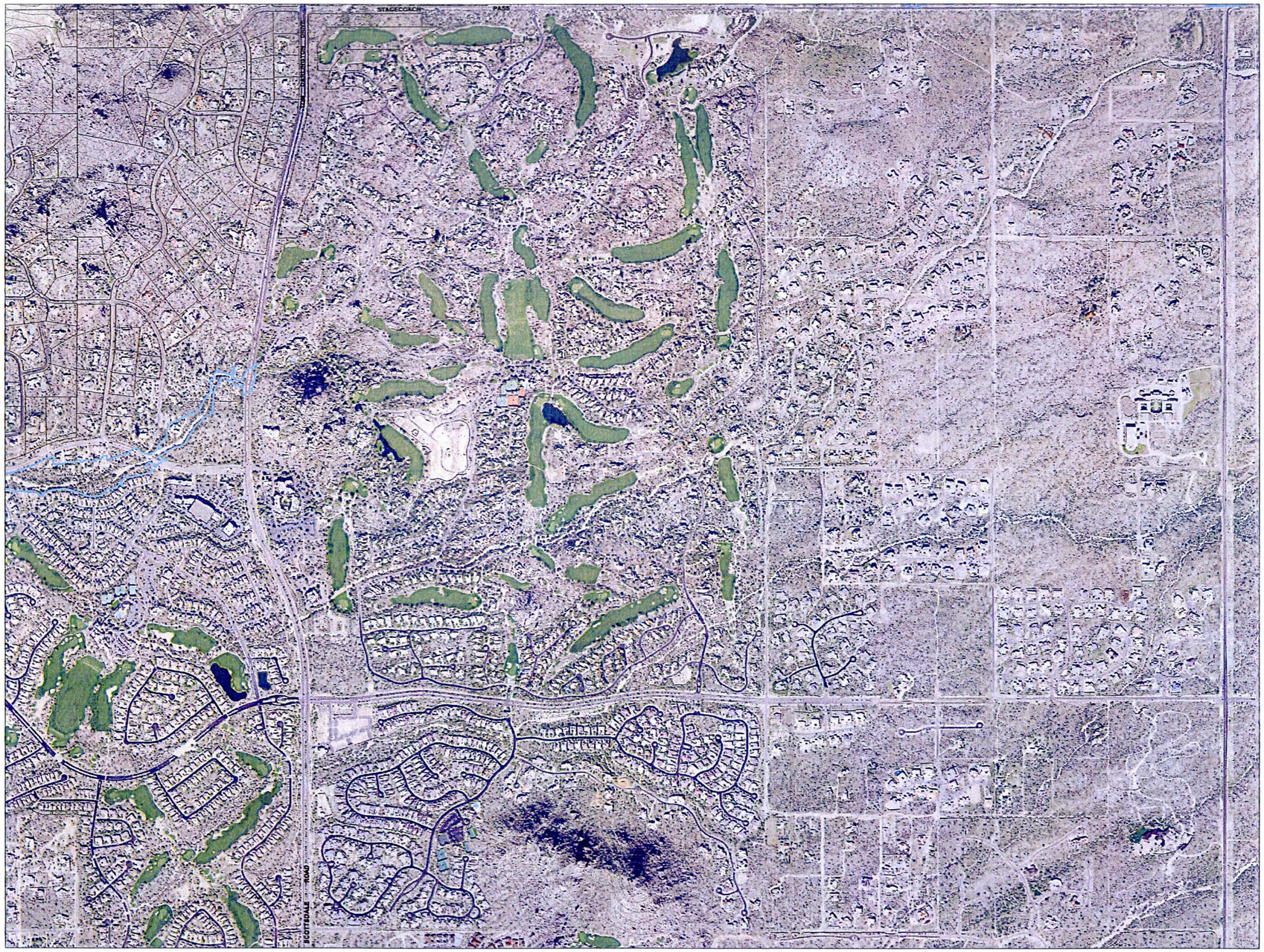
MATCH SHEET 9

MATCH SHEET 11



600' 0' 600' 1200'

SCALE: 1"= 600 FEET
CONTOUR INTERVAL = 10 FEET
FLIGHT DATES: 01/04/01–12/02/04

LEGEND

- DMP BOUNDARY
- BRIDGE
- 100-YR FLOODPLAIN BOUNDARY
- FLOODWAY BOUNDARY
- CULVERTS FROM PLANS — 223
- CULVERTS FIELD LOCATED — 223
- AT-GRADE CROSSING

Flood Control District of Maricopa County

CAVE CREEK ARIZONA
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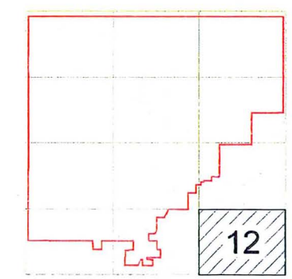

SHEET INDEX MAP

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

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	BY	DATE
DESIGN	–	–
DESIGN CHK.	–	–
PLANS	–	–
PLANS CHK.	–	–

FIGURE 2

SHEET 12 OF 12

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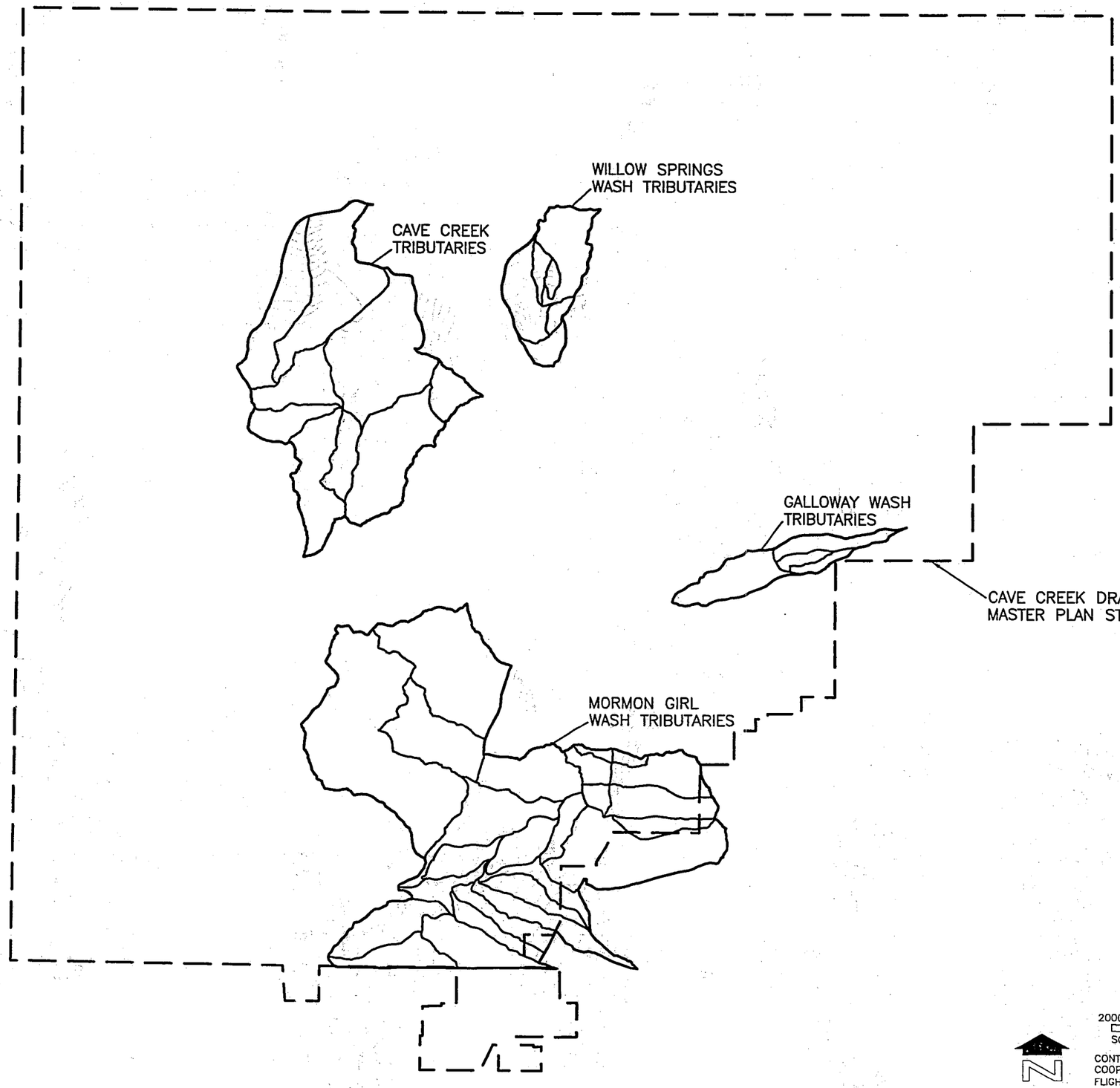
APPENDIX B HYDROLOGY

Sheets 1 through 14 of the Hydrology Report

- New Hydrologic Model Locations
- Existing Hydrologic Model Locations
- SCS Soils Map
- Land Use (Existing and Future)
- Sheet Index
- Sub-basin Identification
- HEC-1 Schematic

HEC-1 Printouts



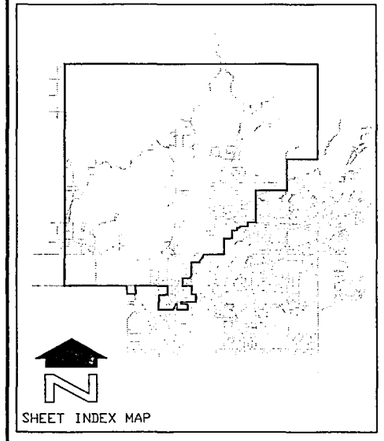
2000' 0' 2000' 4000'
SCALE: 1"= 2000 FEET

CONTOUR INTERVAL = 10'
COOPER AERIAL SURVEY'S COMPANY
FLIGHT DATES: November 2003
through December 2005

LEGEND

DMP BOUNDARY

NEW HYDROLOGY



NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

NEW HYDROLOGIC MODEL LOCATIONS

PRELIMINARY
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	BY	DATE
DESIGN	D. MARTINEZ	05/18/07
DESIGN CHK.	L. POTTER	05/18/07
PLANS	D. MARTINEZ	05/18/07
PLANS CHK.	M. FOUNTAIN	05/18/07

SHEET 1

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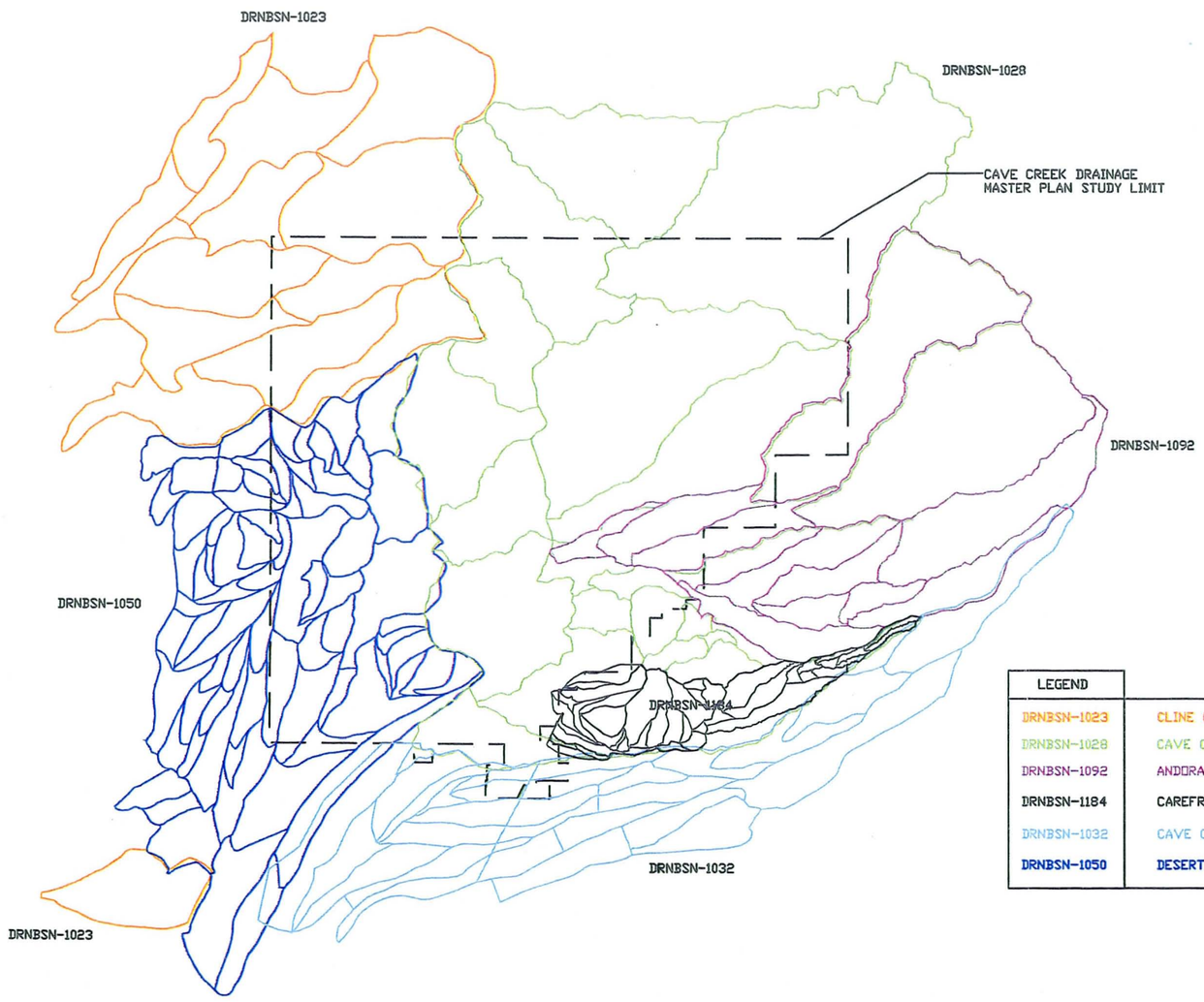
CAVE CREEK DRAINAGE MASTER PLAN EXISTING HYDROLOGIC MODELS



LEGEND	
DRNBSN-1023	CLINE CREEK AND RODGER CREEK FDS 1990
DRNBSN-1028	CAVE CREEK FROM TONTO NATIONAL FOREST TO CAREFREE HWY FDS 1995
DRNBSN-1092	ANDORA HILLS AND GALLOWAY WASHES FDS 1999
DRNBSN-1184	CAREFREE DMP 2001
DRNBSN-1032	CAVE CREEK FDS 1996
DRNBSN-1050	DESERT HILLS AREA FDS 1997

5000' 0' 5000' 10000'

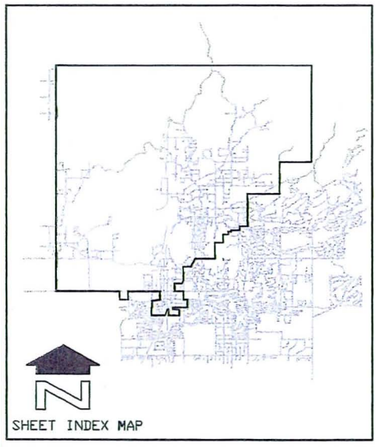
SCALE: 1"= 5000 FEET

CONTOUR INTERVAL = 10'
COOPER AERIAL SURVEY'S COMPANY
FLIGHT DATES: November 2003
through December 2005

LEGEND

DMP BOUNDARY — — — —

HYDROLOGIC MODEL NAME DRNBSN-1092



NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

EXISTING HYDROLOGIC MODELS

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	BY	DATE
DESIGN	D. MARTINEZ	05/18/07
DESIGN CHK.	L. POTTER	05/18/07
PLANS	D. MARTINEZ	05/18/07
PLANS CHK.	M. FOUNTAIN	05/18/07

SHEET 2

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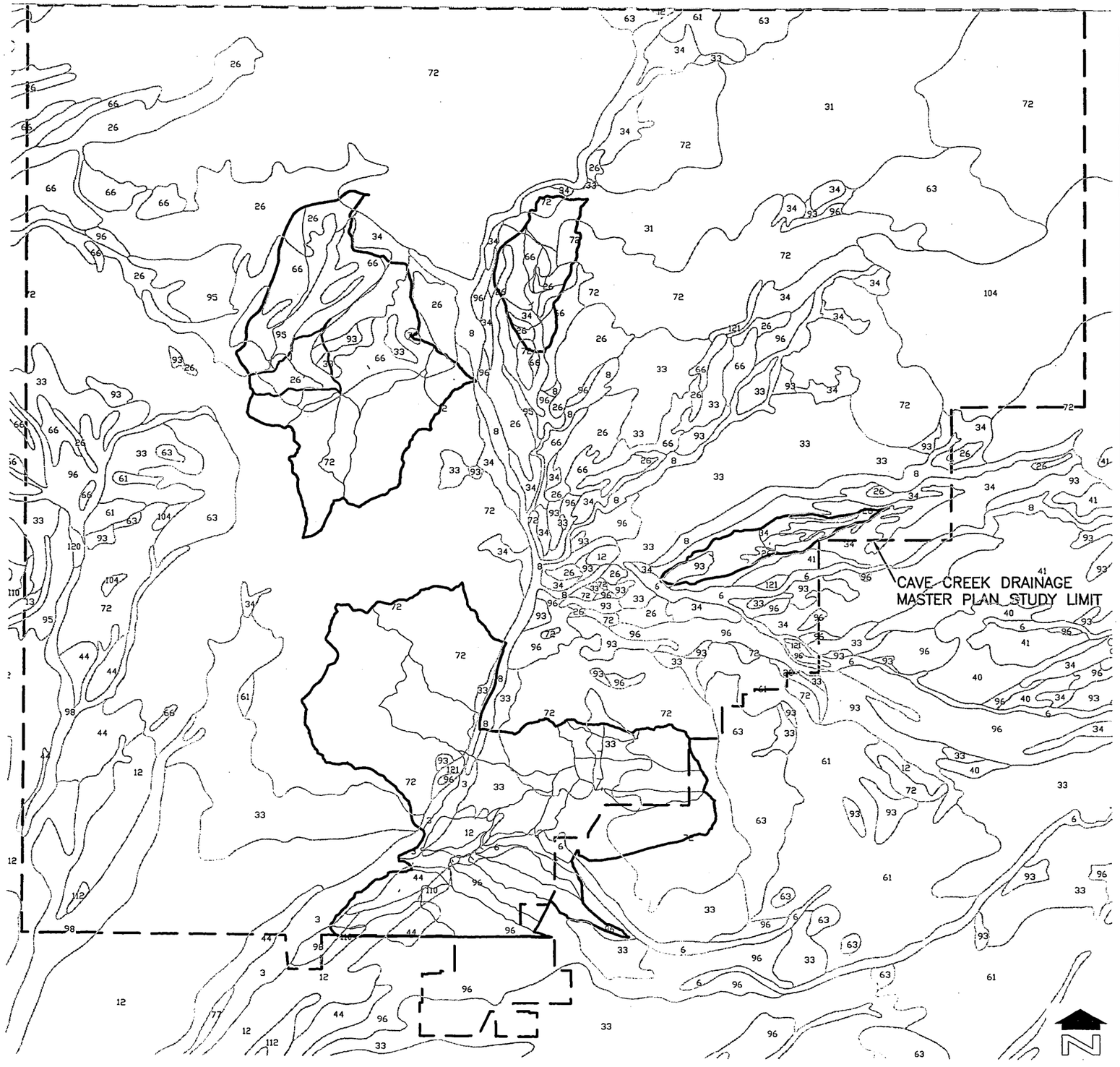


SOIL TYPES

3	ANTHO-CARRIZO-MARIPO
6	ANTHONY-ARIZO
8	ARIZO
12	CAREFREE, 1-8% SLOPES
26	CONTINENTAL, 1-8% SLOPES
31	DIXALETA-ROCK 25-65% SLOPES
33	EBA, 1-8% SLOPES
34	EBA, 8-20% SLOPES
44	EBON, 1-8% SLOPES
66	GREYEAGLE-SUNCITY VARIANT
72	LEHMANS-ROCK 8-65% SLOPES
93	NICKEL-CAVE 8-30% SLOPES
95	OHACO
96	PIRAMT-TREMANT 1-10% SLOPES
98	PINALENO-TRES HERMANOS
110	SUNCITY-CIPRIANO
121	TRES HERMANOS-ANTHONY

REFERENCE: USDA SCS SOIL SURVEY OF AGUILA-CARFREE AREA, 4186

DATE:

2000' 0' 2000' 4000'

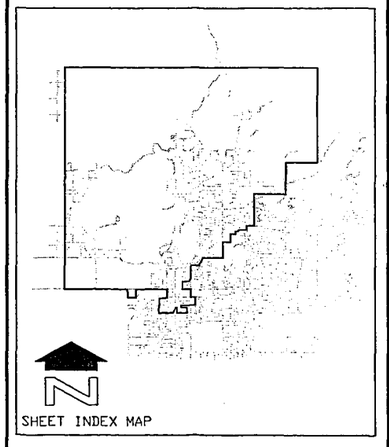
SCALE: 1"= 2000 FEET

CONTOUR INTERVAL = 10'
COOPER AERIAL SURVEY'S COMPANY
FLIGHT DATES: November 2003 through December 2005

LEGEND

DMP BOUNDARY

NEW HYDROLOGY



SHEET INDEX MAP

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

SCS SOILS MAP

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	BY	DATE
DESIGN	D. MARTINEZ	05/18/07
DESIGN CHK.	L. POTTER	05/18/07
PLANS	D. MARTINEZ	05/18/07
PLANS CHK.	M. FOUNTAIN	05/18/07

SHEET 3

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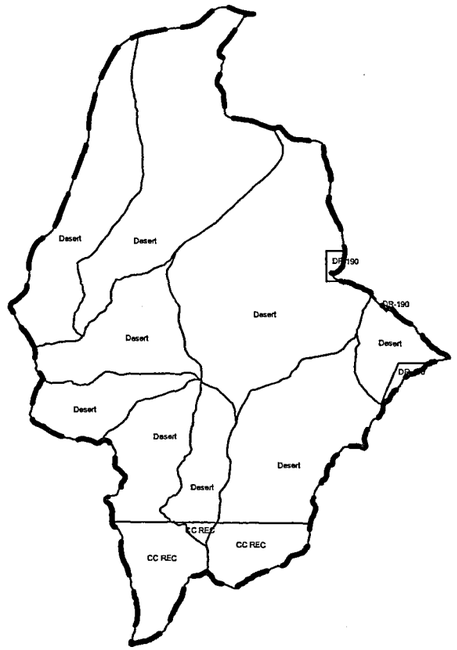
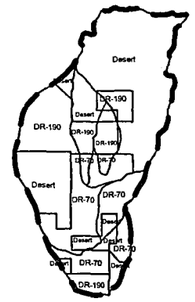
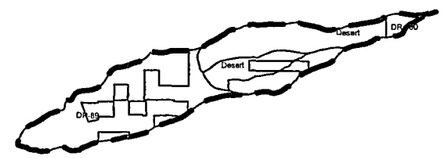
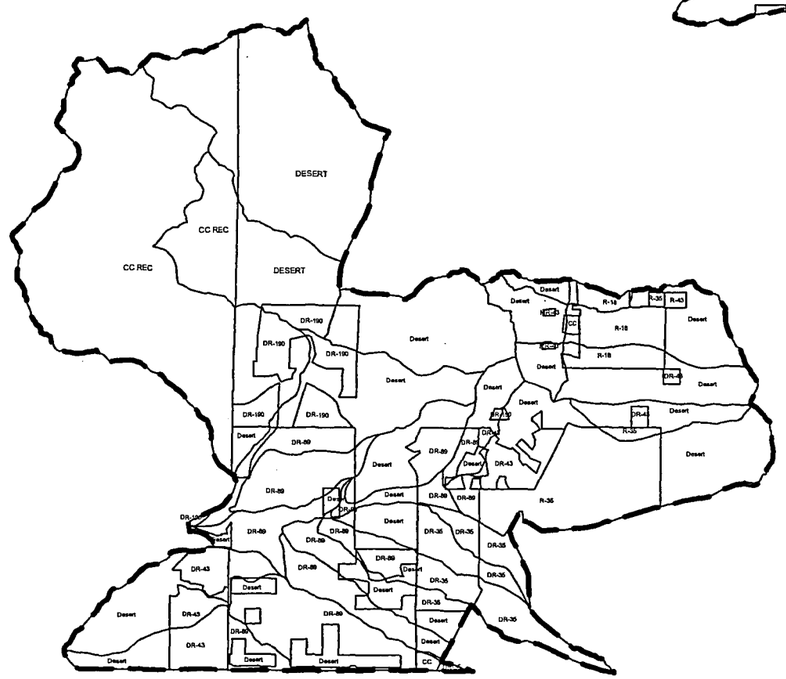








LABEL	LAND USE
DESERT CC REC OSR	OPEN SPACE DESERT
DR-190 DR-89 DR-70 DR-43	VLDR
R-35 R-18	LDR
MR-8	MDR
MR-14 MR-21 MR-43	MFR
CB CC GC	C

1500' 0' 1500' 3000'

SCALE: 1"= 1500 FEET

CONTOUR INTERVAL = 10'

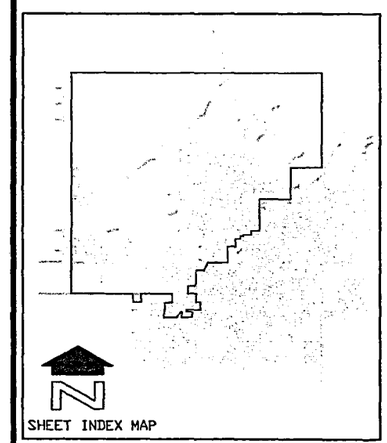
COOPER AERIAL SURVEY'S COMPANY

FLIGHT DATES: November 2003 through December 2005

LEGEND

NEW HYDROLOGY BOUNDARY

LAND USE CODE DR-190



SHEET INDEX MAP

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

LAND USE (EXISTING)

PRELIMINARY NOT FOR CONSTRUCTION

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

	BY	DATE
DESIGN	D. MARTINEZ	05/18/07
DESIGN CHK.	L. POTTER	05/18/07
PLANS	D. MARTINEZ	05/18/07
PLANS CHK.	M. FOUNTAIN	05/18/07

SHEET 4

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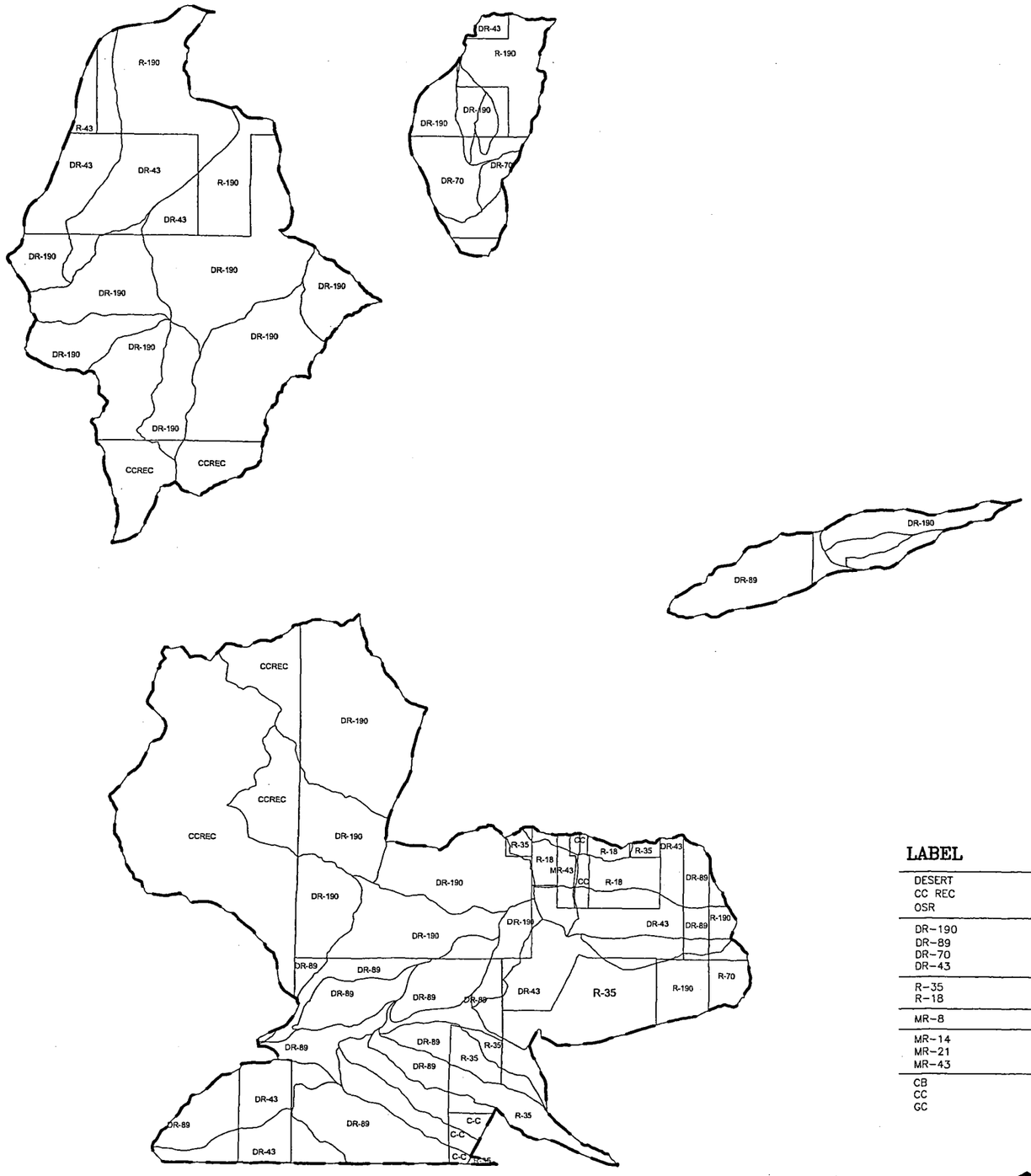
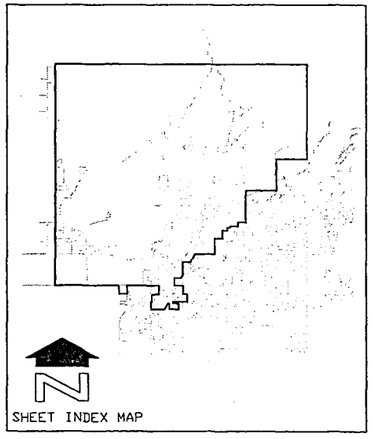


LEGEND

NEW HYDROLOGY BOUNDARY

LAND USE CODE DR-190



LABEL	LAND USE
DESERT CC REC OSR	OPEN SPACE DESERT
DR-190 DR-89 DR-70 DR-43	VLDR
R-35 R-18	LDR
MR-8	MDR
MR-14 MR-21 MR-43	MFR
CB CC GC	C

1500' 0' 1500' 3000'

SCALE: 1"= 1500 FEET

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

LAND USE (FUTURE)

PRELIMINARY NOT FOR CONSTRUCTION

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

	BY	DATE
DESIGN	D. MARTINEZ	05/18/07
DESIGN CHK.	L. POTTER	05/18/07
PLANS	D. MARTINEZ	05/18/07
PLANS CHK.	M. FOUNTAIN	05/18/07

SHEET 5

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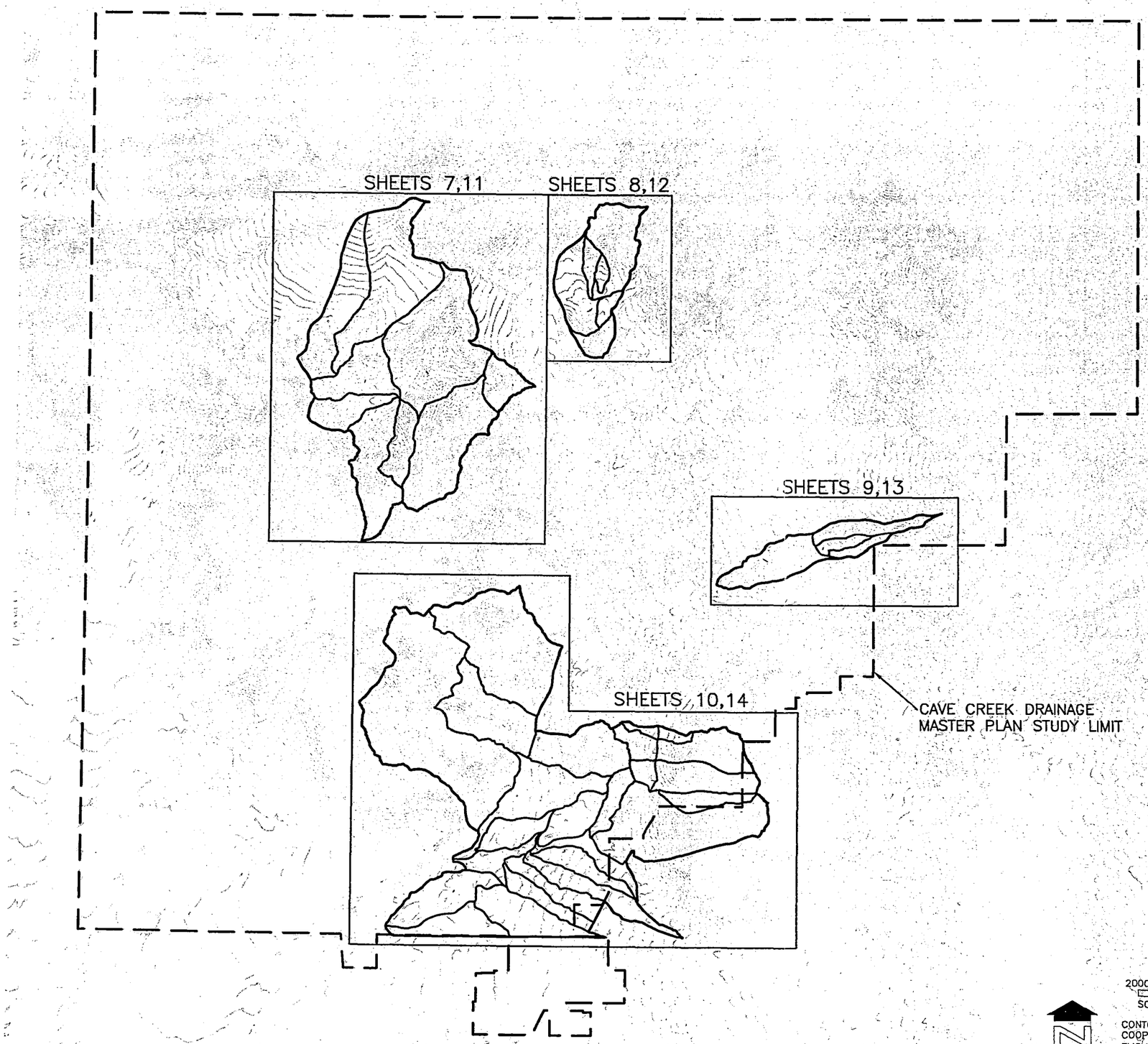
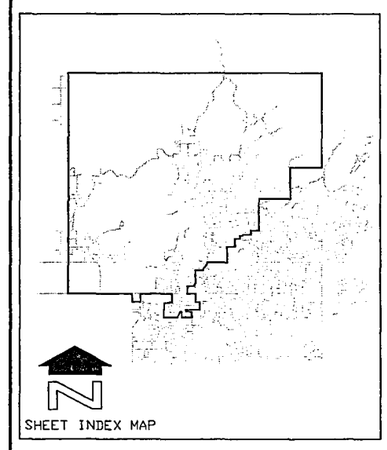


LEGEND

DMP BOUNDARY

NEW HYDROLOGY



NO.	REVISION	BY	DATE
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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

SHEET INDEX

2000' 0' 2000' 4000'
SCALE: 1"= 2000 FEET

CONTOUR INTERVAL = 10'
COOPER AERIAL SURVEY'S COMPANY
FLIGHT DATES: November 2003
through December 2005

PRELIMINARY
NOT FOR
CONSTRUCTION

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

	BY	DATE
DESIGN	D. MARTINEZ	05/18/07
DESIGN CHK.	L. POTTER	05/18/07
PLANS	D. MARTINEZ	05/18/07
PLANS CHK.	M. FOUNTAIN	05/18/07

SHEET 6

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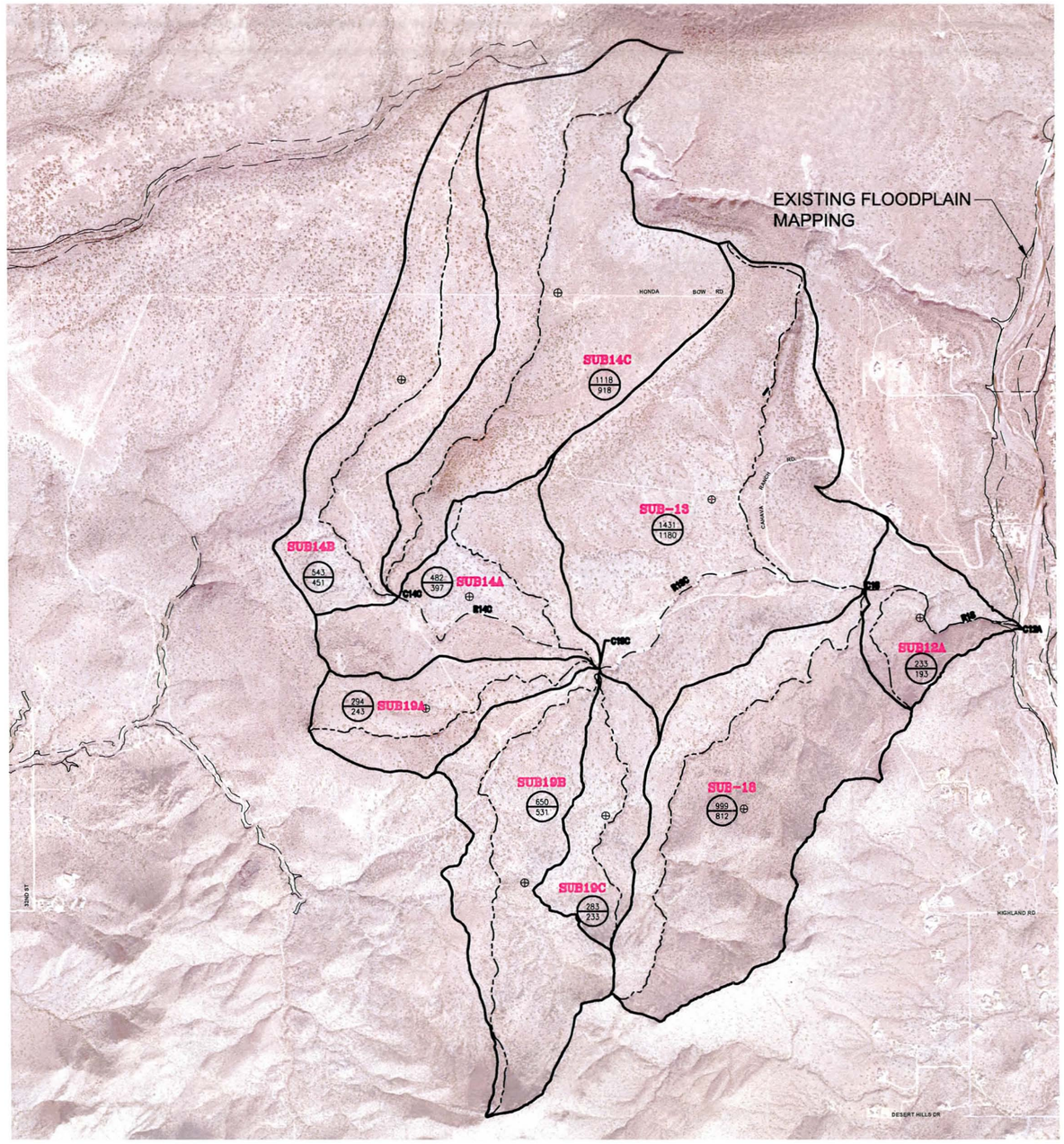


Concentration Point	100-yr, 6-hr Flow (cfs) Exist Cond	100-yr, 24-hr Flow (cfs) Exist Cond
C12A	3198	3699
C14C	1509	1355
C18	3129	3640
C19C	2344	2437

800' 0' 800' 1600'

SCALE: 1"= 800 FEET

CONTOUR INTERVAL = 10'
COOPER AERIAL SURVEY'S COMPANY
FLIGHT DATES: November 2003
through December 2005

LEGEND

CENTROID

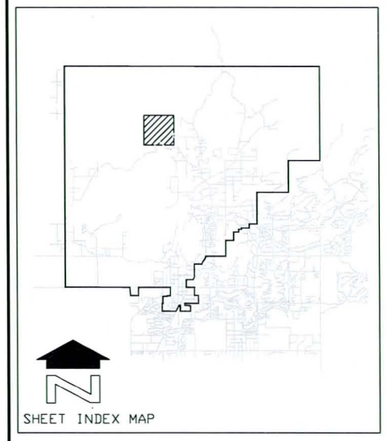
Tc REACH

ROUTING REACH

NEW HYDROLOGIC SUBBASIN

HYDROLOGIC SUBBASIN NAME — 100-YR FLOWS (CFS) EXISTING CONDITION: 6HR / 24HR — SUB-13

CONCENTRATION POINT — C19C



NO.	REVISION	BY	DATE
2			
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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

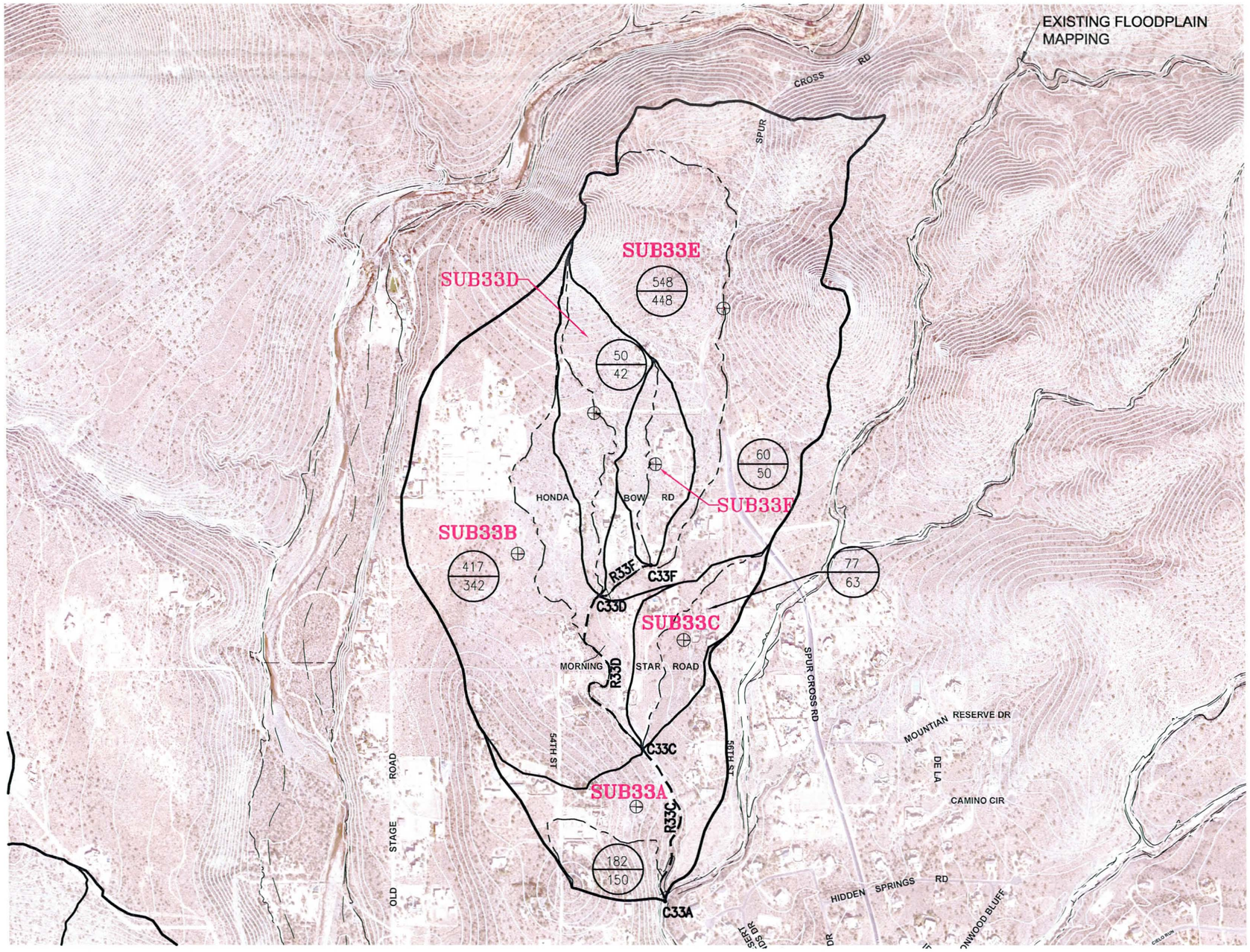
SUB-BASIN IDENTIFICATION

Registered Professional Engineer (Civil) CERTIFICATE NO. 35571 LINDA A. POTTER Date Signed ARIZONA, U.S.A.

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

	BY	DATE
DESIGN	D. MARTINEZ	05/18/07
DESIGN CHK.	L. POTTER	05/18/07
PLANS	D. MARTINEZ	05/18/07
PLANS CHK.	M. FOUNTAIN	05/18/07

SHEET 7



Concentration Point	100-yr, 6-hr Flow (cfs) Exist Cond	100-yr, 24-hr Flow (cfs) Exist Cond
C33A	1182	969
C33C	1092	892
C33D	643	526
C33F	606	495

400' 0' 400' 800'
SCALE: 1"= 400 FEET

CONTOUR INTERVAL = 10'
COOPER AERIAL SURVEY'S COMPANY
FLIGHT DATES: November 2003
through December 2005

LEGEND

CENTROID ⊕

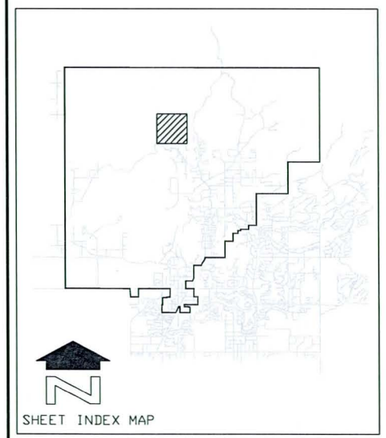
Tc REACH

ROUTING REACH R19C

NEW HYDROLOGIC SUBBASIN

HYDROLOGIC SUBBASIN NAME 6HR / 24HR SUB-13 (100-YR FLOWS (CFS) EXISTING CONDITION)

CONCENTRATION POINT C19C



NO.	REVISION	BY	DATE
2			
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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

SUB-BASIN IDENTIFICATION

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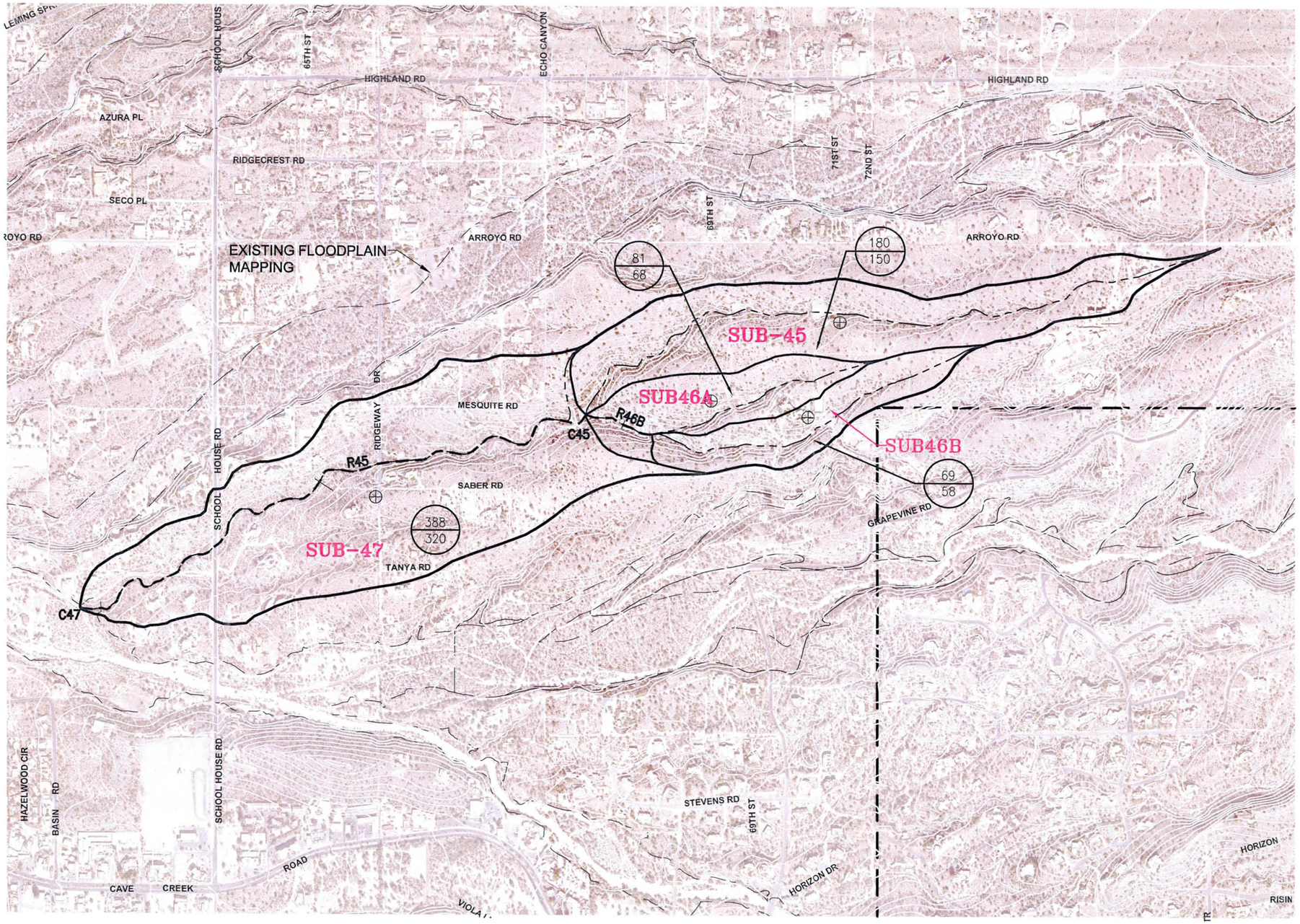
HDR ENGINEERING, INC.
3200 East Camelback Road, Suite 350
PHOENIX, ARIZONA 85018-2311
(602) 522-7700

	BY	DATE
DESIGN	D. MARTINEZ	05/18/07
DESIGN CHK.	L. POTTER	05/18/07
PLANS	D. MARTINEZ	05/18/07
PLANS CHK.	M. FOUNTAIN	05/18/07

SHEET 8



Concentration Point	100-yr, 6-hr Flow (cfs) Exist Cond	100-yr, 24-hr Flow (cfs) Exist Cond
C45	320	266
C47	579	467

400' 0' 400' 800'
SCALE: 1"= 400 FEET

CONTOUR INTERVAL = 10'
COOPER AERIAL SURVEY'S COMPANY
FLIGHT DATES: November 2003
through December 2005

LEGEND

CENTROID ⊕

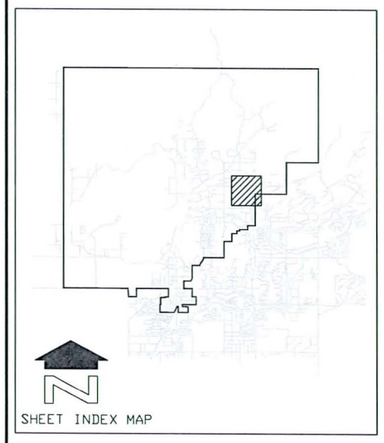
Tc REACH

ROUTING REACH R19C

NEW HYDROLOGIC SUBBASIN

HYDROLOGIC SUBBASIN NAME 6HR / 24HR SUB-13 (100-YR. FLOWS (CFS) EXISTING CONDITION)

CONCENTRATION POINT C19C



NO.	REVISION	BY	DATE
2			
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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

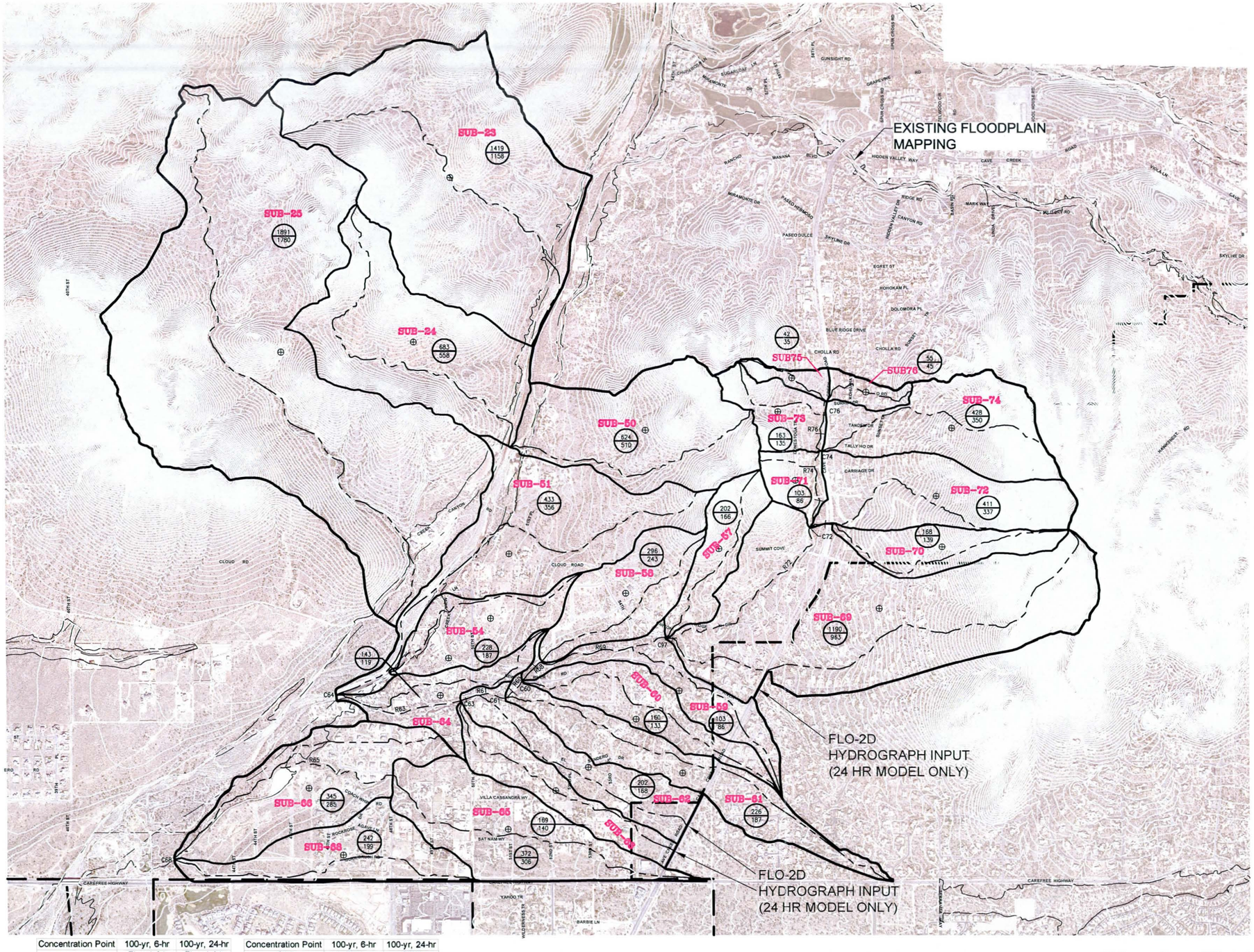
SUB-BASIN IDENTIFICATION

Registered Professional Engineer (Civil) CERTIFICATE NO. 35571 LINDA A. POTTER Date Signed ARIZONA, U.S.A.

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

	BY	DATE
DESIGN	D. MARTINEZ	05/18/07
DESIGN CHK.	L. POTTER	05/18/07
PLANS	D. MARTINEZ	05/18/07
PLANS CHK.	M. FOUNTAIN	05/18/07

SHEET 9



Concentration Point	100-yr, 6-hr Flow (cfs) Exist Cond	100-yr, 24-hr Flow (cfs) Exist Cond
C57	* 2085	2985
C60	* 2272	3251
C61	* 2376	3431
C63	* 2557	3744

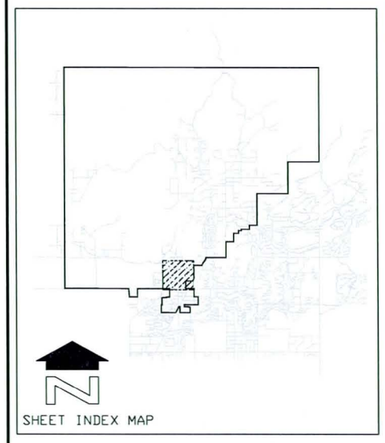
Concentration Point	100-yr, 6-hr	100-yr, 24-hr
C64	* 2611	3829
C68	* 873	778
C72	* 1315	1072
C74	* 680	554
C76	* 97	80

* NOTE: 6-HR FLOWS NOT VALID @ CONCENTRATION POINTS (MISSING UCT HYDROGRAPH INPUT FOR 6-HR MODEL ONLY).

800' 0' 800' 1600'
SCALE: 1"= 800 FEET
CONTOUR INTERVAL = 10'
COOPER AERIAL SURVEY'S COMPANY
FLIGHT DATES: November 2003 through December 2005

LEGEND

CENTROID ⊕
Tc REACH
ROUTING REACH
NEW HYDROLOGIC SUBBASIN
HYDROLOGIC SUBBASIN NAME — 6HR/24HR — 100-YR FLOWS (CFS) EXISTING CONDITION — SUB-13
CONCENTRATION POINT C19C



NO.	REVISION	BY	DATE
2			
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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

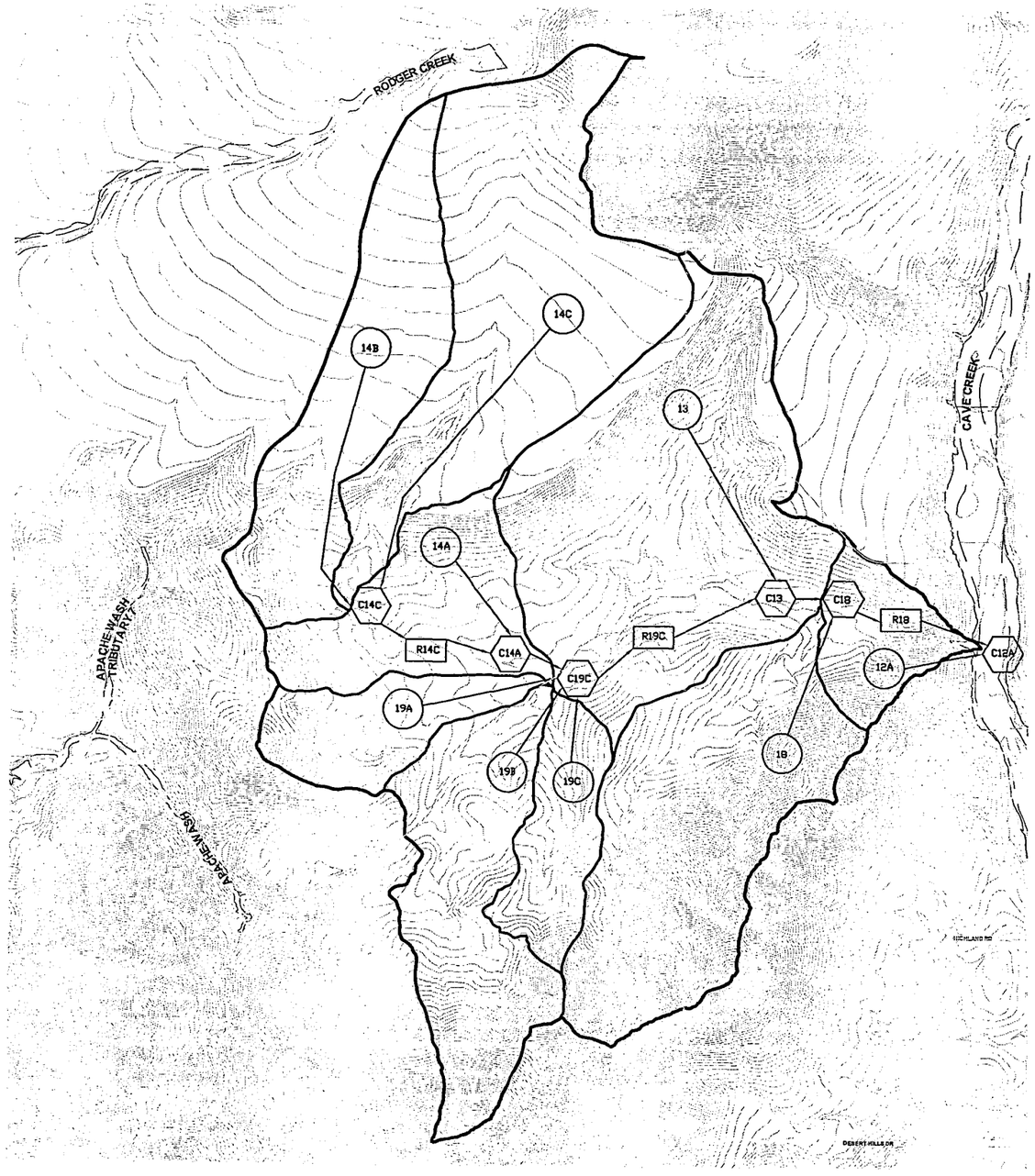
SUB-BASIN IDENTIFICATION

Registered Professional Engineer (Civil) CERTIFICATE NO. 35571 LINDA A. POTTER DATE SIGNED ARIZONA, U.S.A.

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

	BY	DATE
DESIGN	D. MARTINEZ	05/18/07
DESIGN CHK.	L. POTTER	05/18/07
PLANS	D. MARTINEZ	05/18/07
PLANS CHK.	M. FOUNTAIN	05/18/07

SHEET 10



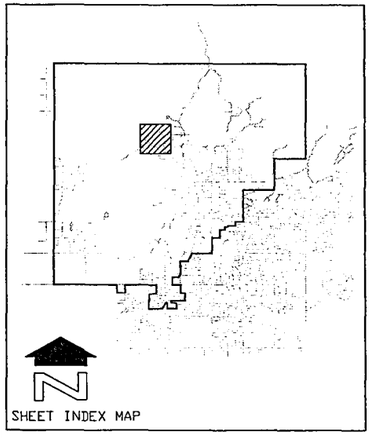
LEGEND

NEW HYDROLOGY

SUBBASIN — 13

CONCENTRATION POINT — C19C

ROUTING — R19C



NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

HEC-1 SCHEMATIC

800' 0' 800' 1600'
SCALE: 1"= 800 FEET

CONTOUR INTERVAL = 10'
COOPER AERIAL SURVEY'S COMPANY
FLIGHT DATES: November 2003
through December 2005

PRELIMINARY
NOT FOR
CONSTRUCTION

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

	BY	DATE
DESIGN	D. MARTINEZ	05/18/07
DESIGN CHK.	L. POTTER	05/18/07
PLANS	D. MARTINEZ	05/18/07
PLANS CHK.	M. FOUNTAIN	05/18/07

SHEET 11

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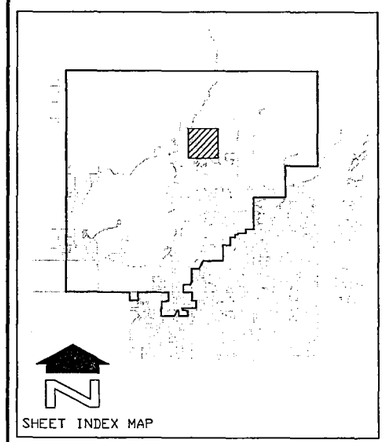
LEGEND

NEW HYDROLOGY

SUBBASIN — 13

CONCENTRATION POINT — C19C

ROUTING — R19C



400' 0' 400' 800'

SCALE: 1"= 400 FEET

CONTOUR INTERVAL = 10'
COOPER AERIAL SURVEY'S COMPANY
FLIGHT DATES: November 2003 through December 2005

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

HEC-1 SCHEMATIC

PRELIMINARY NOT FOR CONSTRUCTION

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

	BY	DATE
DESIGN	D. MARTINEZ	05/18/07
DESIGN CHK.	L. POTTER	05/18/07
PLANS	D. MARTINEZ	05/18/07
PLANS CHK.	M. FOUNTAIN	05/18/07

SHEET 12

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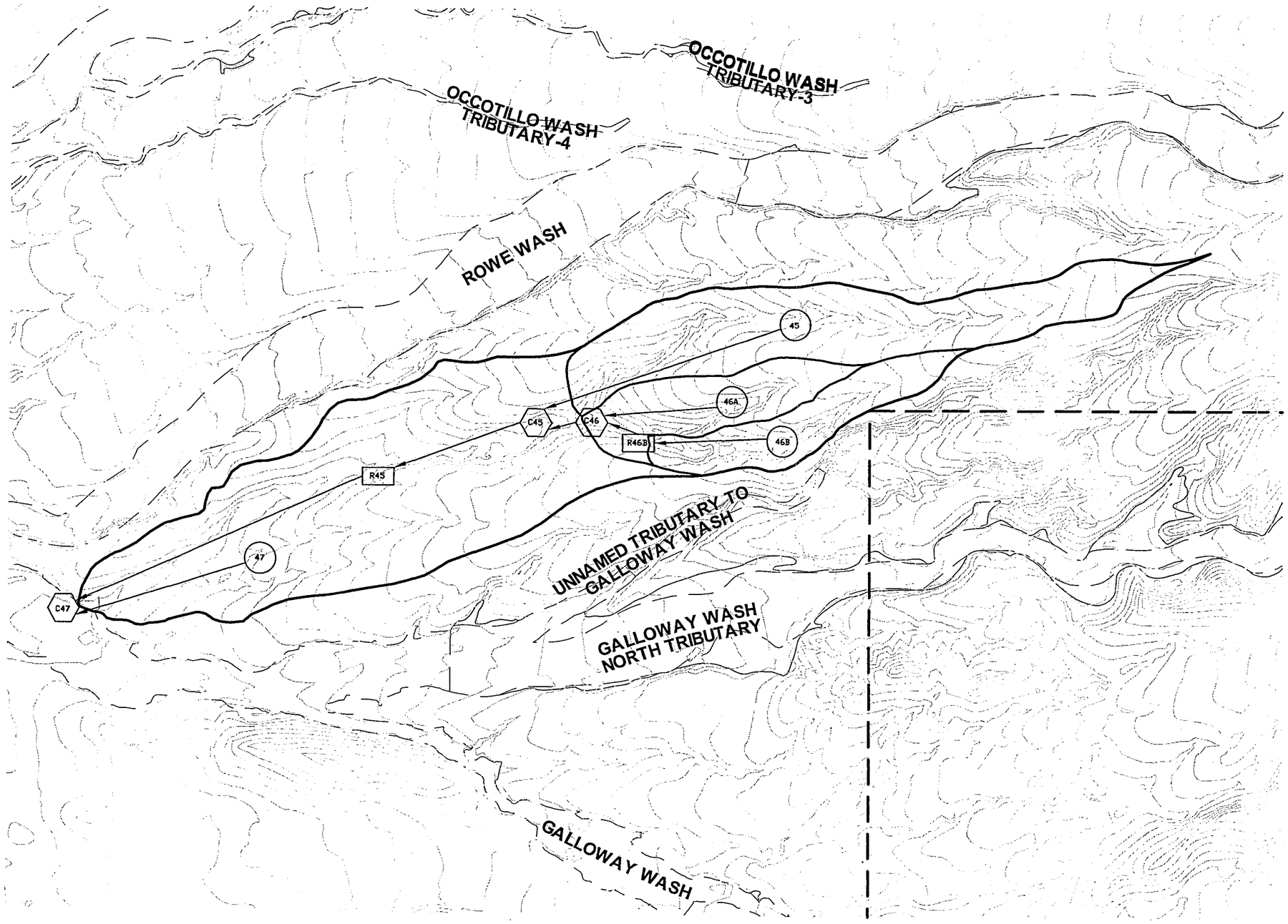
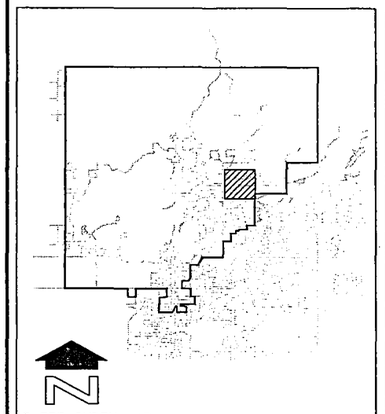


LEGEND

DMP BOUNDARY	
NEW HYDROLOGY	
SUBBASIN	13
CONCENTRATION POINT	C19C
ROUTING	R19C



SHEET INDEX MAP

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

HEC-1 SCHEMATIC

400' 0' 400' 800'

SCALE: 1"= 400 FEET
CONTOUR INTERVAL = 10'
COOPER AERIAL SURVEY'S COMPANY
FLIGHT DATES: November 2003 through December 2005

PRELIMINARY NOT FOR CONSTRUCTION

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

	BY	DATE
DESIGN	D. MARTINEZ	05/18/07
DESIGN CHK.	L. POTTER	05/18/07
PLANS	D. MARTINEZ	05/18/07
PLANS CHK.	M. FOUNTAIN	05/18/07

SHEET 13

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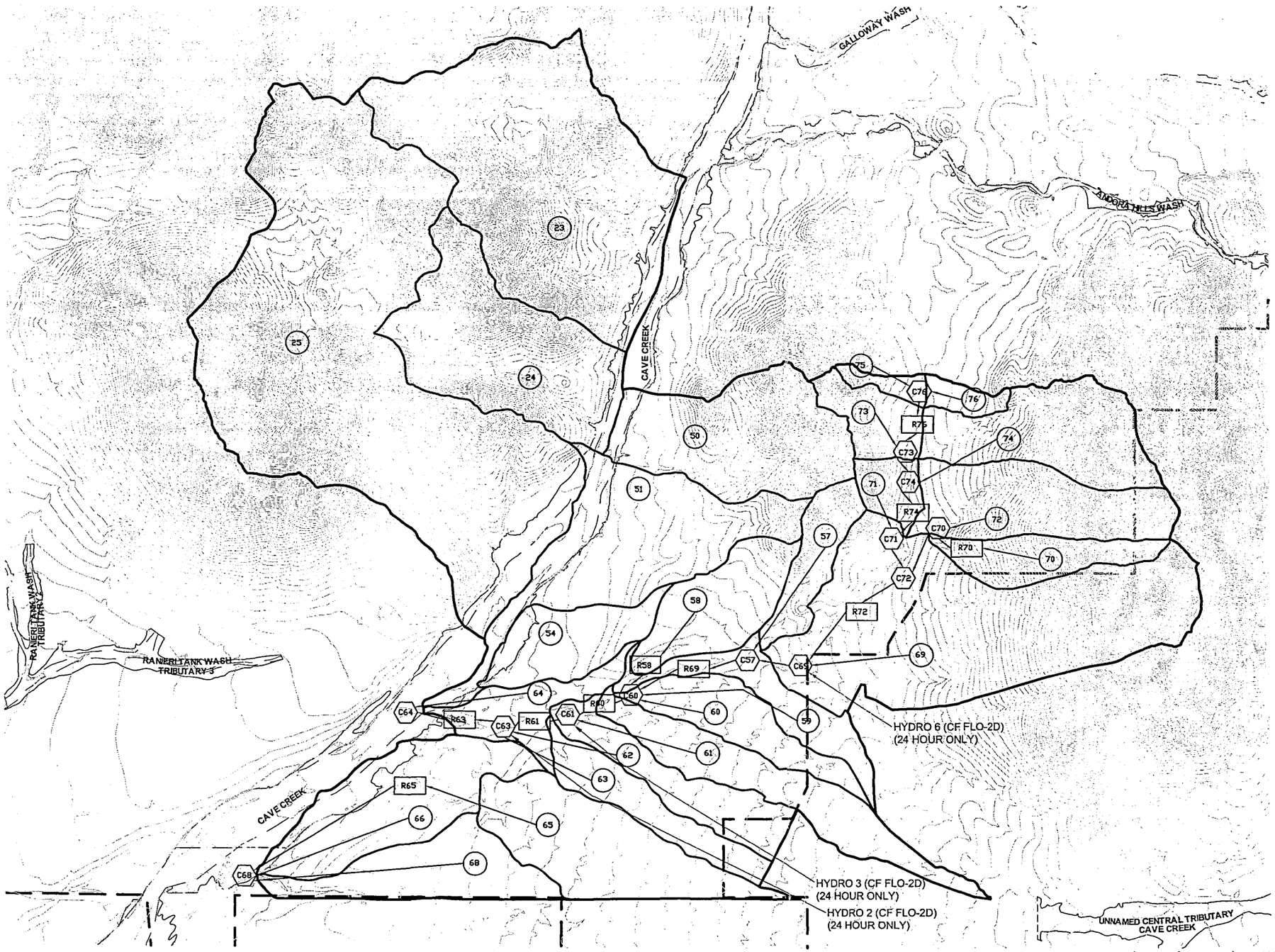
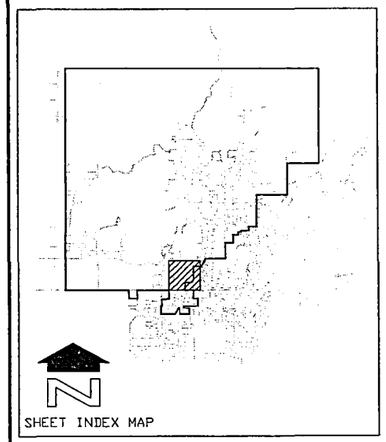


LEGEND

DMP BOUNDARY	
NEW HYDROLOGY	
SUBBASIN	13
CONCENTRATION POINT	C19C
ROUTING	R19C



NO.	REVISION	BY	DATE
2			
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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

HEC-1 SCHEMATIC

PRELIMINARY NOT FOR CONSTRUCTION

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

	BY	DATE
DESIGN	D. MARTINEZ	05/18/07
DESIGN CHK.	L. POTTER	05/18/07
PLANS	D. MARTINEZ	05/18/07
PLANS CHK.	M. FOUNTAIN	05/18/07

SHEET 14

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            VERSION 4.1                  *
*                                       *
*  RUN DATE   20JUL07  TIME  06:28:59   *
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*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
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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


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

  1           ID   Project ID: 40933-EWEST6HR - Major Basin: 01 - Return Period: 100 Years
  2           ID
  3           ID   CAVECREEK DRAINAGE MASTER PLAN
  4           ID   HYDROLOGY OF UNDELINEATED AREAS WEST OF CAVE CREEK.
  5           ID   FCD CONTRACT #2004C072
  6           ID   PREPARED FOR FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
  7           ID   PREPARED BY HDR ENGINEERING-JULY 2007
  8           ID   FILE NAME: EW100-6.DAT
  9           ID
 10           ID   ******************************************************************************
 11           ID   100-YEAR, 6-HOUR STORM EVENT
 12           ID   MULTIPLE STORM EVENT
 13           ID   GREEN-AMPT LOSS METHOD, CLARK UNIT HYDROGRAPH
 14           ID   EXISTING LAND USE FROM AERIAL PHOTOGRAPHY
 15           ID   ******************************************************************************
 16           ID
 17           ID
 18           ID
              *DIAGRAM
 19           IT       2                    2000
 20           IO       3
 21           IN      15
 22           JD    3.40    0.01
 23           PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
 24           PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
 25           PC   0.962   0.972   0.983   0.991   1.000
 26           JD   3.378    0.50
 27           PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
 28           PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
 29           PC   0.962   0.972   0.983   0.991   1.000
 30           JD   3.314    2.80
 31           PC   0.000   0.009   0.016   0.025   0.034   0.042   0.051   0.059   0.067   0.076
 32           PC   0.087   0.100   0.120   0.163   0.252   0.451   0.694   0.837   0.900   0.938
 33           PC   0.950   0.963   0.975   0.988   1.000
 34           JD   3.135    16.0
 35           PC   0.000   0.015   0.020   0.030   0.048   0.063   0.076   0.090   0.105   0.119
 36           PC   0.135   0.152   0.175   0.222   0.304   0.472   0.670   0.796   0.868   0.912
 37           PC   0.946   0.960   0.973   0.987   1.000
 38           JD   2.761    90.0
 39           PC   0.000   0.021   0.035   0.051   0.071   0.087   0.105   0.125   0.143   0.160
 40           PC   0.179   0.201   0.232   0.281   0.364   0.500   0.658   0.773   0.841   0.888
 41           PC   0.927   0.945   0.964   0.982   1.000
 42           JD   1.938   500.0
 43           PC   0.000   0.024   0.043   0.059   0.078   0.098   0.119   0.141   0.162   0.186
 44           PC   0.212   0.239   0.271   0.321   0.408   0.515   0.627   0.735   0.814   0.864
 45           PC   0.907   0.930   0.954   0.977   1.000

 46           KK  SUB-23   BASIN
 47           BA   0.523
 48           LG    0.31    0.20    7.00    0.11      32
 49           UC   0.292   0.187
 50           UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 51           UA     100
```

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

  52          KK  SUB-24   BASIN
  53          BA   0.267
  54          LG    0.35    0.24    7.00    0.12      28
  55          UC   0.263   0.218
  56          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
  57          UA     100

  58          KK  SUB-25   BASIN
  59          BA   0.937
  60          LG    0.35    0.35    7.00    0.12      28
  61          UC   0.363   0.236
  62          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
  63          UA     100
  64          ZZ
1
              SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
 LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

   46      SUB-23
                .
                .
   52           .      SUB-24
                .          .
                .          .
   58           .          .      SUB-25

1
                                   RUNOFF SUMMARY
                            FLOW IN CUBIC FEET PER SECOND
                          TIME IN HOURS,  AREA IN SQUARE MILES

                                     PEAK   TIME OF    AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN    MAXIMUM    TIME OF
        OPERATION        STATION     FLOW    PEAK                                          AREA     STAGE    MAX STAGE
+                                                        6-HOUR      24-HOUR      72-HOUR
        HYDROGRAPH AT
+                        SUB-23     1419.   4.17         140.         35.          13.       .52
        HYDROGRAPH AT
+                        SUB-24      683.   4.13          68.         17.           6.       .27
        HYDROGRAPH AT
+                        SUB-25     1891.   4.20         225.         56.          20.       .94

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

```
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   20JUL07  TIME  06:30:17   *                    *           (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   Project ID: 40933-EWEST24HR - Major Basin: 01 - Return Period: 100 Years
  2           ID
  3           ID   CAVECREEK DRAINAGE MASTER PLAN
  4           ID   HYDROLOGY OF UNDELINEATED AREAS WEST OF CAVE CREEK.
  5           ID   FCD CONTRACT #2004C072
  6           ID   PREPARED FOR FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
  7           ID   PREPARED BY HDR ENGINEERING-JULY 2007
  8           ID   FILE NAME: EW100-24.DAT
  9           ID
 10           ID   ******************************************************************************
 11           ID   100-YEAR, 24-HOUR STORM EVENT
 12           ID   MULTIPLE STORM EVENT
 13           ID   GREEN-AMPT LOSS METHOD, CLARK UNIT HYDROGRAPH
 14           ID   EXISTING LAND USE FROM AERIAL PHOTOGRAPHY
 15           ID   ******************************************************************************
 16           ID
 17           ID
 18           ID
              *DIAGRAM
 19           IT       2                    2000
 20           IO       3
 21           IN      15
 22           JD    4.60    0.01
 23           PC   0.000   0.002   0.005   0.008   0.011   0.014   0.017   0.020   0.023   0.026
 24           PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056   0.060
 25           PC   0.064   0.068   0.072   0.076   0.080   0.085   0.090   0.095   0.100   0.105
 26           PC   0.110   0.115   0.120   0.126   0.133   0.140   0.147   0.155   0.163   0.172
 27           PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
 28           PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
 29           PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
 30           PC   0.913   0.918   0.922   0.926   0.930   0.934   0.938   0.942   0.946   0.950
 31           PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977   0.980
 32           PC   0.983   0.986   0.989   0.992   0.995   0.998   1.000
 33           JD   4.324   10.00
 34           JD   4.140   30.00
 35           JD   3.956   60.00
 36           JD   3.892   90.00
 37           JD   3.836  120.00
 38           JD   3.795  150.00
 39           JD   3.680  300.00
 40           JD   3.588  500.00

 41           KK  SUB-23   BASIN
 42           BA   0.523
 43           LG    0.31    0.20    7.00    0.11      32
 44           UC   0.292   0.187
 45           UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 46           UA     100

 47           KK  SUB-24   BASIN
 48           BA   0.267
 49           LG    0.35    0.24    7.00    0.12      28
 50           UC   0.263   0.218
 51           UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
```

```
          52          UA     100
1                                                HEC-1 INPUT                                                    PAGE  2

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

          53          KK  SUB-25   BASIN
          54          BA   0.937
          55          LG    0.35    0.35    7.00    0.12      28
          56          UC   0.363   0.236
          57          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
          58          UA     100
          59          ZZ
1
                 SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

    41      SUB-23
                 .
                 .
    47           .      SUB-24
                 .          .
                 .          .
    53           .          .      SUB-25

1
                                          RUNOFF SUMMARY
                                     FLOW IN CUBIC FEET PER SECOND
                                   TIME IN HOURS,  AREA IN SQUARE MILES

                                          PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION        STATION       FLOW    PEAK                                            AREA      STAGE     MAX STAGE
+                                                            6-HOUR      24-HOUR      72-HOUR
          HYDROGRAPH AT
+                          SUB-23       1158.   12.17        128.         38.          14.        .52
          HYDROGRAPH AT
+                          SUB-24        558.   12.13         62.         18.           7.        .27
          HYDROGRAPH AT
+                          SUB-25       1780.   12.20        205.         60.          22.        .94

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

```
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   20JUL07  TIME  07:56:12   *                    *          (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   Project ID: 40933-FWEST6HR - Major Basin: 01 - Return Period: 100 Years
          2           ID
          3           ID   CAVECREEK DRAINAGE MASTER PLAN
          4           ID   HYDROLOGY OF UNDELINEATED AREAS WEST OF CAVE CREEK.
          5           ID   FCD CONTRACT #2004C072
          6           ID   PREPARED FOR FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
          7           ID   PREPARED BY HDR ENGINEERING-JULY 2007
          8           ID   FILE NAME: FW100-6.DAT
          9           ID
         10           ID   ******************************************************************************
         11           ID   100-YEAR, 6-HOUR STORM EVENT
         12           ID   MULTIPLE STORM EVENT
         13           ID   GREEN-AMPT LOSS METHOD, CLARK UNIT HYDROGRAPH
         14           ID   FUTURE LAND USE FROM ZONING MAP
         15           ID   ******************************************************************************
         16           ID
         17           ID
         18           ID
                      *DIAGRAM
         19           IT       2                    2000
         20           IO       3
         21           IN      15
         22           JD    3.40    0.01
         23           PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
         24           PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
         25           PC   0.962   0.972   0.983   0.991   1.000
         26           JD   3.378    0.50
         27           PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
         28           PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
         29           PC   0.962   0.972   0.983   0.991   1.000
         30           JD   3.314    2.80
         31           PC   0.000   0.009   0.016   0.025   0.034   0.042   0.051   0.059   0.067   0.076
         32           PC   0.087   0.100   0.120   0.163   0.252   0.451   0.694   0.837   0.900   0.938
         33           PC   0.950   0.963   0.975   0.988   1.000
         34           JD   3.135    16.0
         35           PC   0.000   0.015   0.020   0.030   0.048   0.063   0.076   0.090   0.105   0.119
         36           PC   0.135   0.152   0.175   0.222   0.304   0.472   0.670   0.796   0.868   0.912
         37           PC   0.946   0.960   0.973   0.987   1.000
         38           JD   2.761    90.0
         39           PC   0.000   0.021   0.035   0.051   0.071   0.087   0.105   0.125   0.143   0.160
         40           PC   0.179   0.201   0.232   0.281   0.364   0.500   0.658   0.773   0.841   0.888
         41           PC   0.927   0.945   0.964   0.982   1.000
         42           JD   1.938   500.0
         43           PC   0.000   0.024   0.043   0.059   0.078   0.098   0.119   0.141   0.162   0.186
         44           PC   0.212   0.239   0.271   0.321   0.408   0.515   0.627   0.735   0.814   0.864
         45           PC   0.907   0.930   0.954   0.977   1.000

         46           KK  SUB-23   BASIN
         47           BA   0.523
         48           LG    0.31    0.20    7.00    0.11      32
         49           UC   0.283   0.181
         50           UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
         51           UA     100
                                                HEC-1 INPUT                                                    PAGE  2
```

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

  52          KK  SUB-24   BASIN
  53          BA   0.267
  54          LG    0.32    0.24    7.00    0.11      31
  55          UC   0.246   0.203
  56          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
  57          UA     100

  58          KK  SUB-25   BASIN
  59          BA   0.937
  60          LG    0.34    0.35    7.00    0.12      28
  61          UC   0.383   0.252
  62          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
  63          UA     100
  64          ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

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

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

   46      SUB-23
                .
                .
   52           .      SUB-24
                .           .
                .           .
   58           .           .      SUB-25
```

1

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	SUB-23	1435.	4.17	140.	35.	13.	.52		
+	HYDROGRAPH AT	SUB-24	718.	4.13	70.	18.	6.	.27		
+	HYDROGRAPH AT	SUB-25	1844.	4.23	225.	56.	20.	.94		

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

```
1*****************************************
*                                       *
     FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
              JUN   1998                 *
            VERSION 4.1                  *
*                                       *
*  RUN DATE   20JUL07  TIME  07:56:58   *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (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   Project ID: 40933-FWEST24HR - Major Basin: 01 - Return Period: 100 Years
  2           ID
  3           ID   CAVECREEK DRAINAGE MASTER PLAN
  4           ID   HYDROLOGY OF UNDELINEATED AREAS WEST OF CAVE CREEK.
  5           ID   FCD CONTRACT #2004C072
  6           ID   PREPARED FOR FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
  7           ID   PREPARED BY HDR ENGINEERING-JULY 2007
  8           ID   FILE NAME: FW100-24.DAT
  9           ID
 10           ID   ******************************************************************************
 11           ID   100-YEAR, 24-HOUR STORM EVENT
 12           ID   MULTIPLE STORM EVENT
 13           ID   GREEN-AMPT LOSS METHOD, CLARK UNIT HYDROGRAPH
 14           ID   FUTURE LAND USE FROM ZONING MAP
 15           ID   ******************************************************************************
 16           ID
 17           ID
 18           ID
              *DIAGRAM
 19           IT       2                    2000
 20           IO       3
 21           IN      15
 22           JD    4.60    0.01
 23           PC   0.000   0.002   0.005   0.008   0.011   0.014   0.017   0.020   0.023   0.026
 24           PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056   0.060
 25           PC   0.064   0.068   0.072   0.076   0.080   0.085   0.090   0.095   0.100   0.105
 26           PC   0.110   0.115   0.120   0.126   0.133   0.140   0.147   0.155   0.163   0.172
 27           PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
 28           PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
 29           PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
 30           PC   0.913   0.918   0.922   0.926   0.930   0.934   0.938   0.942   0.946   0.950
 31           PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977   0.980
 32           PC   0.983   0.986   0.989   0.992   0.995   0.998   1.000
 33           JD   4.324   10.00
 34           JD   4.140   30.00
 35           JD   3.956   60.00
 36           JD   3.892   90.00
 37           JD   3.836  120.00
 38           JD   3.795  150.00
 39           JD   3.680  300.00
 40           JD   3.588  500.00

 41           KK  SUB-23   BASIN
 42           BA   0.523
 43           LG    0.31    0.20    7.00    0.11      32
 44           UC   0.283   0.181
 45           UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 46           UA     100

 47           KK  SUB-24   BASIN
 48           BA   0.267
 49           LG    0.32    0.24    7.00    0.11      31
 50           UC   0.246   0.203
 51           UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
```

```
          52          UA     100
1                                                HEC-1 INPUT                                                          PAGE  2

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

          53          KK  SUB-25   BASIN
          54          BA   0.937
          55          LG    0.34    0.35    7.00    0.12      28
          56          UC   0.383   0.252
          57          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
          58          UA     100
          59          ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

    41      SUB-23
                 .
                 .
    47           .      SUB-24
                 .           .
                 .           .
    53           .           .     SUB-25
```

1

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	SUB-23	1170.	12.17	128.	38.	14.	.52		
+	HYDROGRAPH AT	SUB-24	584.	12.13	64.	19.	7.	.27		
+	HYDROGRAPH AT	SUB-25	1728.	12.23	206.	60.	22.	.94		

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

```
1*****************************************
 *                                       *
     FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
               JUN   1998                *
             VERSION 4.1                 *
 *                                       *
 *  RUN DATE   24JUL07  TIME  06:41:28   *
 *                                       *
 *****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (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


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

  1           ID   Project ID: 40933-EEAST6HR - Major Basin: 01 - Return Period: 100 Years
  2           ID
  3           ID   CAVECREEK DRAINAGE MASTER PLAN
  4           ID   HYDROLOGY OF UNDELINEATED AREAS EAST OF CAVE CREEK.
  5           ID   FCD CONTRACT #2004C072
  6           ID   PREPARED FOR FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
  7           ID   PREPARED BY HDR ENGINEERING-JULY 2007
  8           ID   FILE NAME: EE100-6.DAT
  9           ID
 10           ID   ******************************************************************************
 11           ID   100-YEAR, 6-HOUR STORM EVENT
 12           ID   MULTIPLE STORM EVENT
 13           ID   GREEN-AMPT LOSS METHOD, CLARK UNIT HYDROGRAPH
 14           ID   EXISTING LAND USE FROM AERIAL PHOTOGRAPHY
 15           ID   ******************************************************************************
 16           ID
 17           ID
 18           ID
              *DIAGRAM
 19           IT       2                    2000
 20           IO       3
 21           IN      15
 22           JD    3.40    0.01
 23           PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
 24           PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
 25           PC   0.962   0.972   0.983   0.991   1.000
 26           JD   3.378    0.50
 27           PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
 28           PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
 29           PC   0.962   0.972   0.983   0.991   1.000
 30           JD   3.314    2.80
 31           PC   0.000   0.009   0.016   0.025   0.034   0.042   0.051   0.059   0.067   0.076
 32           PC   0.087   0.100   0.120   0.163   0.252   0.451   0.694   0.837   0.900   0.938
 33           PC   0.950   0.963   0.975   0.988   1.000
 34           JD   3.135    16.0
 35           PC   0.000   0.015   0.020   0.030   0.048   0.063   0.076   0.090   0.105   0.119
 36           PC   0.135   0.152   0.175   0.222   0.304   0.472   0.670   0.796   0.868   0.912
 37           PC   0.946   0.960   0.973   0.987   1.000
 38           JD   2.761    90.0
 39           PC   0.000   0.021   0.035   0.051   0.071   0.087   0.105   0.125   0.143   0.160
 40           PC   0.179   0.201   0.232   0.281   0.364   0.500   0.658   0.773   0.841   0.888
 41           PC   0.927   0.945   0.964   0.982   1.000
 42           JD   1.938   500.0
 43           PC   0.000   0.024   0.043   0.059   0.078   0.098   0.119   0.141   0.162   0.186
 44           PC   0.212   0.239   0.271   0.321   0.408   0.515   0.627   0.735   0.814   0.864
 45           PC   0.907   0.930   0.954   0.977   1.000

 46           KK  SUB-50   BASIN
 47           BA   0.220
 48           LG    0.35    0.35    6.60    0.14      24
 49           UC   0.225   0.154
 50           UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 51           UA     100
```

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

  52          KK  SUB-51   BASIN
  53          BA   0.253
  54          LG    0.33    0.31    4.55    0.34       6
  55          UC   0.338   0.350
  56          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
  57          UA     100

  58          KK  SUB-54   BASIN
  59          BA   0.094
  60          LG    0.30    0.13   10.10    0.03       5
  61          UC   0.279   0.283
  62          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
  63          UA     100

  64          KK  SUB-65   BASIN
  65          BA   0.184
  66          LG    0.31    0.19    8.00    0.08       6
  67          UC   0.367   0.352
  68          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
  69          UA     100

  70          KK     R65   ROUTE   BASIN
  71          RS       9    FLOW      -1
  72          RC   0.053   0.045   0.053    4576  0.0131  924.00
  73          RX     0.0    10.3    19.3    25.9    32.9    53.6    89.4   104.0
  74          RY   924.0   922.0   920.0   918.0   918.0   920.0   922.0   924.0

  75          KK  SUB-66   BASIN
  76          BA   0.183
  77          LG    0.33    0.15    8.80    0.06       2
  78          UC   0.417   0.406
  79          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
  80          UA     100

  81          KK  SUB-68   BASIN
  82          BA   0.123
  83          LG    0.32    0.13   10.10    0.03       3
  84          UC   0.367   0.411
  85          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
  86          UA     100

  87          KK     C68
  88          KM   COMBINE R65, SUB-66, AND SUB-68
  89          HC       3
  90          ZZ
1
            SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
 LINE     (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

   46     SUB-50
               .
   52          .      SUB-51
               .          .
   58          .          .      SUB-54
               .          .          .
   64          .          .          .      SUB-65
               .          .          .           V
               .          .          .           V
   70          .          .          .         R65
               .          .          .           .
               .          .          .           .
   75          .          .          .           .      SUB-66
               .          .          .           .           .
               .          .          .           .           .
   81          .          .          .           .           .      SUB-68
               .          .          .           .           .           .
               .          .          .           .           .           .
   87          .          .          .         C68.......................

1
                                    RUNOFF SUMMARY
                              FLOW IN CUBIC FEET PER SECOND
                            TIME IN HOURS,  AREA IN SQUARE MILES

                                        PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN    MAXIMUM    TIME OF
      OPERATION        STATION          FLOW    PEAK                                          AREA     STAGE     MAX STAGE
+                                                          6-HOUR      24-HOUR      72-HOUR

      HYDROGRAPH AT
+                      SUB-50           624.    4.10        52.          13.           5.       .22
```

+	HYDROGRAPH AT	SUB-51	433.	4.20	46.	12.	4.	.25
.	HYDROGRAPH AT	SUB-54	228.	4.17	26.	6.	2.	.09
+	HYDROGRAPH AT	SUB-65	372.	4.23	45.	11.	4.	.18
+	ROUTED TO	R65	354.	4.40	45.	11.	4.	.18
+	HYDROGRAPH AT	SUB-66	345.	4.27	46.	11.	4.	.18
+	HYDROGRAPH AT	SUB-68	242.	4.23	33.	8.	3.	.12
+	3 COMBINED AT	C68	873.	4.33	123.	31.	11.	.49

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

```
1*****************************************
 *                                       *
     FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
               JUN   1998                *
             VERSION 4.1                 *
 *                                       *
 *  RUN DATE   24JUL07  TIME  06:43:38   *
 *                                       *
 *****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (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


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

  1           ID   Project ID: 40933-EEAST24HR - Major Basin: 01 - Return Period: 100 Years
  2           ID
  3           ID   CAVECREEK DRAINAGE MASTER PLAN
  4           ID   HYDROLOGY OF UNDELINEATED AREAS EAST OF CAVE CREEK.
  5           ID   FCD CONTRACT #2004C072
  6           ID   PREPARED FOR FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
  7           ID   PREPARED BY HDR ENGINEERING-JULY 2007
  8           ID   FILE NAME: EE100-24.DAT
  9           ID
 10           ID   ******************************************************************************
 11           ID   100-YEAR, 24-HOUR STORM EVENT
 12           ID   MULTIPLE STORM EVENT
 13           ID   GREEN-AMPT LOSS METHOD, CLARK UNIT HYDROGRAPH
 14           ID   EXISTING LAND USE FROM AERIAL PHOTOGRAPHY
 15           ID   ******************************************************************************
 16           ID
 17           ID
 18           ID
              *DIAGRAM
 19           IT       2                    2000
 20           IO       3
 21           IN      15
 22           JD    4.60    0.01
 23           PC   0.000   0.002   0.005   0.008   0.011   0.014   0.017   0.020   0.023   0.026
 24           PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056   0.060
 25           PC   0.064   0.068   0.072   0.076   0.080   0.085   0.090   0.095   0.100   0.105
 26           PC   0.110   0.115   0.120   0.126   0.133   0.140   0.147   0.155   0.163   0.172
 27           PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
 28           PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
 29           PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
 30           PC   0.913   0.918   0.922   0.926   0.930   0.934   0.938   0.942   0.946   0.950
 31           PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977   0.980
 32           PC   0.983   0.986   0.989   0.992   0.995   0.998   1.000
 33           JD   4.324   10.00
 34           JD   4.140   30.00
 35           JD   3.956   60.00
 36           JD   3.892   90.00
 37           JD   3.836  120.00
 38           JD   3.795  150.00
 39           JD   3.680  300.00
 40           JD   3.588  500.00

 41           KK  SUB-50   BASIN
 42           BA   0.220
 43           LG    0.35    0.35    6.60    0.14      24
 44           UC   0.225   0.154
 45           UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 46           UA     100

 47           KK  SUB-51   BASIN
 48           BA   0.253
 49           LG    0.33    0.31    4.55    0.34       6
 50           UC   0.338   0.350
 51           UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
```

```
 52          UA     100

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

 53          KK  SUB-54   BASIN
 54          BA   0.094
 55          LG    0.30    0.13   10.10    0.03       5
 56          UC   0.279   0.283
 57          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 58          UA     100

 59          KK  SUB-65   BASIN
 60          BA   0.184
 61          LG    0.31    0.19    8.00    0.08       6
 62          UC   0.367   0.352
 63          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 64          UA     100

 65          KK     R65   ROUTE   BASIN
 66          RS       9    FLOW      -1
 67          RC   0.053   0.045   0.053    4576  0.0131 1924.00
 68          RX     0.0    10.3    19.3    25.9    32.9    53.6    89.4   104.0
 69          RY   924.0   922.0   920.0   918.0   918.0   920.0   922.0   924.0

 70          KK  SUB-66   BASIN
 71          BA   0.183
 72          LG    0.33    0.15    8.80    0.06       2
 73          UC   0.417   0.406
 74          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 75          UA     100

 76          KK  SUB-68   BASIN
 77          BA   0.123
 78          LG    0.32    0.13   10.10    0.03       3
 79          UC   0.367   0.411
 80          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 81          UA     100

 82          KK     C68
 83          KM   COMBINE R65, SUB-66, AND SUB-68
 84          HC       3
 85          ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

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

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

   41     SUB-50
               .
               .
   47          .      SUB-51
               .          .
               .          .
   53          .          .      SUB-54
               .          .          .
               .          .          .
   59          .          .          .      SUB-65
               .          .          .          V
               .          .          .          V
   65          .          .          .         R65
               .          .          .          .
               .          .          .          .
   70          .          .          .          .      SUB-66
               .          .          .          .          .
               .          .          .          .          .
   76          .          .          .          .          .      SUB-68
               .          .          .          .          .          .
               .          .          .          .          .          .
   82          .          .          .         C68.......................
```

1

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	SUB-50	510.	12.10	47.	14.	5.	.22		
+	HYDROGRAPH AT	SUB-51	356.	12.20	39.	10.	4.	.25		
+	HYDROGRAPH AT	SUB-54	187.	12.17	27.	7.	3.	.09		

	HYDROGRAPH AT	SUB-65	306.	12.23	42.	11.	4.	.18
+	ROUTED TO	R65	306.	12.27	42.	11.	4.	.18
+	HYDROGRAPH AT	SUB-66	285.	12.27	45.	11.	4.	.18
+	HYDROGRAPH AT	SUB-68	199.	12.23	35.	9.	3.	.12
+	3 COMBINED AT	C68	778.	12.27	120.	31.	11.	.49

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

```
1*****************************************
 *                                       *
     FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
               JUN   1998                *
             VERSION 4.1                 *
 *                                       *
 *  RUN DATE   24JUL07  TIME  06:48:42   *
 *                                       *
 *****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (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


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

  1           ID   Project ID: 40933-FEAST6HR - Major Basin: 01 - Return Period: 100 Years
  2           ID
  3           ID   CAVECREEK DRAINAGE MASTER PLAN
  4           ID   HYDROLOGY OF UNDELINEATED AREAS EAST OF CAVE CREEK.
  5           ID   FCD CONTRACT #2004C072
  6           ID   PREPARED FOR FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
  7           ID   PREPARED BY HDR ENGINEERING-JULY 2007
  8           ID   FILE NAME: FE100-6.DAT
  9           ID
 10           ID   ******************************************************************************
 11           ID   100-YEAR, 6-HOUR STORM EVENT
 12           ID   MULTIPLE STORM EVENT
 13           ID   GREEN-AMPT LOSS METHOD, CLARK UNIT HYDROGRAPH
 14           ID   FUTURE LAND USE FROM ZONING MAP
 15           ID   ******************************************************************************
 16           ID
 17           ID
 18           ID
              *DIAGRAM
 19           IT       2                    2000
 20           IO       3
 21           IN      15
 22           JD    3.40    0.01
 23           PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
 24           PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
 25           PC   0.962   0.972   0.983   0.991   1.000
 26           JD   3.378    0.50
 27           PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
 28           PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
 29           PC   0.962   0.972   0.983   0.991   1.000
 30           JD   3.314    2.80
 31           PC   0.000   0.009   0.016   0.025   0.034   0.042   0.051   0.059   0.067   0.076
 32           PC   0.087   0.100   0.120   0.163   0.252   0.451   0.694   0.837   0.900   0.938
 33           PC   0.950   0.963   0.975   0.988   1.000
 34           JD   3.135    16.0
 35           PC   0.000   0.015   0.020   0.030   0.048   0.063   0.076   0.090   0.105   0.119
 36           PC   0.135   0.152   0.175   0.222   0.304   0.472   0.670   0.796   0.868   0.912
 37           PC   0.946   0.960   0.973   0.987   1.000
 38           JD   2.761    90.0
 39           PC   0.000   0.021   0.035   0.051   0.071   0.087   0.105   0.125   0.143   0.160
 40           PC   0.179   0.201   0.232   0.281   0.364   0.500   0.658   0.773   0.841   0.888
 41           PC   0.927   0.945   0.964   0.982   1.000
 42           JD   1.938   500.0
 43           PC   0.000   0.024   0.043   0.059   0.078   0.098   0.119   0.141   0.162   0.186
 44           PC   0.212   0.239   0.271   0.321   0.408   0.515   0.627   0.735   0.814   0.864
 45           PC   0.907   0.930   0.954   0.977   1.000

 46           KK  SUB-50   BASIN
 47           BA   0.220
 48           LG    0.30    0.19    6.60    0.13      29
 49           UC   0.221   0.151
 50           UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 51           UA     100
```

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

 52           KK  SUB-51   BASIN
 53           BA   0.253
 54           LG    0.30    0.33    4.55    0.32       9
 55           UC   0.329   0.340
 56           UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 57           UA     100

 58           KK  SUB-54   BASIN
 59           BA   0.094
 60           LG    0.30    0.13   10.10    0.03       5
 61           UC   0.275   0.279
 62           UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 63           UA     100

 64           KK  SUB-65   BASIN
 65           BA   0.184
 66           LG    0.29    0.15    8.00    0.08       8
 67           UC   0.350   0.334
 68           UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 69           UA     100

 70           KK     R65   ROUTE   BASIN
 71           RS       9    FLOW      -1
 72           RC   0.053   0.045   0.053    4576  0.0131  924.00
 73           RX     0.0    10.3    19.3    25.9    32.9    53.6    89.4   104.0
 74           RY   924.0   922.0   920.0   918.0   918.0   920.0   922.0   924.0

 75           KK  SUB-66   BASIN
 76           BA   0.183
 77           LG    0.30    0.15    8.80    0.06       5
 78           UC   0.413   0.402
 79           UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 80           UA     100

 81           KK  SUB-68   BASIN
 82           BA   0.123
 83           LG    0.30    0.13   10.10    0.03       6
 84           UC   0.358   0.400
 85           UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 86           UA     100

 87           KK     C68
 88           KM   COMBINE R65, SUB-66, AND SUB-68
 89           HC       3
 90           ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

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

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

   46     SUB-50
               .
               .
   52          .      SUB-51
               .           .
               .           .
   58          .           .      SUB-54
               .           .           .
               .           .           .
   64          .           .           .      SUB-65
               .           .           .           V
               .           .           .           V
   70          .           .           .         R65
               .           .           .           .
               .           .           .           .
   75          .           .           .           .      SUB-66
               .           .           .           .           .
               .           .           .           .           .
   81          .           .           .           .           .      SUB-68
               .           .           .           .           .           .
               .           .           .           .           .           .
   87          .           .           .         C68.......................
```

1

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	SUB-50	656.	4.10	58.	15.	5.	.22		

	HYDROGRAPH AT	SUB-51	451.	4.20	48.	12.	4.	.25
+	HYDROGRAPH AT	SUB-54	230.	4.17	26.	6.	2.	.09
+	HYDROGRAPH AT	SUB-65	388.	4.23	46.	12.	4.	.18
+	ROUTED TO	R65	371.	4.40	46.	12.	4.	.18
+	HYDROGRAPH AT	SUB-66	349.	4.27	47.	12.	4.	.18
+	HYDROGRAPH AT	SUB-68	246.	4.23	34.	8.	3.	.12
+	3 COMBINED AT	C68	902.	4.33	127.	32.	11.	.49

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

```
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   24JUL07  TIME  06:50:32   *                                    *           (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   Project ID: 40933-FEAST24HR - Major Basin: 01 - Return Period: 100 Years
  2           ID
  3           ID   CAVECREEK DRAINAGE MASTER PLAN
  4           ID   HYDROLOGY OF UNDELINEATED AREAS EAST OF CAVE CREEK.
  5           ID   FCD CONTRACT #2004C072
  6           ID   PREPARED FOR FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
  7           ID   PREPARED BY HDR ENGINEERING-JULY 2007
  8           ID   FILE NAME: FE100-24.DAT
  9           ID
 10           ID   ******************************************************************************
 11           ID   100-YEAR, 24-HOUR STORM EVENT
 12           ID   MULTIPLE STORM EVENT
 13           ID   GREEN-AMPT LOSS METHOD, CLARK UNIT HYDROGRAPH
 14           ID   FUTURE LAND USE FROM ZONING MAP
 15           ID   ******************************************************************************
 16           ID
 17           ID
 18           ID
              *DIAGRAM
 19           IT       2                    2000
 20           IO       3
 21           IN      15
 22           JD    4.60    0.01
 23           PC   0.000   0.002   0.005   0.008   0.011   0.014   0.017   0.020   0.023   0.026
 24           PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056   0.060
 25           PC   0.064   0.068   0.072   0.076   0.080   0.085   0.090   0.095   0.100   0.105
 26           PC   0.110   0.115   0.120   0.126   0.133   0.140   0.147   0.155   0.163   0.172
 27           PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
 28           PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
 29           PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
 30           PC   0.913   0.918   0.922   0.926   0.930   0.934   0.938   0.942   0.946   0.950
 31           PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977   0.980
 32           PC   0.983   0.986   0.989   0.992   0.995   0.998   1.000
 33           JD   4.324   10.00
 34           JD   4.140   30.00
 35           JD   3.956   60.00
 36           JD   3.892   90.00
 37           JD   3.836  120.00
 38           JD   3.795  150.00
 39           JD   3.680  300.00
 40           JD   3.588  500.00

 41           KK  SUB-50   BASIN
 42           BA   0.220
 43           LG    0.30    0.19    6.60    0.13      29
 44           UC   0.221   0.151
 45           UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 46           UA     100

 47           KK  SUB-51   BASIN
 48           BA   0.253
 49           LG    0.30    0.33    4.55    0.32       9
 50           UC   0.329   0.340
 51           UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
```

```
 52          UA     100

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

 53          KK  SUB-54   BASIN
 54          BA   0.094
 55          LG    0.30    0.13   10.10    0.03       5
 56          UC   0.275   0.279
 57          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 58          UA     100

 59          KK  SUB-65   BASIN
 60          BA   0.184
 61          LG    0.29    0.15    8.00    0.08       8
 62          UC   0.350   0.334
 63          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 64          UA     100

 65          KK     R65   ROUTE   BASIN
 66          RS       9    FLOW      -1
 67          RC   0.053   0.045   0.053    4576  0.0131  924.00
 68          RX     0.0    10.3    19.3    25.9    32.9    53.6    89.4   104.0
 69          RY   924.0   922.0   920.0   918.0   918.0   920.0   922.0   924.0

 70          KK  SUB-66   BASIN
 71          BA   0.183
 72          LG    0.30    0.15    8.80    0.06       5
 73          UC   0.413   0.402
 74          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 75          UA     100

 76          KK  SUB-68   BASIN
 77          BA   0.123
 78          LG    0.30    0.13   10.10    0.03       6
 79          UC   0.358   0.400
 80          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 81          UA     100

 82          KK     C68
 83          KM   COMBINE R65, SUB-66, AND SUB-68
 84          HC       3
 85          ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

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

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

   41     SUB-50
               .
               .
   47          .      SUB-51
               .          .
               .          .
   53          .          .      SUB-54
               .          .          .
               .          .          .
   59          .          .          .      SUB-65
               .          .          .          V
               .          .          .          V
   65          .          .          .         R65
               .          .          .          .
               .          .          .          .
   70          .          .          .          .      SUB-66
               .          .          .          .          .
               .          .          .          .          .
   76          .          .          .          .          .      SUB-68
               .          .          .          .          .          .
               .          .          .          .          .          .
   82          .          .          .         C68.......................
```

1

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	SUB-50	533.	12.10	53.	15.	6.	.22		
+	HYDROGRAPH AT	SUB-51	370.	12.20	41.	11.	4.	.25		
+	HYDROGRAPH AT	SUB-54	188.	12.17	27.	7.	3.	.09		

	HYDROGRAPH AT	SUB-65	318.	12.23	44.	11.	4.	.18
+	ROUTED TO	R65	303.	12.40	44.	11.	4.	.18
+	HYDROGRAPH AT	SUB-66	287.	12.27	45.	12.	4.	.18
+	HYDROGRAPH AT	SUB-68	202.	12.23	35.	9.	3.	.12
+	3 COMBINED AT	C68	732.	12.33	123.	32.	12.	.49

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

```
1****************************************
*                                      *
    FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
              JUN   1998                *
            VERSION 4.1                 *
*                                      *
*  RUN DATE   25JUL07  TIME  08:01:36  *
*                                      *
****************************************
```

```
****************************************
*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET           *
*       DAVIS, CALIFORNIA 95616        *
*           (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


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

  1           ID   Project ID: 40933-E6HR - Major Basin: 01 - Return Period: 100 Years
  2           ID
  3           ID
  4           ID   CAVECREEK DRAINAGE MASTER PLAN
  5           ID   FLOODPLAIN DELINEATION STUDY OF CAVECREEK TRIBUTARIES, WILLOW SPRINGS WASH
  6           ID   TRIBUTARIES, GALLOWAY TRIBUTARIES, AND MORMAN GIRL WASH TRIBUTARIES.
  7           ID   FCD CONTRACT #2004C072
  8           ID   PREPARED FOR FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
  9           ID   PREPARED BY HDR ENGINEERING-July 2007
 10           ID   FILE NAME: E100-6.DAT
 11           ID
 12           ID   ******************************************************************************
 13           ID   100-YEAR, 6-HOUR STORM EVENT
 14           ID   MULTIPLE STORM EVENT
 15           ID   GREEN-AMPT LOSS METHOD, CLARK UNIT HYDROGRAPH
 16           ID   EXISTING LAND USE FROM AERIAL PHOTOGRAPHY
 17           ID   ******************************************************************************
 18           ID
 19           ID
 20           ID
 21           ID
              *DIAGRAM
 22           IT       2                    2000
 23           IO       3
 24           IN      15
 25           JD    3.40    0.01
 26           PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
 27           PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
 28           PC   0.962   0.972   0.983   0.991   1.000
 29           JD   3.378    0.50
 30           PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
 31           PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
 32           PC   0.962   0.972   0.983   0.991   1.000
 33           JD   3.314    2.80
 34           PC   0.000   0.009   0.016   0.025   0.034   0.042   0.051   0.059   0.067   0.076
 35           PC   0.087   0.100   0.120   0.163   0.252   0.451   0.694   0.837   0.900   0.938
 36           PC   0.950   0.963   0.975   0.988   1.000
 37           JD   3.135    16.0
 38           PC   0.000   0.015   0.020   0.030   0.048   0.063   0.076   0.090   0.105   0.119
 39           PC   0.135   0.152   0.175   0.222   0.304   0.472   0.670   0.796   0.868   0.912
 40           PC   0.946   0.960   0.973   0.987   1.000
 41           JD   2.761    90.0
 42           PC   0.000   0.021   0.035   0.051   0.071   0.087   0.105   0.125   0.143   0.160
 43           PC   0.179   0.201   0.232   0.281   0.364   0.500   0.658   0.773   0.841   0.888
 44           PC   0.927   0.945   0.964   0.982   1.000
 45           JD   1.938   500.0
 46           PC   0.000   0.024   0.043   0.059   0.078   0.098   0.119   0.141   0.162   0.186
 47           PC   0.212   0.239   0.271   0.321   0.408   0.515   0.627   0.735   0.814   0.864
 48           PC   0.907   0.930   0.954   0.977   1.000
```



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

```
 49          KK  SUB14B   BASIN
 50          BA   0.267
             *
 51          LG    0.35    0.35    7.00    0.12       0
 52          UC   0.313   0.300
 53          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 54          UA     100
             *

 55          KK  SUB14C   BASIN
 56          BA   0.458
 57          LG    0.35    0.32    7.60    0.10       1
 58          UC   0.279   0.218
 59          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 60          UA     100
             *

 61          KK    C14C
 62          KM   COMBINE SUB-14B, AND SUB-14C
 63          HC       2
             *

 64          KK    R14C   ROUTE   REACH
 65          RS       4    FLOW      -1
 66          RC   0.053   0.045   0.053    3270  0.0130  246.00
 67          RX     0.0     4.8     9.6    14.5    39.4    78.3    94.4   110.1
 68          RY   246.0   244.0   242.0   240.0   240.0   242.0   244.0   246.0
             *

 69          KK  SUB14A   BASIN
 70          BA   0.180
 71          LG    0.35    0.30    8.00    0.08       3
 72          UC   0.233   0.191
 73          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 74          UA     100
             *

 75          KK    C14A
 76          KM   COMBINE R14C AND SUB-14A
 77          HC       2
             *

 78          KK  SUB19A   BASIN
 79          BA   0.111
 80          LG    0.35    0.32    7.60    0.10      19
 81          UC   0.208   0.201
 82          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 83          UA     100
             *
```



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

 84          KK  SUB19B   BASIN
 85          BA   0.257
 86          LG    0.35    0.35    7.00    0.12      29
 87          UC   0.250   0.220
 88          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 89          UA     100
             *

 90          KK  SUB19C   BASIN
 91          BA   0.105
 92          LG    0.35    0.33    7.30    0.11      30
 93          UC   0.204   0.199
 94          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 95          UA     100
             *

 96          KK    C19C
 97          KM   COMBINE C14A, SUB-19A, SUB-19B, AND SUB-19C
 98          HC       4
             *

 99          KK    R19C   ROUTE   REACH
100          RS       5    FLOW      -1
101          RC   0.053   0.045   0.053    4116  0.0114  204.00
102          RX     0.0    47.6    66.1    87.7   106.8   112.7   131.1   138.9
103          RY   204.0   202.0   200.0   198.0   198.0   200.0   202.0   204.0
             *

104          KK  SUB-13   BASIN
105          BA   0.541
106          LG    0.35    0.37    5.20    0.25       4
107          UC   0.246   0.133
108          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
109          UA     100
             *

110          KK     C13
111          KM   COMBINE R19C AND SUB-13
```

```
 112          HC       2
              *

 113          KK  SUB-18   BASIN
 114          BA   0.385
 115          LG    0.35    0.33    7.30    0.11      30
 116          UC   0.271   0.204
 117          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 118          UA     100
              *
```



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

 119          KK     C18
 120          KM   COMBINE C13 AND SUB-18
 121          HC       2
              *

 122          KK     R18   ROUTE   REACH
 123          RS       2    FLOW      -1
 124          RC   0.053   0.045   0.053    2572  0.0233  146.00
 125          RX     0.0     2.6     5.9     9.9    20.8    24.7    27.3    30.4
 126          RY   146.0   144.0   142.0   140.0   140.0   142.0   144.0   146.0
              *

 127          KK  SUB12A   BASIN
 128          BA   0.089
 129          LG    0.34    0.35    6.60    0.14      21
 130          UC   0.200   0.200
 131          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 132          UA     100
              *

 133          KK    C12A
 134          KM   COMBINE R18 AND SUB12A
 135          HC       2
              *

 136          KK  SUB33E   BASIN
 137          BA   0.194
 138          LG    0.34    0.33    6.80    0.13      26
 139          UC   0.221   0.163
 140          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 141          UA     100
              *

 142          KK  SUB33F   BASIN
 143          BA   0.021
 144          LG    0.31    0.20    6.80    0.12       4
 145          UC   0.158   0.178
 146          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 147          UA     100
              *

 148          KK    R33F   ROUTE   BASIN
 149          RS       1    FLOW      -1
 150          RC   0.053   0.045   0.053     477  0.0168  192.00
 151          RX     0.0    15.0    30.0    40.5    41.5    52.5    73.7   108.0
 152          RY   192.0   191.0   190.0   188.0   188.0   190.0   190.2   192.0
              *

 153          KK    C33F
 154          KM   COMBINE R33F AND SUB33E
 155          HC       2
              *
```



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

 156          KK  SUB33D   BASIN
 157          BA   0.035
 158          LG    0.33    0.32    5.70    0.20       5
 159          UC   0.350   0.518
 160          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 161          UA     100
              *

 162          KK    C33D
 163          KM   COMBINE C33F AND SUB33D
 164          HC       2
              *

 165          KK    R33D   ROUTE   REACH
 166          RS       3    FLOW      -1
 167          RC   0.053   0.045   0.053    1637  0.0104  188.00
 168          RX     0.0    49.3    60.6    71.9    83.0   133.7   175.9   214.2
 169          RY   188.0   186.0   184.0   182.0   182.0   184.0   186.0   188.0
              *
```

```
170          KK  SUB33B   BASIN
171          BA   0.155
172          LG    0.32    0.22    7.30    0.10       3
173          UC   0.225   0.193
174          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
175          UA     100
             *

176          KK    C33B
177          KM   COMBINE R33D AND SUB 33B
178          HC       2
             *

179          KK  SUB33C   BASIN
180          BA   0.028
181          LG    0.31    0.15   10.10    0.03       4
182          UC   0.196   0.223
183          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
184          UA     100
             *

185          KK    C33C
186          KM   COMBINE C33B AND SUB33C
187          HC       2
             *

188          KK    R33C   ROUTE   REACH
189          RS       1    FLOW      -1
190          RC   0.053   0.045   0.053    1320  0.0159  158.00
191          RX     0.0     6.5    14.3    25.5    44.2    52.6    58.3    64.3
192          RY   158.0   156.0   154.0   152.0   152.0   154.0   156.0   158.0
             *
```

1 HEC-1 INPUT PAGE 6

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

193          KK  SUB33A   BASIN
194          BA   0.055
195          LG    0.31    0.20    7.00    0.11       7
196          UC   0.150   0.106
197          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
198          UA     100
             *

199          KK    C33A
200          KM   COMBINE R33C AND SUB33A
201          HC       2
             *
             *

202          KK  SUB46A   BASIN
203          BA   0.032
204          LG    0.34    0.31    7.00    0.12       1
205          UC   0.179   0.217
206          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
207          UA     100
             *

208          KK  SUB46B   BASIN
209          BA   0.031
210          LG    0.34    0.33    7.00    0.12       1
211          UC   0.196   0.276
212          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
213          UA     100
             *

214          KK    R46B   ROUTE   BASIN
215          RS       1    FLOW      -1
216          RC   0.053   0.045   0.053     564  0.0390  262.00
217          RX     0.0     8.2    16.6    27.9    50.0    57.9    65.9    73.0
218          RY   262.0   260.0   258.0   256.0   256.0   258.0   260.0   262.0
             *

219          KK     C46
220          KM   COMBINE R46B AND SUB46A
221          HC       2
             *

222          KK  SUB-45   BASIN
223          BA   0.088
224          LG    0.34    0.24    9.70    0.05       1
225          UC   0.267   0.363
226          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
227          UA     100
             *
```

1 HEC-1 INPUT PAGE 7

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

228          KK     C45
```

```
229          KM   COMBINE C46 AND SUB45
230          HC       2
             *

231          KK     R45   ROUTE   REACH
232          RS       9    FLOW      -1
233          RC   0.053   0.045   0.053    4898  0.0218  192.00
234          RX     0.0    26.3    64.2   107.1   146.4   157.7   166.9   176.3
235          RY   192.0   190.0   188.0   186.0   186.0   188.0   190.0   192.0
             *

236          KK  SUB-47   BASIN
237          BA   0.178
238          LG    0.32    0.29    5.40    0.21       3
239          UC   0.292   0.256
240          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
241          UA     100
             *

242          KK     C47
243          KM   COMBINE R45 AND SUB47
244          HC       2
             *
             *

245          KK  SUB-75   BASIN
246          BA   0.016
247          LG    0.35    0.40    6.00    0.18      13
248          UC   0.142   0.188
249          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
250          UA     100
             *

251          KK  SUB-76   BASIN
252          BA   0.020
253          LG    0.31    0.28    5.20    0.24       7
254          UC   0.146   0.171
255          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
256          UA     100
             *

257          KK     C76
258          KM   COMBINE SUB-75, AND SUB-76
259          HC       2
             *

260          KK     R76   ROUTE   REACH
261          RS       2    FLOW      -1
262          RC   0.053   0.045   0.053     919  0.0152  114.00
263          RX     0.0    44.9    63.2    67.9    71.3   107.2   136.4   159.2
264          RY   114.0   112.0   110.0   108.0   108.0   110.0   112.0   114.0
             *
```



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

265          KK  SUB-73   BASIN
266          BA   0.056
267          LG    0.34    0.36    6.60    0.15      24
268          UC   0.163   0.151
269          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
270          UA     100
             *

271          KK     C73
272          KM   COMBINE R76 AND SUB-73
273          HC       2
             *

274          KK  SUB-74   BASIN
275          BA   0.156
276          LG    0.32    0.28    6.80    0.14      31
277          UC   0.217   0.184
278          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
279          UA     100
             *

280          KK     C74
281          KM   COMBINE C73 AND SUB-74
282          HC       2
             *

283          KK     R74   ROUTE   REACH
284          RS       2    FLOW      -1
285          RC   0.053   0.045   0.053    1412  0.0212   92.00
286          RX     0.0    25.4    69.1    79.9    84.8    92.1    99.9   130.3
287          RY    92.0    90.0    88.0    86.0    86.0    88.0    90.0    92.0
             *

288          KK  SUB-71   BASIN
289          BA   0.035
```

```
290          LG    0.35    0.36    6.60    0.15      22
291          UC   0.150   0.149
292          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
293          UA     100
             *

294          KK     C71
295          KM   COMBINE R74 AND SUB-71
296          HC       2
             *

297          KK  SUB-70   BASIN
298          BA   0.072
299          LG    0.34    0.33    6.60    0.15      25
300          UC   0.213   0.261
301          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
302          UA     100
             *
```



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

303          KK     R70   ROUTE   BASIN
304          RS       1    FLOW      -1
305          RC   0.053   0.045   0.053     403  0.0546   92.00
306          RX     0.0    10.7    21.5    44.3    64.8    88.0   122.0   149.0
307          RY    92.0    90.0    88.0    86.0    86.0    88.0    90.0    92.0
             *

308          KK  SUB-72   BASIN
309          BA   0.155
310          LG    0.34    0.33    6.60    0.15      23
311          UC   0.217   0.188
312          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
313          UA     100
             *

314          KK     C70
315          KM   COMBINE R70 AND SUB-72
316          HC       2
             *

317          KK     C72
318          KM   COMBINE C70 AND C71
319          HC       2
             *

320          KK     R72   ROUTE   REACH
321          RS       4    FLOW      -1
322          RC   0.053   0.045   0.053    3492  0.0218    6.00
323          RX     0.0    21.3    57.8    75.7    77.8    85.0    92.5    99.9
324          RY     5.0     4.0     2.0     0.0     0.0     2.0     4.0     6.0
             *

325          KK  SUB-69   BASIN
326          BA   0.471
327          LG    0.32    0.31    6.00    0.19      23
328          UC   0.275   0.198
329          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
330          UA     100
             *

331          KK     C69
332          KM   COMBINE R72 AND SUB-69
333          HC       2
             *

334          KK  SUB-57   BASIN
335          BA   0.066
336          LG    0.33    0.33    5.80    0.19      15
337          UC   0.158   0.121
338          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
339          UA     100
             *
```



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

340          KK     C57
341          KM   COMBINE SUB-57 AND C69
342          HC       2
             *

343          KK     R69   ROUTE   REACH
344          RS       3    FLOW      -1
345          RC   0.053   0.045   0.053    2610  0.0146  972.00
346          RX     0.0    36.7    77.1    91.0   126.4   146.8   157.7   170.6
347          RY   972.0   970.0   968.0   966.0   966.0   968.0   970.0   972.0
             *
```

```
348          KK  SUB-58   BASIN
349          BA   0.111
350          LG    0.33    0.33    5.30    0.23       3
351          UC   0.196   0.163
352          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
353          UA     100
             *

354          KK     R58   ROUTE   BASIN
355          RS       1    FLOW      -1
356          RC   0.053   0.045   0.053     455  0.0132  972.00
357          RX     0.0    36.7    77.1    91.0   126.4   146.8   157.7   170.6
358          RY   972.0   970.0   968.0   966.0   966.0   968.0   970.0   972.0
             *

359          KK  SUB-59   BASIN
360          BA   0.082
361          LG    0.31    0.27    5.00    0.30      10
362          UC   0.400   0.605
363          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
364          UA     100
             *

365          KK  SUB-60   BASIN
366          BA   0.092
367          LG    0.32    0.23    7.00    0.13       9
368          UC   0.338   0.432
369          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
370          UA     100
             *

371          KK     C60
372          KM   COMBINE R69, R58, SUB-59, SUB-60
373          HC       4
             *

374          KK     R60   ROUTE   REACH
375          RS       1    FLOW      -1
376          RC   0.053   0.045   0.053     420  0.0143  960.00
377          RX     0.0    42.8    63.6    82.6   106.8   117.5   120.1   182.8
378          RY   964.0   962.0   960.0   958.0   958.0   960.0   960.0   960.0
             *
```



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

379          KK  SUB-61   BASIN
380          BA   0.142
381          LG    0.31    0.17    7.60    0.10      11
382          UC   0.396   0.527
383          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
384          UA     100
             *

385          KK     C61
386          KM   COMBINE R60, AND SUB-61
387          HC       2
             *

388          KK     R61   ROUTE   REACH
389          RS       1    FLOW      -1
390          RC   0.053   0.045   0.053     780  0.0103  950.00
391          RX     0.0     7.4    14.6    36.2    47.1    62.9    69.6    76.4
392          RY   950.0   948.0   946.0   946.0   946.0   946.0   948.0   950.0
             *

393          KK  SUB-62   BASIN
394          BA   0.098
395          LG    0.32    0.22    7.60    0.10       4
396          UC   0.304   0.332
397          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
398          UA     100
             *

399          KK  SUB-63   BASIN
400          BA   0.082
401          LG    0.31    0.18    8.00    0.08       5
402          UC   0.292   0.351
403          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
404          UA     100
             *

405          KK     C63
406          KM   COMBINE R61, SUB-62, AND SUB-63
407          HC       3
             *

408          KK     R63   ROUTE   REACH
409          RS       2    FLOW      -1
410          RC   0.053   0.045   0.053    2145  0.0196  922.00
411          RX     0.0     4.2     8.2    12.2    36.3    41.2    45.8    50.4
```

```
412          RY   922.0   920.0   918.0   916.0   916.0   918.0   920.0   922.0
             *

413          KK  SUB-64   BASIN
414          BA   0.071
415          LG    0.31    0.18    7.30    0.10       4
416          UC   0.292   0.360
417          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
418          UA     100
             *
1                                          HEC-1 INPUT                                          PAGE 12

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

419          KK     C64
420          KM   COMBINE R63, AND SUB-64
421          HC       2
             *
422          ZZ
1
     SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
 LINE     (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

   49     SUB14B
               .
               .
   55          .      SUB14C
               .           .
               .           .
   61       C14C............
               V
               V
   64       R14C
               .
               .
   69          .      SUB14A
               .           .
               .           .
   75       C14A............
               .
               .
   78          .      SUB19A
               .           .
               .           .
   84          .           .      SUB19B
               .           .           .
               .           .           .
   90          .           .           .      SUB19C
               .           .           .           .
               .           .           .           .
   96       C19C.......................................
               V
               V
   99       R19C
               .
               .
  104          .      SUB-13
               .           .
               .           .
  110        C13............
               .
               .
  113          .      SUB-18
               .           .
               .           .
  119        C18............
               V
               V
  122        R18
               .
               .
  127          .      SUB12A
               .           .
               .           .
  133       C12A............
               .
               .
  136          .      SUB33E
               .           .
               .           .
  142          .           .      SUB33F
               .           .           V
               .           .           V
  148          .           .        R33F
               .           .           .
               .           .           .
  153          .         C33F............
               .           .
```

```
156          .           .      SUB33D
             .           .           .
             .           .           .
162          .       C33D............
             .           V
             .           V
165          .       R33D
             .           .
             .           .
170          .           .      SUB33B
             .           .           .
             .           .           .
176          .       C33B............
             .           .
             .           .
179          .           .      SUB33C
             .           .           .
             .           .           .
185          .       C33C............
             .           V
             .           V
188          .       R33C
             .           .
             .           .
193          .           .      SUB33A
             .           .           .
             .           .           .
199          .       C33A............
             .           .
             .           .
202          .           .      SUB46A
             .           .           .
             .           .           .
208          .           .           .      SUB46B
             .           .           .           V
             .           .           .           V
214          .           .           .        R46B
             .           .           .           .
             .           .           .           .
219          .           .        C46............
             .           .           .
             .           .           .
222          .           .           .      SUB-45
             .           .           .           .
             .           .           .           .
28           .           .        C45............
             .           .          V
             .           .          V
231          .           .        R45
             .           .           .
             .           .           .
236          .           .           .      SUB-47
             .           .           .           .
             .           .           .           .
242          .           .        C47............
             .           .           .
             .           .           .
245          .           .           .      SUB-75
             .           .           .           .
             .           .           .           .
251          .           .           .           .      SUB-76
             .           .           .           .           .
             .           .           .           .           .
257          .           .           .         C76............
             .           .           .           V
             .           .           .           V
260          .           .           .         R76
             .           .           .           .
             .           .           .           .
265          .           .           .           .      SUB-73
             .           .           .           .           .
             .           .           .           .           .
271          .           .           .         C73............
             .           .           .           .
             .           .           .           .
274          .           .           .           .      SUB-74
             .           .           .           .           .
             .           .           .           .           .
280          .           .           .         C74............
             .           .           .           V
             .           .           .           V
283          .           .           .         R74
             .           .           .           .
             .           .           .           .
288          .           .           .           .      SUB-71
             .           .           .           .           .
             .           .           .           .           .
294          .           .           .         C71............
             .           .           .           .
             .           .           .           .
97           .           .           .           .      SUB-70
```

```
                                                  V
                                                  V
303                                             R70
                                                  .
308                                               .      SUB-72
                                                  .        .
314                                             C70............
                                                  .
317                                         C72...........
                                              V
                                              V
320                                         R72
                                              .
325                                           .      SUB-69
                                              .        .
331                                         C69...........
                                              .
334                                           .      SUB-57
                                              .        .
340                                         C57...........
                                              V
                                              V
343                                         R69
                                              .
348                                           .      SUB-58
                                              .         V
                                              .         V
354                                           .        R58
                                              .         .
359                                           .         .      SUB-59
                                              .         .        .
365                                           .         .        .      SUB-60
                                              .         .        .        .
371                                         C60.................................
                                              V
                                              V
374                                         R60
                                              .
379                                           .      SUB-61
                                              .        .
385                                         C61...........
                                              V
                                              V
388                                         R61
                                              .
393                                           .      SUB-62
                                              .        .
399                                           .         .      SUB-63
                                              .         .        .
405                                         C63......................
                                              V
                                              V
408                                         R63
                                              .
413                                           .      SUB-64
                                              .        .
419                                         C64...........
```

1

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	SUB14B	543.	4.20	54.	14.	5.	.27		
+	HYDROGRAPH AT	SUB14C	1118.	4.17	97.	24.	9.	.46		

+	2 COMBINED AT	C14C	1509.	4.17	148.	37.	13.	.73
	ROUTED TO	R14C	1451.	4.27	148.	37.	13.	.73
+	HYDROGRAPH AT	SUB14A	482.	4.13	40.	10.	4.	.18
+	2 COMBINED AT	C14A	1691.	4.23	185.	46.	17.	.91
+	HYDROGRAPH AT	SUB19A	294.	4.10	27.	7.	2.	.11
+	HYDROGRAPH AT	SUB19B	650.	4.13	64.	16.	6.	.26
+	HYDROGRAPH AT	SUB19C	283.	4.10	27.	7.	2.	.10
+	4 COMBINED AT	C19C	2344.	4.17	292.	73.	26.	1.38
+	ROUTED TO	R19C	2274.	4.30	292.	73.	26.	1.38
+	HYDROGRAPH AT	SUB-13	1431.	4.13	99.	25.	9.	.54
+	2 COMBINED AT	C13	2664.	4.23	372.	93.	34.	1.92
+	HYDROGRAPH AT	SUB-18	999.	4.17	97.	24.	9.	.38
+	2 COMBINED AT	C18	3129.	4.20	458.	115.	41.	2.30
+	ROUTED TO	R18	3117.	4.27	458.	115.	41.	2.30
+	HYDROGRAPH AT	SUB12A	233.	4.10	21.	5.	2.	.09
	2 COMBINED AT	C12A	3198.	4.27	476.	120.	43.	2.39
+	HYDROGRAPH AT	SUB33E	548.	4.10	47.	12.	4.	.19
+	HYDROGRAPH AT	SUB33F	60.	4.07	5.	1.	0.	.02
+	ROUTED TO	R33F	59.	4.10	5.	1.	0.	.02
+	2 COMBINED AT	C33F	606.	4.10	52.	13.	5.	.22
+	HYDROGRAPH AT	SUB33D	50.	4.23	7.	2.	1.	.04
+	2 COMBINED AT	C33D	643.	4.10	59.	15.	5.	.25
+	ROUTED TO	R33D	625.	4.17	59.	15.	5.	.25
+	HYDROGRAPH AT	SUB33B	417.	4.13	36.	9.	3.	.16
+	2 COMBINED AT	C33B	1017.	4.13	94.	24.	9.	.41
+	HYDROGRAPH AT	SUB33C	77.	4.10	8.	2.	1.	.03
+	2 COMBINED AT	C33C	1092.	4.13	102.	26.	9.	.43
+	ROUTED TO	R33C	1073.	4.17	102.	26.	9.	.43
+	HYDROGRAPH AT	SUB33A	182.	4.07	13.	3.	1.	.05
+	2 COMBINED AT	C33A	1182.	4.17	115.	29.	10.	.49
	HYDROGRAPH AT	SUB46A	81.	4.10	7.	2.	1.	.03

+	HYDROGRAPH AT	SUB46B	69.	4.10	6.	2.	1.	.03
+	ROUTED TO	R46B	68.	4.13	6.	2.	1.	.03
+	2 COMBINED AT	C46	146.	4.10	13.	3.	1.	.06
+	HYDROGRAPH AT	SUB-45	180.	4.17	21.	5.	2.	.09
+	2 COMBINED AT	C45	320.	4.13	34.	9.	3.	.15
+	ROUTED TO	R45	296.	4.37	34.	9.	3.	.15
+	HYDROGRAPH AT	SUB-47	388.	4.17	36.	9.	3.	.18
+	2 COMBINED AT	C47	579.	4.27	70.	17.	6.	.33
+	HYDROGRAPH AT	SUB-75	42.	4.07	3.	1.	0.	.02
+	HYDROGRAPH AT	SUB-76	55.	4.07	4.	1.	0.	.02
+	2 COMBINED AT	C76	97.	4.07	7.	2.	1.	.04
+	ROUTED TO	R76	92.	4.10	7.	2.	1.	.04
+	HYDROGRAPH AT	SUB-73	163.	4.07	13.	3.	1.	.06
+	2 COMBINED AT	C73	253.	4.10	21.	5.	2.	.09
+	HYDROGRAPH AT	SUB-74	428.	4.10	40.	10.	4.	.16
+	2 COMBINED AT	C74	680.	4.10	60.	15.	5.	.25
+	ROUTED TO	R74	661.	4.13	60.	15.	5.	.25
+	HYDROGRAPH AT	SUB-71	103.	4.07	8.	2.	1.	.04
+	2 COMBINED AT	C71	747.	4.13	68.	17.	6.	.28
+	HYDROGRAPH AT	SUB-70	168.	4.13	17.	4.	2.	.07
+	ROUTED TO	R70	168.	4.13	17.	4.	2.	.07
+	HYDROGRAPH AT	SUB-72	411.	4.10	36.	9.	3.	.16
+	2 COMBINED AT	C70	577.	4.13	54.	13.	5.	.23
+	2 COMBINED AT	C72	1315.	4.13	121.	30.	11.	.51
+	ROUTED TO	R72	1250.	4.23	121.	30.	11.	.51
+	HYDROGRAPH AT	SUB-69	1190.	4.17	109.	27.	10.	.47
+	2 COMBINED AT	C69	2008.	4.17	222.	56.	20.	.98
+	HYDROGRAPH AT	SUB-57	202.	4.07	14.	4.	1.	.07
+	2 COMBINED AT	C57	2085.	4.17	235.	59.	21.	1.05
+	ROUTED TO	R69	2035.	4.23	234.	59.	21.	1.05
	HYDROGRAPH AT							

+		SUB-58	296.	4.10	21.	5.	2.	.11
	ROUTED TO	R58	290.	4.10	21.	5.	2.	.11
	HYDROGRAPH AT							
+		SUB-59	103.	4.27	16.	4.	1.	.08
	HYDROGRAPH AT							
+		SUB-60	160.	4.23	21.	5.	2.	.09
	4 COMBINED AT							
+		C60	2272.	4.23	285.	72.	26.	1.33
	ROUTED TO							
+		R60	2258.	4.27	285.	72.	26.	1.33
	HYDROGRAPH AT							
+		SUB-61	226.	4.27	35.	9.	3.	.14
	2 COMBINED AT							
+		C61	2376.	4.27	317.	80.	29.	1.47
	ROUTED TO							
+		R61	2370.	4.27	317.	80.	29.	1.47
	HYDROGRAPH AT							
+		SUB-62	202.	4.20	23.	6.	2.	.10
	HYDROGRAPH AT							
+		SUB-63	169.	4.17	20.	5.	2.	.08
	3 COMBINED AT							
+		C63	2557.	4.27	355.	89.	32.	1.65
	ROUTED TO							
+		R63	2544.	4.30	355.	89.	32.	1.65
	HYDROGRAPH AT							
+		SUB-64	143.	4.20	17.	4.	2.	.07
	2 COMBINED AT							
+		C64	2611.	4.30	370.	93.	33.	1.72

NORMAL END OF HEC-1 ***

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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   25JUL07  TIME  08:46:57  *                                                    *           (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   Project ID: 40933-E24HR - Major Basin: 01 - Return Period: 100 Years
        2           ID
        3           ID
        4           ID   CAVECREEK DRAINAGE MASTER PLAN
        5           ID   FLOODPLAIN DELINEATION STUDY OF CAVECREEK TRIBUTARIES, WILLOW SPRINGS WASH
        6           ID   TRIBUTARIES, GALLOWAY TRIBUTARIES, AND MORMAN GIRL WASH TRIBUTARIES.
        7           ID   FCD CONTRACT #2004C072
        8           ID   PREPARED FOR FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
        9           ID   PREPARED BY HDR ENGINEERING-July 2007
       10           ID   FILE NAME: E100-24.DAT
       11           ID
       12           ID   ******************************************************************************
       13           ID   100-YEAR, 24-HOUR STORM EVENT
       14           ID   MULTIPLE STORM EVENT
       15           ID   GREEN-AMPT LOSS METHOD, CLARK UNIT HYDROGRAPH
       16           ID   EXISTING LAND USE FROM AERIAL PHOTOGRAPHY
       17           ID   ******************************************************************************
       18           ID
       19           ID
       20           ID
       21           ID
                    *DIAGRAM
       22           IT       2                    2000
       23           IO       3
       24           IN      15
       25           JD    4.60    0.01
       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   4.324      10
       37           JD   4.140      30
       38           JD   3.956      60
       39           JD   3.892      90
       40           JD   3.836     120
       41           JD   3.795     150
       42           JD   3.680     300
       43           JD   3.588     500

       44           KK  SUB14B   BASIN
       45           BA   0.267
                    *
       46           LG    0.35    0.35    7.00    0.12       0
       47           UC   0.313   0.300
       48           UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
       49           UA     100
                    *
                                                   HEC-1 INPUT                                                          PAGE  2
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  50          KK  SUB14C   BASIN
  51          BA   0.458
  52          LG    0.35    0.32    7.60    0.10       1
  53          UC   0.279   0.218
  54          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
  55          UA     100
              *

  56          KK    C14C
  57          KM   COMBINE SUB-14B, AND SUB-14C
  58          HC       2
              *

  59          KK    R14C   ROUTE   REACH
  60          RS       4    FLOW      -1
  61          RC   0.053   0.045   0.053    3270  0.0130  246.00
  62          RX     0.0     4.8     9.6    14.5    39.4    78.3    94.4   110.1
  63          RY   246.0   244.0   242.0   240.0   240.0   242.0   244.0   246.0
              *

  64          KK  SUB14A   BASIN
  65          BA   0.180
  66          LG    0.35    0.30    8.00    0.08       3
  67          UC   0.233   0.191
  68          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
  69          UA     100
              *

  70          KK    C14A
  71          KM   COMBINE R14C AND SUB-14A
  72          HC       2
              *

  73          KK  SUB19A   BASIN
  74          BA   0.111
  75          LG    0.35    0.32    7.60    0.10      19
  76          UC   0.208   0.201
  77          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
  78          UA     100
              *

  79          KK  SUB19B   BASIN
  80          BA   0.257
  81          LG    0.35    0.35    7.00    0.12      29
  82          UC   0.250   0.220
  83          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
  84          UA     100
              *
1                                        HEC-1 INPUT                                        PAGE  3

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

  85          KK  SUB19C   BASIN
  86          BA   0.105
  87          LG    0.35    0.33    7.30    0.11      30
  88          UC   0.204   0.199
  89          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
  90          UA     100
              *

  91          KK    C19C
  92          KM   COMBINE C14A, SUB-19A, SUB-19B, AND SUB-19C
  93          HC       4
              *

  94          KK    R19C   ROUTE   REACH
  95          RS       5    FLOW      -1
  96          RC   0.053   0.045   0.053    4116  0.0114  204.00
  97          RX     0.0    47.6    66.1    87.7   106.8   112.7   131.1   138.9
  98          RY   204.0   202.0   200.0   198.0   198.0   200.0   202.0   204.0
              *

  99          KK  SUB-13   BASIN
 100          BA   0.541
 101          LG    0.35    0.37    5.20    0.25       4
 102          UC   0.246   0.133
 103          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 104          UA     100
              *

 105          KK     C13
 106          KM   COMBINE R19C AND SUB-13
 107          HC       2
              *

 108          KK  SUB-18   BASIN
 109          BA   0.385
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110          LG    0.35    0.33    7.30    0.11      30
111          UC   0.271   0.204
112          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
113          UA     100
             *

114          KK     C18
115          KM   COMBINE C13 AND SUB-18
116          HC       2
             *

117          KK     R18   ROUTE   REACH
118          RS       1    FLOW      -1
119          RC   0.053   0.045   0.053    2572  0.0233  146.00
120          RX     0.0     2.6     5.9     9.9    20.8    24.7    27.3    30.4
121          RY   146.0   144.0   142.0   140.0   140.0   142.0   144.0   146.0
             *
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

122          KK  SUB12A   BASIN
123          BA   0.089
124          LG    0.34    0.35    6.60    0.14      21
125          UC   0.200   0.200
126          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
127          UA     100
             *

128          KK    C12A
129          KM   COMBINE R18 AND SUB12A
130          HC       2
             *

131          KK  SUB33E   BASIN
132          BA   0.194
133          LG    0.34    0.33    6.80    0.13      26
134          UC   0.221   0.163
135          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
136          UA     100
             *

137          KK  SUB33F   BASIN
138          BA   0.021
139          LG    0.31    0.20    6.80    0.12       4
140          UC   0.158   0.178
141          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
142          UA     100
             *

143          KK    R33F   ROUTE   BASIN
144          RS       1    FLOW      -1
145          RC   0.053   0.045   0.053     477  0.0168  192.00
146          RX     0.0    15.0    30.0    40.5    41.5    52.5    73.7   108.0
147          RY   192.0   191.0   190.0   188.0   188.0   190.0   190.2   192.0
             *

148          KK    C33F
149          KM   COMBINE R33F AND SUB33E
150          HC       2
             *

151          KK  SUB33D   BASIN
152          BA   0.035
153          LG    0.33    0.32    5.70    0.20       5
154          UC   0.350   0.518
155          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
156          UA     100
             *
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

157          KK    C33D
158          KM   COMBINE C33F AND SUB33D
159          HC       2
             *

160          KK    R33D   ROUTE   REACH
161          RS       4    FLOW      -1
162          RC   0.053   0.045   0.053    1637  0.0104  188.00
163          RX     0.0    49.3    60.6    71.9    83.0   133.7   175.9   214.2
164          RY   188.0   186.0   184.0   182.0   182.0   184.0   186.0   188.0
             *

165          KK  SUB33B   BASIN
166          BA   0.155
167          LG    0.32    0.22    7.30    0.10       3
168          UC   0.225   0.193
169          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
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170          UA     100
             *

171          KK    C33B
172          KM   COMBINE R33D AND SUB33B
173          HC       2
             *

174          KK  SUB33C   BASIN
175          BA   0.028
176          LG    0.31    0.15   10.10    0.03       4
177          UC   0.196   0.223
178          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
179          UA     100
             *

180          KK    C33C
181          KM   COMBINE C33B AND SUB33C
182          HC       2
             *

183          KK    R33C   ROUTE   REACH
184          RS       2    FLOW      -1
185          RC   0.053   0.045   0.053    1320  0.0159  158.00
186          RX     0.0     6.5    14.3    25.5    44.2    52.6    58.3    64.3
187          RY   158.0   156.0   154.0   152.0   152.0   154.0   156.0   158.0
             *

188          KK  SUB33A   BASIN
189          BA   0.055
190          LG    0.31    0.20    7.00    0.11       7
191          UC   0.150   0.106
192          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
193          UA     100
             *
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

194          KK    C33A
195          KM   COMBINE R33C AND SUB33A
196          HC       2
             *
             *

197          KK  SUB46A   BASIN
198          BA   0.032
199          LG    0.34    0.31    7.00    0.12       1
200          UC   0.179   0.217
201          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
202          UA     100
             *

203          KK  SUB46B   BASIN
204          BA   0.031
205          LG    0.34    0.33    7.00    0.12       1
206          UC   0.196   0.276
207          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
208          UA     100
             *

209          KK    R46B   ROUTE   BASIN
210          RS       1    FLOW      -1
211          RC   0.053   0.045   0.053     564  0.0390  262.00
212          RX     0.0     8.2    16.6    27.9    50.0    57.9    65.9    73.0
213          RY   262.0   260.0   258.0   256.0   256.0   258.0   260.0   262.0
             *

214          KK     C46
215          KM   COMBINE R46B AND SUB46A
216          HC       2
             *

217          KK  SUB-45   BASIN
218          BA   0.088
219          LG    0.34    0.24    9.70    0.05       1
220          UC   0.267   0.363
221          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
222          UA     100
             *

223          KK     C45
224          KM   COMBINE C46 AND SUB-45
225          HC       2
             *

226          KK     R45   ROUTE   REACH
227          RS      10    FLOW      -1
228          RC   0.053   0.045   0.053    4898  0.0218  192.00
229          RX     0.0    26.3    64.2   107.1   146.4   157.7   166.9   176.3
230          RY   192.0   190.0   188.0   186.0   186.0   188.0   190.0   192.0
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                *
LINE            ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 231            KK  SUB-47   BASIN
 232            BA   0.178
 233            LG    0.32    0.29    5.40    0.21       3
 234            UC   0.292   0.256
 235            UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 236            UA     100
                *

 237            KK     C47
 238            KM   COMBINE R45 AND SUB47
 239            HC       2
                *
                *

 240            KK  SUB-75   BASIN
 241            BA   0.016
 242            LG    0.35    0.40    6.00    0.18      13
 243            UC   0.142   0.188
 244            UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 245            UA     100
                *

 246            KK  SUB-76   BASIN
 247            BA   0.020
 248            LG    0.31    0.28    5.20    0.24       7
 249            UC   0.146   0.171
 250            UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 251            UA     100
                *

 252            KK     C76
 253            KM   COMBINE SUB-75, AND SUB-76
 254            HC       2
                *

 255            KK     R76   ROUTE   REACH
 256            RS       3    FLOW      -1
 257            RC   0.053   0.045   0.053     919  0.0152  114.00
 258            RX     0.0    44.9    63.2    67.9    71.3   107.2   136.4   159.2
 259            RY   114.0   112.0   110.0   108.0   108.0   110.0   112.0   114.0
                *

 260            KK  SUB-73   BASIN
 261            BA   0.056
 262            LG    0.34    0.36    6.60    0.15      24
 263            UC   0.163   0.151
 264            UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 265            UA     100
                *
```



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

 266            KK     C73
 267            KM   COMBINE R76 AND SUB-73
 268            HC       2
                *

 269            KK  SUB-74   BASIN
 270            BA   0.156
 271            LG    0.32    0.28    6.80    0.14      31
 272            UC   0.217   0.184
 273            UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 274            UA     100
                *

 275            KK     C74
 276            KM   COMBINE C73 AND SUB-74
 277            HC       2
                *

 278            KK     R74   ROUTE   REACH
 279            RS       2    FLOW      -1
 280            RC   0.053   0.045   0.053    1412  0.0212   92.00
 281            RX     0.0    25.4    69.1    79.9    84.8    92.1    99.9   130.3
 282            RY    92.0    90.0    88.0    86.0    86.0    88.0    90.0    92.0
                *

 283            KK  SUB-71   BASIN
 284            BA   0.035
 285            LG    0.35    0.36    6.60    0.15      22
 286            UC   0.150   0.149
 287            UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 288            UA     100
                *
```

```
289          KK     C71
290          KM   COMBINE R74 AND SUB-71
291          HC       2
             *

292          KK  SUB-70   BASIN
293          BA   0.072
294          LG    0.34    0.33    6.60    0.15      25
295          UC   0.213   0.261
296          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
297          UA     100
             *

298          KK     R70   ROUTE   BASIN
299          RS       1    FLOW      -1
300          RC   0.053   0.045   0.053     403  0.0546   92.00
301          RX     0.0    10.7    21.5    44.3    64.8    88.0   122.0   149.0
302          RY    92.0    90.0    88.0    86.0    86.0    88.0    90.0    92.0
             *
1                                          HEC-1 INPUT                                          PAGE  9

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

303          KK  SUB-72   BASIN
304          BA   0.155
305          LG    0.34    0.33    6.60    0.15      23
306          UC   0.217   0.188
307          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
308          UA     100
             *

309          KK     C70
310          KM   COMBINE R70 AND SUB-72
311          HC       2
             *

312          KK     C72
313          KM   COMBINE C70 AND C71
314          HC       2
             *

315          KK     R72   ROUTE   REACH
316          RS       4    FLOW      -1
317          RC   0.053   0.045   0.053    3492  0.0218    6.00
318          RX     0.0    21.3    57.8    75.7    77.8    85.0    92.5    99.9
319          RY     5.0     4.0     2.0     0.0     0.0     2.0     4.0     6.0
             *

320          KK  SUB-69   BASIN
321          BA   0.471
322          LG    0.32    0.31    6.00    0.19      23
323          UC   0.275   0.198
324          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
325          UA     100
             *
326          IN       6
             *

327          KK  HYDRO6
328          BA   0.001
329          QI       0       0       0       0       0       0       0       0       0       0
330          QI       0       0       0       0       0       0       0       0       0       0
331          QI       0       0       0       0       0       0       0       0       0       0
332          QI       0       0       0       0       0       0       0       0       0       0
333          QI       0       0       0       0       0       0       0       0       0       0
334          QI       0       0       0       0       0       0       0       0       0       0
335          QI       0       0       0       0       0       0       0       0       0       0
336          QI       0       0       0       0       0       0       0       0       0       0
337          QI       0       0       0       0       0       0       0       0       0       0
338          QI       0       0       0       0    0.59    2.27    2.61    2.85    2.95     3.1
339          QI    3.29    3.52    3.71    3.83    4.02    4.18    4.39    4.72    5.19     5.7
340          QI    6.56   10.56    20.2   25.52   30.32   33.97   41.23   69.55  206.95  363.49
341          QI  608.08   767.6  995.12 1056.41 1235.54 1198.32 1078.59  945.57  854.97   782.6
342          QI  718.04     626  525.97  440.05  378.58  326.95  282.22  247.17  216.01  191.48
343          QI  170.93  153.54  139.24  126.93   116.2  107.13   98.18   91.55   85.28   79.28
344          QI   73.58   67.19   63.42   60.18   57.37   54.61   52.49   49.38    46.2    42.9
345          QI   40.71   38.54   37.29   34.88   33.38   32.08   30.76   29.61    28.8    27.6
1                                          HEC-1 INPUT                                          PAGE 10

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

346          QI   26.45   25.96   25.16   24.41   24.09   23.51    22.7   22.33   22.02   21.29
347          QI   20.86   20.15    19.6   19.19   18.52   18.22   17.76   17.28   16.92   16.81
348          QI   16.34      16   15.86   15.66   15.57   15.26   14.94   14.65   14.44   14.21
349          QI   14.08    13.7   13.42   13.02   12.69   12.44   12.24   12.11      12   11.91
350          QI   11.67   11.61   11.38   11.28   11.04   10.94   10.72   10.44   10.16    9.79
351          QI    9.67    9.43    9.27    9.04    8.84    8.76    8.62    8.52    8.44    8.37
352          QI    8.32    8.24    8.18    8.13    8.08       8    7.99       8       8    7.99
353          QI     0.1
             *
```

```
354          KK     C69
355          KM   COMBINE R72, SUB-69, AND HYDRO6
356          HC       3
             *

357          KK  SUB-57   BASIN
358          BA   0.066
359          LG    0.33    0.33    5.80    0.19      15
360          UC   0.158   0.121
361          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
362          UA     100
             *

363          KK     C57
364          KM   COMBINE SUB-57 AND C69
365          HC       2
             *

366          KK     R69   ROUTE   REACH
367          RS       3    FLOW      -1
368          RC   0.053   0.045   0.053    2610  0.0146  972.00
369          RX     0.0    36.7    77.1    91.0   126.4   146.8   157.7   170.6
370          RY   972.0   970.0   968.0   966.0   966.0   968.0   970.0   972.0
             *

371          KK  SUB-58   BASIN
372          BA   0.111
373          LG    0.33    0.33    5.30    0.23       3
374          UC   0.196   0.163
375          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
376          UA     100
             *

377          KK     R58   ROUTE   BASIN
378          RS       1    FLOW      -1
379          RC   0.053   0.045   0.053     455  0.0132  972.00
380          RX     0.0    36.7    77.1    91.0   126.4   146.8   157.7   170.6
381          RY   972.0   970.0   968.0   966.0   966.0   968.0   970.0   972.0
             *
```



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

382          KK  SUB-59   BASIN
383          BA   0.082
384          LG    0.31    0.27    5.00    0.30      10
385          UC   0.400   0.605
386          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
387          UA     100
             *

388          KK  SUB-60   BASIN
389          BA   0.092
390          LG    0.32    0.23    7.00    0.13       9
391          UC   0.338   0.432
392          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
393          UA     100
             *

394          KK     C60
395          KM   COMBINE R69, R58, SUB-59, SUB-60
396          HC       4
             *

397          KK     R60   ROUTE   REACH
398          RS       1    FLOW      -1
399          RC   0.053   0.045   0.053     420  0.0143  960.00
400          RX     0.0    42.8    63.6    82.6   106.8   117.5   120.1   182.8
401          RY   964.0   962.0   960.0   958.0   958.0   960.0   960.0   960.0
             *

402          KK  SUB-61   BASIN
403          BA   0.142
404          LG    0.31    0.17    7.60    0.10      11
405          UC   0.396   0.527
406          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
407          UA     100
             *

408          KK     C61
409          KM   COMBINE R60, AND SUB-61
410          HC       2
             *

411          KK     R61   ROUTE   REACH
412          RS       1    FLOW      -1
413          RC   0.053   0.045   0.053     780  0.0103  950.00
414          RX     0.0     7.4    14.6    36.2    47.1    62.9    69.6    76.4
415          RY   950.0   948.0   946.0   946.0   946.0   946.0   948.0   950.0
             *
```

```
416          KK  SUB-62   BASIN
417          BA   0.098
418          LG    0.32    0.22    7.60    0.10       4
419          UC   0.304   0.332
420          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
421          UA     100
             *
1                                        HEC-1 INPUT                                          PAGE 12

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

422          KK  SUB-63   BASIN
423          BA   0.082
424          LG    0.31    0.18    8.00    0.08       5
425          UC   0.292   0.351
426          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
427          UA     100
             *

428          KK  HYDRO2
429          BA   0.001
430          QI       0       0       0       0       0       0       0       0       0       0
431          QI       0       0       0       0       0       0       0       0       0       0
432          QI       0       0       0       0       0       0       0       0       0       0
433          QI       0       0       0       0       0       0       0       0       0       0
434          QI       0       0       0       0       0       0       0       0       0       0
435          QI       0       0       0       0       0       0       0       0       0       0
436          QI       0       0       0       0       0       0       0       0       0       0
437          QI       0       0       0       0       0       0       0       0       0       0
438          QI       0       0       0       0       0       0       0       0       0       0
439          QI       0       0       0       0       0       0       0       0       0       0
440          QI       0       0       0       0       0       0       0       0       0       0
441          QI       0       0       0       0       0       0       0    0.06    0.21    4.92
442          QI   15.82   42.09    68.3   70.34   82.67  198.46  208.82  193.16  164.98  143.11
443          QI  117.68  107.17   99.98   91.35   87.97   83.27   80.93   76.24   74.23   70.99
444          QI   67.18   63.35   60.23    55.6   37.08    34.4   30.86   27.52   25.07   23.88
445          QI   21.83   19.98   18.41   16.76   15.18   13.65   12.63   11.77   10.72    9.53
446          QI    8.73    8.01    7.35     6.7    6.45    5.83    5.52    5.36     5.1    4.86
447          QI    4.44    4.07     3.9    3.73    3.42    3.17    3.03    2.93    2.79     2.6
448          QI    2.38    2.18    2.12    1.66    1.33    1.44    1.23    1.45     1.4    1.28
449          QI    1.15    1.12    1.02    0.94    0.89    0.82    0.76    0.71    0.67    0.62
450          QI    0.58    0.55    0.55    0.53    0.49    0.48    0.47    0.39    0.37    0.42
451          QI    0.39    0.34    0.33    0.32    0.31     0.3    0.29    0.29    0.28    0.28
452          QI    0.27    0.26    0.25    0.23    0.23    0.22    0.21     0.2    0.19    0.19
453          QI    0.18    0.17    0.16    0.15    0.15    0.14    0.13    0.13    0.12    0.04
454          QI    0.01
             *

455          KK  HYDRO3
456          BA   0.001
457          QI       0       0       0       0       0       0       0       0       0       0
458          QI       0       0       0       0       0       0       0       0       0       0
459          QI       0       0       0       0       0       0       0       0       0       0
460          QI       0       0       0       0       0       0       0       0       0       0
461          QI       0       0       0       0       0       0       0       0       0       0
462          QI       0       0       0       0       0       0       0       0       0       0
463          QI       0       0       0       0       0       0       0       0       0       0
464          QI       0       0       0       0       0       0       0       0       0       0
465          QI       0       0       0       0       0       0       0       0       0       0
466          QI       0       0       0       0       0       0       0       0       0       0
467          QI       0       0       0       0       0       0       0       0       0       0
468          QI       0       0       0       0       0       0       0       0    1.96    6.05
469          QI    8.11    2.58    3.37   15.16  223.84  553.48  557.89  484.36  405.52  337.86
470          QI  289.58  244.22  200.76  162.35  123.39   96.28   70.95   48.75   36.47   26.05
471          QI   18.93   13.62     9.5    6.39    3.99    2.65     1.3    0.78    0.57    0.37
1                                        HEC-1 INPUT                                          PAGE 13

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

472          QI     0.3    0.23    0.17    0.12    0.08    0.05    0.02       0       0       0
473          QI       0       0       0       0       0       0       0       0       0       0
474          QI       0       0       0       0       0       0       0       0       0       0
475          QI       0       0       0       0       0       0       0       0       0       0
476          QI       0       0       0       0       0       0       0       0       0       0
477          QI       0       0       0       0       0       0       0       0       0       0
478          QI       0       0       0       0       0       0       0       0       0       0
479          QI       0       0       0       0       0       0       0       0       0       0
480          QI       0       0       0       0       0       0       0       0       0       0
481          QI       0
             *

482          KK     C63
483          KM   COMBINE R61, SUB-62, SUB-63, HYDRO2, AND HYDRO3
484          HC       5
             *

485          KK     R63   ROUTE   REACH
486          RS       2    FLOW      -1
487          RC   0.053   0.045   0.053    2145  0.0196  922.00
488          RX     0.0     4.2     8.2    12.2    36.3    41.2    45.8    50.4
```

```
489          RY   922.0   920.0   918.0   916.0   916.0   918.0   920.0   922.0
             *

490          KK  SUB-64   BASIN
491          BA   0.071
492          LG    0.31    0.18    7.30    0.10       4
493          UC   0.292   0.360
494          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
495          UA     100
             *

496          KK     C64
497          KM   COMBINE R63, AND SUB-64
498          HC       2
             *
499          ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

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

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

   44      SUB14B
                .
                .
   50           .      SUB14C
                .           .
                .           .
   56        C14C............
                V
                V
   59        R14C
                .
                .
   64           .      SUB14A
                .           .
                .           .
   70        C14A............
                .
                .
   73           .      SUB19A
                .           .
                .           .
   79           .           .      SUB19B
                .           .           .
                .           .           .
   85           .           .           .      SUB19C
                .           .           .           .
                .           .           .           .
   91        C19C.................................
                V
                V
   94        R19C
                .
                .
   99           .      SUB-13
                .           .
                .           .
  105         C13............
                .
                .
  108           .      SUB-18
                .           .
                .           .
  114         C18............
                V
                V
  117         R18
                .
                .
  122           .      SUB12A
                .           .
                .           .
  128        C12A............
                .
                .
  131           .      SUB33E
                .           .
                .           .
  137           .           .      SUB33F
                .           .           V
                .           .           V
  143           .           .        R33F
                .           .           .
                .           .           .
  148           .        C33F............
                .           .
                .           .
  151           .           .      SUB33D
                .           .           .
                .           .           .
```

```
157          .        C33D............
             .           V
             .           V
160          .        R33D
             .           .
             .           .
165          .           .      SUB33B
             .           .          .
             .           .          .
171          .        C33B............
             .           .
             .           .
174          .           .      SUB33C
             .           .          .
             .           .          .
180          .        C33C............
             .           V
             .           V
183          .        R33C
             .           .
             .           .
188          .           .      SUB33A
             .           .          .
             .           .          .
194          .        C33A............
             .           .
             .           .
197          .           .      SUB46A
             .           .          .
             .           .          .
203          .           .          .      SUB46B
             .           .          .          V
             .           .          .          V
209          .           .          .        R46B
             .           .          .          .
             .           .          .          .
214          .           .        C46............
             .           .          .
             .           .          .
217          .           .          .      SUB-45
             .           .          .          .
             .           .          .          .
223          .           .        C45............
             .           .          V
             .           .          V
226          .           .        R45
             .           .          .
             .           .          .
231          .           .          .      SUB-47
             .           .          .          .
             .           .          .          .
237          .           .        C47............
             .           .          .
             .           .          .
240          .           .          .      SUB-75
             .           .          .          .
             .           .          .          .
246          .           .          .          .      SUB-76
             .           .          .          .          .
             .           .          .          .          .
252          .           .          .        C76............
             .           .          .          V
             .           .          .          V
255          .           .          .        R76
             .           .          .          .
             .           .          .          .
260          .           .          .          .      SUB-73
             .           .          .          .          .
             .           .          .          .          .
266          .           .          .        C73............
             .           .          .          .
             .           .          .          .
269          .           .          .          .      SUB-74
             .           .          .          .          .
             .           .          .          .          .
275          .           .          .        C74............
             .           .          .          V
             .           .          .          V
278          .           .          .        R74
             .           .          .          .
             .           .          .          .
283          .           .          .          .      SUB-71
             .           .          .          .          .
             .           .          .          .          .
289          .           .          .        C71............
             .           .          .          .
             .           .          .          .
292          .           .          .          .      SUB-70
             .           .          .          .          V
             .           .          .          .          V
298          .           .          .          .        R70
             .           .          .          .          .
```

```
303          .          .          .          .          .
             .          .          .          .          .     SUB-72
             .          .          .          .          .          .
309          .          .          .          .       C70.....
             .          .          .          .          .
             .          .          .          .          .
312          .          .          .       C72.....
             .          .          .         V
             .          .          .         V
315          .          .          .       R72
             .          .          .          .
             .          .          .          .
320          .          .          .          .    SUB-69
             .          .          .          .          .
             .          .          .          .          .
327          .          .          .          .          .     HYDRO6
             .          .          .          .          .          .
             .          .          .          .          .          .
354          .          .          .       C69.....................
             .          .          .          .
             .          .          .          .
357          .          .          .          .    SUB-57
             .          .          .          .          .
             .          .          .          .          .
363          .          .          .       C57.....
             .          .          .         V
             .          .          .         V
366          .          .          .       R69
             .          .          .          .
             .          .          .          .
371          .          .          .          .    SUB-58
             .          .          .          .         V
             .          .          .          .         V
377          .          .          .          .       R58
             .          .          .          .          .
             .          .          .          .          .
382          .          .          .          .          .     SUB-59
             .          .          .          .          .          .
             .          .          .          .          .          .
388          .          .          .          .          .          .     SUB-60
             .          .          .          .          .          .          .
             .          .          .          .          .          .          .
394          .          .          .       C60.................................
             .          .          .         V
             .          .          .         V
 )7          .          .          .       R60
             .          .          .          .
             .          .          .          .
402          .          .          .          .    SUB-61
             .          .          .          .          .
             .          .          .          .          .
408          .          .          .       C61.....
             .          .          .         V
             .          .          .         V
411          .          .          .       R61
             .          .          .          .
             .          .          .          .
416          .          .          .          .    SUB-62
             .          .          .          .          .
             .          .          .          .          .
422          .          .          .          .          .     SUB-63
             .          .          .          .          .          .
             .          .          .          .          .          .
428          .          .          .          .          .          .     HYDRO2
             .          .          .          .          .          .          .
             .          .          .          .          .          .          .
455          .          .          .          .          .          .          .     HYDRO3
             .          .          .          .          .          .          .          .
             .          .          .          .          .          .          .          .
482          .          .          .       C63.............................................
             .          .          .         V
             .          .          .         V
485          .          .          .       R63
             .          .          .          .
             .          .          .          .
490          .          .          .          .    SUB-64
             .          .          .          .          .
             .          .          .          .          .
496          .          .          .       C64.....
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1

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									

+		SUB14B	451.	12.20	47.	12.	4.	.27
+	HYDROGRAPH AT	SUB14C	918.	12.17	86.	22.	8.	.46
+	2 COMBINED AT	C14C	1355.	12.17	132.	33.	12.	.73
+	ROUTED TO	R14C	1297.	12.27	132.	33.	12.	.73
+	HYDROGRAPH AT	SUB14A	397.	12.13	37.	9.	3.	.18
+	2 COMBINED AT	C14A	1584.	12.23	168.	42.	15.	.91
+	HYDROGRAPH AT	SUB19A	243.	12.10	24.	7.	2.	.11
+	HYDROGRAPH AT	SUB19B	531.	12.13	58.	17.	6.	.26
+	HYDROGRAPH AT	SUB19C	233.	12.10	24.	7.	3.	.10
+	4 COMBINED AT	C19C	2437.	12.17	270.	72.	26.	1.38
+	ROUTED TO	R19C	2334.	12.30	270.	72.	26.	1.38
+	HYDROGRAPH AT	SUB-13	1180.	12.13	84.	22.	8.	.54
+	2 COMBINED AT	C13	2909.	12.23	352.	93.	34.	1.92
+	HYDROGRAPH AT	SUB-18	812.	12.17	88.	26.	9.	.38
+	2 COMBINED AT	C18	3640.	12.20	437.	118.	43.	2.30
+	ROUTED TO	R18	3574.	12.23	437.	118.	43.	2.30
+	HYDROGRAPH AT	SUB12A	193.	12.10	19.	5.	2.	.09
+	2 COMBINED AT	C12A	3699.	12.23	454.	123.	45.	2.39
+	HYDROGRAPH AT	SUB33E	448.	12.10	43.	12.	4.	.19
+	HYDROGRAPH AT	SUB33F	50.	12.07	4.	1.	0.	.02
+	ROUTED TO	R33F	49.	12.10	4.	1.	0.	.02
+	2 COMBINED AT	C33F	495.	12.10	47.	13.	5.	.22
+	HYDROGRAPH AT	SUB33D	42.	12.23	6.	2.	1.	.04
+	2 COMBINED AT	C33D	526.	12.10	53.	15.	5.	.25
+	ROUTED TO	R33D	513.	12.17	53.	15.	5.	.25
+	HYDROGRAPH AT	SUB33B	342.	12.13	32.	8.	3.	.16
+	2 COMBINED AT	C33B	832.	12.13	84.	23.	8.	.41
+	HYDROGRAPH AT	SUB33C	63.	12.10	8.	2.	1.	.03
+	2 COMBINED AT	C33C	892.	12.13	92.	25.	9.	.43
+	ROUTED TO	R33C	883.	12.17	92.	25.	9.	.43
+	HYDROGRAPH AT	SUB33A	150.	12.07	12.	3.	1.	.05

+	2 COMBINED AT	C33A	969.	12.17	104.	28.	10.	.49
	HYDROGRAPH AT	SUB46A	68.	12.10	6.	2.	1.	.03
+	HYDROGRAPH AT	SUB46B	58.	12.10	6.	1.	1.	.03
+	ROUTED TO	R46B	57.	12.13	6.	1.	1.	.03
+	2 COMBINED AT	C46	123.	12.10	12.	3.	1.	.06
+	HYDROGRAPH AT	SUB-45	150.	12.17	21.	5.	2.	.09
+	2 COMBINED AT	C45	266.	12.13	32.	8.	3.	.15
+	ROUTED TO	R45	247.	12.37	32.	8.	3.	.15
+	HYDROGRAPH AT	SUB-47	320.	12.17	30.	8.	3.	.18
+	2 COMBINED AT	C47	467.	12.27	62.	16.	6.	.33
+	HYDROGRAPH AT	SUB-75	35.	12.07	3.	1.	0.	.02
+	HYDROGRAPH AT	SUB-76	45.	12.07	4.	1.	0.	.02
+	2 COMBINED AT	C76	80.	12.07	7.	2.	1.	.04
+	ROUTED TO	R76	77.	12.13	7.	2.	1.	.04
+	HYDROGRAPH AT	SUB-73	135.	12.07	12.	3.	1.	.06
	2 COMBINED AT	C73	208.	12.10	18.	5.	2.	.09
+	HYDROGRAPH AT	SUB-74	350.	12.10	36.	11.	4.	.16
+	2 COMBINED AT	C74	554.	12.10	54.	16.	6.	.25
+	ROUTED TO	R74	539.	12.13	54.	16.	6.	.25
+	HYDROGRAPH AT	SUB-71	86.	12.07	7.	2.	1.	.04
+	2 COMBINED AT	C71	608.	12.13	61.	18.	6.	.28
+	HYDROGRAPH AT	SUB-70	139.	12.13	16.	5.	2.	.07
+	ROUTED TO	R70	139.	12.13	16.	5.	2.	.07
+	HYDROGRAPH AT	SUB-72	337.	12.10	33.	9.	3.	.16
+	2 COMBINED AT	C70	471.	12.13	48.	14.	5.	.23
+	2 COMBINED AT	C72	1072.	12.13	108.	31.	11.	.51
+	ROUTED TO	R72	1018.	12.23	108.	31.	11.	.51
+	HYDROGRAPH AT	SUB-69	963.	12.17	96.	28.	10.	.47
+	HYDROGRAPH AT	HYDRO6	1236.	12.40	273.	73.	26.	.00
+	3 COMBINED AT	C69	2903.	12.20	472.	131.	47.	.98
	HYDROGRAPH AT	SUB-57	166.	12.07	13.	4.	1.	.07

+	2 COMBINED AT	C57	2985.	12.20	484.	134.	48.	1.05
+	ROUTED TO	R69	2914.	12.27	484.	134.	48.	1.05
+	HYDROGRAPH AT	SUB-58	243.	12.10	18.	5.	2.	.11
+	ROUTED TO	R58	238.	12.10	18.	5.	2.	.11
+	HYDROGRAPH AT	SUB-59	86.	12.27	14.	4.	1.	.08
+	HYDROGRAPH AT	SUB-60	133.	12.23	19.	5.	2.	.09
+	4 COMBINED AT	C60	3251.	12.23	533.	147.	53.	1.33
+	ROUTED TO	R60	3251.	12.27	533.	147.	53.	1.33
+	HYDROGRAPH AT	SUB-61	187.	12.27	32.	9.	3.	.14
+	2 COMBINED AT	C61	3431.	12.27	563.	155.	56.	1.47
+	ROUTED TO	R61	3408.	12.30	563.	155.	56.	1.47
+	HYDROGRAPH AT	SUB-62	168.	12.20	21.	5.	2.	.10
+	HYDROGRAPH AT	SUB-63	140.	12.17	19.	5.	2.	.08
+	HYDROGRAPH AT	HYDRO2	209.	12.60	46.	12.	4.	.00
+	HYDROGRAPH AT	HYDRO3	558.	12.60	66.	16.	6.	.00
+	5 COMBINED AT	C63	3744.	12.27	712.	193.	70.	1.66
+	ROUTED TO	R63	3740.	12.33	712.	193.	70.	1.66
+	HYDROGRAPH AT	SUB-64	119.	12.17	16.	4.	1.	.07
+	2 COMBINED AT	C64	3829.	12.33	727.	197.	71.	1.73

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

```
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   25JUL07  TIME  09:04:43  *                                    *           (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   Project ID: 40933-F6HR - Major Basin: 01 - Return Period: 100 Years
  2           ID
  3           ID
  4           ID   CAVECREEK DRAINAGE MASTER PLAN
  5           ID   FLOODPLAIN DELINEATION STUDY OF CAVECREEK TRIBUTARIES, WILLOW SPRINGS WASH
  6           ID   TRIBUTARIES, GALLOWAY TRIBUTARIES, AND MORMAN GIRL WASH TRIBUTARIES.
  7           ID   FCD CONTRACT #2004C072
  8           ID   PREPARED FOR FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
  9           ID   PREPARED BY HDR ENGINEERING-JULY 2007
 10           ID   FILE NAME: F100-6.DAT
 11           ID
 12           ID   ******************************************************************************
 13           ID   100-YEAR, 6-HOUR STORM EVENT
 14           ID   MULTIPLE STORM EVENT
 15           ID   GREEN-AMPT LOSS METHOD, CLARK UNIT HYDROGRAPH
 16           ID   FUTURE LAND USE FROM ZONING MAP
 17           ID   ******************************************************************************
 18           ID
 19           ID
 20           ID
              *DIAGRAM
 21           IT       2                    2000
 22           IO       3
 23           IN      15
 24           JD    3.40    0.01
 25           PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
 26           PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
 27           PC   0.962   0.972   0.983   0.991   1.000
 28           JD   3.378    0.50
 29           PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
 30           PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
 31           PC   0.962   0.972   0.983   0.991   1.000
 32           JD   3.314    2.80
 33           PC   0.000   0.009   0.016   0.025   0.034   0.042   0.051   0.059   0.067   0.076
 34           PC   0.087   0.100   0.120   0.163   0.252   0.451   0.694   0.837   0.900   0.938
 35           PC   0.950   0.963   0.975   0.988   1.000
 36           JD   3.135    16.0
 37           PC   0.000   0.015   0.020   0.030   0.048   0.063   0.076   0.090   0.105   0.119
 38           PC   0.135   0.152   0.175   0.222   0.304   0.472   0.670   0.796   0.868   0.912
 39           PC   0.946   0.960   0.973   0.987   1.000
 40           JD   2.761    90.0
 41           PC   0.000   0.021   0.035   0.051   0.071   0.087   0.105   0.125   0.143   0.160
 42           PC   0.179   0.201   0.232   0.281   0.364   0.500   0.658   0.773   0.841   0.888
 43           PC   0.927   0.945   0.964   0.982   1.000
 44           JD   1.938   500.0
 45           PC   0.000   0.024   0.043   0.059   0.078   0.098   0.119   0.141   0.162   0.186
 46           PC   0.212   0.239   0.271   0.321   0.408   0.515   0.627   0.735   0.814   0.864
 47           PC   0.907   0.930   0.954   0.977   1.000

 48           KK  SUB14B   BASIN
 49           BA   0.267
              *
 50           LG    0.30    0.15    7.00    0.11       5
 51           UC   0.304   0.291
```

```
  52          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
1                                                HEC-1 INPUT                                                    PAGE  2

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

  53          UA     100
              *

  54          KK  SUB14C   BASIN
  55          BA   0.458
  56          LG    0.30    0.15    7.60    0.09       6
  57          UC   0.275   0.215
  58          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
  59          UA     100
              *

  60          KK    C14C
  61          KM   COMBINE SUB-14B, AND SUB-14C
  62          HC       2
              *

  63          KK    R14C   ROUTE   REACH
  64          RS       4    FLOW      -1
  65          RC   0.053   0.045   0.053    3270  0.0130  246.00
  66          RX     0.0     4.8     9.6    14.5    39.4    78.3    94.4   110.1
  67          RY   246.0   244.0   242.0   240.0   240.0   242.0   244.0   246.0
              *

  68          KK  SUB14A   BASIN
  69          BA   0.180
  70          LG    0.30    0.15    8.00    0.08       8
  71          UC   0.229   0.187
  72          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
  73          UA     100
              *

  74          KK    C14A
  75          KM   COMBINE R14C AND SUB-14A
  76          HC       2
              *

  77          KK  SUB19A   BASIN
  78          BA   0.111
  79          LG    0.30    0.15    7.60    0.09      24
  80          UC   0.208   0.201
  81          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
  82          UA     100
              *

  83          KK  SUB19B   BASIN
  84          BA   0.257
  85          LG    0.32    0.24    7.00    0.11      31
  86          UC   0.246   0.216
  87          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
  88          UA     100
              *
1                                                HEC-1 INPUT                                                    PAGE  3

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

  89          KK  SUB19C   BASIN
  90          BA   0.105
  91          LG    0.30    0.16    7.30    0.10      35
  92          UC   0.200   0.195
  93          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
  94          UA     100
              *

  95          KK    C19C
  96          KM   COMBINE C14A, SUB-19A, SUB-19B, AND SUB-19C
  97          HC       4
              *

  98          KK    R19C   ROUTE   REACH
  99          RS       5    FLOW      -1
 100          RC   0.053   0.045   0.053    4116  0.0114  204.00
 101          RX     0.0    47.6    66.1    87.7   106.8   112.7   131.1   138.9
 102          RY   204.0   202.0   200.0   198.0   198.0   200.0   202.0   204.0
              *

 103          KK  SUB-13   BASIN
 104          BA   0.541
 105          LG    0.30    0.25    5.20    0.23       9
 106          UC   0.242   0.131
 107          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 108          UA     100
              *

 109          KK     C13
 110          KM   COMBINE R19C, AND SUB-13
 111          HC       2
```

```
                *

 112            KK  SUB-18   BASIN
 113            BA   0.385
 114            LG    0.31    0.19    7.30    0.10      34
 115            UC   0.267   0.200
 116            UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 117            UA     100
                *

 118            KK     C18
 119            KM   COMBINE C13, AND SUB-18
 120            HC       2
                *

 121            KK     R18   ROUTE   REACH
 122            RS       1    FLOW      -1
 123            RC   0.053   0.045   0.053    2572  0.0233  146.00
 124            RX     0.0     2.6     5.9     9.9    20.8    24.7    27.3    30.4
 125            RY   146.0   144.0   142.0   140.0   140.0   142.0   144.0   146.0
                *
1                                          HEC-1 INPUT                                          PAGE  4

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

 126            KK  SUB12A   BASIN
 127            BA   0.089
 128            LG    0.30    0.19    6.60    0.13      25
 129            UC   0.192   0.190
 130            UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 131            UA     100
                *

 132            KK    C12A
 133            KM   COMBINE R18 AND SUB12A
 134            HC       2
                *

 135            KK  SUB33E   BASIN
 136            BA   0.194
 137            LG    0.30    0.17    6.80    0.12      30
 138            UC   0.213   0.157
 139            UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 140            UA     100
                *

 141            KK  SUB33F   BASIN
 142            BA   0.021
 143            LG    0.30    0.17    6.80    0.12       5
 144            UC   0.150   0.168
 145            UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 146            UA     100
                *

 147            KK    R33F   ROUTE   BASIN
 148            RS       1    FLOW      -1
 149            RC   0.053   0.045   0.053     477  0.0168  192.00
 150            RX     0.0    15.0    30.0    40.5    41.5    52.5    73.7   108.0
 151            RY   192.0   191.0   190.0   188.0   188.0   190.0   190.2   192.0
                *

 152            KK    C33F
 153            KM   COMBINE R33F AND SUB33E
 154            HC       2
                *

 155            KK  SUB33D   BASIN
 156            BA   0.035
 157            LG    0.30    0.25    5.70    0.19       7
 158            UC   0.325   0.477
 159            UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 160            UA     100
                *
1                                          HEC-1 INPUT                                          PAGE  5

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

 161            KK    C33D
 162            KM   COMBINE C33F AND SUB33D
 163            HC       2
                *

 164            KK    R33D   ROUTE   REACH
 165            RS       4    FLOW      -1
 166            RC   0.053   0.045   0.053    1637  0.0104  188.00
 167            RX     0.0    49.3    60.6    71.9    83.0   133.7   175.9   214.2
 168            RY   188.0   186.0   184.0   182.0   182.0   184.0   186.0   188.0
                *

 169            KK  SUB33B   BASIN
```

```
170          BA   0.155
171          LG    0.30    0.15    7.30    0.10       5
172          UC   0.213   0.181
173          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
174          UA     100
             *

175          KK    C33B
176          KM   COMBINE R33D AND SUB33B
177          HC       2
             *

178          KK  SUB33C   BASIN
179          BA   0.028
180          LG    0.30    0.13   10.10    0.03       5
181          UC   0.192   0.218
182          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
183          UA     100
             *

184          KK    C33C
185          KM   COMBINE C33B AND SUB33C
186          HC       2
             *

187          KK    R33C   ROUTE   REACH
188          RS       2    FLOW      -1
189          RC   0.053   0.045   0.053    1320  0.0159  158.00
190          RX     0.0     6.5    14.3    25.5    44.2    52.6    58.3    64.3
191          RY   158.0   156.0   154.0   152.0   152.0   154.0   156.0   158.0
             *

192          KK  SUB33A   BASIN
193          BA   0.055
194          LG    0.30    0.15    7.00    0.11       8
195          UC   0.142   0.100
196          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
197          UA     100
             *
```



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

198          KK    C33A
199          KM   COMBINE R33C AND SUB33A
200          HC       2
             *
             *

201          KK  SUB46A   BASIN
202          BA   0.032
203          LG    0.30    0.15    7.00    0.11       5
204          UC   0.171   0.206
205          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
206          UA     100
             *

207          KK  SUB46B   BASIN
208          BA   0.031
209          LG    0.30    0.15    7.00    0.11       5
210          UC   0.188   0.263
211          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
212          UA     100
             *

213          KK    R46B   ROUTE   BASIN
214          RS       1    FLOW      -1
215          RC   0.053   0.045   0.053     564  0.0390  262.00
216          RX     0.0     8.2    16.6    27.9    50.0    57.9    65.9    73.0
217          RY   262.0   260.0   258.0   256.0   256.0   258.0   260.0   262.0
             *

218          KK     C46
219          KM   COMBINE R46B AND SUB46A
220          HC       2
             *

221          KK  SUB-45   BASIN
222          BA   0.088
223          LG    0.30    0.15    9.70    0.04       5
224          UC   0.258   0.350
225          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
226          UA     100
             *

227          KK     C45
228          KM   COMBINE C46 AND SUB-45
229          HC       2
             *

230          KK     R45   ROUTE   REACH
```

```
 231          RS      10    FLOW      -1
 232          RC   0.053   0.045   0.053    4898  0.0218  192.00
 233          RX     0.0    26.3    64.2   107.1   146.4   157.7   166.9   176.3
 234          RY   192.0   190.0   188.0   186.0   186.0   188.0   190.0   192.0
              *
1                                        HEC-1 INPUT                                                    PAGE  7

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

 235          KK  SUB-47   BASIN
 236          BA   0.178
 237          LG    0.30    0.25    5.40    0.21       5
 238          UC   0.275   0.240
 239          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 240          UA     100
              *

 241          KK     C47
 242          KM   COMBINE R45 AND SUB47
 243          HC       2
              *
              *

 244          KK  SUB-75   BASIN
 245          BA   0.016
 246          LG    0.23    0.25    6.00    0.22      54
 247          UC   0.133   0.176
 248          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 249          UA     100
              *

 250          KK  SUB-76   BASIN
 251          BA   0.020
 252          LG    0.26    0.25    5.20    0.31      30
 253          UC   0.138   0.160
 254          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 255          UA     100
              *

 256          KK     C76
 257          KM   COMBINE SUB-75, AND SUB-76
 258          HC       2
              *

 259          KK     R76   ROUTE   REACH
 260          RS       3    FLOW      -1
 261          RC   0.053   0.045   0.053     919  0.0152  114.00
 262          RX     0.0    44.9    63.2    67.9    71.3   107.2   136.4   159.2
 263          RY   114.0   112.0   110.0   108.0   108.0   110.0   112.0   114.0
              *

 264          KK  SUB-73   BASIN
 265          BA   0.056
 266          LG    0.28    0.19    6.60    0.17      47
 267          UC   0.167   0.155
 268          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 269          UA     100
              *
1                                        HEC-1 INPUT                                                    PAGE  8

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

 270          KK     C73
 271          KM   COMBINE R76 AND SUB-73
 272          HC       2
              *

 273          KK  SUB-74   BASIN
 274          BA   0.156
 275          LG    0.29    0.17    6.80    0.14      37
 276          UC   0.208   0.176
 277          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 278          UA     100
              *

 279          KK     C74
 280          KM   COMBINE C73 AND SUB-74
 281          HC       2
              *

 282          KK     R74   ROUTE   REACH
 283          RS       2    FLOW      -1
 284          RC   0.053   0.045   0.053    1412  0.0212   92.00
 285          RX     0.0    25.4    69.1    79.9    84.8    92.1    99.9   130.3
 286          RY    92.0    90.0    88.0    86.0    86.0    88.0    90.0    92.0
              *

 287          KK  SUB-71   BASIN
 288          BA   0.035
 289          LG    0.28    0.19    6.60    0.17      43
```

```
290          UC   0.150   0.149
291          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
292          UA     100
             *

293          KK     C71
294          KM   COMBINE R74 AND SUB-71
295          HC       2
             *

296          KK  SUB-70   BASIN
297          BA   0.072
298          LG    0.30    0.19    6.60    0.14      28
299          UC   0.208   0.255
300          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
301          UA     100
             *

302          KK     R70   ROUTE   BASIN
303          RS       1    FLOW      -1
304          RC   0.053   0.045   0.053     403  0.0546   92.00
305          RX     0.0    10.7    21.5    44.3    64.8    88.0   122.0   149.0
306          RY    92.0    90.0    88.0    86.0    86.0    88.0    90.0    92.0
             *
```



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

307          KK  SUB-72   BASIN
308          BA   0.155
309          LG    0.29    0.19    6.60    0.14      30
310          UC   0.213   0.184
311          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
312          UA     100
             *

313          KK     C70
314          KM   COMBINE R70 AND SUB-72
315          HC       2
             *

316          KK     C72
317          KM   COMBINE C70 AND C71
318          HC       2
             *

319          KK     R72   ROUTE   REACH
320          RS       4    FLOW      -1
321          RC   0.053   0.045   0.053    3492  0.0218    6.00
322          RX     0.0    21.3    57.8    75.7    77.8    85.0    92.5    99.9
323          RY     5.0     4.0     2.0     0.0     0.0     2.0     4.0     6.0
             *

324          KK  SUB-69   BASIN
325          BA   0.471
326          LG    0.30    0.25    6.00    0.18      25
327          UC   0.267   0.192
328          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
329          UA     100
             *

330          KK     C69
331          KM   COMBINE R72 AND SUB-69
332          HC       2
             *

333          KK  SUB-57   BASIN
334          BA   0.066
335          LG    0.30    0.25    5.80    0.18      18
336          UC   0.150   0.114
337          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
338          UA     100
             *

339          KK     C57
340          KM   COMBINE SUB-57 AND C69
341          HC       2
             *
```



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

342          KK     R69   ROUTE   REACH
343          RS       3    FLOW      -1
344          RC   0.053   0.045   0.053    2610  0.0146  972.00
345          RX     0.0    36.7    77.1    91.0   126.4   146.8   157.7   170.6
346          RY   972.0   970.0   968.0   966.0   966.0   968.0   970.0   972.0
             *

347          KK  SUB-58   BASIN
```

```
348          BA   0.111
349          LG    0.30    0.25    5.30    0.22       6
350          UC   0.192   0.159
351          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
352          UA     100
             *

353          KK     R58   ROUTE   BASIN
354          RS       1    FLOW      -1
355          RC   0.053   0.045   0.053     455  0.0132  972.00
356          RX     0.0    36.7    77.1    91.0   126.4   146.8   157.7   170.6
357          RY   972.0   970.0   968.0   966.0   966.0   968.0   970.0   972.0
             *

358          KK  SUB-59   BASIN
359          BA   0.082
360          LG    0.30    0.25    5.00    0.29      11
361          UC   0.388   0.584
362          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
363          UA     100
             *

364          KK  SUB-60   BASIN
365          BA   0.092
366          LG    0.30    0.15    7.00    0.13      11
367          UC   0.333   0.426
368          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
369          UA     100
             *

370          KK     C60
371          KM   COMBINE R69, R58, SUB-59, SUB-60
372          HC       4
             *

373          KK     R60   ROUTE   REACH
374          RS       1    FLOW      -1
375          RC   0.053   0.045   0.053     420  0.0143  960.00
376          RX     0.0    42.8    63.6    82.6   106.8   117.5   120.1   182.8
377          RY   964.0   962.0   960.0   958.0   958.0   960.0   960.0   960.0
             *
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

378          KK  SUB-61   BASIN
379          BA   0.142
380          LG    0.30    0.15    7.60    0.10      12
381          UC   0.388   0.514
382          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
383          UA     100
             *

384          KK     C61
385          KM   COMBINE R60, AND SUB-61
386          HC       2
             *

387          KK     R61   ROUTE   REACH
388          RS       1    FLOW      -1
389          RC   0.053   0.045   0.053     780  0.0103  950.00
390          RX     0.0     7.4    14.6    36.2    47.1    62.9    69.6    76.4
391          RY   950.0   948.0   946.0   946.0   946.0   946.0   948.0   950.0
             *

392          KK  SUB-62   BASIN
393          BA   0.098
394          LG    0.26    0.15    7.60    0.10      20
395          UC   0.279   0.302
396          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
397          UA     100
             *

398          KK  SUB-63   BASIN
399          BA   0.082
400          LG    0.27    0.15    8.00    0.08      16
401          UC   0.271   0.323
402          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
403          UA     100
             *

404          KK     C63
405          KM   COMBINE R61, SUB-62, AND SUB-63
406          HC       3
             *

407          KK     R63   ROUTE   REACH
408          RS       2    FLOW      -1
409          RC   0.053   0.045   0.053    2145  0.0196  922.00
410          RX     0.0     4.2     8.2    12.2    36.3    41.2    45.8    50.4
411          RY   922.0   920.0   918.0   916.0   916.0   918.0   920.0   922.0
```

```
                    *
 412                KK  SUB-64   BASIN
 413                BA   0.071
 414                LG    0.30    0.15    7.30    0.10       5
 415                UC   0.279   0.343
 416                UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 417                UA     100
                    *
1                                                HEC-1 INPUT                                                PAGE 12

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

 418                KK     C64
 419                KM   COMBINE R63, AND SUB-64
 420                HC       2
                    *
 421                ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

    48      SUB14B
                 .
    54           .      SUB14C
                 .           .
    60        C14C............
                 V
                 V
    63        R14C
                 .
    68           .      SUB14A
                 .           .
    74        C14A............
                 .
    77           .      SUB19A
                 .           .
    83           .           .     SUB19B
                 .           .           .
    89           .           .           .     SUB19C
                 .           .           .           .
    95        C19C...................................
                 V
                 V
    98        R19C
                 .
   103           .      SUB-13
                 .           .
   109         C13............
                 .
   112           .      SUB-18
                 .           .
   118         C18............
                 V
                 V
   121         R18
                 .
   126           .      SUB12A
                 .           .
   132        C12A............
                 .
   135           .      SUB33E
                 .           .
   141           .           .     SUB33F
                 .           .           V
                 .           .           V
   147           .           .       R33F
                 .           .           .
   152           .        C33F............
                 .           .
                 .           .
```

```
155          .           .      SUB33D
             .           .           .
 51          .        C33D...........
             .           V
             .           V
164          .        R33D
             .           .
             .           .
169          .           .      SUB33B
             .           .           .
             .           .           .
175          .        C33B...........
             .           .
             .           .
178          .           .      SUB33C
             .           .           .
             .           .           .
184          .        C33C...........
             .           V
             .           V
187          .        R33C
             .           .
             .           .
192          .           .      SUB33A
             .           .           .
             .           .           .
198          .        C33A...........
             .           .
             .           .
201          .           .      SUB46A
             .           .           .
             .           .           .
207          .           .           .      SUB46B
             .           .           .           V
             .           .           .           V
213          .           .           .        R46B
             .           .           .           .
             .           .           .           .
218          .           .         C46...........
             .           .           .
             .           .           .
221          .           .           .      SUB-45
             .           .           .           .
             .           .           .           .
227          .           .         C45...........
             .           .           V
             .           .           V
230          .           .         R45
             .           .           .
             .           .           .
235          .           .           .      SUB-47
             .           .           .           .
             .           .           .           .
241          .           .         C47...........
             .           .           .
             .           .           .
244          .           .           .      SUB-75
             .           .           .           .
             .           .           .           .
250          .           .           .           .      SUB-76
             .           .           .           .           .
             .           .           .           .           .
256          .           .           .         C76...........
             .           .           .           V
             .           .           .           V
259          .           .           .         R76
             .           .           .           .
             .           .           .           .
264          .           .           .           .      SUB-73
             .           .           .           .           .
             .           .           .           .           .
270          .           .           .         C73...........
             .           .           .           .
             .           .           .           .
273          .           .           .           .      SUB-74
             .           .           .           .           .
             .           .           .           .           .
279          .           .           .         C74...........
             .           .           .           V
             .           .           .           V
282          .           .           .         R74
             .           .           .           .
             .           .           .           .
287          .           .           .           .      SUB-71
             .           .           .           .           .
             .           .           .           .           .
293          .           .           .         C71...........
             .           .           .           .
             .           .           .           .
  6          .           .           .           .      SUB-70
             .           .           .           .           V
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302                                  V
                                    R70
307                                                 SUB-72
313                                    C70............
316                            C72............
                                 V
                                 V
319                            R72
324                                      SUB-69
330                            C69............
333                                      SUB-57
339                            C57............
                                 V
                                 V
342                            R69
347                                      SUB-58
                                            V
                                            V
353                                        R58
358                                                 SUB-59
364                                                           SUB-60
370                            C60.................................
                                 V
                                 V
373                            R60
378                                      SUB-61
384                            C61............
                                 V
                                 V
387                            R61
392                                      SUB-62
398                                                 SUB-63
404                            C63......................
                                 V
                                 V
407                            R63
412                                      SUB-64
418                            C64............
```

1

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	SUB14B	597.	4.20	64.	16.	6.	.27		
+	HYDROGRAPH AT	SUB14C	1192.	4.17	113.	28.	10.	.46		
	2 COMBINED AT									

+	C14C	1640.	4.17	175.	44.	16.	.73
ROUTED TO	R14C	1588.	4.23	174.	44.	16.	.73
+ HYDROGRAPH AT	SUB14A	504.	4.13	45.	11.	4.	.18
+ 2 COMBINED AT	C14A	1841.	4.23	217.	54.	20.	.91
+ HYDROGRAPH AT	SUB19A	308.	4.10	30.	7.	3.	.11
+ HYDROGRAPH AT	SUB19B	675.	4.13	68.	17.	6.	.26
+ HYDROGRAPH AT	SUB19C	298.	4.10	29.	7.	3.	.10
+ 4 COMBINED AT	C19C	2554.	4.17	337.	84.	30.	1.38
+ ROUTED TO	R19C	2481.	4.30	337.	84.	30.	1.38
+ HYDROGRAPH AT	SUB-13	1521.	4.13	114.	28.	10.	.54
+ 2 COMBINED AT	C13	2958.	4.23	436.	109.	39.	1.92
+ HYDROGRAPH AT	SUB-18	1043.	4.13	105.	26.	10.	.38
+ 2 COMBINED AT	C18	3468.	4.20	533.	134.	48.	2.30
+ ROUTED TO	R18	3435.	4.23	533.	134.	48.	2.30
+ HYDROGRAPH AT	SUB12A	250.	4.10	23.	6.	2.	.09
+ 2 COMBINED AT	C12A	3528.	4.23	554.	139.	50.	2.39
+ HYDROGRAPH AT	SUB33E	579.	4.10	52.	13.	5.	.19
+ HYDROGRAPH AT	SUB33F	62.	4.07	5.	1.	0.	.02
+ ROUTED TO	R33F	60.	4.10	5.	1.	0.	.02
+ 2 COMBINED AT	C33F	639.	4.10	57.	14.	5.	.22
+ HYDROGRAPH AT	SUB33D	56.	4.20	8.	2.	1.	.04
+ 2 COMBINED AT	C33D	683.	4.10	64.	16.	6.	.25
+ ROUTED TO	R33D	668.	4.17	64.	16.	6.	.25
+ HYDROGRAPH AT	SUB33B	436.	4.10	38.	9.	3.	.16
+ 2 COMBINED AT	C33B	1082.	4.13	102.	26.	9.	.41
+ HYDROGRAPH AT	SUB33C	78.	4.10	8.	2.	1.	.03
+ 2 COMBINED AT	C33C	1158.	4.13	110.	27.	10.	.43
+ ROUTED TO	R33C	1146.	4.17	110.	27.	10.	.43
+ HYDROGRAPH AT	SUB33A	186.	4.07	13.	3.	1.	.05
+ 2 COMBINED AT	C33A	1252.	4.13	123.	31.	11.	.49
HYDROGRAPH AT	SUB46A	87.	4.10	8.	2.	1.	.03

+	HYDROGRAPH AT	SUB46B	76.	4.10	7.	2.	1.	.03
+	ROUTED TO	R46B	75.	4.13	7.	2.	1.	.03
+	2 COMBINED AT	C46	161.	4.10	15.	4.	1.	.06
+	HYDROGRAPH AT	SUB-45	191.	4.17	23.	6.	2.	.09
+	2 COMBINED AT	C45	345.	4.13	38.	10.	3.	.15
+	ROUTED TO	R45	321.	4.33	38.	10.	3.	.15
+	HYDROGRAPH AT	SUB-47	410.	4.17	37.	9.	3.	.18
+	2 COMBINED AT	C47	625.	4.23	75.	19.	7.	.33
+	HYDROGRAPH AT	SUB-75	48.	4.07	5.	1.	0.	.02
+	HYDROGRAPH AT	SUB-76	58.	4.07	5.	1.	0.	.02
+	2 COMBINED AT	C76	105.	4.07	9.	2.	1.	.04
+	ROUTED TO	R76	101.	4.10	9.	2.	1.	.04
+	HYDROGRAPH AT	SUB-73	171.	4.07	16.	4.	1.	.06
+	2 COMBINED AT	C73	271.	4.10	25.	6.	2.	.09
+	HYDROGRAPH AT	SUB-74	451.	4.10	43.	11.	4.	.16
+	2 COMBINED AT	C74	720.	4.10	68.	17.	6.	.25
+	ROUTED TO	R74	702.	4.13	68.	17.	6.	.25
+	HYDROGRAPH AT	SUB-71	109.	4.07	10.	2.	1.	.04
+	2 COMBINED AT	C71	794.	4.13	78.	19.	7.	.28
+	HYDROGRAPH AT	SUB-70	178.	4.13	19.	5.	2.	.07
+	ROUTED TO	R70	177.	4.13	19.	5.	2.	.07
+	HYDROGRAPH AT	SUB-72	435.	4.10	41.	10.	4.	.16
+	2 COMBINED AT	C70	608.	4.13	60.	15.	5.	.23
+	2 COMBINED AT	C72	1393.	4.13	137.	34.	12.	.51
+	ROUTED TO	R72	1328.	4.20	137.	34.	12.	.51
+	HYDROGRAPH AT	SUB-69	1235.	4.13	114.	29.	10.	.47
+	2 COMBINED AT	C69	2126.	4.17	244.	61.	22.	.98
+	HYDROGRAPH AT	SUB-57	211.	4.07	15.	4.	1.	.07
+	2 COMBINED AT	C57	2201.	4.17	258.	65.	23.	1.05
+	ROUTED TO	R69	2152.	4.23	258.	65.	23.	1.05
+	HYDROGRAPH AT	SUB-58	310.	4.10	23.	6.	2.	.11

	ROUTED TO	R58	305.	4.10	23.	6.	2.	.11
+	HYDROGRAPH AT	SUB-59	108.	4.27	17.	4.	2.	.08
+	HYDROGRAPH AT	SUB-60	168.	4.20	22.	6.	2.	.09
+	4 COMBINED AT	C60	2404.	4.23	314.	79.	28.	1.33
+	ROUTED TO	R60	2397.	4.23	314.	79.	28.	1.33
+	HYDROGRAPH AT	SUB-61	233.	4.27	36.	9.	3.	.14
+	2 COMBINED AT	C61	2515.	4.23	346.	87.	31.	1.47
+	ROUTED TO	R61	2508.	4.27	346.	87.	31.	1.47
+	HYDROGRAPH AT	SUB-62	224.	4.17	26.	6.	2.	.10
+	HYDROGRAPH AT	SUB-63	183.	4.17	22.	5.	2.	.08
+	3 COMBINED AT	C63	2708.	4.27	390.	98.	35.	1.65
+	ROUTED TO	R63	2696.	4.30	390.	98.	35.	1.65
+	HYDROGRAPH AT	SUB-64	149.	4.17	17.	4.	2.	.07
+	2 COMBINED AT	C64	2765.	4.30	405.	102.	37.	1.72

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

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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   25JUL07  TIME  09:28:58   *                                                    *          (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   Project ID: 40933-F24HR - Major Basin: 01 - Return Period: 100 Years
    2           ID
    3           ID
    4           ID   CAVECREEK DRAINAGE MASTER PLAN
    5           ID   FLOODPLAIN DELINEATION STUDY OF CAVECREEK TRIBUTARIES, WILLOW SPRINGS WASH
    6           ID   TRIBUTARIES, GALLOWAY TRIBUTARIES, AND MORMAN GIRL WASH TRIBUTARIES.
    7           ID   FCD CONTRACT #2004C072
    8           ID   PREPARED FOR FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
    9           ID   PREPARED BY HDR ENGINEERING-JULY 2007
   10           ID   FILE NAME: F100-24.DAT
   11           ID
   12           ID   ****************************************************************************
   13           ID   100-YEAR, 24-HOUR STORM EVENT
   14           ID   MULTIPLE STORM EVENT
   15           ID   GREEN-AMPT LOSS METHOD, CLARK UNIT HYDROGRAPH
   16           ID   FUTURE LAND USE FROM ZONING MAP
   17           ID   ****************************************************************************
   18           ID
   19           ID
   20           ID
                *DIAGRAM
   21           IT       2                    2000
   22           IO       3
   23           IN      15
   24           JD    4.60    0.01
   25           PC   0.000   0.002   0.005   0.008   0.011   0.014   0.017   0.020   0.023   0.026
   26           PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056   0.060
   27           PC   0.064   0.068   0.072   0.076   0.080   0.085   0.090   0.095   0.100   0.105
   28           PC   0.110   0.115   0.120   0.126   0.133   0.140   0.147   0.155   0.163   0.172
   29           PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
   30           PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
   31           PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
   32           PC   0.913   0.918   0.922   0.926   0.930   0.934   0.938   0.942   0.946   0.950
   33           PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977   0.980
   34           PC   0.983   0.986   0.989   0.992   0.995   0.998   1.000
   35           JD   4.324      10
   36           JD   4.140      30
   37           JD   3.956      60
   38           JD   3.892      90
   39           JD   3.836     120
   40           JD   3.795     150
   41           JD   3.680     300
   42           JD   3.588     500

   43           KK  SUB14B   BASIN
   44           BA   0.267
                *
   45           LG    0.30    0.15    7.00    0.11       5
   46           UC   0.321   0.309
   47           UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
   48           UA     100
                *
                                                    HEC-1 INPUT                                                          PAGE  2
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  49          KK  SUB14C   BASIN
  50          BA   0.458
  51          LG    0.30    0.15    7.60    0.09       6
  52          UC   0.292   0.229
  53          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
  54          UA     100
              *

  55          KK    C14C
  56          KM   COMBINE SUB-14B, AND SUB-14C
  57          HC       2
              *

  58          KK    R14C   ROUTE   REACH
  59          RS       4    FLOW      -1
  60          RC   0.053   0.045   0.053    3270  0.0130  246.00
  61          RX     0.0     4.8     9.6    14.5    39.4    78.3    94.4   110.1
  62          RY   246.0   244.0   242.0   240.0   240.0   242.0   244.0   246.0
              *

  63          KK  SUB14A   BASIN
  64          BA   0.180
  65          LG    0.30    0.15    8.00    0.08       8
  66          UC   0.242   0.198
  67          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
  68          UA     100
              *

  69          KK    C14A
  70          KM   COMBINE R14C AND SUB-14A
  71          HC       2
              *

  72          KK  SUB19A   BASIN
  73          BA   0.111
  74          LG    0.30    0.15    7.60    0.09      24
  75          UC   0.217   0.210
  76          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
  77          UA     100
              *

  78          KK  SUB19B   BASIN
  79          BA   0.257
  80          LG    0.32    0.24    7.00    0.11      31
  81          UC   0.258   0.229
  82          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
  83          UA     100
              *
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  84          KK  SUB19C   BASIN
  85          BA   0.105
  86          LG    0.30    0.16    7.30    0.10      35
  87          UC   0.213   0.208
  88          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
  89          UA     100
              *

  90          KK    C19C
  91          KM   COMBINE C14A, SUB-19A, SUB-19B, AND SUB-19C
  92          HC       4
              *

  93          KK    R19C   ROUTE   REACH
  94          RS       5    FLOW      -1
  95          RC   0.053   0.045   0.053    4116  0.0114  204.00
  96          RX     0.0    47.6    66.1    87.7   106.8   112.7   131.1   138.9
  97          RY   204.0   202.0   200.0   198.0   198.0   200.0   202.0   204.0
              *

  98          KK  SUB-13   BASIN
  99          BA   0.541
 100          LG    0.30    0.25    5.20    0.23       9
 101          UC   0.250   0.136
 102          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 103          UA     100
              *

 104          KK     C13
 105          KM   COMBINE R19C AND SUB-13
 106          HC       2
              *

 107          KK  SUB-18   BASIN
 108          BA   0.385
 109          LG    0.31    0.19    7.30    0.10      34
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 110          UC   0.283   0.214
 111          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 112          UA     100
              *

 113          KK     C18
 114          KM   COMBINE C13, AND SUB-18
 115          HC       2
              *

 116          KK     R18   ROUTE   REACH
 117          RS       1    FLOW      -1
 118          RC   0.053   0.045   0.053    2572  0.0233  146.00
 119          RX     0.0     2.6     5.9     9.9    20.8    24.7    27.3    30.4
 120          RY   146.0   144.0   142.0   140.0   140.0   142.0   144.0   146.0
              *
1                                          HEC-1 INPUT                                          PAGE  4

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

 121          KK  SUB12A   BASIN
 122          BA   0.089
 123          LG    0.30    0.19    6.60    0.13      25
 124          UC   0.204   0.204
 125          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 126          UA     100
              *

 127          KK    C12A
 128          KM   COMBINE R18 AND SUB12A
 129          HC       2
              *

 130          KK  SUB33E   BASIN
 131          BA   0.194
 132          LG    0.30    0.17    6.80    0.12      30
 133          UC   0.221   0.163
 134          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 135          UA     100
              *

 136          KK  SUB33F   BASIN
 137          BA   0.021
 138          LG    0.30    0.17    6.80    0.12       5
 139          UC   0.158   0.178
 140          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 141          UA     100
              *

 142          KK    R33F   ROUTE   BASIN
 143          RS       1    FLOW      -1
 144          RC   0.053   0.045   0.053     477  0.0168  192.00
 145          RX     0.0    15.0    30.0    40.5    41.5    52.5    73.7   108.0
 146          RY   192.0   191.0   190.0   188.0   188.0   190.0   190.2   192.0
              *

 147          KK    C33F
 148          KM   COMBINE R33F AND SUB33E
 149          HC       2
              *

 150          KK  SUB33D   BASIN
 151          BA   0.035
 152          LG    0.30    0.25    5.70    0.19       7
 153          UC   0.342   0.505
 154          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 155          UA     100
              *
1                                          HEC-1 INPUT                                          PAGE  5

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

 156          KK    C33D
 157          KM   COMBINE C33F AND SUB33D
 158          HC       2
              *

 159          KK    R33D   ROUTE   REACH
 160          RS       4    FLOW      -1
 161          RC   0.053   0.045   0.053    1637  0.0104  188.00
 162          RX     0.0    49.3    60.6    71.9    83.0   133.7   175.9   214.2
 163          RY   188.0   186.0   184.0   182.0   182.0   184.0   186.0   188.0
              *

 164          KK  SUB33B   BASIN
 165          BA   0.155
 166          LG    0.30    0.15    7.30    0.10       5
 167          UC   0.221   0.189
 168          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 169          UA     100
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                *

170             KK    C33B
171             KM   COMBINE R33D AND SUB33B
172             HC       2
                *

173             KK  SUB33C   BASIN
174             BA   0.028
175             LG    0.30    0.13   10.10    0.03       5
176             UC   0.200   0.229
177             UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
178             UA     100
                *

179             KK    C33C
180             KM   COMBINE C33B AND SUB33C
181             HC       2
                *

182             KK    R33C   ROUTE   REACH
183             RS       2    FLOW      -1
184             RC   0.053   0.045   0.053    1320  0.0159  158.00
185             RX     0.0     6.5    14.3    25.5    44.2    52.6    58.3    64.3
186             RY   158.0   156.0   154.0   152.0   152.0   154.0   156.0   158.0
                *

187             KK  SUB33A   BASIN
188             BA   0.055
189             LG    0.30    0.15    7.00    0.11       8
190             UC   0.146   0.103
191             UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
192             UA     100
                *
1                                          HEC-1 INPUT                                          PAGE  6

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

193             KK    C33A
194             KM   COMBINE R33C AND SUB33A
195             HC       2
                *
                *

196             KK  SUB46A   BASIN
197             BA   0.032
198             LG    0.30    0.15    7.00    0.11       5
199             UC   0.179   0.217
200             UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
201             UA     100
                *

202             KK  SUB46B   BASIN
203             BA   0.031
204             LG    0.30    0.15    7.00    0.11       5
205             UC   0.196   0.276
206             UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
207             UA     100
                *

208             KK    R46B   ROUTE   BASIN
209             RS       1    FLOW      -1
210             RC   0.053   0.045   0.053     564  0.0390  262.00
211             RX     0.0     8.2    16.6    27.9    50.0    57.9    65.9    73.0
212             RY   262.0   260.0   258.0   256.0   256.0   258.0   260.0   262.0
                *

213             KK     C46
214             KM   COMBINE R46B AND SUB46A
215             HC       2
                *

216             KK  SUB-45   BASIN
217             BA   0.088
218             LG    0.30    0.15    9.70    0.04       5
219             UC   0.271   0.369
220             UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
221             UA     100
                *

222             KK     C45
223             KM   COMBINE C46 AND SUB-45
224             HC       2
                *

225             KK     R45   ROUTE   REACH
226             RS      10    FLOW      -1
227             RC   0.053   0.045   0.053    4898  0.0218  192.00
228             RX     0.0    26.3    64.2   107.1   146.4   157.7   166.9   176.3
229             RY   192.0   190.0   188.0   186.0   186.0   188.0   190.0   192.0
                *
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 230          KK  SUB-47   BASIN
 231          BA   0.178
 232          LG    0.30    0.25    5.40    0.21       5
 233          UC   0.292   0.256
 234          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 235          UA     100
              *

 236          KK     C47
 237          KM   COMBINE R45 AND SUB47
 238          HC       2
              *
              *

 239          KK  SUB-75   BASIN
 240          BA   0.016
 241          LG    0.23    0.25    6.00    0.22      54
 242          UC   0.142   0.188
 243          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 244          UA     100
              *

 245          KK  SUB-76   BASIN
 246          BA   0.020
 247          LG    0.26    0.25    5.20    0.31      30
 248          UC   0.146   0.171
 249          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 250          UA     100
              *

 251          KK     C76
 252          KM   COMBINE SUB-75, AND SUB-76
 253          HC       2
              *

 254          KK     R76   ROUTE   REACH
 255          RS       3    FLOW      -1
 256          RC   0.053   0.045   0.053     919  0.0152  114.00
 257          RX     0.0    44.9    63.2    67.9    71.3   107.2   136.4   159.2
 258          RY   114.0   112.0   110.0   108.0   108.0   110.0   112.0   114.0
              *

 259          KK  SUB-73   BASIN
 260          BA   0.056
 261          LG    0.28    0.19    6.60    0.17      47
 262          UC   0.175   0.164
 263          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 264          UA     100
              *
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 265          KK     C73
 266          KM   COMBINE R76 AND SUB-73
 267          HC       2
              *

 268          KK  SUB-74   BASIN
 269          BA   0.156
 270          LG    0.29    0.17    6.80    0.14      37
 271          UC   0.221   0.188
 272          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 273          UA     100
              *

 274          KK     C74
 275          KM   COMBINE C73 AND SUB-74
 276          HC       2
              *

 277          KK     R74   ROUTE   REACH
 278          RS       2    FLOW      -1
 279          RC   0.053   0.045   0.053    1412  0.0212   92.00
 280          RX     0.0    25.4    69.1    79.9    84.8    92.1    99.9   130.3
 281          RY    92.0    90.0    88.0    86.0    86.0    88.0    90.0    92.0
              *

 282          KK  SUB-71   BASIN
 283          BA   0.035
 284          LG    0.28    0.19    6.60    0.17      43
 285          UC   0.158   0.158
 286          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 287          UA     100
              *
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288          KK     C71
289          KM   COMBINE R74 AND SUB-71
290          HC       2
             *

291          KK  SUB-70   BASIN
292          BA   0.072
293          LG    0.30    0.19    6.60    0.14      28
294          UC   0.217   0.267
295          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
296          UA     100
             *

297          KK     R70   ROUTE   BASIN
298          RS       1    FLOW      -1
299          RC   0.053   0.045   0.053     403  0.0546   92.00
300          RX     0.0    10.7    21.5    44.3    64.8    88.0   122.0   149.0
301          RY    92.0    90.0    88.0    86.0    86.0    88.0    90.0    92.0
             *
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

302          KK  SUB-72   BASIN
303          BA   0.155
304          LG    0.29    0.19    6.60    0.14      30
305          UC   0.221   0.192
306          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
307          UA     100
             *

308          KK     C70
309          KM   COMBINE R70 AND SUB-72
310          HC       2
             *

311          KK     C72
312          KM   COMBINE C70 AND C71
313          HC       2
             *

314          KK     R72   ROUTE   REACH
315          RS       4    FLOW      -1
316          RC   0.053   0.045   0.053    3492  0.0218    6.00
317          RX     0.0    21.3    57.8    75.7    77.8    85.0    92.5    99.9
318          RY     5.0     4.0     2.0     0.0     0.0     2.0     4.0     6.0
             *

319          KK  SUB-69   BASIN
320          BA   0.471
321          LG    0.30    0.25    6.00    0.18      25
322          UC   0.279   0.202
323          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
324          UA     100
             *
325          IN       6
             *

326          KK  HYDRO6
327          BA   0.001
328          QI       0       0       0       0       0       0       0       0       0       0
329          QI       0       0       0       0       0       0       0       0       0       0
330          QI       0       0       0       0       0       0       0       0       0       0
331          QI       0       0       0       0       0       0       0       0       0       0
332          QI       0       0       0       0       0       0       0       0       0       0
333          QI       0       0       0       0       0       0       0       0       0       0
334          QI       0       0       0       0       0       0       0       0       0       0
335          QI       0       0       0       0       0       0       0       0       0       0
336          QI       0       0       0       0       0       0       0       0       0       0
337          QI       0       0       0       0    0.59    2.27    2.61    2.85    2.95     3.1
338          QI    3.29    3.52    3.71    3.83    4.02    4.18    4.39    4.72    5.19     5.7
339          QI    6.56   10.56    20.2   25.52   30.32   33.97   41.23   69.55  206.95  363.49
340          QI  608.08   767.6  995.12 1056.41 1235.54 1198.32 1078.59  945.57  854.97   782.6
341          QI  718.04     626  525.97  440.05  378.58  326.95  282.22  247.17  216.01  191.48
342          QI  170.93  153.54  139.24  126.93   116.2  107.13   98.18   91.55   85.28   79.28
343          QI   73.58   67.19   63.42   60.18   57.37   54.61   52.49   49.38    46.2    42.9
344          QI   40.71   38.54   37.29   34.88   33.38   32.08   30.76   29.61    28.8    27.6
```



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

345          QI   26.45   25.96   25.16   24.41   24.09   23.51    22.7   22.33   22.02   21.29
346          QI   20.86   20.15    19.6   19.19   18.52   18.22   17.76   17.28   16.92   16.81
347          QI   16.34      16   15.86   15.66   15.57   15.26   14.94   14.65   14.44   14.21
348          QI   14.08    13.7   13.42   13.02   12.69   12.44   12.24   12.11      12   11.91
349          QI   11.67   11.61   11.38   11.28   11.04   10.94   10.72   10.44   10.16    9.79
350          QI    9.67    9.43    9.27    9.04    8.84    8.76    8.62    8.52    8.44    8.37
351          QI    8.32    8.24    8.18    8.13    8.08       8    7.99       8       8    7.99
352          QI     0.1
             *
```

```
353          KK     C69
354          KM   COMBINE R72, SUB-69 AND HYDRO6
355          HC       3
             *

356          KK  SUB-57   BASIN
357          BA   0.066
358          LG    0.30    0.25    5.80    0.18      18
359          UC   0.158   0.121
360          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
361          UA     100
             *

362          KK     C57
363          KM   COMBINE SUB-57 AND C69
364          HC       2
             *

365          KK     R69   ROUTE   REACH
366          RS       3    FLOW      -1
367          RC   0.053   0.045   0.053    2610  0.0146  972.00
368          RX     0.0    36.7    77.1    91.0   126.4   146.8   157.7   170.6
369          RY   972.0   970.0   968.0   966.0   966.0   968.0   970.0   972.0
             *

370          KK  SUB-58   BASIN
371          BA   0.111
372          LG    0.30    0.25    5.30    0.22       6
373          UC   0.200   0.167
374          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
375          UA     100
             *

376          KK     R58   ROUTE   BASIN
377          RS       1    FLOW      -1
378          RC   0.053   0.045   0.053     455  0.0132  972.00
379          RX     0.0    36.7    77.1    91.0   126.4   146.8   157.7   170.6
380          RY   972.0   970.0   968.0   966.0   966.0   968.0   970.0   972.0
             *
```



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

381          KK  SUB-59   BASIN
382          BA   0.082
383          LG    0.30    0.25    5.00    0.29      11
384          UC   0.404   0.612
385          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
386          UA     100
             *

387          KK  SUB-60   BASIN
388          BA   0.092
389          LG    0.30    0.15    7.00    0.13      11
390          UC   0.350   0.450
391          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
392          UA     100
             *

393          KK     C60
394          KM   COMBINE R69, R58, SUB-59, SUB-60
395          HC       4
             *

396          KK     R60   ROUTE   REACH
397          RS       1    FLOW      -1
398          RC   0.053   0.045   0.053     420  0.0143  960.00
399          RX     0.0    42.8    63.6    82.6   106.8   117.5   120.1   182.8
400          RY   964.0   962.0   960.0   958.0   958.0   960.0   960.0   960.0
             *

401          KK  SUB-61   BASIN
402          BA   0.142
403          LG    0.30    0.15    7.60    0.10      12
404          UC   0.408   0.545
405          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
406          UA     100
             *

407          KK     C61
408          KM   COMBINE R60, AND SUB-61
409          HC       2
             *

410          KK     R61   ROUTE   REACH
411          RS       1    FLOW      -1
412          RC   0.053   0.045   0.053     780  0.0103  950.00
413          RX     0.0     7.4    14.6    36.2    47.1    62.9    69.6    76.4
414          RY   950.0   948.0   946.0   946.0   946.0   946.0   948.0   950.0
             *
```

```
415          KK  SUB-62   BASIN
416          BA   0.098
417          LG    0.26    0.15    7.60    0.10      20
418          UC   0.296   0.322
419          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
420          UA     100
             *
```



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

421          KK  SUB-63   BASIN
422          BA   0.082
423          LG    0.27    0.15    8.00    0.08      16
424          UC   0.288   0.345
425          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
426          UA     100
             *

427          KK  HYDRO2
428          BA   0.001
429          QI       0       0       0       0       0       0       0       0       0       0
430          QI       0       0       0       0       0       0       0       0       0       0
431          QI       0       0       0       0       0       0       0       0       0       0
432          QI       0       0       0       0       0       0       0       0       0       0
433          QI       0       0       0       0       0       0       0       0       0       0
434          QI       0       0       0       0       0       0       0       0       0       0
435          QI       0       0       0       0       0       0       0       0       0       0
436          QI       0       0       0       0       0       0       0       0       0       0
437          QI       0       0       0       0       0       0       0       0       0       0
438          QI       0       0       0       0       0       0       0       0       0       0
439          QI       0       0       0       0       0       0       0       0       0       0
440          QI       0       0       0       0       0       0       0    0.06    0.21    4.92
441          QI   15.82   42.09    68.3   70.34   82.67  198.46  208.82  193.16  164.98  143.11
442          QI  117.68  107.17   99.98   91.35   87.97   83.27   80.93   76.24   74.23   70.99
443          QI   67.18   63.35   60.23    55.6   37.08    34.4   30.86   27.52   25.07   23.88
444          QI   21.83   19.98   18.41   16.76   15.18   13.65   12.63   11.77   10.72    9.53
445          QI    8.73    8.01    7.35     6.7    6.45    5.83    5.52    5.36     5.1    4.86
446          QI    4.44    4.07     3.9    3.73    3.42    3.17    3.03    2.93    2.79     2.6
447          QI    2.38    2.18    2.12    1.66    1.33    1.44    1.23    1.45     1.4    1.28
448          QI    1.15    1.12    1.02    0.94    0.89    0.82    0.76    0.71    0.67    0.62
449          QI    0.58    0.55    0.55    0.53    0.49    0.48    0.47    0.39    0.37    0.42
450          QI    0.39    0.34    0.33    0.32    0.31     0.3    0.29    0.29    0.28    0.28
451          QI    0.27    0.26    0.25    0.23    0.23    0.22    0.21     0.2    0.19    0.19
452          QI    0.18    0.17    0.16    0.15    0.15    0.14    0.13    0.13    0.12    0.04
453          QI    0.01
             *

454          KK  HYDRO3
455          BA   0.001
456          QI       0       0       0       0       0       0       0       0       0       0
457          QI       0       0       0       0       0       0       0       0       0       0
458          QI       0       0       0       0       0       0       0       0       0       0
459          QI       0       0       0       0       0       0       0       0       0       0
460          QI       0       0       0       0       0       0       0       0       0       0
461          QI       0       0       0       0       0       0       0       0       0       0
462          QI       0       0       0       0       0       0       0       0       0       0
463          QI       0       0       0       0       0       0       0       0       0       0
464          QI       0       0       0       0       0       0       0       0       0       0
465          QI       0       0       0       0       0       0       0       0       0       0
466          QI       0       0       0       0       0       0       0       0       0       0
467          QI       0       0       0       0       0       0       0       0    1.96    6.05
468          QI    8.11    2.58    3.37   15.16  223.84  553.48  557.89  484.36  405.52  337.86
469          QI  289.58  244.22  200.76  162.35  123.39   96.28   70.95   48.75   36.47   26.05
470          QI   18.93   13.62     9.5    6.39    3.99    2.65     1.3    0.78    0.57    0.37
```



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

471          QI     0.3    0.23    0.17    0.12    0.08    0.05    0.02       0       0       0
472          QI       0       0       0       0       0       0       0       0       0       0
473          QI       0       0       0       0       0       0       0       0       0       0
474          QI       0       0       0       0       0       0       0       0       0       0
475          QI       0       0       0       0       0       0       0       0       0       0
476          QI       0       0       0       0       0       0       0       0       0       0
477          QI       0       0       0       0       0       0       0       0       0       0
478          QI       0       0       0       0       0       0       0       0       0       0
479          QI       0       0       0       0       0       0       0       0       0       0
480          QI       0
             *

481          KK     C63
482          KM   COMBINE R61, SUB-62, SUB-63, HYDRO2, AND HYDRO3
483          HC       5
             *

484          KK     R63   ROUTE   REACH
485          RS       2    FLOW      -1
486          RC   0.053   0.045   0.053    2145  0.0196  922.00
487          RX     0.0     4.2     8.2    12.2    36.3    41.2    45.8    50.4
488          RY   922.0   920.0   918.0   916.0   916.0   918.0   920.0   922.0
```

```
                    *
489                 KK  SUB-64   BASIN
490                 BA   0.071
491                 LG    0.30    0.15    7.30    0.10       5
492                 UC   0.296   0.365
493                 UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
494                 UA     100
                    *

495                 KK     C64
496                 KM   COMBINE R63, AND SUB-64
497                 HC       2
                    *
498                 ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

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

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

    43      SUB14B
                 .
                 .
    49           .      SUB14C
                 .           .
                 .           .
    55        C14C............
                 V
                 V
    58        R14C
                 .
                 .
    63           .      SUB14A
                 .           .
                 .           .
    69        C14A............
                 .
                 .
    72           .      SUB19A
                 .           .
                 .           .
    78           .           .      SUB19B
                 .           .           .
                 .           .           .
    84           .           .           .      SUB19C
                 .           .           .           .
                 .           .           .           .
    90        C19C.................................
                 V
                 V
    93        R19C
                 .
                 .
    98           .      SUB-13
                 .           .
                 .           .
   104         C13............
                 .
                 .
   107           .      SUB-18
                 .           .
                 .           .
   113         C18............
                 V
                 V
   116         R18
                 .
                 .
   121           .      SUB12A
                 .           .
                 .           .
   127        C12A............
                 .
                 .
   130           .      SUB33E
                 .           .
                 .           .
   136           .           .      SUB33F
                 .           .           V
                 .           .           V
   142           .           .        R33F
                 .           .           .
                 .           .           .
   147           .        C33F............
                 .           .
                 .           .
   150           .           .      SUB33D
                 .           .           .
                 .           .           .
    56           .        C33D............
```

```
                 V
                 V
159            R33D
                 .
                 .
164              .      SUB33B
                 .          .
                 .          .
170            C33B............
                 .
                 .
173              .      SUB33C
                 .          .
                 .          .
179            C33C............
                 V
                 V
182            R33C
                 .
                 .
187              .      SUB33A
                 .          .
                 .          .
193            C33A............
                 .
                 .
196              .      SUB46A
                 .          .
                 .          .
202              .          .      SUB46B
                 .          .          V
                 .          .          V
208              .          .        R46B
                 .          .          .
                 .          .          .
213              .        C46............
                 .          .
                 .          .
216              .          .      SUB-45
                 .          .          .
                 .          .          .
222              .        C45............
                 .          V
                 .          V
225              .        R45
                 .          .
                 .          .
230              .          .      SUB-47
                 .          .          .
                 .          .          .
236              .        C47............
                 .          .
                 .          .
239              .          .      SUB-75
                 .          .          .
                 .          .          .
245              .          .          .      SUB-76
                 .          .          .          .
                 .          .          .          .
251              .          .        C76............
                 .          .          V
                 .          .          V
254              .          .        R76
                 .          .          .
                 .          .          .
259              .          .          .      SUB-73
                 .          .          .          .
                 .          .          .          .
265              .          .        C73............
                 .          .          .
                 .          .          .
268              .          .          .      SUB-74
                 .          .          .          .
                 .          .          .          .
274              .          .        C74............
                 .          .          V
                 .          .          V
277              .          .        R74
                 .          .          .
                 .          .          .
282              .          .          .      SUB-71
                 .          .          .          .
                 .          .          .          .
288              .          .        C71............
                 .          .          .
                 .          .          .
291              .          .          .      SUB-70
                 .          .          .          V
                 .          .          .          V
297              .          .          .        R70
                 .          .          .          .
                 .          .          .          .
```

```
302                                                  SUB-72
                                                       .
 08                                            C70............
                                                       .
311                                   C72............
                                        V
                                        V
314                                   R72
                                        .
319                                   .      SUB-69
                                        .          .
326                                   .          .      HYDRO6
                                        .          .        .
353                                   C69........................
                                        .
356                                   .      SUB-57
                                        .          .
362                                   C57............
                                        V
                                        V
365                                   R69
                                        .
370                                   .      SUB-58
                                        .          V
                                        .          V
376                                   .        R58
                                        .          .
381                                   .          .      SUB-59
                                        .          .        .
387                                   .          .        .      SUB-60
                                        .          .        .        .
393                                   C60....................................
                                        V
                                        V
396                                   R60
                                        .
401                                   .      SUB-61
                                        .          .
407                                   C61............
                                        V
                                        V
410                                   R61
                                        .
415                                   .      SUB-62
                                        .          .
421                                   .          .      SUB-63
                                        .          .        .
427                                   .          .        .      HYDRO2
                                        .          .        .        .
454                                   .          .        .        .      HYDRO3
                                        .          .        .        .        .
481                                   C63.............................................
                                        V
                                        V
484                                   R63
                                        .
489                                   .      SUB-64
                                        .          .
495                                   C64............
```

1

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									

+		SUB14B	475.	12.20	59.	15.	5.	.27
+	HYDROGRAPH AT	SUB14C	942.	12.17	104.	27.	10.	.46
+	2 COMBINED AT	C14C	1400.	12.17	162.	42.	15.	.73
+	ROUTED TO	R14C	1352.	12.27	162.	42.	15.	.73
+	HYDROGRAPH AT	SUB14A	403.	12.13	43.	11.	4.	.18
+	2 COMBINED AT	C14A	1645.	12.23	203.	53.	19.	.91
+	HYDROGRAPH AT	SUB19A	246.	12.13	28.	8.	3.	.11
+	HYDROGRAPH AT	SUB19B	533.	12.13	62.	18.	7.	.26
+	HYDROGRAPH AT	SUB19C	235.	12.10	27.	8.	3.	.10
+	4 COMBINED AT	C19C	2508.	12.17	317.	86.	31.	1.38
+	ROUTED TO	R19C	2416.	12.30	317.	86.	31.	1.38
+	HYDROGRAPH AT	SUB-13	1239.	12.13	97.	26.	9.	.54
+	2 COMBINED AT	C13	3055.	12.23	411.	111.	40.	1.92
+	HYDROGRAPH AT	SUB-18	823.	12.17	97.	29.	10.	.38
+	2 COMBINED AT	C18	3811.	12.20	505.	139.	50.	2.30
+	ROUTED TO	R18	3744.	12.23	505.	139.	50.	2.30
+	HYDROGRAPH AT	SUB12A	198.	12.10	21.	6.	2.	.09
+	2 COMBINED AT	C12A	3878.	12.23	525.	145.	52.	2.39
+	HYDROGRAPH AT	SUB33E	462.	12.10	48.	14.	5.	.19
+	HYDROGRAPH AT	SUB33F	50.	12.07	5.	1.	0.	.02
+	ROUTED TO	R33F	49.	12.10	5.	1.	0.	.02
+	2 COMBINED AT	C33F	510.	12.10	52.	15.	5.	.22
+	HYDROGRAPH AT	SUB33D	45.	12.23	7.	2.	1.	.04
+	2 COMBINED AT	C33D	543.	12.10	58.	17.	6.	.25
+	ROUTED TO	R33D	531.	12.17	58.	17.	6.	.25
+	HYDROGRAPH AT	SUB33B	349.	12.13	35.	9.	3.	.16
+	2 COMBINED AT	C33B	857.	12.13	93.	26.	9.	.41
+	HYDROGRAPH AT	SUB33C	63.	12.10	8.	2.	1.	.03
+	2 COMBINED AT	C33C	917.	12.13	100.	28.	10.	.43
+	ROUTED TO	R33C	908.	12.17	100.	28.	10.	.43
+	HYDROGRAPH AT	SUB33A	152.	12.07	13.	3.	1.	.05

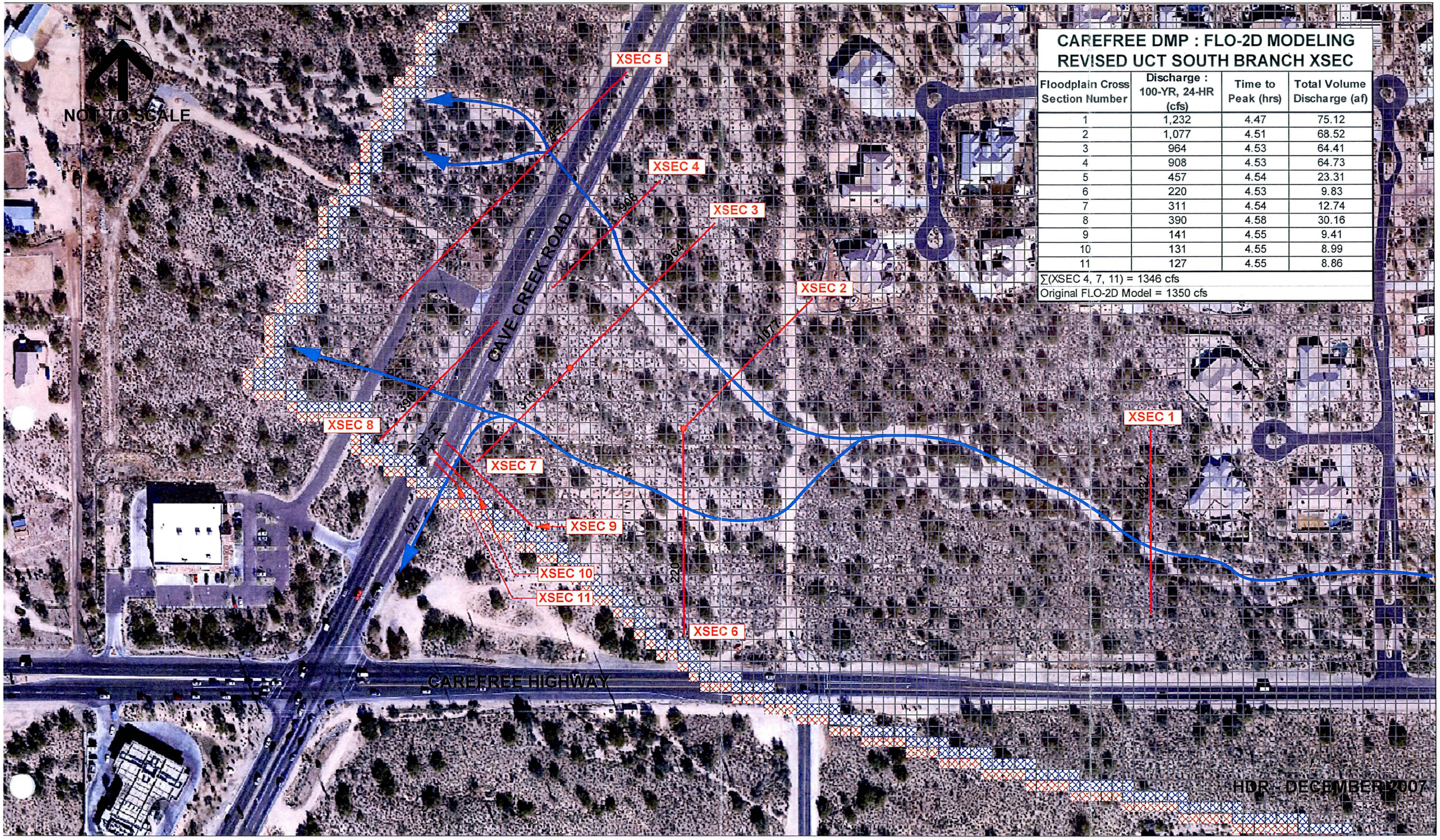
	2 COMBINED AT	C33A	993.	12.17	112.	31.	11.	.49
	HYDROGRAPH AT	SUB46A	71.	12.10	7.	2.	1.	.03
+	HYDROGRAPH AT	SUB46B	61.	12.10	7.	2.	1.	.03
+	ROUTED TO	R46B	61.	12.13	7.	2.	1.	.03
+	2 COMBINED AT	C46	129.	12.10	14.	4.	1.	.06
+	HYDROGRAPH AT	SUB-45	153.	12.17	24.	6.	2.	.09
+	2 COMBINED AT	C45	274.	12.13	38.	10.	3.	.15
+	ROUTED TO	R45	256.	12.37	38.	10.	3.	.15
+	HYDROGRAPH AT	SUB-47	325.	12.17	32.	8.	3.	.18
+	2 COMBINED AT	C47	487.	12.27	69.	18.	6.	.33
+	HYDROGRAPH AT	SUB-75	38.	12.07	4.	1.	0.	.02
+	HYDROGRAPH AT	SUB-76	46.	12.07	4.	1.	0.	.02
+	2 COMBINED AT	C76	84.	12.07	8.	3.	1.	.04
+	ROUTED TO	R76	81.	12.10	8.	3.	1.	.04
+	HYDROGRAPH AT	SUB-73	136.	12.10	15.	5.	2.	.06
	2 COMBINED AT	C73	216.	12.10	23.	7.	3.	.09
+	HYDROGRAPH AT	SUB-74	354.	12.10	39.	12.	4.	.16
+	2 COMBINED AT	C74	566.	12.10	61.	19.	7.	.25
+	ROUTED TO	R74	550.	12.13	61.	19.	7.	.25
+	HYDROGRAPH AT	SUB-71	87.	12.07	9.	3.	1.	.04
+	2 COMBINED AT	C71	625.	12.13	70.	21.	8.	.28
+	HYDROGRAPH AT	SUB-70	143.	12.13	17.	5.	2.	.07
+	ROUTED TO	R70	142.	12.13	17.	5.	2.	.07
+	HYDROGRAPH AT	SUB-72	347.	12.13	37.	11.	4.	.16
+	2 COMBINED AT	C70	486.	12.13	54.	16.	6.	.23
+	2 COMBINED AT	C72	1103.	12.13	123.	37.	13.	.51
+	ROUTED TO	R72	1051.	12.23	123.	37.	13.	.51
+	HYDROGRAPH AT	SUB-69	977.	12.17	101.	29.	11.	.47
+	HYDROGRAPH AT	HYDRO6	1236.	12.40	273.	73.	26.	.00
+	3 COMBINED AT	C69	2950.	12.20	491.	138.	50.	.98
	HYDROGRAPH AT	SUB-57	170.	12.07	14.	4.	1.	.07

+	2 COMBINED AT	C57	3036.	12.20	504.	142.	51.	1.05
+	ROUTED TO	R69	2967.	12.27	504.	142.	51.	1.05
+	HYDROGRAPH AT	SUB-58	249.	12.10	20.	5.	2.	.11
+	ROUTED TO	R58	244.	12.13	20.	5.	2.	.11
+	HYDROGRAPH AT	SUB-59	87.	12.27	15.	4.	1.	.08
+	HYDROGRAPH AT	SUB-60	133.	12.23	20.	5.	2.	.09
+	4 COMBINED AT	C60	3316.	12.27	556.	156.	56.	1.33
+	ROUTED TO	R60	3311.	12.27	556.	156.	56.	1.33
+	HYDROGRAPH AT	SUB-61	184.	12.27	33.	9.	3.	.14
+	2 COMBINED AT	C61	3488.	12.27	588.	164.	59.	1.47
+	ROUTED TO	R61	3470.	12.30	588.	164.	59.	1.47
+	HYDROGRAPH AT	SUB-62	176.	12.17	24.	7.	2.	.10
+	HYDROGRAPH AT	SUB-63	144.	12.17	21.	6.	2.	.08
+	HYDROGRAPH AT	HYDRO2	209.	12.60	46.	12.	4.	.00
+	HYDROGRAPH AT	HYDRO3	558.	12.60	66.	16.	6.	.00
+	5 COMBINED AT	C63	3811.	12.30	742.	204.	74.	1.66
+	ROUTED TO	R63	3809.	12.33	742.	204.	74.	1.66
+	HYDROGRAPH AT	SUB-64	119.	12.20	16.	4.	1.	.07
+	2 COMBINED AT	C64	3900.	12.33	757.	208.	75.	1.73

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

APPENDIX C HYDRAULICS

FLO-2D DOCUMENTATION



CAREFREE DMP : FLO-2D MODELING
REVISED UCT SOUTH BRANCH XSEC

Floodplain Cross Section Number	Discharge : 100-YR, 24-HR (cfs)	Time to Peak (hrs)	Total Volume Discharge (af)
1	1,232	4.47	75.12
2	1,077	4.51	68.52
3	964	4.53	64.41
4	908	4.53	64.73
5	457	4.54	23.31
6	220	4.53	9.83
7	311	4.54	12.74
8	390	4.58	30.16
9	141	4.55	9.41
10	131	4.55	8.99
11	127	4.55	8.86

∑(XSEC 4, 7, 11) = 1346 cfs
Original FLO-2D Model = 1350 cfs

FLO-2D OUTPUT FROM REVISED JEFULLER CAREFREE DMP: 100-YEAR, 24-HOUR MODEL
MODEL REPRESENTS THE UNNAMED CENTRAL TRIBUTARY SPLIT (NORTH AND SOUTH BRANCH)
[FLOODPLAIN CROSS SECTION REVISED AND RENUMBERED FOR AREA OF INTEREST]

Table C.1 FLO-2D Hydraulic Modeling Results Summary

Floodplain Cross Section Number	Discharge : 100-YR, 24-HR (cfs)	Time to Peak (hrs)	Total Volume Discharge (af)
1	1,232	4.47	75.12
2	1,077	4.51	68.52
3	964	4.53	64.41
4	908	4.53	64.73
5	457	4.54	23.31
6	220	4.53	9.83
7	311	4.54	12.74
8	390	4.58	30.16
9	141	4.55	9.41
10	131	4.55	8.99
11	127	4.55	8.86
∑(XSEC 4, 7, 11) = 1346 cfs Original FLO-2D Model = 1350 cfs			

Units: (cfs = cubic feet per second), (hrs = hours) and (af = acre-feet)

THE MAXIMUM DISCHARGE FROM CROSS SECTION 1 IS: 1231.51 CFS
AT TIME: 4.47 HOURS
THE TOTAL VOLUME OF DISCHARGE IS: 75.12 AF

HYDROGRAPH AND AVERAGE FLOODPLAIN HYDRAULICS FOR CROSS SECTION NO: 1

TIME (HRS)	TOPWID (FT)	DEPTH (FT)	VELOCITY (FPS)	DISCHARGE (CFS)
3.90	300.00	0.06	0.12	2.22
4.00	220.00	0.12	0.26	6.68
4.10	100.00	0.28	0.49	13.71
4.20	120.00	0.24	0.50	14.30
4.30	320.00	0.51	2.32	381.63
4.40	360.00	0.94	3.44	1166.45
4.50	360.00	0.97	3.48	1216.04
4.60	360.00	0.91	3.34	1095.01
4.70	360.00	0.82	3.08	909.99
4.80	360.00	0.73	2.88	756.35
4.90	360.00	0.65	2.68	631.00
5.00	360.00	0.59	2.52	531.23
5.10	340.00	0.54	2.39	442.23
5.20	340.00	0.49	2.18	360.30
5.30	340.00	0.41	2.03	285.59
5.40	280.00	0.42	1.95	229.43
5.50	240.00	0.41	1.84	182.33
5.60	200.00	0.41	1.73	142.96
5.70	120.00	0.57	1.65	113.05
5.80	120.00	0.51	1.51	91.41
5.90	100.00	0.54	1.38	74.11
6.00	60.00	0.79	1.31	61.81
6.10	80.00	0.55	1.14	50.37
6.20	60.00	0.65	1.07	41.91
6.30	60.00	0.60	1.01	36.28
6.40	60.00	0.56	0.92	30.90
6.50	60.00	0.51	0.86	26.35
6.60	60.00	0.48	0.79	22.79
6.70	60.00	0.45	0.74	19.85
6.80	60.00	0.41	0.70	17.19
6.90	60.00	0.39	0.63	14.73
7.00	60.00	0.36	0.57	12.35
7.10	60.00	0.34	0.53	11.04
7.20	60.00	0.32	0.50	9.54
7.30	60.00	0.29	0.48	8.47
7.40	60.00	0.28	0.46	7.66
7.50	60.00	0.26	0.43	6.67
7.60	60.00	0.25	0.42	6.28
7.70	60.00	0.23	0.40	5.51
7.80	60.00	0.21	0.38	4.87
7.90	60.00	0.19	0.37	4.31
8.00	60.00	0.18	0.36	3.89
8.10	60.00	0.17	0.35	3.57
8.20	40.00	0.22	0.35	3.06
8.30	40.00	0.21	0.33	2.77
8.40	40.00	0.20	0.32	2.60
8.50	40.00	0.20	0.26	2.05
8.60	40.00	0.20	0.24	1.92

8.70	40.00	0.20	0.21	1.67
8.80	40.00	0.19	0.22	1.68
8.90	40.00	0.18	0.19	1.38
9.00	40.00	0.17	0.18	1.22
9.10	40.00	0.16	0.17	1.07
9.20	40.00	0.14	0.16	0.93
9.30	40.00	0.13	0.15	0.82
9.40	40.00	0.12	0.14	0.66
9.50	40.00	0.09	0.11	0.41
9.60	40.00	0.09	0.11	0.41
9.70	40.00	0.08	0.11	0.34
9.80	40.00	0.08	0.10	0.32
9.90	40.00	0.07	0.10	0.30
10.00	40.00	0.07	0.10	0.27
10.10	40.00	0.06	0.09	0.24
10.20	40.00	0.06	0.09	0.22
10.30	40.00	0.06	0.09	0.20
10.40	40.00	0.05	0.08	0.18
10.50	40.00	0.05	0.05	0.10
10.60	40.00	0.05	0.08	0.15
10.70	40.00	0.05	0.05	0.10
10.80	20.00	0.05	0.02	0.02
10.90	20.00	0.05	0.06	0.06
11.00	40.00	0.05	0.03	0.06
11.10	40.00	0.05	0.02	0.04
11.20	40.00	0.05	0.02	0.05
11.30	40.00	0.05	0.02	0.05

THE MAXIMUM DISCHARGE FROM CROSS SECTION 2 IS: 1077.02 CFS
AT TIME: 4.51 HOURS
THE TOTAL VOLUME OF DISCHARGE IS: 68.52 AF

HYDROGRAPH AND AVERAGE FLOODPLAIN HYDRAULICS FOR CROSS SECTION NO: 2

TIME (HRS)	TOPWID (FT)	DEPTH (FT)	VELOCITY (FPS)	DISCHARGE (CFS)
3.90	240.00	0.06	0.15	2.24
4.00	260.00	0.13	0.33	10.89
4.10	160.00	0.20	0.51	16.33
4.20	140.00	0.19	0.72	19.65
4.30	140.00	0.19	1.09	29.35
4.40	240.00	0.67	4.71	758.73
4.50	240.00	0.88	5.04	1068.73
4.60	240.00	0.86	4.93	1021.93
4.70	240.00	0.78	4.72	879.44
4.80	240.00	0.69	4.47	736.35
4.90	240.00	0.61	4.24	617.80
5.00	240.00	0.54	4.09	526.03
5.10	240.00	0.47	3.92	445.81
5.20	240.00	0.43	3.65	373.67
5.30	240.00	0.36	3.56	309.74
5.40	240.00	0.30	3.53	253.58
5.50	240.00	0.25	3.44	207.28
5.60	240.00	0.22	3.06	165.29
5.70	240.00	0.19	2.88	132.89
5.80	180.00	0.21	2.87	106.21
5.90	100.00	0.30	2.91	87.05
6.00	100.00	0.28	2.63	72.44
6.10	60.00	0.40	2.48	59.58
6.20	40.00	0.37	3.38	49.56
6.30	40.00	0.31	3.39	41.78
6.40	40.00	0.29	3.16	36.15
6.50	40.00	0.26	2.85	30.13
6.60	40.00	0.24	2.71	25.75
6.70	40.00	0.23	2.52	22.97
6.80	40.00	0.21	2.36	19.97
6.90	40.00	0.19	2.20	17.11
7.00	40.00	0.18	2.07	15.10
7.10	40.00	0.17	1.91	12.64
7.20	40.00	0.16	1.78	11.23
7.30	40.00	0.15	1.68	10.00
7.40	40.00	0.15	1.44	8.68
7.50	40.00	0.14	1.36	7.73
7.60	40.00	0.13	1.29	6.83
7.70	40.00	0.12	1.25	6.12
7.80	40.00	0.12	1.17	5.64
7.90	40.00	0.12	0.95	4.52
8.00	40.00	0.12	0.82	3.84
8.10	40.00	0.11	0.80	3.56
8.20	40.00	0.11	0.97	4.40
8.30	40.00	0.09	0.88	3.18
8.40	40.00	0.08	0.86	2.89
8.50	40.00	0.08	0.86	2.77
8.60	40.00	0.08	0.65	2.10
8.70	40.00	0.08	0.65	2.07

8.80	40.00	0.07	0.62	1.69
8.90	40.00	0.06	0.60	1.52
9.00	40.00	0.06	0.58	1.35
9.10	40.00	0.05	0.56	1.20
9.20	40.00	0.05	0.54	1.07
9.30	40.00	0.05	0.52	0.97
9.40	40.00	0.04	0.50	0.88
9.50	40.00	0.04	0.49	0.80
9.60	40.00	0.04	0.47	0.71
9.70	40.00	0.03	0.44	0.61
9.80	40.00	0.03	0.42	0.53
9.90	40.00	0.03	0.41	0.48
10.00	40.00	0.03	0.39	0.40
10.10	40.00	0.03	0.33	0.33
10.20	40.00	0.03	0.27	0.27
10.30	40.00	0.03	0.20	0.20
10.40	20.00	0.05	0.11	0.11
10.50	40.00	0.03	0.09	0.09
10.60	40.00	0.05	0.08	0.15

THE MAXIMUM DISCHARGE FROM CROSS SECTION 3 IS: 963.86 CFS
AT TIME: 4.53 HOURS
THE TOTAL VOLUME OF DISCHARGE IS: 64.41 AF

HYDROGRAPH AND AVERAGE FLOODPLAIN HYDRAULICS FOR CROSS SECTION NO: 3

TIME (HRS)	TOPWID (FT)	DEPTH (FT)	VELOCITY (FPS)	DISCHARGE (CFS)
3.90	280.00	0.07	0.15	3.01
4.00	280.00	0.10	0.33	9.47
4.10	80.00	0.18	1.00	14.61
4.20	80.00	0.17	1.18	16.42
4.30	60.00	0.24	1.65	24.00
4.40	180.00	0.67	4.91	592.20
4.50	260.00	0.82	4.44	950.07
4.60	260.00	0.82	4.37	929.43
4.70	260.00	0.74	4.22	812.81
4.80	260.00	0.64	4.16	692.90
4.90	260.00	0.56	4.05	591.49
5.00	260.00	0.50	3.95	510.56
5.10	260.00	0.43	3.92	438.97
5.20	200.00	0.47	3.90	370.08
5.30	200.00	0.41	3.86	312.88
5.40	180.00	0.37	3.92	258.57
5.50	180.00	0.31	3.84	212.58
5.60	180.00	0.26	3.67	171.12
5.70	140.00	0.26	3.74	136.95
5.80	120.00	0.24	3.77	110.82
5.90	60.00	0.39	3.90	90.25
6.00	40.00	0.50	3.76	75.17
6.10	40.00	0.45	3.46	62.64
6.20	40.00	0.40	3.18	51.35
6.30	40.00	0.36	2.98	43.13
6.40	20.00	0.62	3.02	37.20
6.50	20.00	0.54	2.88	31.34
6.60	20.00	0.51	2.64	26.71
6.70	20.00	0.48	2.47	23.76
6.80	20.00	0.44	2.35	20.85
6.90	20.00	0.38	2.31	17.50
7.00	20.00	0.35	2.25	15.58
7.10	20.00	0.31	2.20	13.52
7.20	20.00	0.27	2.16	11.64
7.30	20.00	0.24	2.13	10.39
7.40	20.00	0.22	2.09	9.17
7.50	20.00	0.20	2.02	8.06
7.60	20.00	0.20	1.81	7.24
7.70	20.00	0.20	1.57	6.28
7.80	20.00	0.20	1.43	5.70
7.90	20.00	0.18	1.42	5.25
8.00	20.00	0.15	1.62	4.74
8.10	20.00	0.12	1.68	4.11
8.20	20.00	0.10	1.73	3.63
8.30	20.00	0.09	1.81	3.36
8.40	20.00	0.08	1.97	3.03
8.50	20.00	0.06	2.15	2.67
8.60	20.00	0.05	2.30	2.31
8.70	20.00	0.05	2.13	2.13

8.80	20.00	0.05	1.84	1.84
8.90	20.00	0.05	1.58	1.58
9.00	20.00	0.05	1.38	1.38
9.10	20.00	0.05	1.21	1.21
9.20	20.00	0.05	1.10	1.10
9.30	20.00	0.05	1.03	1.03
9.40	20.00	0.05	1.01	1.01
9.50	20.00	0.05	0.78	0.78
9.60	20.00	0.05	0.52	0.52
9.70	20.00	0.05	0.59	0.59
9.80	20.00	0.05	0.52	0.52
9.90	20.00	0.05	0.52	0.52
10.00	20.00	0.05	0.43	0.43
10.10	20.00	0.05	0.38	0.38
10.20	20.00	0.05	0.32	0.32
10.30	20.00	0.05	0.31	0.31
10.40	20.00	0.05	0.20	0.20
10.50	20.00	0.05	0.14	0.14
10.60	20.00	0.05	0.09	0.09

THE MAXIMUM DISCHARGE FROM CROSS SECTION 4 IS: 907.73 CFS
AT TIME: 4.53 HOURS
THE TOTAL VOLUME OF DISCHARGE IS: 64.73 AF

HYDROGRAPH AND AVERAGE FLOODPLAIN HYDRAULICS FOR CROSS SECTION NO: 4

TIME (HRS)	TOPWID (FT)	DEPTH (FT)	VELOCITY (FPS)	DISCHARGE (CFS)
3.70	20.00	0.04	0.11	0.08
3.80	20.00	0.17	0.06	0.21
3.90	220.00	0.11	0.07	1.84
4.00	180.00	0.33	0.06	3.68
4.10	120.00	0.84	0.14	14.32
4.20	120.00	0.96	0.16	18.34
4.30	120.00	1.04	0.23	28.98
4.40	180.00	1.25	2.44	550.68
4.50	200.00	1.38	3.25	896.32
4.60	200.00	1.38	3.21	884.90
4.70	200.00	1.32	2.99	789.57
4.80	200.00	1.25	2.74	685.98
4.90	180.00	1.33	2.47	593.00
5.00	180.00	1.27	2.26	518.86
5.10	180.00	1.21	2.07	452.16
5.20	180.00	1.17	1.85	388.81
5.30	180.00	1.13	1.63	331.59
5.40	180.00	1.09	1.41	276.89
5.50	180.00	1.04	1.25	233.74
5.60	180.00	0.99	1.07	190.77
5.70	160.00	1.06	0.92	155.10
5.80	160.00	1.00	0.79	126.67
5.90	140.00	1.09	0.68	103.66
6.00	100.00	1.44	0.59	85.92
6.10	100.00	1.40	0.52	72.25
6.20	100.00	1.34	0.45	59.95
6.30	100.00	1.27	0.39	49.54
6.40	80.00	1.52	0.35	42.04
6.50	80.00	1.47	0.29	34.42
6.60	80.00	1.42	0.26	29.61
6.70	80.00	1.39	0.24	26.11
6.80	80.00	1.35	0.21	22.92
6.90	80.00	1.32	0.19	19.53
7.00	80.00	1.28	0.17	17.31
7.10	80.00	1.23	0.15	14.93
7.20	80.00	1.20	0.13	12.83
7.30	80.00	1.16	0.12	11.12
7.40	80.00	1.13	0.11	9.78
7.50	80.00	1.09	0.10	8.83
7.60	80.00	1.07	0.09	7.77
7.70	80.00	1.06	0.08	6.50
7.80	80.00	1.06	0.09	7.74
7.90	80.00	1.05	0.07	5.71
8.00	80.00	1.05	0.06	5.00
8.10	60.00	1.37	0.06	4.83
8.20	60.00	1.34	0.06	4.80
8.30	60.00	1.33	0.08	6.15
8.40	60.00	1.32	0.05	3.93
8.50	60.00	1.30	0.04	3.01

8.60	60.00	1.29	0.06	4.45
8.70	60.00	1.27	0.04	2.70
8.80	60.00	1.26	0.03	1.97
8.90	60.00	1.23	0.05	3.34
9.00	60.00	1.21	0.02	1.18
9.10	60.00	1.20	0.02	1.75
9.20	60.00	1.18	0.01	0.47
9.30	60.00	1.17	0.01	0.57
9.40	60.00	1.15	0.00	0.21
9.50	60.00	1.13	0.01	0.55
9.60	60.00	1.12	0.02	1.19
9.70	60.00	1.10	0.01	0.76
9.80	60.00	1.10	0.01	0.62
9.90	60.00	1.09	0.00	0.18
10.00	60.00	1.09	0.01	0.35
10.10	60.00	1.08	0.00	0.18
10.20	60.00	1.08	0.01	0.53
10.30	60.00	1.07	0.00	0.23
10.40	60.00	1.07	0.00	0.13
10.50	60.00	1.06	0.01	0.43
10.60	40.00	1.30	0.00	0.02
10.70	60.00	1.03	0.00	0.14
10.80	40.00	1.28	0.00	0.05
10.90	60.00	1.01	0.00	0.13
11.00	40.00	1.26	0.00	0.00
11.10	60.00	0.98	0.00	0.10
11.20	60.00	0.97	0.00	0.08
11.30	60.00	0.97	0.00	0.04
11.40	20.00	1.53	0.00	0.05
11.50	20.00	1.51	0.00	0.07
11.60	20.00	1.49	0.00	0.02
11.70	40.00	0.95	0.00	0.05
14.10	20.00	1.35	0.00	0.02
14.40	20.00	0.78	0.00	0.00
16.00	20.00	1.28	0.00	0.01
17.20	20.00	1.23	0.00	0.01
17.30	20.00	1.22	0.00	0.01
19.00	20.00	1.15	0.00	0.00
19.80	20.00	0.09	0.00	0.00
19.90	20.00	1.11	0.00	0.01
20.60	20.00	1.09	0.00	0.01
21.20	20.00	1.06	0.00	0.00
21.90	20.00	1.03	0.00	0.00

THE MAXIMUM DISCHARGE FROM CROSS SECTION 5 IS: 456.50 CFS
AT TIME: 4.54 HOURS
THE TOTAL VOLUME OF DISCHARGE IS: 23.31 AF

HYDROGRAPH AND AVERAGE FLOODPLAIN HYDRAULICS FOR CROSS SECTION NO: 5

TIME (HRS)	TOPWID (FT)	DEPTH (FT)	VELOCITY (FPS)	DISCHARGE (CFS)
3.60	60.00	0.05	0.03	0.10
3.70	40.00	0.05	0.04	0.07
3.80	200.00	0.06	0.10	1.07
3.90	380.00	0.06	0.12	2.84
4.00	400.00	0.06	0.10	2.61
4.10	60.00	0.07	0.09	0.35
4.20	140.00	0.05	0.05	0.37
4.30	120.00	0.05	0.05	0.31
4.40	420.00	0.24	1.02	100.63
4.50	420.00	0.56	1.87	441.26
4.60	420.00	0.56	1.88	444.32
4.70	420.00	0.52	1.73	376.86
4.80	440.00	0.45	1.58	312.21
4.90	420.00	0.42	1.44	253.30
5.00	420.00	0.38	1.31	207.59
5.10	420.00	0.34	1.19	170.17
5.20	420.00	0.31	1.03	135.21
5.30	400.00	0.30	0.89	105.75
5.40	400.00	0.26	0.79	81.27
5.50	340.00	0.25	0.71	60.74
5.60	320.00	0.21	0.63	42.93
5.70	300.00	0.17	0.54	28.10
5.80	280.00	0.16	0.42	18.11
5.90	240.00	0.14	0.35	11.72
6.00	260.00	0.10	0.25	6.85
6.10	160.00	0.10	0.23	3.64
6.20	80.00	0.09	0.19	1.38
6.30	60.00	0.10	0.14	0.85
6.40	20.00	0.13	0.14	0.37
6.50	20.00	0.08	0.10	0.17
6.60	20.00	0.05	0.07	0.07
8.80	20.00	0.05	0.03	0.03

THE MAXIMUM DISCHARGE FROM CROSS SECTION 6 IS: 219.93 CFS
AT TIME: 4.53 HOURS
THE TOTAL VOLUME OF DISCHARGE IS: 9.83 AF

HYDROGRAPH AND AVERAGE FLOODPLAIN HYDRAULICS FOR CROSS SECTION NO: 6

TIME (HRS)	TOPWID (FT)	DEPTH (FT)	VELOCITY (FPS)	DISCHARGE (CFS)
3.90	320.00	0.11	0.04	1.61
4.00	360.00	0.15	0.15	8.49
4.10	100.00	0.39	0.17	6.78
4.20	100.00	0.37	0.16	6.02
4.30	60.00	0.55	0.12	3.93
4.40	120.00	0.77	1.22	113.34
4.50	160.00	0.77	1.76	216.82
4.60	160.00	0.81	1.67	215.99
4.70	160.00	0.74	1.48	176.09
4.80	100.00	1.03	1.29	132.81
4.90	100.00	0.90	1.09	98.47
5.00	100.00	0.80	0.93	73.99
5.10	100.00	0.70	0.77	53.81
5.20	100.00	0.60	0.63	37.93
5.30	100.00	0.51	0.47	24.23
5.40	100.00	0.45	0.31	13.82
5.50	100.00	0.39	0.21	8.32
5.60	100.00	0.35	0.15	5.17
5.70	100.00	0.33	0.09	2.97
5.80	60.00	0.49	0.06	1.72
5.90	60.00	0.45	0.03	0.92
6.00	60.00	0.44	0.02	0.53
6.10	40.00	0.59	0.01	0.28
6.20	40.00	0.55	0.01	0.14
6.30	40.00	0.51	0.00	0.08
6.40	40.00	0.49	0.00	0.06
6.50	40.00	0.48	0.00	0.01

THE MAXIMUM DISCHARGE FROM CROSS SECTION 7 IS: 311.45 CFS
AT TIME: 4.54 HOURS
THE TOTAL VOLUME OF DISCHARGE IS: 12.74 AF

HYDROGRAPH AND AVERAGE FLOODPLAIN HYDRAULICS FOR CROSS SECTION NO: 7

TIME (HRS)	TOPWID (FT)	DEPTH (FT)	VELOCITY (FPS)	DISCHARGE (CFS)
3.90	160.00	0.08	0.11	1.53
4.00	160.00	0.15	0.26	6.34
4.10	120.00	0.17	0.25	4.90
4.20	100.00	0.19	0.29	5.45
4.30	80.00	0.22	0.33	5.71
4.40	80.00	0.52	0.14	5.93
4.50	160.00	1.05	1.77	298.36
4.60	160.00	1.06	1.78	300.56
4.70	160.00	0.98	1.59	250.77
4.80	160.00	0.88	1.35	189.86
4.90	160.00	0.77	1.10	135.91
5.00	160.00	0.70	0.87	97.70
5.10	140.00	0.71	0.69	67.85
5.20	140.00	0.62	0.51	44.22
5.30	120.00	0.63	0.38	28.86
5.40	120.00	0.54	0.25	16.35
5.50	80.00	0.70	0.17	9.77
5.60	80.00	0.62	0.13	6.34
5.70	80.00	0.54	0.09	4.07
5.80	80.00	0.49	0.08	3.02
5.90	60.00	0.50	0.06	1.82
6.00	60.00	0.39	0.05	1.22
6.10	60.00	0.30	0.04	0.82
6.20	60.00	0.17	0.09	0.96
6.30	40.00	0.20	0.17	1.35
6.40	40.00	0.20	0.13	1.03
6.50	40.00	0.20	0.11	0.89
6.60	40.00	0.16	0.08	0.52
6.70	20.00	0.20	0.09	0.34
6.80	20.00	0.16	0.07	0.21
6.90	20.00	0.12	0.07	0.16
7.00	20.00	0.10	0.07	0.12
7.10	20.00	0.08	0.07	0.11
7.20	20.00	0.07	0.07	0.10
7.30	20.00	0.05	0.03	0.03
7.40	20.00	0.05	0.04	0.04

THE MAXIMUM DISCHARGE FROM CROSS SECTION 8 IS: 390.05 CFS
AT TIME: 4.58 HOURS
THE TOTAL VOLUME OF DISCHARGE IS: 30.16 AF

HYDROGRAPH AND AVERAGE FLOODPLAIN HYDRAULICS FOR CROSS SECTION NO: 8

TIME (HRS)	TOPWID (FT)	DEPTH (FT)	VELOCITY (FPS)	DISCHARGE (CFS)
3.60	80.00	0.04	0.03	0.10
3.70	100.00	0.05	0.04	0.18
3.80	140.00	0.11	0.05	0.74
3.90	180.00	0.26	0.06	2.70
4.00	180.00	0.30	0.17	9.35
4.10	80.00	0.61	0.19	9.29
4.20	140.00	0.43	0.47	28.09
4.30	160.00	0.41	0.60	38.79
4.40	160.00	0.66	1.17	124.59
4.50	200.00	0.79	2.33	369.60
4.60	200.00	0.80	2.32	369.99
4.70	200.00	0.77	2.15	332.22
4.80	200.00	0.73	1.89	276.04
4.90	200.00	0.70	1.70	237.32
5.00	180.00	0.72	1.53	199.12
5.10	180.00	0.70	1.39	175.32
5.20	180.00	0.64	1.28	148.66
5.30	180.00	0.62	1.24	139.02
5.40	180.00	0.60	1.18	127.00
5.50	180.00	0.57	1.11	114.31
5.60	180.00	0.55	1.07	105.77
5.70	180.00	0.53	1.01	97.12
5.80	180.00	0.52	0.98	90.54
5.90	180.00	0.51	0.90	82.41
6.00	160.00	0.54	0.85	72.86
6.10	160.00	0.51	0.83	67.08
6.20	160.00	0.49	0.78	60.99
6.30	160.00	0.43	0.56	38.66
6.40	160.00	0.41	0.53	34.53
6.50	160.00	0.39	0.48	30.24
6.60	160.00	0.38	0.44	26.94
6.70	160.00	0.37	0.41	24.13
6.80	120.00	0.47	0.39	21.95
6.90	60.00	0.88	0.38	20.26
7.00	100.00	0.54	0.33	17.85
7.10	60.00	0.86	0.31	15.70
7.20	60.00	0.84	0.28	14.40
7.30	20.00	2.37	0.26	12.59
7.40	20.00	2.34	0.24	11.30
7.50	20.00	2.30	0.21	9.87
7.60	20.00	2.25	0.19	8.67
7.70	20.00	2.20	0.17	7.58
7.80	20.00	2.15	0.15	6.42
7.90	20.00	2.15	0.14	5.87
8.00	20.00	2.12	0.13	5.37
8.10	20.00	2.11	0.12	5.15
8.20	20.00	2.09	0.12	4.85
8.30	20.00	2.05	0.10	4.19
8.40	20.00	2.04	0.09	3.79

8.50	20.00	2.02	0.09	3.57
8.60	20.00	1.99	0.08	3.18
8.70	20.00	1.98	0.08	2.99
8.80	20.00	1.97	0.07	2.87
8.90	20.00	1.96	0.07	2.64
9.00	20.00	1.94	0.06	2.43
9.10	20.00	1.92	0.06	2.19
9.20	20.00	1.90	0.05	1.97
9.30	20.00	1.88	0.05	1.74
9.40	20.00	1.86	0.04	1.58
9.50	40.00	0.94	0.04	1.42
9.60	20.00	1.84	0.04	1.29
9.70	20.00	1.82	0.03	1.15
9.80	20.00	1.80	0.03	0.99
9.90	20.00	1.77	0.02	0.80
10.00	20.00	1.78	0.02	0.66
10.10	20.00	1.79	0.01	0.47
10.20	20.00	1.79	0.01	0.46
10.30	20.00	1.78	0.01	0.44
10.40	20.00	1.78	0.01	0.42
10.50	20.00	1.76	0.01	0.35
10.60	40.00	0.90	0.01	0.35
10.70	20.00	1.74	0.01	0.30
10.80	20.00	1.73	0.01	0.28
10.90	20.00	1.73	0.01	0.27
11.00	20.00	1.73	0.01	0.27
11.10	20.00	1.72	0.01	0.25
11.20	20.00	1.71	0.01	0.22
11.30	20.00	1.71	0.01	0.21
11.40	20.00	1.70	0.01	0.20
11.50	20.00	1.70	0.01	0.19
11.60	20.00	1.69	0.00	0.16
11.70	20.00	1.68	0.00	0.15
11.80	20.00	1.67	0.00	0.13
11.90	20.00	1.67	0.00	0.12
12.00	20.00	1.66	0.00	0.11
12.10	20.00	1.65	0.00	0.10
12.20	20.00	1.64	0.00	0.08
12.30	20.00	1.63	0.00	0.07
12.40	20.00	1.62	0.00	0.06
12.50	20.00	1.62	0.00	0.05
12.60	20.00	1.59	0.00	0.04

THE MAXIMUM DISCHARGE FROM CROSS SECTION 9 IS: 141.40 CFS
AT TIME: 4.55 HOURS
THE TOTAL VOLUME OF DISCHARGE IS: 9.41 AF

HYDROGRAPH AND AVERAGE FLOODPLAIN HYDRAULICS FOR CROSS SECTION NO: 9

TIME (HRS)	TOPWID (FT)	DEPTH (FT)	VELOCITY (FPS)	DISCHARGE (CFS)
3.70	40.00	0.05	0.00	0.01
3.80	20.00	0.05	0.08	0.08
3.90	160.00	0.05	0.10	0.88
4.00	160.00	0.06	0.11	1.03
4.10	20.00	0.13	0.08	0.22
4.20	60.00	0.16	0.32	3.11
4.30	40.00	0.28	0.74	8.18
4.40	40.00	0.39	1.93	30.15
4.50	40.00	0.85	3.90	133.40
4.60	40.00	0.89	3.92	138.82
4.70	40.00	0.81	3.89	126.06
4.80	40.00	0.77	3.53	109.14
4.90	40.00	0.69	3.22	89.03
5.00	40.00	0.66	3.05	80.63
5.10	40.00	0.62	2.77	68.35
5.20	40.00	0.58	2.68	61.67
5.30	40.00	0.54	2.35	51.17
5.40	40.00	0.50	2.11	41.89
5.50	40.00	0.46	1.96	36.04
5.60	40.00	0.43	1.80	30.85
5.70	40.00	0.37	1.58	23.53
5.80	40.00	0.35	1.24	17.38
5.90	40.00	0.31	1.01	12.63
6.00	40.00	0.28	0.71	7.77
6.10	40.00	0.23	0.40	3.75
6.20	20.00	0.36	0.34	2.40
6.30	40.00	0.32	1.08	13.71
6.40	40.00	0.29	0.94	10.82
6.50	40.00	0.27	0.71	7.84
6.60	40.00	0.27	0.61	6.71
6.70	40.00	0.26	0.48	5.06
6.80	40.00	0.23	0.39	3.60
6.90	40.00	0.21	0.34	2.94
7.00	20.00	0.35	0.33	2.26
7.10	20.00	0.30	0.29	1.77
7.20	20.00	0.27	0.26	1.42
7.30	20.00	0.24	0.24	1.13
7.40	20.00	0.22	0.24	1.06
7.50	20.00	0.22	0.23	1.01
7.60	20.00	0.20	0.19	0.76
7.70	20.00	0.20	0.12	0.50
7.80	20.00	0.18	0.10	0.36
7.90	20.00	0.14	0.08	0.21
8.00	20.00	0.11	0.07	0.15
8.10	20.00	0.09	0.06	0.12
8.20	20.00	0.08	0.06	0.10
8.30	20.00	0.06	0.05	0.07
8.40	40.00	0.05	0.01	0.01
10.10	40.00	0.05	0.02	0.04

11.20	20.00	0.05	0.00	0.00
11.40	20.00	0.05	0.07	0.07
12.60	20.00	0.05	0.01	0.01

THE MAXIMUM DISCHARGE FROM CROSS SECTION 10 IS: 130.97 CFS
AT TIME: 4.55 HOURS
THE TOTAL VOLUME OF DISCHARGE IS: 8.99 AF

HYDROGRAPH AND AVERAGE FLOODPLAIN HYDRAULICS FOR CROSS SECTION NO: 10

TIME (HRS)	TOPWID (FT)	DEPTH (FT)	VELOCITY (FPS)	DISCHARGE (CFS)
3.70	20.00	0.05	0.06	0.06
3.80	20.00	0.05	0.02	0.02
3.90	80.00	0.05	0.05	0.22
4.00	80.00	0.05	0.13	0.52
4.10	20.00	0.05	0.20	0.20
4.20	40.00	0.07	0.84	2.49
4.30	20.00	0.26	1.15	6.00
4.40	60.00	0.20	2.56	30.98
4.50	60.00	0.54	3.87	124.26
4.60	60.00	0.55	3.91	129.08
4.70	60.00	0.52	3.81	118.83
4.80	60.00	0.51	3.39	103.19
4.90	60.00	0.47	3.01	85.00
5.00	60.00	0.44	2.94	77.40
5.10	60.00	0.40	2.76	66.11
5.20	60.00	0.37	2.65	59.43
5.30	60.00	0.38	2.21	49.81
5.40	60.00	0.34	2.05	41.28
5.50	60.00	0.31	1.93	35.93
5.60	60.00	0.29	1.78	30.74
5.70	60.00	0.21	1.81	23.05
5.80	60.00	0.18	1.61	17.37
5.90	20.00	0.36	1.78	12.88
6.00	20.00	0.27	1.13	6.02
6.10	20.00	0.20	0.89	3.57
6.20	20.00	0.14	0.91	2.58
6.30	20.00	0.36	1.85	13.33
6.40	20.00	0.31	1.79	11.11
6.50	20.00	0.25	1.77	8.87
6.60	20.00	0.27	1.19	6.54
6.70	20.00	0.23	1.12	5.17
6.80	20.00	0.20	0.89	3.55
6.90	20.00	0.17	0.87	3.02
7.00	20.00	0.13	0.94	2.36
7.10	20.00	0.09	1.02	1.85
7.20	20.00	0.07	1.11	1.47
7.30	20.00	0.05	1.16	1.16
7.40	20.00	0.05	1.07	1.07
7.50	20.00	0.05	1.03	1.03
7.60	20.00	0.05	0.84	0.84
7.70	20.00	0.05	0.45	0.45
7.80	20.00	0.05	0.37	0.37
7.90	20.00	0.05	0.25	0.25
8.00	20.00	0.05	0.18	0.18
8.10	20.00	0.05	0.14	0.14
8.20	20.00	0.05	0.11	0.11
8.30	20.00	0.05	0.09	0.09
8.40	40.00	0.05	0.09	0.18
8.50	20.00	0.05	0.03	0.03

8.60	20.00	0.05	0.02	0.02
8.70	20.00	0.05	0.01	0.01
9.00	20.00	0.05	0.03	0.03
11.20	20.00	0.05	0.07	0.07
12.60	20.00	0.05	0.12	0.12

THE MAXIMUM DISCHARGE FROM CROSS SECTION 11 IS: 126.79 CFS
AT TIME: 4.55 HOURS
THE TOTAL VOLUME OF DISCHARGE IS: 8.86 AF

HYDROGRAPH AND AVERAGE FLOODPLAIN HYDRAULICS FOR CROSS SECTION NO: 11

TIME (HRS)	TOPWID (FT)	DEPTH (FT)	VELOCITY (FPS)	DISCHARGE (CFS)
3.70	20.00	0.05	0.02	0.02
3.80	20.00	0.05	0.12	0.12
3.90	60.00	0.05	0.10	0.32
4.00	60.00	0.07	0.13	0.51
4.10	20.00	0.06	0.17	0.22
4.20	20.00	0.20	0.52	2.10
4.30	40.00	0.21	0.82	6.88
4.40	40.00	0.35	2.01	27.87
4.50	40.00	0.76	3.97	120.37
4.60	40.00	0.77	4.05	125.03
4.70	40.00	0.74	3.90	115.52
4.80	40.00	0.64	3.95	101.43
4.90	40.00	0.59	3.53	83.79
5.00	40.00	0.58	3.31	76.98
5.10	40.00	0.54	3.07	65.85
5.20	40.00	0.51	2.88	59.26
5.30	40.00	0.51	2.41	49.72
5.40	40.00	0.47	2.16	41.09
5.50	40.00	0.42	2.14	36.11
5.60	40.00	0.37	2.07	30.92
5.70	40.00	0.33	1.89	25.22
5.80	40.00	0.34	1.29	17.43
5.90	40.00	0.31	1.12	13.68
6.00	40.00	0.21	0.93	7.96
6.10	40.00	0.15	0.69	4.03
6.20	20.00	0.20	0.66	2.63
6.30	40.00	0.30	1.10	13.27
6.40	40.00	0.27	1.03	11.35
6.50	40.00	0.24	0.93	8.83
6.60	40.00	0.20	0.76	6.13
6.70	40.00	0.17	0.75	5.22
6.80	40.00	0.14	0.68	3.86
6.90	40.00	0.13	0.58	3.07
7.00	20.00	0.20	0.63	2.53
7.10	20.00	0.20	0.57	2.26
7.20	20.00	0.20	0.37	1.47
7.30	20.00	0.17	0.34	1.18
7.40	20.00	0.16	0.33	1.07
7.50	20.00	0.16	0.32	1.02
7.60	20.00	0.14	0.30	0.86
7.70	20.00	0.11	0.24	0.52
7.80	20.00	0.09	0.22	0.40
7.90	20.00	0.07	0.19	0.27
8.00	20.00	0.06	0.17	0.19
8.10	20.00	0.05	0.15	0.15
8.20	20.00	0.05	0.13	0.13
8.30	20.00	0.05	0.11	0.11
8.40	20.00	0.05	0.09	0.09
9.00	40.00	0.05	0.06	0.11

FPXSEC.DAT (INPUT FILE FOR CROSS SECTION LOCATIONS WITHIN EFFECTIVE FLO-2D MODEL)

```
P 1
X 4 22 227 264 302 342 386 431 478 529 583 641 699 760 823 889 957 1028 1101 1177 1255 1335 1417 1501
X 8 12 151 183 216 253 291 331 375 420 467 518 572 630
X 7 9 790 729 670 614 558 506 457 412 369
X 4 18 8244 8245 8246 8247 8248 8249 8250 8251 8252 8253 8254 8255 8256 8257 8258 8259 8260 8261
X 8 13 1925 2027 2133 2241 2351 2463 2576 2690 2807 2925 3044 3165 3287
X 4 20 1906 1907 1908 1909 1910 1911 1912 1913 1914 1915 1916 1917 1918 1919 1920 1921 1922 1923 1924
1925
X 4 10 507 561 619 677 738 801 867 935 1006 1079
X 7 5 504 455 410 367 325
X 7 3 409 366 324
X 8 14 1079 1155 1233 1313 1395 1479 1566 1655 1747 1842 1941 2043 2149 2257
X 8 11 944 1015 1088 1164 1242 1322 1404 1488 1575 1664 1756
```

Cross Section for Spur Cross Rd at WS Wash proposed

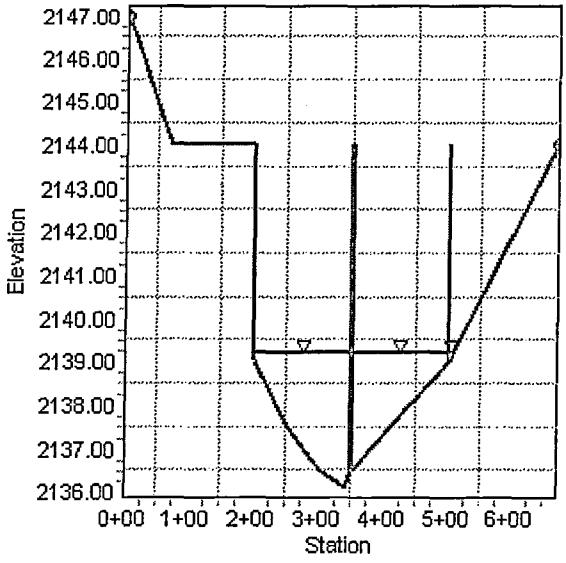
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.02400	ft/ft
Normal Depth	3.10	ft
Discharge	4800.00	ft³/s

Cross Section Image



Worksheet for Spur Cross Rd at WS Wash proposed

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.02400	ft/ft
Discharge	4800.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	2147.00
0+70	2144.00
2+00	2144.00
2+00	2139.00
2+50	2137.50
3+00	2136.50
3+40	2136.10
3+50	2136.50
3+50	2144.00
3+51	2144.00
3+51	2136.50
5+00	2139.00
5+00	2144.00
5+01	2144.00
5+01	2139.00
6+70	2144.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 2147.00)	(6+70, 2144.00)	0.035

Results

Normal Depth	3.10	ft
Elevation Range	2136.10 to 2147.00 ft	

Worksheet for Spur Cross Rd at WS Wash proposed

Results

Flow Area		519.40	ft²
Wetted Perimeter		311.85	ft
Top Width		305.78	ft
Normal Depth		3.10	ft
Critical Depth		3.39	ft
Critical Slope		0.01479	ft/ft
Velocity		9.24	ft/s
Velocity Head		1.33	ft
Specific Energy		4.43	ft
Froude Number		1.25	
Flow Type	Supercritical		

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	3.10	ft
Critical Depth	3.39	ft
Channel Slope	0.02400	ft/ft
Critical Slope	0.01479	ft/ft

Cross Section for Spur Cross Rd at WS Wash Trib5

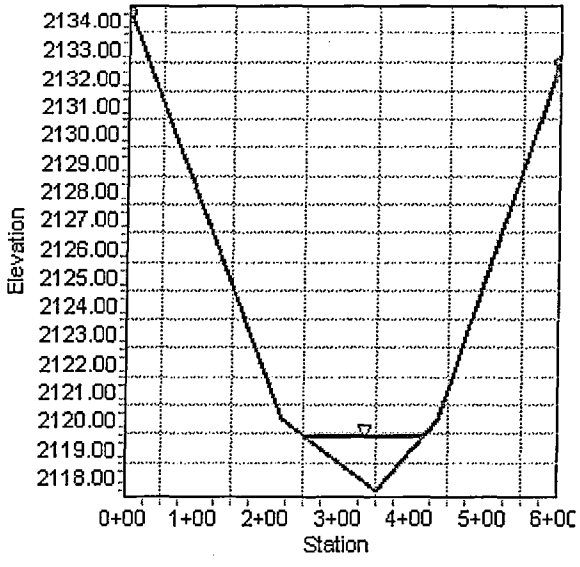
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.01000	ft/ft
Normal Depth	1.89	ft
Discharge	631.00	ft^3/s

Cross Section Image



Worksheet for Spur Cross Rd at WS Wash Trib5

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.01000	ft/ft
Discharge	631.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	2134.30
2+20	2120.00
3+50	2117.50
4+35	2120.00
6+00	2132.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 2134.30)	(6+00, 2132.50)	0.035

Results

Normal Depth	1.89	ft
Elevation Range	2117.50 to 2134.30 ft	
Flow Area	154.18	ft²
Wetted Perimeter	162.89	ft
Top Width	162.84	ft
Normal Depth	1.89	ft
Critical Depth	1.68	ft
Critical Slope	0.01893	ft/ft
Velocity	4.09	ft/s
Velocity Head	0.26	ft
Specific Energy	2.15	ft
Froude Number	0.74	
Flow Type	Subcritical	

Cross Section for School House Rd at Ocotillo Wash proposed

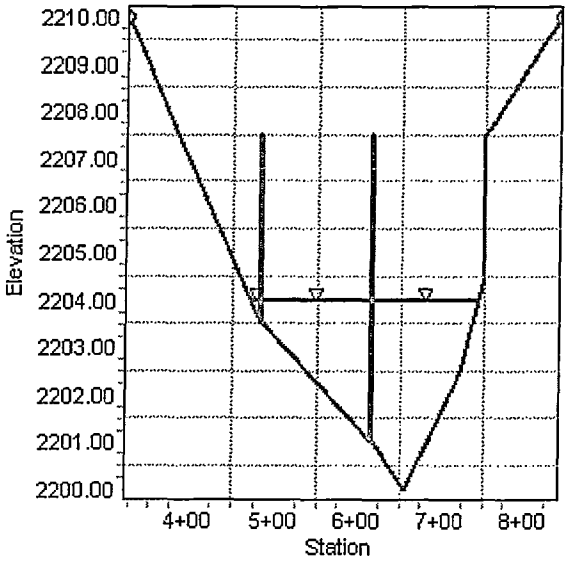
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.01500	ft/ft
Normal Depth	3.97	ft
Discharge	4630.00	ft³/s

Cross Section Image



Worksheet for School House Rd at Ocotillo Wash proposed

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.01500	ft/ft
Discharge	4630.00	ft^3/s

Section Definitions

Station (ft)	Elevation (ft)
3+20	2210.00
4+82	2203.50
4+82	2207.50
4+83	2207.50
4+83	2203.50
6+15	2201.00
6+15	2207.50
6+16	2207.50
6+16	2201.00
6+55	2200.00
7+20	2202.50
7+50	2204.50
7+50	2207.50
8+40	2210.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(3+20, 2210.00)	(8+40, 2210.00)	0.035

Results

Normal Depth	3.97	ft
Elevation Range	2200.00 to 2210.00 ft	
Flow Area	557.91	ft^2
Wetted Perimeter	276.75	ft

Worksheet for School House Rd at Ocotillo Wash proposed

Results

Top Width		269.73	ft
Normal Depth		3.97	ft
Critical Depth		4.00	ft
Critical Slope		0.01446	ft/ft
Velocity		8.30	ft/s
Velocity Head		1.07	ft
Specific Energy		5.04	ft
Froude Number		1.02	
Flow Type	Supercritical		

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	3.97	ft
Critical Depth	4.00	ft
Channel Slope	0.01500	ft/ft
Critical Slope	0.01446	ft/ft

Cross Section for School House Rd at Rowe Wash proposed

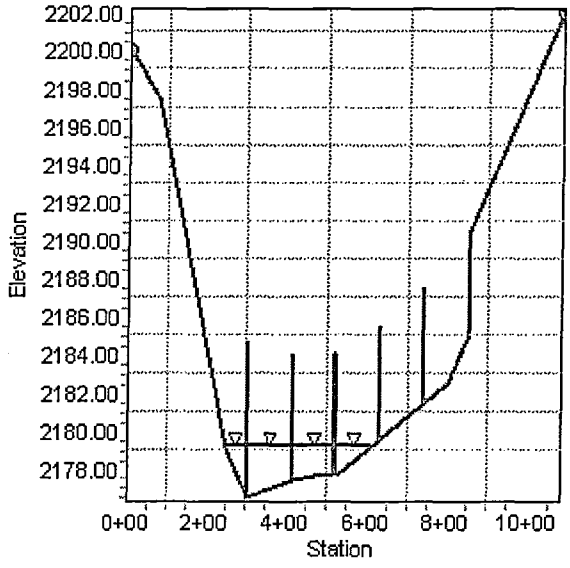
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.02500	ft/ft
Normal Depth	2.76	ft
Discharge	5094.00	ft³/s

Cross Section Image



Worksheet for School House Rd at Rowe Wash proposed

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.02500	ft/ft
Discharge	5094.00	ft^3/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	2200.00
0+75	2197.50
2+50	2179.00
3+00	2176.50
3+00	2184.60
3+01	2184.60
3+01	2176.50
4+15	2177.50
4+15	2184.00
4+16	2184.00
4+16	2177.50
4+70	2177.70
5+20	2177.70
5+20	2184.00
5+21	2184.00
5+21	2177.70
6+30	2179.60
6+30	2185.50
6+31	2185.50
6+31	2179.60
7+40	2181.50
7+40	2187.50
7+41	2187.50
7+41	2181.50
8+00	2182.50
8+50	2185.00
8+50	2190.50

Worksheet for School House Rd at Rowe Wash proposed

Input Data

Station (ft)	Elevation (ft)
10+80	2202.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 2200.00)	(10+80, 2202.00)	0.035

Results

Normal Depth		2.76	ft
Elevation Range	2176.50 to 2202.00 ft		
Flow Area		570.69	ft²
Wetted Perimeter		372.16	ft
Top Width		359.91	ft
Normal Depth		2.76	ft
Critical Depth		3.04	ft
Critical Slope		0.01546	ft/ft
Velocity		8.93	ft/s
Velocity Head		1.24	ft
Specific Energy		4.00	ft
Froude Number		1.25	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	2.76	ft

Worksheet for School House Rd at Rowe Wash proposed

GVF Output Data

Critical Depth	3.04	ft
Channel Slope	0.02500	ft/ft
Critical Slope	0.01546	ft/ft

Cross Section for School House Rd at Galloway Wash proposed

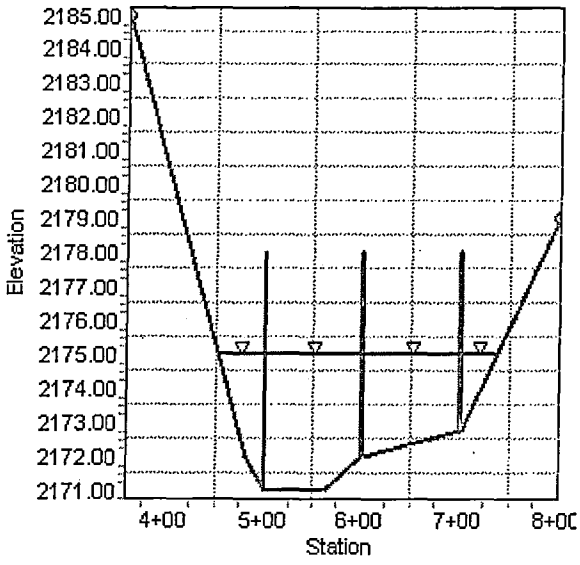
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.03000	ft/ft
Normal Depth	3.99	ft
Discharge	10908.00	ft³/s

Cross Section Image



Worksheet for School House Rd at Galloway Wash proposed

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.03000	ft/ft
Discharge	10908.00	ft^3/s

Section Definitions

Station (ft)	Elevation (ft)
3+60	2185.00
4+80	2172.00
5+00	2171.00
5+00	2178.00
5+01	2178.00
5+01	2171.00
5+60	2171.00
6+00	2172.00
6+00	2178.00
6+01	2178.00
6+01	2172.00
7+00	2172.80
7+00	2178.00
7+01	2178.00
7+01	2172.80
8+00	2179.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(3+60, 2185.00)	(8+00, 2179.00)	0.035

Results

Normal Depth	3.99	ft
Elevation Range	2171.00 to 2185.00 ft	

Worksheet for School House Rd at Galloway Wash proposed

Results

Flow Area	781.98	ft²
Wetted Perimeter	299.31	ft
Top Width	280.68	ft
Normal Depth	3.99	ft
Critical Depth	4.87	ft
Critical Slope	0.01310	ft/ft
Velocity	13.95	ft/s
Velocity Head	3.02	ft
Specific Energy	7.02	ft
Froude Number	1.47	
Flow Type	Supercritical	

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	3.99	ft
Critical Depth	4.87	ft
Channel Slope	0.03000	ft/ft
Critical Slope	0.01310	ft/ft

Culvert Calculator Report
UCT NORTH BRANCH AT CAVE CREEK ROAD <1252 cfs>

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	2,036.57 ft	Headwater Depth/Height	1.40
Computed Headwater Elev	2,034.59 ft	Discharge	1,252.00 cfs
Inlet Control HW Elev.	2,034.59 ft	Tailwater Elevation	2,030.00 ft
Outlet Control HW Elev.	2,034.46 ft	Control Type	Inlet Control

Grades			
Upstream Invert	2,029.00 ft	Downstream Invert	2,026.50 ft
Length	150.00 ft	Constructed Slope	0.016667 ft/ft

Hydraulic Profile			
Profile	CompositeS1S2	Depth, Downstream	1.98 ft
Slope Type	Steep	Normal Depth	1.77 ft
Flow Regime	N/A	Critical Depth	3.12 ft
Velocity Downstream	15.82 ft/s	Critical Slope	0.003218 ft/ft

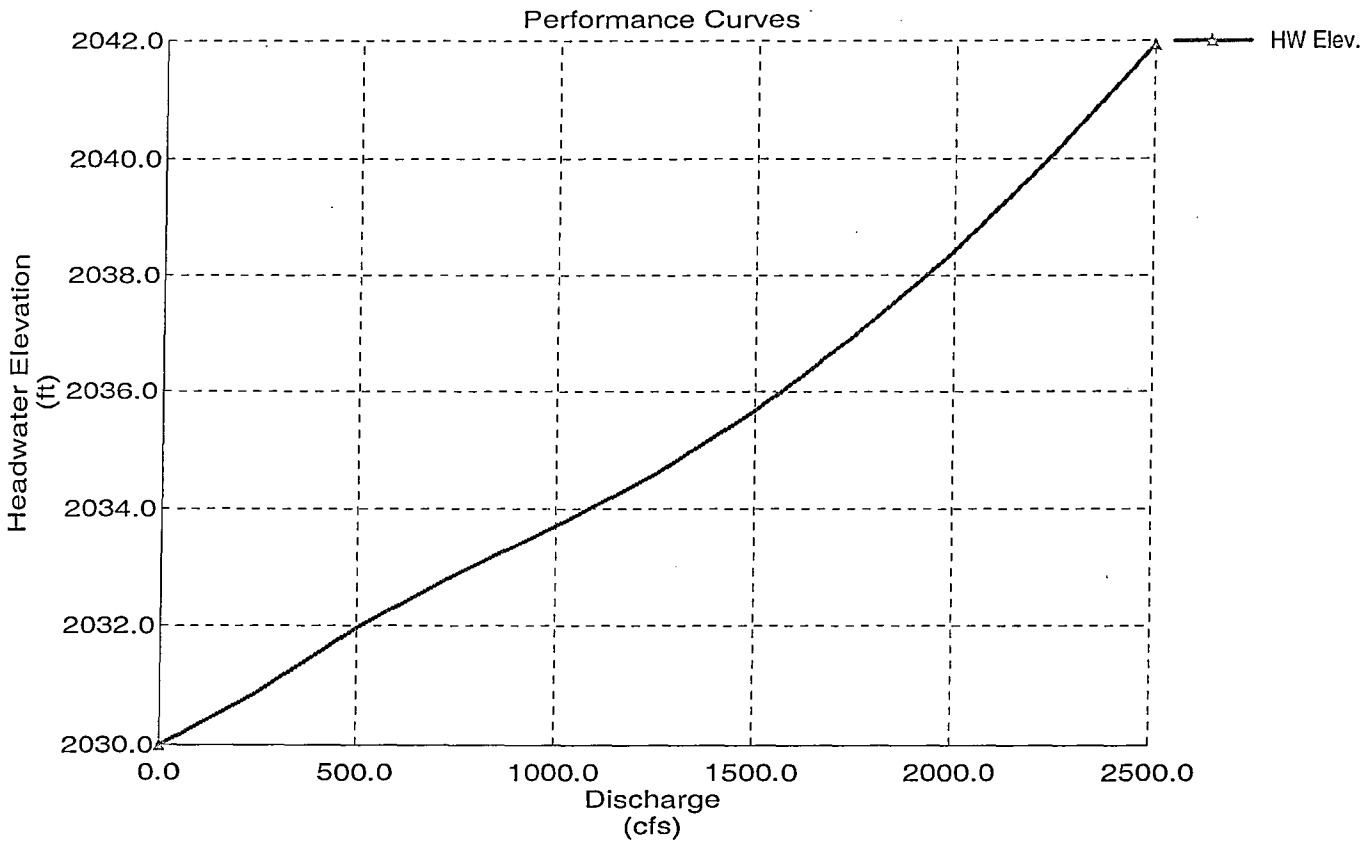
Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	10.00 ft
Section Size	10 x 4 ft	Rise	4.00 ft
Number Sections	4		

Outlet Control Properties			
Outlet Control HW Elev.	2,034.46 ft	Upstream Velocity Head	1.56 ft
Ke	0.50	Entrance Loss	0.78 ft

Inlet Control Properties			
Inlet Control HW Elev.	2,034.59 ft	Flow Control	N/A
Inlet Type	90 and 15° wingwall flares	Area Full	160.0 ft²
K	0.06100	HDS 5 Chart	8
M	0.75000	HDS 5 Scale	2
C	0.04000	Equation Form	1
Y	0.80000		

Performance Curves Report
UCT NORTH BRANCH AT CAVE CREEK ROAD <1252 cfs>

Range Data:				
	Minimum	Maximum	Increment	
Discharge	0.00	2,500.00	250.00	cfs



Culvert Calculator Report
UCT SOUTH BRANCH AT CAVE CREEK ROAD <911 cfs>

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	2,044.00 ft	Headwater Depth/Height	1.47
Computed Headwater Elev	2,042.92 ft	Discharge	911.00 cfs
Inlet Control HW Elev.	2,042.62 ft	Tailwater Elevation	2,040.00 ft
Outlet Control HW Elev.	2,042.92 ft	Control Type	Entrance Control

Grades			
Upstream Invert	2,038.50 ft	Downstream Invert	2,037.00 ft
Length	150.00 ft	Constructed Slope	0.010000 ft/ft

Hydraulic Profile			
Profile	CompositeS1S2	Depth, Downstream	3.00 ft
Slope Type	Steep	Normal Depth	1.75 ft
Flow Regime	N/A	Critical Depth	2.53 ft
Velocity Downstream	7.59 ft/s	Critical Slope	0.003473 ft/ft

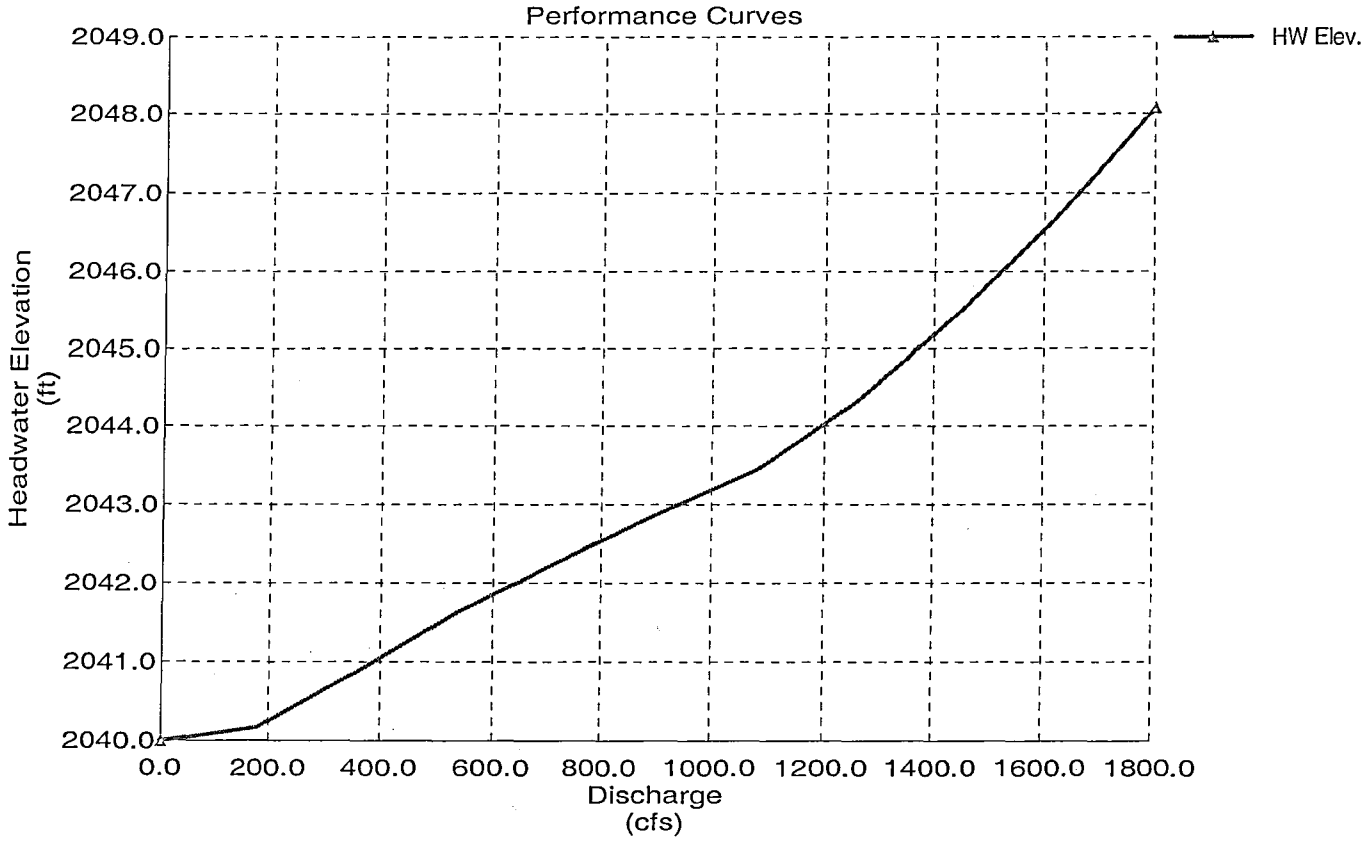
Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	8.00 ft
Section Size	8 x 3 ft	Rise	3.00 ft
Number Sections	5		

Outlet Control Properties			
Outlet Control HW Elev.	2,042.92 ft	Upstream Velocity Head	1.26 ft
Ke	0.50	Entrance Loss	0.63 ft

Inlet Control Properties			
Inlet Control HW Elev.	2,042.62 ft	Flow Control	Submerged
Inlet Type	45° Bevels; 10 - 45° skewed headwall	Area Full	120.0 ft²
K	0.49800	HDS 5 Chart	11
M	0.66700	HDS 5 Scale	4
C	0.03270	Equation Form	2
Y	0.75000		

Performance Curves Report
UCT SOUTH BRANCH AT CAVE CREEK ROAD <911 cfs>

Range Data:			
	Minimum	Maximum	Increment
Discharge	0.00	1,800.00	180.00 cfs



FLO-2D OUTPUT FROM REVISED JEFULLER CAREFREE DMP: 100-YEAR, 24-HOUR MODEL
MODEL REPRESENTS THE UNNAMED CENTRAL TRIBUTARY SPLIT (NORTH AND SOUTH BRANCH)
[FLOODPLAIN CROSS SECTION REVISED AND RENUMBERED FOR AREA OF INTEREST]

Table C.1 FLO-2D Hydraulic Modeling Results Summary

Floodplain Cross Section Number	Discharge : 100-YR, 24-HR (cfs)	Time to Peak (hrs)	Total Volume Discharge (af)
1	1,232	4.47	75.12
2	1,077	4.51	68.52
3	964	4.53	64.41
4	908	4.53	64.73
5	457	4.54	23.31
6	220	4.53	9.83
7	311	4.54	12.74
8	390	4.58	30.16
9	141	4.55	9.41
10	131	4.55	8.99
11	127	4.55	8.86
∑(XSEC 4, 7, 11) = 1346 cfs Original FLO-2D Model = 1350 cfs			

Units: (cfs = cubic feet per second), (hrs = hours) and (af = acre-feet)

THE MAXIMUM DISCHARGE FROM CROSS SECTION 1 IS: 1231.51 CFS
AT TIME: 4.47 HOURS
THE TOTAL VOLUME OF DISCHARGE IS: 75.12 AF

HYDROGRAPH AND AVERAGE FLOODPLAIN HYDRAULICS FOR CROSS SECTION NO: 1

TIME (HRS)	TOPWID (FT)	DEPTH (FT)	VELOCITY (FPS)	DISCHARGE (CFS)
3.90	300.00	0.06	0.12	2.22
4.00	220.00	0.12	0.26	6.68
4.10	100.00	0.28	0.49	13.71
4.20	120.00	0.24	0.50	14.30
4.30	320.00	0.51	2.32	381.63
4.40	360.00	0.94	3.44	1166.45
4.50	360.00	0.97	3.48	1216.04
4.60	360.00	0.91	3.34	1095.01
4.70	360.00	0.82	3.08	909.99
4.80	360.00	0.73	2.88	756.35
4.90	360.00	0.65	2.68	631.00
5.00	360.00	0.59	2.52	531.23
5.10	340.00	0.54	2.39	442.23
5.20	340.00	0.49	2.18	360.30
5.30	340.00	0.41	2.03	285.59
5.40	280.00	0.42	1.95	229.43
5.50	240.00	0.41	1.84	182.33
5.60	200.00	0.41	1.73	142.96
5.70	120.00	0.57	1.65	113.05
5.80	120.00	0.51	1.51	91.41
5.90	100.00	0.54	1.38	74.11
6.00	60.00	0.79	1.31	61.81
6.10	80.00	0.55	1.14	50.37
6.20	60.00	0.65	1.07	41.91
6.30	60.00	0.60	1.01	36.28
6.40	60.00	0.56	0.92	30.90
6.50	60.00	0.51	0.86	26.35
6.60	60.00	0.48	0.79	22.79
6.70	60.00	0.45	0.74	19.85
6.80	60.00	0.41	0.70	17.19
6.90	60.00	0.39	0.63	14.73
7.00	60.00	0.36	0.57	12.35
7.10	60.00	0.34	0.53	11.04
7.20	60.00	0.32	0.50	9.54
7.30	60.00	0.29	0.48	8.47
7.40	60.00	0.28	0.46	7.66
7.50	60.00	0.26	0.43	6.67
7.60	60.00	0.25	0.42	6.28
7.70	60.00	0.23	0.40	5.51
7.80	60.00	0.21	0.38	4.87
7.90	60.00	0.19	0.37	4.31
8.00	60.00	0.18	0.36	3.89
8.10	60.00	0.17	0.35	3.57
8.20	40.00	0.22	0.35	3.06
8.30	40.00	0.21	0.33	2.77
8.40	40.00	0.20	0.32	2.60
8.50	40.00	0.20	0.26	2.05
8.60	40.00	0.20	0.24	1.92

8.70	40.00	0.20	0.21	1.67
8.80	40.00	0.19	0.22	1.68
8.90	40.00	0.18	0.19	1.38
9.00	40.00	0.17	0.18	1.22
9.10	40.00	0.16	0.17	1.07
9.20	40.00	0.14	0.16	0.93
9.30	40.00	0.13	0.15	0.82
9.40	40.00	0.12	0.14	0.66
9.50	40.00	0.09	0.11	0.41
9.60	40.00	0.09	0.11	0.41
9.70	40.00	0.08	0.11	0.34
9.80	40.00	0.08	0.10	0.32
9.90	40.00	0.07	0.10	0.30
10.00	40.00	0.07	0.10	0.27
10.10	40.00	0.06	0.09	0.24
10.20	40.00	0.06	0.09	0.22
10.30	40.00	0.06	0.09	0.20
10.40	40.00	0.05	0.08	0.18
10.50	40.00	0.05	0.05	0.10
10.60	40.00	0.05	0.08	0.15
10.70	40.00	0.05	0.05	0.10
10.80	20.00	0.05	0.02	0.02
10.90	20.00	0.05	0.06	0.06
11.00	40.00	0.05	0.03	0.06
11.10	40.00	0.05	0.02	0.04
11.20	40.00	0.05	0.02	0.05
11.30	40.00	0.05	0.02	0.05

THE MAXIMUM DISCHARGE FROM CROSS SECTION 2 IS: 1077.02 CFS
AT TIME: 4.51 HOURS
THE TOTAL VOLUME OF DISCHARGE IS: 68.52 AF

HYDROGRAPH AND AVERAGE FLOODPLAIN HYDRAULICS FOR CROSS SECTION NO: 2

TIME (HRS)	TOPWID (FT)	DEPTH (FT)	VELOCITY (FPS)	DISCHARGE (CFS)
3.90	240.00	0.06	0.15	2.24
4.00	260.00	0.13	0.33	10.89
4.10	160.00	0.20	0.51	16.33
4.20	140.00	0.19	0.72	19.65
4.30	140.00	0.19	1.09	29.35
4.40	240.00	0.67	4.71	758.73
4.50	240.00	0.88	5.04	1068.73
4.60	240.00	0.86	4.93	1021.93
4.70	240.00	0.78	4.72	879.44
4.80	240.00	0.69	4.47	736.35
4.90	240.00	0.61	4.24	617.80
5.00	240.00	0.54	4.09	526.03
5.10	240.00	0.47	3.92	445.81
5.20	240.00	0.43	3.65	373.67
5.30	240.00	0.36	3.56	309.74
5.40	240.00	0.30	3.53	253.58
5.50	240.00	0.25	3.44	207.28
5.60	240.00	0.22	3.06	165.29
5.70	240.00	0.19	2.88	132.89
5.80	180.00	0.21	2.87	106.21
5.90	100.00	0.30	2.91	87.05
6.00	100.00	0.28	2.63	72.44
6.10	60.00	0.40	2.48	59.58
6.20	40.00	0.37	3.38	49.56
6.30	40.00	0.31	3.39	41.78
6.40	40.00	0.29	3.16	36.15
6.50	40.00	0.26	2.85	30.13
6.60	40.00	0.24	2.71	25.75
6.70	40.00	0.23	2.52	22.97
6.80	40.00	0.21	2.36	19.97
6.90	40.00	0.19	2.20	17.11
7.00	40.00	0.18	2.07	15.10
7.10	40.00	0.17	1.91	12.64
7.20	40.00	0.16	1.78	11.23
7.30	40.00	0.15	1.68	10.00
7.40	40.00	0.15	1.44	8.68
7.50	40.00	0.14	1.36	7.73
7.60	40.00	0.13	1.29	6.83
7.70	40.00	0.12	1.25	6.12
7.80	40.00	0.12	1.17	5.64
7.90	40.00	0.12	0.95	4.52
8.00	40.00	0.12	0.82	3.84
8.10	40.00	0.11	0.80	3.56
8.20	40.00	0.11	0.97	4.40
8.30	40.00	0.09	0.88	3.18
8.40	40.00	0.08	0.86	2.89
8.50	40.00	0.08	0.86	2.77
8.60	40.00	0.08	0.65	2.10
8.70	40.00	0.08	0.65	2.07

8.80	40.00	0.07	0.62	1.69
8.90	40.00	0.06	0.60	1.52
9.00	40.00	0.06	0.58	1.35
9.10	40.00	0.05	0.56	1.20
9.20	40.00	0.05	0.54	1.07
9.30	40.00	0.05	0.52	0.97
9.40	40.00	0.04	0.50	0.88
9.50	40.00	0.04	0.49	0.80
9.60	40.00	0.04	0.47	0.71
9.70	40.00	0.03	0.44	0.61
9.80	40.00	0.03	0.42	0.53
9.90	40.00	0.03	0.41	0.48
10.00	40.00	0.03	0.39	0.40
10.10	40.00	0.03	0.33	0.33
10.20	40.00	0.03	0.27	0.27
10.30	40.00	0.03	0.20	0.20
10.40	20.00	0.05	0.11	0.11
10.50	40.00	0.03	0.09	0.09
10.60	40.00	0.05	0.08	0.15

THE MAXIMUM DISCHARGE FROM CROSS SECTION 3 IS: 963.86 CFS
AT TIME: 4.53 HOURS
THE TOTAL VOLUME OF DISCHARGE IS: 64.41 AF

HYDROGRAPH AND AVERAGE FLOODPLAIN HYDRAULICS FOR CROSS SECTION NO: 3

TIME (HRS)	TOPWID (FT)	DEPTH (FT)	VELOCITY (FPS)	DISCHARGE (CFS)
3.90	280.00	0.07	0.15	3.01
4.00	280.00	0.10	0.33	9.47
4.10	80.00	0.18	1.00	14.61
4.20	80.00	0.17	1.18	16.42
4.30	60.00	0.24	1.65	24.00
4.40	180.00	0.67	4.91	592.20
4.50	260.00	0.82	4.44	950.07
4.60	260.00	0.82	4.37	929.43
4.70	260.00	0.74	4.22	812.81
4.80	260.00	0.64	4.16	692.90
4.90	260.00	0.56	4.05	591.49
5.00	260.00	0.50	3.95	510.56
5.10	260.00	0.43	3.92	438.97
5.20	200.00	0.47	3.90	370.08
5.30	200.00	0.41	3.86	312.88
5.40	180.00	0.37	3.92	258.57
5.50	180.00	0.31	3.84	212.58
5.60	180.00	0.26	3.67	171.12
5.70	140.00	0.26	3.74	136.95
5.80	120.00	0.24	3.77	110.82
5.90	60.00	0.39	3.90	90.25
6.00	40.00	0.50	3.76	75.17
6.10	40.00	0.45	3.46	62.64
6.20	40.00	0.40	3.18	51.35
6.30	40.00	0.36	2.98	43.13
6.40	20.00	0.62	3.02	37.20
6.50	20.00	0.54	2.88	31.34
6.60	20.00	0.51	2.64	26.71
6.70	20.00	0.48	2.47	23.76
6.80	20.00	0.44	2.35	20.85
6.90	20.00	0.38	2.31	17.50
7.00	20.00	0.35	2.25	15.58
7.10	20.00	0.31	2.20	13.52
7.20	20.00	0.27	2.16	11.64
7.30	20.00	0.24	2.13	10.39
7.40	20.00	0.22	2.09	9.17
7.50	20.00	0.20	2.02	8.06
7.60	20.00	0.20	1.81	7.24
7.70	20.00	0.20	1.57	6.28
7.80	20.00	0.20	1.43	5.70
7.90	20.00	0.18	1.42	5.25
8.00	20.00	0.15	1.62	4.74
8.10	20.00	0.12	1.68	4.11
8.20	20.00	0.10	1.73	3.63
8.30	20.00	0.09	1.81	3.36
8.40	20.00	0.08	1.97	3.03
8.50	20.00	0.06	2.15	2.67
8.60	20.00	0.05	2.30	2.31
8.70	20.00	0.05	2.13	2.13

8.80	20.00	0.05	1.84	1.84
8.90	20.00	0.05	1.58	1.58
9.00	20.00	0.05	1.38	1.38
9.10	20.00	0.05	1.21	1.21
9.20	20.00	0.05	1.10	1.10
9.30	20.00	0.05	1.03	1.03
9.40	20.00	0.05	1.01	1.01
9.50	20.00	0.05	0.78	0.78
9.60	20.00	0.05	0.52	0.52
9.70	20.00	0.05	0.59	0.59
9.80	20.00	0.05	0.52	0.52
9.90	20.00	0.05	0.52	0.52
10.00	20.00	0.05	0.43	0.43
10.10	20.00	0.05	0.38	0.38
10.20	20.00	0.05	0.32	0.32
10.30	20.00	0.05	0.31	0.31
10.40	20.00	0.05	0.20	0.20
10.50	20.00	0.05	0.14	0.14
10.60	20.00	0.05	0.09	0.09

THE MAXIMUM DISCHARGE FROM CROSS SECTION 4 IS: 907.73 CFS
AT TIME: 4.53 HOURS
THE TOTAL VOLUME OF DISCHARGE IS: 64.73 AF

HYDROGRAPH AND AVERAGE FLOODPLAIN HYDRAULICS FOR CROSS SECTION NO: 4

TIME (HRS)	TOPWID (FT)	DEPTH (FT)	VELOCITY (FPS)	DISCHARGE (CFS)
3.70	20.00	0.04	0.11	0.08
3.80	20.00	0.17	0.06	0.21
3.90	220.00	0.11	0.07	1.84
4.00	180.00	0.33	0.06	3.68
4.10	120.00	0.84	0.14	14.32
4.20	120.00	0.96	0.16	18.34
4.30	120.00	1.04	0.23	28.98
4.40	180.00	1.25	2.44	550.68
4.50	200.00	1.38	3.25	896.32
4.60	200.00	1.38	3.21	884.90
4.70	200.00	1.32	2.99	789.57
4.80	200.00	1.25	2.74	685.98
4.90	180.00	1.33	2.47	593.00
5.00	180.00	1.27	2.26	518.86
5.10	180.00	1.21	2.07	452.16
5.20	180.00	1.17	1.85	388.81
5.30	180.00	1.13	1.63	331.59
5.40	180.00	1.09	1.41	276.89
5.50	180.00	1.04	1.25	233.74
5.60	180.00	0.99	1.07	190.77
5.70	160.00	1.06	0.92	155.10
5.80	160.00	1.00	0.79	126.67
5.90	140.00	1.09	0.68	103.66
6.00	100.00	1.44	0.59	85.92
6.10	100.00	1.40	0.52	72.25
6.20	100.00	1.34	0.45	59.95
6.30	100.00	1.27	0.39	49.54
6.40	80.00	1.52	0.35	42.04
6.50	80.00	1.47	0.29	34.42
6.60	80.00	1.42	0.26	29.61
6.70	80.00	1.39	0.24	26.11
6.80	80.00	1.35	0.21	22.92
6.90	80.00	1.32	0.19	19.53
7.00	80.00	1.28	0.17	17.31
7.10	80.00	1.23	0.15	14.93
7.20	80.00	1.20	0.13	12.83
7.30	80.00	1.16	0.12	11.12
7.40	80.00	1.13	0.11	9.78
7.50	80.00	1.09	0.10	8.83
7.60	80.00	1.07	0.09	7.77
7.70	80.00	1.06	0.08	6.50
7.80	80.00	1.06	0.09	7.74
7.90	80.00	1.05	0.07	5.71
8.00	80.00	1.05	0.06	5.00
8.10	60.00	1.37	0.06	4.83
8.20	60.00	1.34	0.06	4.80
8.30	60.00	1.33	0.08	6.15
8.40	60.00	1.32	0.05	3.93
8.50	60.00	1.30	0.04	3.01

8.60	60.00	1.29	0.06	4.45
8.70	60.00	1.27	0.04	2.70
8.80	60.00	1.26	0.03	1.97
8.90	60.00	1.23	0.05	3.34
9.00	60.00	1.21	0.02	1.18
9.10	60.00	1.20	0.02	1.75
9.20	60.00	1.18	0.01	0.47
9.30	60.00	1.17	0.01	0.57
9.40	60.00	1.15	0.00	0.21
9.50	60.00	1.13	0.01	0.55
9.60	60.00	1.12	0.02	1.19
9.70	60.00	1.10	0.01	0.76
9.80	60.00	1.10	0.01	0.62
9.90	60.00	1.09	0.00	0.18
10.00	60.00	1.09	0.01	0.35
10.10	60.00	1.08	0.00	0.18
10.20	60.00	1.08	0.01	0.53
10.30	60.00	1.07	0.00	0.23
10.40	60.00	1.07	0.00	0.13
10.50	60.00	1.06	0.01	0.43
10.60	40.00	1.30	0.00	0.02
10.70	60.00	1.03	0.00	0.14
10.80	40.00	1.28	0.00	0.05
10.90	60.00	1.01	0.00	0.13
11.00	40.00	1.26	0.00	0.00
11.10	60.00	0.98	0.00	0.10
11.20	60.00	0.97	0.00	0.08
11.30	60.00	0.97	0.00	0.04
11.40	20.00	1.53	0.00	0.05
11.50	20.00	1.51	0.00	0.07
11.60	20.00	1.49	0.00	0.02
11.70	40.00	0.95	0.00	0.05
14.10	20.00	1.35	0.00	0.02
14.40	20.00	0.78	0.00	0.00
16.00	20.00	1.28	0.00	0.01
17.20	20.00	1.23	0.00	0.01
17.30	20.00	1.22	0.00	0.01
19.00	20.00	1.15	0.00	0.00
19.80	20.00	0.09	0.00	0.00
19.90	20.00	1.11	0.00	0.01
20.60	20.00	1.09	0.00	0.01
21.20	20.00	1.06	0.00	0.00
21.90	20.00	1.03	0.00	0.00

THE MAXIMUM DISCHARGE FROM CROSS SECTION 5 IS: 456.50 CFS
AT TIME: 4.54 HOURS
THE TOTAL VOLUME OF DISCHARGE IS: 23.31 AF

HYDROGRAPH AND AVERAGE FLOODPLAIN HYDRAULICS FOR CROSS SECTION NO: 5

TIME (HRS)	TOPWID (FT)	DEPTH (FT)	VELOCITY (FPS)	DISCHARGE (CFS)
3.60	60.00	0.05	0.03	0.10
3.70	40.00	0.05	0.04	0.07
3.80	200.00	0.06	0.10	1.07
3.90	380.00	0.06	0.12	2.84
4.00	400.00	0.06	0.10	2.61
4.10	60.00	0.07	0.09	0.35
4.20	140.00	0.05	0.05	0.37
4.30	120.00	0.05	0.05	0.31
4.40	420.00	0.24	1.02	100.63
4.50	420.00	0.56	1.87	441.26
4.60	420.00	0.56	1.88	444.32
4.70	420.00	0.52	1.73	376.86
4.80	440.00	0.45	1.58	312.21
4.90	420.00	0.42	1.44	253.30
5.00	420.00	0.38	1.31	207.59
5.10	420.00	0.34	1.19	170.17
5.20	420.00	0.31	1.03	135.21
5.30	400.00	0.30	0.89	105.75
5.40	400.00	0.26	0.79	81.27
5.50	340.00	0.25	0.71	60.74
5.60	320.00	0.21	0.63	42.93
5.70	300.00	0.17	0.54	28.10
5.80	280.00	0.16	0.42	18.11
5.90	240.00	0.14	0.35	11.72
6.00	260.00	0.10	0.25	6.85
6.10	160.00	0.10	0.23	3.64
6.20	80.00	0.09	0.19	1.38
6.30	60.00	0.10	0.14	0.85
6.40	20.00	0.13	0.14	0.37
6.50	20.00	0.08	0.10	0.17
6.60	20.00	0.05	0.07	0.07
8.80	20.00	0.05	0.03	0.03

THE MAXIMUM DISCHARGE FROM CROSS SECTION 6 IS: 219.93 CFS
AT TIME: 4.53 HOURS
THE TOTAL VOLUME OF DISCHARGE IS: 9.83 AF

HYDROGRAPH AND AVERAGE FLOODPLAIN HYDRAULICS FOR CROSS SECTION NO: 6

TIME (HRS)	TOPWID (FT)	DEPTH (FT)	VELOCITY (FPS)	DISCHARGE (CFS)
3.90	320.00	0.11	0.04	1.61
4.00	360.00	0.15	0.15	8.49
4.10	100.00	0.39	0.17	6.78
4.20	100.00	0.37	0.16	6.02
4.30	60.00	0.55	0.12	3.93
4.40	120.00	0.77	1.22	113.34
4.50	160.00	0.77	1.76	216.82
4.60	160.00	0.81	1.67	215.99
4.70	160.00	0.74	1.48	176.09
4.80	100.00	1.03	1.29	132.81
4.90	100.00	0.90	1.09	98.47
5.00	100.00	0.80	0.93	73.99
5.10	100.00	0.70	0.77	53.81
5.20	100.00	0.60	0.63	37.93
5.30	100.00	0.51	0.47	24.23
5.40	100.00	0.45	0.31	13.82
5.50	100.00	0.39	0.21	8.32
5.60	100.00	0.35	0.15	5.17
5.70	100.00	0.33	0.09	2.97
5.80	60.00	0.49	0.06	1.72
5.90	60.00	0.45	0.03	0.92
6.00	60.00	0.44	0.02	0.53
6.10	40.00	0.59	0.01	0.28
6.20	40.00	0.55	0.01	0.14
6.30	40.00	0.51	0.00	0.08
6.40	40.00	0.49	0.00	0.06
6.50	40.00	0.48	0.00	0.01

THE MAXIMUM DISCHARGE FROM CROSS SECTION 7 IS: 311.45 CFS
AT TIME: 4.54 HOURS
THE TOTAL VOLUME OF DISCHARGE IS: 12.74 AF

HYDROGRAPH AND AVERAGE FLOODPLAIN HYDRAULICS FOR CROSS SECTION NO: 7

TIME (HRS)	TOPWID (FT)	DEPTH (FT)	VELOCITY (FPS)	DISCHARGE (CFS)
3.90	160.00	0.08	0.11	1.53
4.00	160.00	0.15	0.26	6.34
4.10	120.00	0.17	0.25	4.90
4.20	100.00	0.19	0.29	5.45
4.30	80.00	0.22	0.33	5.71
4.40	80.00	0.52	0.14	5.93
4.50	160.00	1.05	1.77	298.36
4.60	160.00	1.06	1.78	300.56
4.70	160.00	0.98	1.59	250.77
4.80	160.00	0.88	1.35	189.86
4.90	160.00	0.77	1.10	135.91
5.00	160.00	0.70	0.87	97.70
5.10	140.00	0.71	0.69	67.85
5.20	140.00	0.62	0.51	44.22
5.30	120.00	0.63	0.38	28.86
5.40	120.00	0.54	0.25	16.35
5.50	80.00	0.70	0.17	9.77
5.60	80.00	0.62	0.13	6.34
5.70	80.00	0.54	0.09	4.07
5.80	80.00	0.49	0.08	3.02
5.90	60.00	0.50	0.06	1.82
6.00	60.00	0.39	0.05	1.22
6.10	60.00	0.30	0.04	0.82
6.20	60.00	0.17	0.09	0.96
6.30	40.00	0.20	0.17	1.35
6.40	40.00	0.20	0.13	1.03
6.50	40.00	0.20	0.11	0.89
6.60	40.00	0.16	0.08	0.52
6.70	20.00	0.20	0.09	0.34
6.80	20.00	0.16	0.07	0.21
6.90	20.00	0.12	0.07	0.16
7.00	20.00	0.10	0.07	0.12
7.10	20.00	0.08	0.07	0.11
7.20	20.00	0.07	0.07	0.10
7.30	20.00	0.05	0.03	0.03
7.40	20.00	0.05	0.04	0.04

THE MAXIMUM DISCHARGE FROM CROSS SECTION 8 IS: 390.05 CFS
AT TIME: 4.58 HOURS
THE TOTAL VOLUME OF DISCHARGE IS: 30.16 AF

HYDROGRAPH AND AVERAGE FLOODPLAIN HYDRAULICS FOR CROSS SECTION NO: 8

TIME (HRS)	TOPWID (FT)	DEPTH (FT)	VELOCITY (FPS)	DISCHARGE (CFS)
3.60	80.00	0.04	0.03	0.10
3.70	100.00	0.05	0.04	0.18
3.80	140.00	0.11	0.05	0.74
3.90	180.00	0.26	0.06	2.70
4.00	180.00	0.30	0.17	9.35
4.10	80.00	0.61	0.19	9.29
4.20	140.00	0.43	0.47	28.09
4.30	160.00	0.41	0.60	38.79
4.40	160.00	0.66	1.17	124.59
4.50	200.00	0.79	2.33	369.60
4.60	200.00	0.80	2.32	369.99
4.70	200.00	0.77	2.15	332.22
4.80	200.00	0.73	1.89	276.04
4.90	200.00	0.70	1.70	237.32
5.00	180.00	0.72	1.53	199.12
5.10	180.00	0.70	1.39	175.32
5.20	180.00	0.64	1.28	148.66
5.30	180.00	0.62	1.24	139.02
5.40	180.00	0.60	1.18	127.00
5.50	180.00	0.57	1.11	114.31
5.60	180.00	0.55	1.07	105.77
5.70	180.00	0.53	1.01	97.12
5.80	180.00	0.52	0.98	90.54
5.90	180.00	0.51	0.90	82.41
6.00	160.00	0.54	0.85	72.86
6.10	160.00	0.51	0.83	67.08
6.20	160.00	0.49	0.78	60.99
6.30	160.00	0.43	0.56	38.66
6.40	160.00	0.41	0.53	34.53
6.50	160.00	0.39	0.48	30.24
6.60	160.00	0.38	0.44	26.94
6.70	160.00	0.37	0.41	24.13
6.80	120.00	0.47	0.39	21.95
6.90	60.00	0.88	0.38	20.26
7.00	100.00	0.54	0.33	17.85
7.10	60.00	0.86	0.31	15.70
7.20	60.00	0.84	0.28	14.40
7.30	20.00	2.37	0.26	12.59
7.40	20.00	2.34	0.24	11.30
7.50	20.00	2.30	0.21	9.87
7.60	20.00	2.25	0.19	8.67
7.70	20.00	2.20	0.17	7.58
7.80	20.00	2.15	0.15	6.42
7.90	20.00	2.15	0.14	5.87
8.00	20.00	2.12	0.13	5.37
8.10	20.00	2.11	0.12	5.15
8.20	20.00	2.09	0.12	4.85
8.30	20.00	2.05	0.10	4.19
8.40	20.00	2.04	0.09	3.79

8.50	20.00	2.02	0.09	3.57
8.60	20.00	1.99	0.08	3.18
8.70	20.00	1.98	0.08	2.99
8.80	20.00	1.97	0.07	2.87
8.90	20.00	1.96	0.07	2.64
9.00	20.00	1.94	0.06	2.43
9.10	20.00	1.92	0.06	2.19
9.20	20.00	1.90	0.05	1.97
9.30	20.00	1.88	0.05	1.74
9.40	20.00	1.86	0.04	1.58
9.50	40.00	0.94	0.04	1.42
9.60	20.00	1.84	0.04	1.29
9.70	20.00	1.82	0.03	1.15
9.80	20.00	1.80	0.03	0.99
9.90	20.00	1.77	0.02	0.80
10.00	20.00	1.78	0.02	0.66
10.10	20.00	1.79	0.01	0.47
10.20	20.00	1.79	0.01	0.46
10.30	20.00	1.78	0.01	0.44
10.40	20.00	1.78	0.01	0.42
10.50	20.00	1.76	0.01	0.35
10.60	40.00	0.90	0.01	0.35
10.70	20.00	1.74	0.01	0.30
10.80	20.00	1.73	0.01	0.28
10.90	20.00	1.73	0.01	0.27
11.00	20.00	1.73	0.01	0.27
11.10	20.00	1.72	0.01	0.25
11.20	20.00	1.71	0.01	0.22
11.30	20.00	1.71	0.01	0.21
11.40	20.00	1.70	0.01	0.20
11.50	20.00	1.70	0.01	0.19
11.60	20.00	1.69	0.00	0.16
11.70	20.00	1.68	0.00	0.15
11.80	20.00	1.67	0.00	0.13
11.90	20.00	1.67	0.00	0.12
12.00	20.00	1.66	0.00	0.11
12.10	20.00	1.65	0.00	0.10
12.20	20.00	1.64	0.00	0.08
12.30	20.00	1.63	0.00	0.07
12.40	20.00	1.62	0.00	0.06
12.50	20.00	1.62	0.00	0.05
12.60	20.00	1.59	0.00	0.04

THE MAXIMUM DISCHARGE FROM CROSS SECTION 9 IS: 141.40 CFS
AT TIME: 4.55 HOURS
THE TOTAL VOLUME OF DISCHARGE IS: 9.41 AF

HYDROGRAPH AND AVERAGE FLOODPLAIN HYDRAULICS FOR CROSS SECTION NO: 9

TIME (HRS)	TOPWID (FT)	DEPTH (FT)	VELOCITY (FPS)	DISCHARGE (CFS)
3.70	40.00	0.05	0.00	0.01
3.80	20.00	0.05	0.08	0.08
3.90	160.00	0.05	0.10	0.88
4.00	160.00	0.06	0.11	1.03
4.10	20.00	0.13	0.08	0.22
4.20	60.00	0.16	0.32	3.11
4.30	40.00	0.28	0.74	8.18
4.40	40.00	0.39	1.93	30.15
4.50	40.00	0.85	3.90	133.40
4.60	40.00	0.89	3.92	138.82
4.70	40.00	0.81	3.89	126.06
4.80	40.00	0.77	3.53	109.14
4.90	40.00	0.69	3.22	89.03
5.00	40.00	0.66	3.05	80.63
5.10	40.00	0.62	2.77	68.35
5.20	40.00	0.58	2.68	61.67
5.30	40.00	0.54	2.35	51.17
5.40	40.00	0.50	2.11	41.89
5.50	40.00	0.46	1.96	36.04
5.60	40.00	0.43	1.80	30.85
5.70	40.00	0.37	1.58	23.53
5.80	40.00	0.35	1.24	17.38
5.90	40.00	0.31	1.01	12.63
6.00	40.00	0.28	0.71	7.77
6.10	40.00	0.23	0.40	3.75
6.20	20.00	0.36	0.34	2.40
6.30	40.00	0.32	1.08	13.71
6.40	40.00	0.29	0.94	10.82
6.50	40.00	0.27	0.71	7.84
6.60	40.00	0.27	0.61	6.71
6.70	40.00	0.26	0.48	5.06
6.80	40.00	0.23	0.39	3.60
6.90	40.00	0.21	0.34	2.94
7.00	20.00	0.35	0.33	2.26
7.10	20.00	0.30	0.29	1.77
7.20	20.00	0.27	0.26	1.42
7.30	20.00	0.24	0.24	1.13
7.40	20.00	0.22	0.24	1.06
7.50	20.00	0.22	0.23	1.01
7.60	20.00	0.20	0.19	0.76
7.70	20.00	0.20	0.12	0.50
7.80	20.00	0.18	0.10	0.36
7.90	20.00	0.14	0.08	0.21
8.00	20.00	0.11	0.07	0.15
8.10	20.00	0.09	0.06	0.12
8.20	20.00	0.08	0.06	0.10
8.30	20.00	0.06	0.05	0.07
8.40	40.00	0.05	0.01	0.01
10.10	40.00	0.05	0.02	0.04

11.20	20.00	0.05	0.00	0.00
11.40	20.00	0.05	0.07	0.07
12.60	20.00	0.05	0.01	0.01

THE MAXIMUM DISCHARGE FROM CROSS SECTION 10 IS: 130.97 CFS
AT TIME: 4.55 HOURS
THE TOTAL VOLUME OF DISCHARGE IS: 8.99 AF

HYDROGRAPH AND AVERAGE FLOODPLAIN HYDRAULICS FOR CROSS SECTION NO: 10

TIME (HRS)	TOPWID (FT)	DEPTH (FT)	VELOCITY (FPS)	DISCHARGE (CFS)
3.70	20.00	0.05	0.06	0.06
3.80	20.00	0.05	0.02	0.02
3.90	80.00	0.05	0.05	0.22
4.00	80.00	0.05	0.13	0.52
4.10	20.00	0.05	0.20	0.20
4.20	40.00	0.07	0.84	2.49
4.30	20.00	0.26	1.15	6.00
4.40	60.00	0.20	2.56	30.98
4.50	60.00	0.54	3.87	124.26
4.60	60.00	0.55	3.91	129.08
4.70	60.00	0.52	3.81	118.83
4.80	60.00	0.51	3.39	103.19
4.90	60.00	0.47	3.01	85.00
5.00	60.00	0.44	2.94	77.40
5.10	60.00	0.40	2.76	66.11
5.20	60.00	0.37	2.65	59.43
5.30	60.00	0.38	2.21	49.81
5.40	60.00	0.34	2.05	41.28
5.50	60.00	0.31	1.93	35.93
5.60	60.00	0.29	1.78	30.74
5.70	60.00	0.21	1.81	23.05
5.80	60.00	0.18	1.61	17.37
5.90	20.00	0.36	1.78	12.88
6.00	20.00	0.27	1.13	6.02
6.10	20.00	0.20	0.89	3.57
6.20	20.00	0.14	0.91	2.58
6.30	20.00	0.36	1.85	13.33
6.40	20.00	0.31	1.79	11.11
6.50	20.00	0.25	1.77	8.87
6.60	20.00	0.27	1.19	6.54
6.70	20.00	0.23	1.12	5.17
6.80	20.00	0.20	0.89	3.55
6.90	20.00	0.17	0.87	3.02
7.00	20.00	0.13	0.94	2.36
7.10	20.00	0.09	1.02	1.85
7.20	20.00	0.07	1.11	1.47
7.30	20.00	0.05	1.16	1.16
7.40	20.00	0.05	1.07	1.07
7.50	20.00	0.05	1.03	1.03
7.60	20.00	0.05	0.84	0.84
7.70	20.00	0.05	0.45	0.45
7.80	20.00	0.05	0.37	0.37
7.90	20.00	0.05	0.25	0.25
8.00	20.00	0.05	0.18	0.18
8.10	20.00	0.05	0.14	0.14
8.20	20.00	0.05	0.11	0.11
8.30	20.00	0.05	0.09	0.09
8.40	40.00	0.05	0.09	0.18
8.50	20.00	0.05	0.03	0.03

8.60	20.00	0.05	0.02	0.02
8.70	20.00	0.05	0.01	0.01
9.00	20.00	0.05	0.03	0.03
11.20	20.00	0.05	0.07	0.07
12.60	20.00	0.05	0.12	0.12

THE MAXIMUM DISCHARGE FROM CROSS SECTION 11 IS: 126.79 CFS
AT TIME: 4.55 HOURS
THE TOTAL VOLUME OF DISCHARGE IS: 8.86 AF

HYDROGRAPH AND AVERAGE FLOODPLAIN HYDRAULICS FOR CROSS SECTION NO: 11

TIME (HRS)	TOPWID (FT)	DEPTH (FT)	VELOCITY (FPS)	DISCHARGE (CFS)
3.70	20.00	0.05	0.02	0.02
3.80	20.00	0.05	0.12	0.12
3.90	60.00	0.05	0.10	0.32
4.00	60.00	0.07	0.13	0.51
4.10	20.00	0.06	0.17	0.22
4.20	20.00	0.20	0.52	2.10
4.30	40.00	0.21	0.82	6.88
4.40	40.00	0.35	2.01	27.87
4.50	40.00	0.76	3.97	120.37
4.60	40.00	0.77	4.05	125.03
4.70	40.00	0.74	3.90	115.52
4.80	40.00	0.64	3.95	101.43
4.90	40.00	0.59	3.53	83.79
5.00	40.00	0.58	3.31	76.98
5.10	40.00	0.54	3.07	65.85
5.20	40.00	0.51	2.88	59.26
5.30	40.00	0.51	2.41	49.72
5.40	40.00	0.47	2.16	41.09
5.50	40.00	0.42	2.14	36.11
5.60	40.00	0.37	2.07	30.92
5.70	40.00	0.33	1.89	25.22
5.80	40.00	0.34	1.29	17.43
5.90	40.00	0.31	1.12	13.68
6.00	40.00	0.21	0.93	7.96
6.10	40.00	0.15	0.69	4.03
6.20	20.00	0.20	0.66	2.63
6.30	40.00	0.30	1.10	13.27
6.40	40.00	0.27	1.03	11.35
6.50	40.00	0.24	0.93	8.83
6.60	40.00	0.20	0.76	6.13
6.70	40.00	0.17	0.75	5.22
6.80	40.00	0.14	0.68	3.86
6.90	40.00	0.13	0.58	3.07
7.00	20.00	0.20	0.63	2.53
7.10	20.00	0.20	0.57	2.26
7.20	20.00	0.20	0.37	1.47
7.30	20.00	0.17	0.34	1.18
7.40	20.00	0.16	0.33	1.07
7.50	20.00	0.16	0.32	1.02
7.60	20.00	0.14	0.30	0.86
7.70	20.00	0.11	0.24	0.52
7.80	20.00	0.09	0.22	0.40
7.90	20.00	0.07	0.19	0.27
8.00	20.00	0.06	0.17	0.19
8.10	20.00	0.05	0.15	0.15
8.20	20.00	0.05	0.13	0.13
8.30	20.00	0.05	0.11	0.11
8.40	20.00	0.05	0.09	0.09
9.00	40.00	0.05	0.06	0.11

FPXSEC.DAT (INPUT FILE FOR CROSS SECTION LOCATIONS WITHIN EFFECTIVE FLO-2D MODEL)

```
P 1
X 4 22 227 264 302 342 386 431 478 529 583 641 699 760 823 889 957 1028 1101 1177 1255 1335 1417 1501
X 8 12 151 183 216 253 291 331 375 420 467 518 572 630
X 7 9 790 729 670 614 558 506 457 412 369
X 4 18 8244 8245 8246 8247 8248 8249 8250 8251 8252 8253 8254 8255 8256 8257 8258 8259 8260 8261
X 8 13 1925 2027 2133 2241 2351 2463 2576 2690 2807 2925 3044 3165 3287
X 4 20 1906 1907 1908 1909 1910 1911 1912 1913 1914 1915 1916 1917 1918 1919 1920 1921 1922 1923 1924
1925
X 4 10 507 561 619 677 738 801 867 935 1006 1079
X 7 5 504 455 410 367 325
X 7 3 409 366 324
X 8 14 1079 1155 1233 1313 1395 1479 1566 1655 1747 1842 1941 2043 2149 2257
X 8 11 944 1015 1088 1164 1242 1322 1404 1488 1575 1664 1756
```

Cross Section for Spur Cross Rd at WS Wash proposed

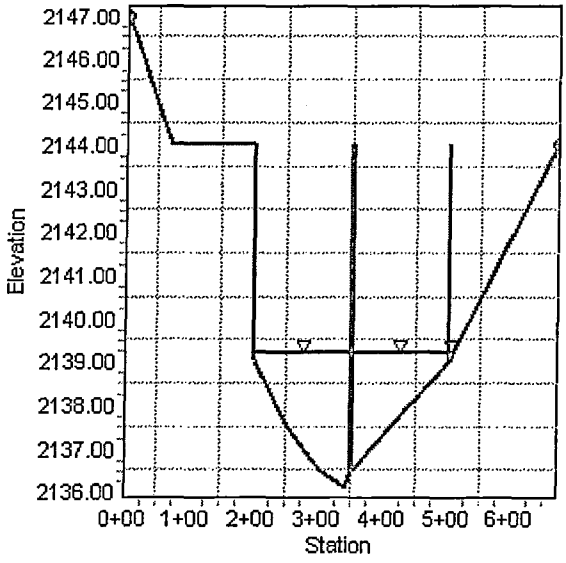
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.02400	ft/ft
Normal Depth	3.10	ft
Discharge	4800.00	ft³/s

Cross Section Image



Worksheet for Spur Cross Rd at WS Wash proposed

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.02400	ft/ft
Discharge	4800.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	2147.00
0+70	2144.00
2+00	2144.00
2+00	2139.00
2+50	2137.50
3+00	2136.50
3+40	2136.10
3+50	2136.50
3+50	2144.00
3+51	2144.00
3+51	2136.50
5+00	2139.00
5+00	2144.00
5+01	2144.00
5+01	2139.00
6+70	2144.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 2147.00)	(6+70, 2144.00)	0.035

Results

Normal Depth	3.10	ft
Elevation Range	2136.10 to 2147.00 ft	

Worksheet for Spur Cross Rd at WS Wash proposed

Results

Flow Area		519.40	ft²
Wetted Perimeter		311.85	ft
Top Width		305.78	ft
Normal Depth		3.10	ft
Critical Depth		3.39	ft
Critical Slope		0.01479	ft/ft
Velocity		9.24	ft/s
Velocity Head		1.33	ft
Specific Energy		4.43	ft
Froude Number		1.25	
Flow Type	Supercritical		

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	3.10	ft
Critical Depth	3.39	ft
Channel Slope	0.02400	ft/ft
Critical Slope	0.01479	ft/ft

Cross Section for Spur Cross Rd at WS Wash Trib5

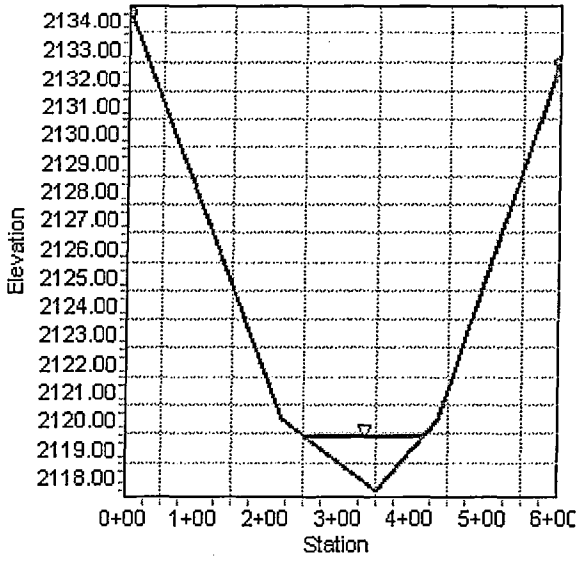
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.01000	ft/ft
Normal Depth	1.89	ft
Discharge	631.00	ft^3/s

Cross Section Image



Worksheet for Spur Cross Rd at WS Wash Trib5

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.01000	ft/ft
Discharge	631.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	2134.30
2+20	2120.00
3+50	2117.50
4+35	2120.00
6+00	2132.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 2134.30)	(6+00, 2132.50)	0.035

Results

Normal Depth	1.89	ft
Elevation Range	2117.50 to 2134.30 ft	
Flow Area	154.18	ft²
Wetted Perimeter	162.89	ft
Top Width	162.84	ft
Normal Depth	1.89	ft
Critical Depth	1.68	ft
Critical Slope	0.01893	ft/ft
Velocity	4.09	ft/s
Velocity Head	0.26	ft
Specific Energy	2.15	ft
Froude Number	0.74	
Flow Type	Subcritical	

Cross Section for School House Rd at Ocotillo Wash proposed

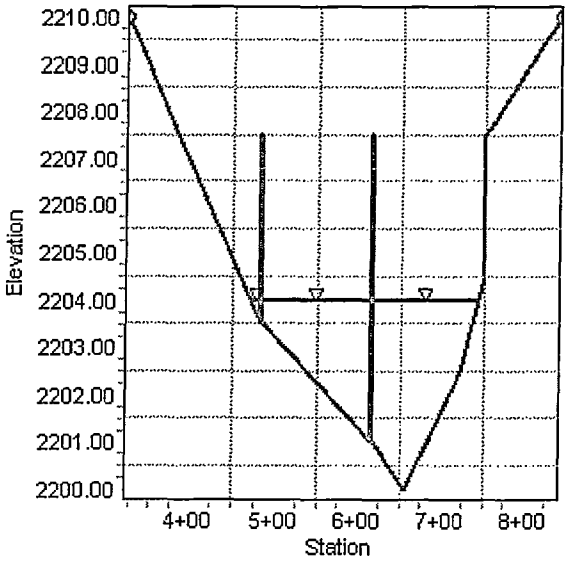
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.01500	ft/ft
Normal Depth	3.97	ft
Discharge	4630.00	ft³/s

Cross Section Image



Worksheet for School House Rd at Ocotillo Wash proposed

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.01500	ft/ft
Discharge	4630.00	ft^3/s

Section Definitions

Station (ft)	Elevation (ft)
3+20	2210.00
4+82	2203.50
4+82	2207.50
4+83	2207.50
4+83	2203.50
6+15	2201.00
6+15	2207.50
6+16	2207.50
6+16	2201.00
6+55	2200.00
7+20	2202.50
7+50	2204.50
7+50	2207.50
8+40	2210.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(3+20, 2210.00)	(8+40, 2210.00)	0.035

Results

Normal Depth	3.97	ft
Elevation Range	2200.00 to 2210.00 ft	
Flow Area	557.91	ft^2
Wetted Perimeter	276.75	ft

Worksheet for School House Rd at Ocotillo Wash proposed

Results

Top Width		269.73	ft
Normal Depth		3.97	ft
Critical Depth		4.00	ft
Critical Slope		0.01446	ft/ft
Velocity		8.30	ft/s
Velocity Head		1.07	ft
Specific Energy		5.04	ft
Froude Number		1.02	
Flow Type	Supercritical		

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	3.97	ft
Critical Depth	4.00	ft
Channel Slope	0.01500	ft/ft
Critical Slope	0.01446	ft/ft

Cross Section for School House Rd at Rowe Wash proposed

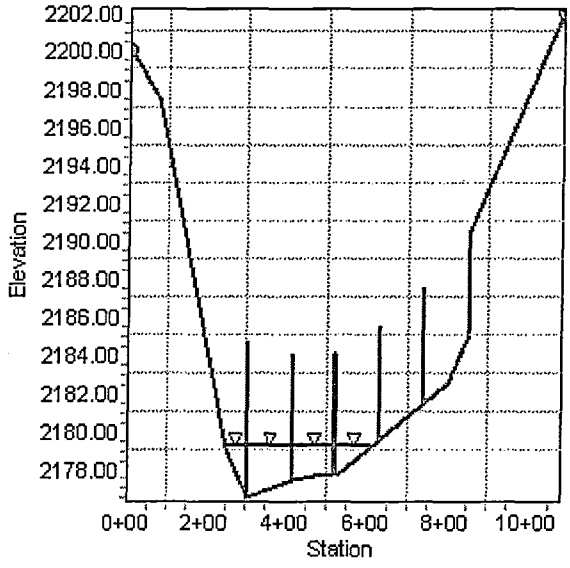
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.02500	ft/ft
Normal Depth	2.76	ft
Discharge	5094.00	ft³/s

Cross Section Image



Worksheet for School House Rd at Rowe Wash proposed

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.02500	ft/ft
Discharge	5094.00	ft^3/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	2200.00
0+75	2197.50
2+50	2179.00
3+00	2176.50
3+00	2184.60
3+01	2184.60
3+01	2176.50
4+15	2177.50
4+15	2184.00
4+16	2184.00
4+16	2177.50
4+70	2177.70
5+20	2177.70
5+20	2184.00
5+21	2184.00
5+21	2177.70
6+30	2179.60
6+30	2185.50
6+31	2185.50
6+31	2179.60
7+40	2181.50
7+40	2187.50
7+41	2187.50
7+41	2181.50
8+00	2182.50
8+50	2185.00
8+50	2190.50

Worksheet for School House Rd at Rowe Wash proposed

Input Data

Station (ft)	Elevation (ft)
10+80	2202.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 2200.00)	(10+80, 2202.00)	0.035

Results

Normal Depth		2.76	ft
Elevation Range	2176.50 to 2202.00 ft		
Flow Area		570.69	ft²
Wetted Perimeter		372.16	ft
Top Width		359.91	ft
Normal Depth		2.76	ft
Critical Depth		3.04	ft
Critical Slope		0.01546	ft/ft
Velocity		8.93	ft/s
Velocity Head		1.24	ft
Specific Energy		4.00	ft
Froude Number		1.25	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	2.76	ft

Worksheet for School House Rd at Rowe Wash proposed

GVF Output Data

Critical Depth	3.04	ft
Channel Slope	0.02500	ft/ft
Critical Slope	0.01546	ft/ft

Cross Section for School House Rd at Galloway Wash proposed

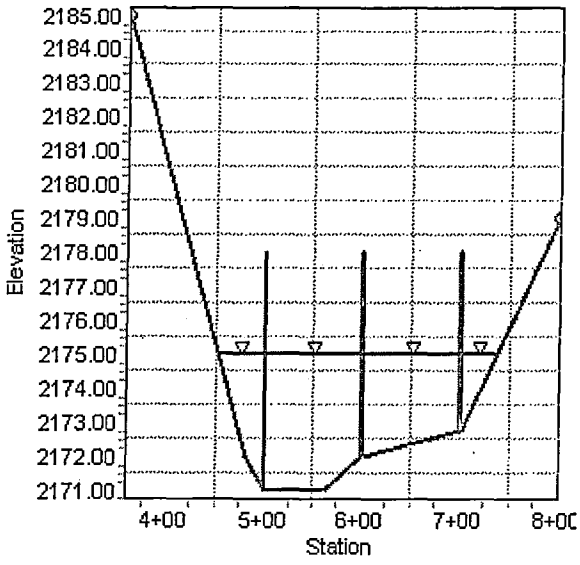
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.03000	ft/ft
Normal Depth	3.99	ft
Discharge	10908.00	ft³/s

Cross Section Image



Worksheet for School House Rd at Galloway Wash proposed

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.03000	ft/ft
Discharge	10908.00	ft^3/s

Section Definitions

Station (ft)	Elevation (ft)
3+60	2185.00
4+80	2172.00
5+00	2171.00
5+00	2178.00
5+01	2178.00
5+01	2171.00
5+60	2171.00
6+00	2172.00
6+00	2178.00
6+01	2178.00
6+01	2172.00
7+00	2172.80
7+00	2178.00
7+01	2178.00
7+01	2172.80
8+00	2179.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(3+60, 2185.00)	(8+00, 2179.00)	0.035

Results

Normal Depth	3.99	ft
Elevation Range	2171.00 to 2185.00 ft	

Worksheet for School House Rd at Galloway Wash proposed

Results

Flow Area	781.98	ft²
Wetted Perimeter	299.31	ft
Top Width	280.68	ft
Normal Depth	3.99	ft
Critical Depth	4.87	ft
Critical Slope	0.01310	ft/ft
Velocity	13.95	ft/s
Velocity Head	3.02	ft
Specific Energy	7.02	ft
Froude Number	1.47	
Flow Type	Supercritical	

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	3.99	ft
Critical Depth	4.87	ft
Channel Slope	0.03000	ft/ft
Critical Slope	0.01310	ft/ft

Culvert Calculator Report
UCT NORTH BRANCH AT CAVE CREEK ROAD <1252 cfs>

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	2,036.57 ft	Headwater Depth/Height	1.40
Computed Headwater Elev	2,034.59 ft	Discharge	1,252.00 cfs
Inlet Control HW Elev.	2,034.59 ft	Tailwater Elevation	2,030.00 ft
Outlet Control HW Elev.	2,034.46 ft	Control Type	Inlet Control

Grades			
Upstream Invert	2,029.00 ft	Downstream Invert	2,026.50 ft
Length	150.00 ft	Constructed Slope	0.016667 ft/ft

Hydraulic Profile			
Profile	CompositeS1S2	Depth, Downstream	1.98 ft
Slope Type	Steep	Normal Depth	1.77 ft
Flow Regime	N/A	Critical Depth	3.12 ft
Velocity Downstream	15.82 ft/s	Critical Slope	0.003218 ft/ft

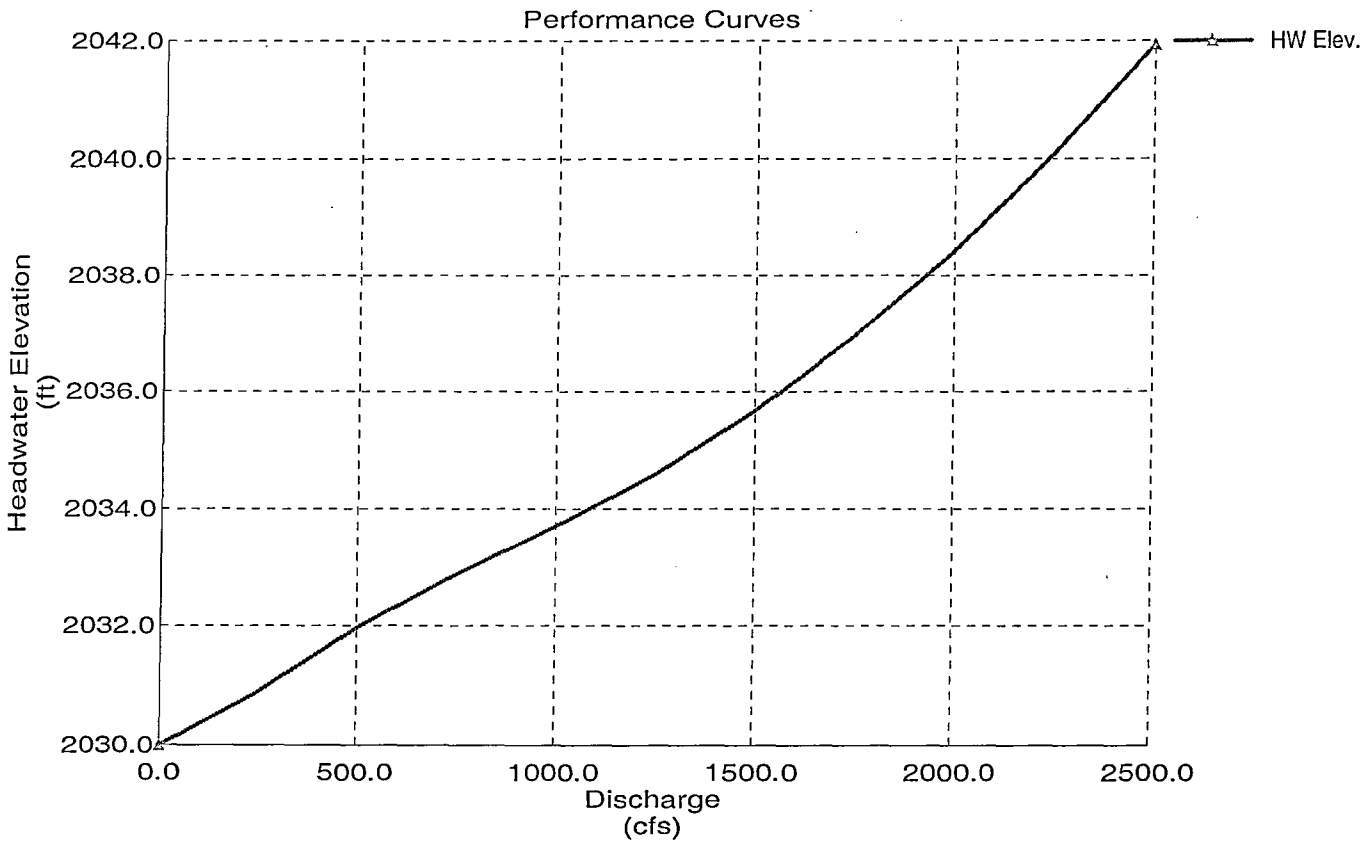
Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	10.00 ft
Section Size	10 x 4 ft	Rise	4.00 ft
Number Sections	4		

Outlet Control Properties			
Outlet Control HW Elev.	2,034.46 ft	Upstream Velocity Head	1.56 ft
Ke	0.50	Entrance Loss	0.78 ft

Inlet Control Properties			
Inlet Control HW Elev.	2,034.59 ft	Flow Control	N/A
Inlet Type	90 and 15° wingwall flares	Area Full	160.0 ft²
K	0.06100	HDS 5 Chart	8
M	0.75000	HDS 5 Scale	2
C	0.04000	Equation Form	1
Y	0.80000		

Performance Curves Report
UCT NORTH BRANCH AT CAVE CREEK ROAD <1252 cfs>

Range Data:				
	Minimum	Maximum	Increment	
Discharge	0.00	2,500.00	250.00	cfs



Culvert Calculator Report
UCT SOUTH BRANCH AT CAVE CREEK ROAD <911 cfs>

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	2,044.00 ft	Headwater Depth/Height	1.47
Computed Headwater Elev	2,042.92 ft	Discharge	911.00 cfs
Inlet Control HW Elev.	2,042.62 ft	Tailwater Elevation	2,040.00 ft
Outlet Control HW Elev.	2,042.92 ft	Control Type	Entrance Control

Grades			
Upstream Invert	2,038.50 ft	Downstream Invert	2,037.00 ft
Length	150.00 ft	Constructed Slope	0.010000 ft/ft

Hydraulic Profile			
Profile	CompositeS1S2	Depth, Downstream	3.00 ft
Slope Type	Steep	Normal Depth	1.75 ft
Flow Regime	N/A	Critical Depth	2.53 ft
Velocity Downstream	7.59 ft/s	Critical Slope	0.003473 ft/ft

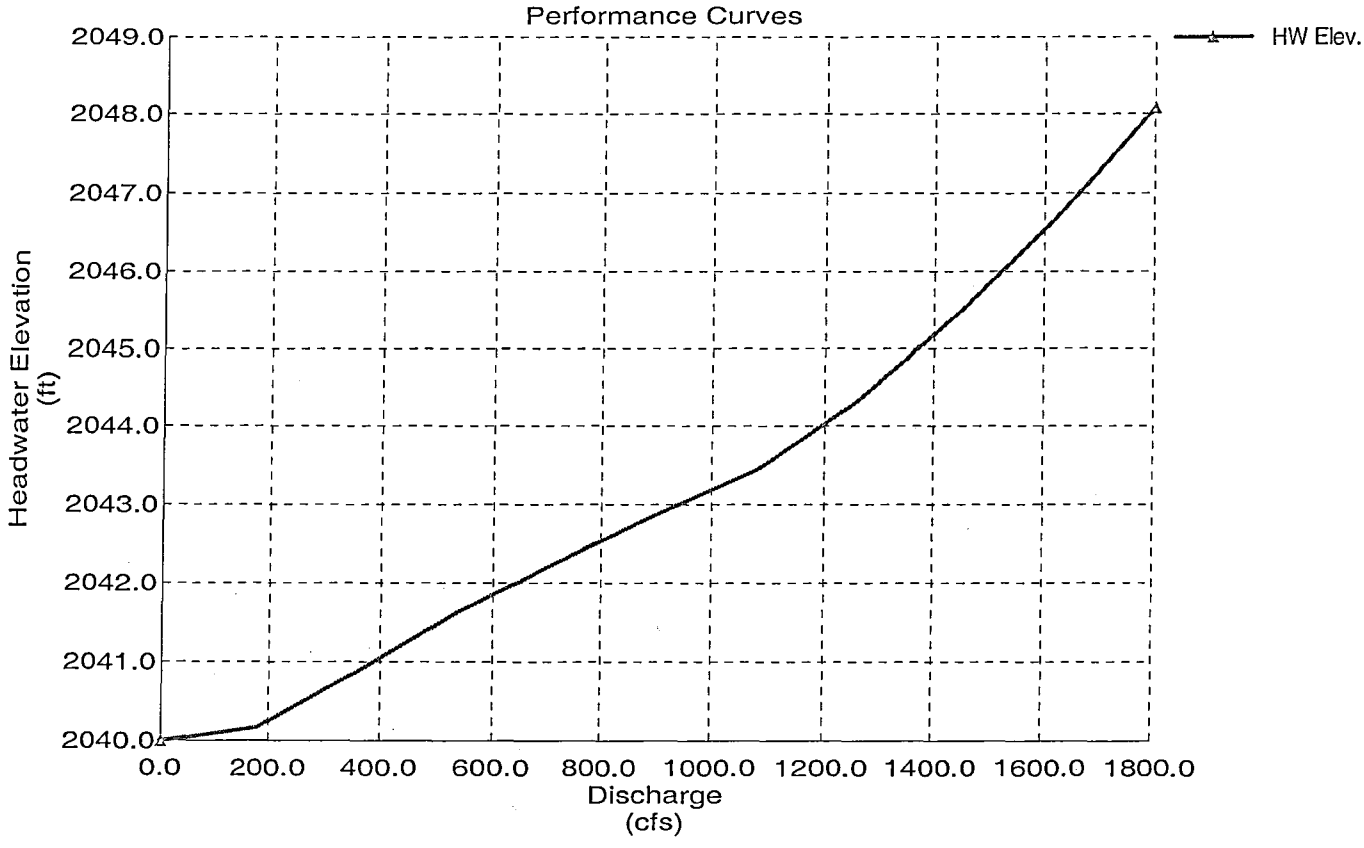
Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	8.00 ft
Section Size	8 x 3 ft	Rise	3.00 ft
Number Sections	5		

Outlet Control Properties			
Outlet Control HW Elev.	2,042.92 ft	Upstream Velocity Head	1.26 ft
Ke	0.50	Entrance Loss	0.63 ft

Inlet Control Properties			
Inlet Control HW Elev.	2,042.62 ft	Flow Control	Submerged
Inlet Type	45° Bevels; 10 - 45° skewed headwall	Area Full	120.0 ft²
K	0.49800	HDS 5 Chart	11
M	0.66700	HDS 5 Scale	4
C	0.03270	Equation Form	2
Y	0.75000		

Performance Curves Report
UCT SOUTH BRANCH AT CAVE CREEK ROAD <911 cfs>

Range Data:			
	Minimum	Maximum	Increment
Discharge	0.00	1,800.00	180.00 cfs



APPENDIX D ALTERNATIVE ANALYSIS

Evaluation Matrix

CAVE CREEK DMP ALTERNATIVES EVALUATION

ID	ISSUES	IDENTIFIED PROBLEM	POSSIBLE SOLUTIONS: Bridge	Culvert/Storm Drain	At grade/Low water crossing	Maintenance/Monitoring	Education	Bank Protection	Flood Warning/Response Plan	Channel	FCDMC's FPPAP	Conservation Easement	Erosion Hazard Setbacks/Education	Remove obstruction(s)	Re-map floodplain	No Action	Drainage Guidelines	EVALUATION CRITERIA: Safety	Number of people impacted	Environmental Impact	Context Sensitive/Aesthetics	Public Acceptance	Agency Acceptance	Cost	Multi-use Facility	Degree of Improvement			RECOMMENDATION: Initial Concept	Team Suggestion	RESPONSIBLE PARTY: FCDMC	County (MCDOT, etc.)	Town	Resident/Owner Flood Response Plan (Town)	Carefree	State Land	NOTES
1	Mormon Girl Wash - Walls, development in wash	Wash Encroachment		✓														○	●	●	●	◒	◒	●	●	●						✓	✓				Pipe flows in underground storm drain
	(20 +/- locations)													✓				○	●	◒	◒	●	◒	●	◒	●			Remove Obstruction	Modify wall openings			✓	✓				Remove walls that inhibit flow
						✓										✓		○	●	◒	○	●	●	●	○	◒				Education	✓		✓					Education - how obstructions affect wash function, drainage guidelines
															✓			○	●	◒	◒	●	◒	●	●	●											No Action - walls remain. May flood neighbors' properties
2	Andora Hills Wash between Basin Road and Linda Drive	Fill in wash								✓								○	◒	◒	◒	◒	◒	●	○	◒						✓					Channelize wash in area of dumped fill
							✓									✓		○	◒	◒	○	●	●	●	○	◒				Education	✓		✓					Education
													✓					○	◒	●	●	◒	◒	◒	○	●			Remove Obstruction	Remove Obstruction	✓		✓	✓				Enforce removal of fill in wash
															✓			○	◒	○	○	●	◒	◒	○	◒					✓		✓					Re-map floodplain to reflect fill impact
																✓		○	○	○	◒	◒	◒	●	○	●												No Action - fill remains
3	Ocotillo Wash - 1 house in floodway	Flooding									✓							●	◒	◒	○	●	●	◒	○	●			FPPAP	FPPAP	✓			✓				FCDMC's Flood prone properties acquision program
								✓										◒	◒	○	○	◒	◒	●	○	◒					✓		✓					Add property to Flood Warning System
															✓			●	○	○	○	●	◒	●	○	●												No action
4	Ocotillo Wash - Floodplain Encroachments	Wash Encroachment											✓					○	◒	○	○	◒	◒	●	○	◒			Erosion Haz. Setback/Educa.	Erosion Haz. Setback/Educa.			✓					Apply erosion hazard setbacks, educate owners with exist structures in EHS
														✓				○	◒	●	○	●	◒	◒	○	●					✓		✓					Enforce removal of obstructions and fill, restore channel
									✓									○	◒	◒	◒	◒	◒	●	◒	●					✓		✓					Channelize wash through encroached reach
							✓											○	◒	◒	◒	◒	◒	●	○	◒								✓				Construct bank protection at encroached properties
																	✓	○	○	○	○	●	●	●	○	●												No action
5	Galloway Wash - Floodplain Encroachments	Wash Encroachment											✓					○	◒	○	○	◒	◒	●	○	◒			Erosion Haz. Setback/Educa.	Erosion Haz. Setback/Educa.			✓					Apply erosion hazard setbacks, educate owners with exist structures in EHS
										✓								○	◒	◒	○	●	◒	◒	○	●				FPPAP	✓			✓				FCDMC's Flood prone properties acquision program
														✓				○	◒	●	○	●	◒	◒	○	●					✓		✓					Enforce removal of obstructions and fill, restore channel
									✓									○	◒	◒	◒	◒	◒	●	◒	●					✓		✓					Channelize wash through encroached reach
							✓											○	◒	◒	◒	◒	◒	●	○	◒								✓				Construct bank protection at encroached properties
																	✓	○	○	○	○	●	●	●	○	●												No action
6	Yolantha Street - Walls, development in wash	Wash Encroachment												✓				○	◒	◒	○	●	◒	◒	◒	◒				Remove Obstructions	✓		✓	✓				Enforce removal of walls and obstructions
				✓														○	◒	◒	◒	◒	◒	●	○	●			Storm Drain				✓					Construct storm drain
																	✓	○	○	○	○	◒	○	●	○	●												No action
7	Apache Wash between Cloud and Carlise Rd	Piles, cars, fill in floodway												✓				◒	◒	◒	◒	◒	◒	◒	○	●			Remove Obstruction	Remove Obstruction	✓			✓				Enforce removal of obstructions from wash
						✓												○	◒	◒	◒	◒	●	◒	○	◒												Regular maintenance to remove fill as it accumulates
							✓											○	◒	○	○	◒	●	●	○	○				Education	✓							Educate public on dumping and placing fill in wash
																	✓	○	○	○	○	◒	◒	●	○	●												No action
8	24th Street at Joy Ranch Road (Plugged Culvert)	Sedimentation				✓												◒	◒	○	◒	●	◒	◒	○	◒			Maintenance	Maintenance		✓						Regular maintenance to remove sediment and debris
				✓														◒	◒	○	◒	◒	◒	◒	○	●						✓						Re-design culvert/upsize to allow sediment passage
																	✓	○	○	○	○	◒	◒	●	○	●												No action

CAVE CREEK DMP ALTERNATIVES EVALUATION

ID	ISSUES	IDENTIFIED PROBLEM	POSSIBLE SOLUTIONS: Bridge	Culvert/Storm Drain	At grade/Low water crossing	Maintenance/Monitoring	Education	Bank Protection	Flood Warning/Response Plan	Channel	FCDMC's FPPAP	Conservation Easement	Erosion Hazard Setbacks/Education	Remove obstruction(s)	Re-map floodplain	No Action	Drainage Guidelines	EVALUATION CRITERIA: Safety	Number of people impacted	Environmental Impact	Context Sensitive/Aesthetics	Public Acceptance	Agency Acceptance	Cost	Multi-use Facility	Degree of Improvement			RECOMMENDATION: Initial Concept	Team Suggestion	RESPONSIBLE PARTY: FCDMC	County (MCDOT, etc.)	Town	Resident/Owner	Flood Response Plan (Town)	Carefree	State Land	NOTES
9	Carriage Drive at Sunset Trail (Blk Mtn Runoff)	Access, Erosion		✓														●	◒	◒	◒	◒	◒	◒	●							✓						Install culvert across roadway
	(Other locations (Talley Ho, Tandem) with similar problems)				✓													◒	◒	◒	◒	◒	◒	◒	◒			Low water crossing					✓					Install low water or at-grade crossing over road
						✓												◒	◒	◒	○	●	●	◒	○	◒			Maintenance			✓						Maintenance
							✓											◒	◒	○	○	●	●	●	○	◒			Education	✓		✓						Education
			✓															●	◒	◒	◒	●	◒	●	◒	●						✓						Install bridge over roadway
																✓		●	○	○	○	◒	○	●	○	●			No Action									No action - Developer currently making improvements to roads in area
10	Galloway Wash T1 at Carefree Boundary (New Development)	Channelization, encroachment		✓														○	◒	◒	◒	◒	◒	●	●	◒							✓					Construct storm drain to carry wash flows
	(Stagecoach Villiage)								✓									○	◒	◒	◒	◒	○	◒	◒	◒			Channel				✓					Channelize Wash (development semi-channelizing)
														✓				○	◒	○	○	○	◒	○	○	●			Map Floodplain		✓	✓						Map floodplain through area based on improvements
													✓					○	◒	●	●	●	●	●	◒	●							✓					Remove development's channelization, restore wash
																✓		○	○	○	○	◒	○	●	◒	●			No Action									No action - improvements happening as part of development
11	Willow Springs T1 between Cahava Ranch and Spur Cross	Bank Erosion						✓										◒	◒	◒	●	◒	◒	◒	○	◒						✓	✓					Construct bank protection along reach
												✓						●	◒	○	○	◒	●	●	○	◒			EH Setbacks	EHS, Education	✓	✓						Map and apply erosion hazard setbacks (INCLUDE MONITORING)
																	✓	○	◒	○	○	●	●	●	○	◒				Guidelines	✓	✓						Drainage Guidelines
					✓													○	◒	○	○	◒	●	●	○	◒				Monitoring				✓				Monitor slopes
																✓		○	○	○	○	◒	◒	●	○	●												No action
12	Cave Creek Rd at Mormon Girl South Tributary	Sedimentation	✓															●	●	◒	◒	◒	◒	●	◒	●					✓	✓	✓					Construct bridge at crossing
				✓														●	●	◒	○	○	◒	◒	◒	●			Culvert	Culvert	✓	✓	✓					Improve culvert crossing
						✓												◒	●	○	○	○	◒	◒	○	◒							✓					Perform maintenance, remove sediment from culverts regularly
							✓										✓	◒	●	○	○	●	●	●	○	◒				Education								Education/Drainage Guidelines
																✓		○	○	○	○	○	○	●	○	●												No action
13	Cave Creek Rd at Mormon Girl North Tributary	Sedimentation	✓															●	●	◒	◒	◒	◒	●	◒	●					✓	✓	✓					Construct bridge at crossing
				✓														●	●	◒	○	○	◒	◒	◒	●			Culvert	Culvert	✓	✓	✓					Improve culvert crossing
						✓												◒	●	○	○	○	◒	◒	○	◒							✓					Perform maintenance, remove sediment from culverts regularly
							✓										✓	◒	●	○	○	●	●	●	○	◒				Education	✓		✓					Education/Drainage Guidelines
																✓		○	○	○	○	○	○	●	○	●												No action
14	Apache Wash between Bently Mine Rd & Saddle Mtn	Wash Encroachment										✓						○	◒	○	○	◒	◒	●	○	◒			EHS/Educ	EHS/Educ			✓					Apply erosion hazard setbacks and education to exist owners
													✓					○	◒	●	○	●	◒	◒	○	●					✓		✓					Remove obstructions and fill, restore channel
									✓									○	◒	◒	◒	◒	◒	●	◒	●					✓		✓					Channelize wash through encroached reach
								✓										○	◒	◒	◒	◒	◒	●	○	◒								✓				Construct bank protection at encroached properties
																✓		○	○	○	○	●	●	●	○	●												No action
15	(Deleted)																																					
16	Desert Hills Drive btwn Old Stage Rd and 50th St	Erosion						✓										●	◒	○	○	◒	◒	◒	◒	●			Bank Protect.	Bank Protect.			✓					Construct downstream fill protection at culverts
																	✓	○	◒	○	○	◒	◒	◒	◒	◒				Guidelines	✓		✓					Drainage Guidelines
																✓		○	○	○	○	◒	◒	●	○	●												No action

CAVE CREEK DMP ALTERNATIVES EVALUATION

ID	ISSUES	IDENTIFIED PROBLEM	POSSIBLE SOLUTIONS															EVALUATION CRITERIA											RECOMMENDATION		RESPONSIBLE PARTY							NOTES
			Bridge	Culvert/Storm Drain	At grade/Low water crossing	Maintenance/Monitoring	Education	Bank Protection	Flood Warning/Response Plan	Channel	FCDMC's FPPAP	Conservation Easement	Erosion Hazard Setbacks/Education	Remove obstruction(s)	Re-map floodplain	No Action	Drainage Guidelines	Safety	Number of people impacted	Environmental Impact	Context Sensitive/Aesthetics	Public Acceptance	Agency Acceptance	Cost	Multi-use Facility	Degree of Improvement			Initial Concept	Team Suggestion	FCDMC	County (MCDOT, etc.)	Town	Resident/Owner	Flood Response Plan (Town)	Carefree	State Land	
17	Cave Creek Rd - big culvert pointed at road (new dvlpmt)	Flooding		✓														●	◒	○	○	◒	◒	◒	○	●			Re-do culvert				✓	✓				Re-design culvert system or install downstream catchment
	Stagecoach Pass Development															✓		○	○	○	○	◒	◒	●	○	●				No Action								No action - DEVELOPER REQ'D TO FIX PROBLEM
18	Cave Creek wash between New River and CF Hwy	Bank Erosion										✓						◒	◒	○	○	●	●	◒	○	◒			EHS/Educat.	EHS/Educat.	✓		✓					Apply erosion hazard setbacks and education to exist owners
	Las Ventanas							✓										●	◒	○	◒	◒	◒	◒	○	●							✓	✓				Construct bank protection at encroachments
																	✓	○	◒	○	○	◒	◒	◒	◒	◒				Guidelines								Drainage Guidelines
																✓		○	○	○	○	◒	◒	●	○	●												No action
19	Apache Wash - 2+ houses in Floodway	Flooding								✓								●	◒	◒	○	●	●	◒	○	●			FPPAP	FPPAP	✓			✓				FCDMC's Flood prone properties acquision program
									✓									◒	◒	○	○	◒	◒	●	○	◒					✓		✓					Part of Adobe/DH Flood Warning System
																✓		●	◒	○	○	●	◒	●	○	●												No action
20	Mormon Girl Wash T1 - encroachment by new development	Wash Encroachment								✓								●	◒	◒	◒	◒	◒	◒	◒	◒							✓	✓				Improve channelized wash conditions
												✓						◒	◒	○	○	◒	◒	◒	○	○					✓		✓					Apply erosion hazard setbacks and education
														✓				◒	◒	○	○	◒	◒	○	○	○			Map Floodplain		✓		✓					Map floodplain based on current development (channel and culvert)
													✓					◒	◒	●	●	●	◒	●	●	●					✓		✓					Enforce removal of obstructions and restore natural wash
																✓		●	○	○	○	◒	◒	●	◒	●				No Action			✓					No action - Town working with Engineer of Development
1	Old New River Rd at Cave Creek Wash and Mormon Girl	Excavation/Fill in FP/FW												✓				◒	◒	●	●	◒	●	◒	●	●			Remove fill	Remove fill	✓		✓	✓				Enforce removal and restoration of washes
															✓			○	◒	○	○	◒	◒	◒	○	○					✓		✓					Remap floodplain/floodway to reflect changes
										✓								◒	◒	◒	◒	◒	◒	●	◒	◒					✓		✓					Channelize washes (Cave Creek and Mormon Girl)
																✓		○	○	○	○	○	◒	●	○	●												No action
22	(Deleted)																																					
23	Galloway Wash T2 - Roadway Crossings acting as dams	Wash Encroachment	✓															○	◒	◒	◒	●	◒	●	◒	●							✓	✓				Construct bridges at driveways acting as dams
				✓														○	◒	◒	◒	●	●	◒	◒	●			Culverts				✓	✓				Construct properly-designed culverts to carry 100-year flow
													✓					○	◒	●	●	●	●	◒	●	●							✓	✓				Remove fill
														✓				○	◒	○	○	◒	◒	◒	○	◒				Map Floodplain	✓		✓					Re-map floodplain based on current conditions
															✓			○	○	○	○	○	◒	●	○	●												No action
	Major Crossings (Arterials)																																					
	Grouping #1: Two Bridges (Spur Cross)		✓															●	●	◒	●	●	◒	●	◒	●			Bridges		✓	✓	✓					Construct Bridge at crossing (passes 50- to 100-year event)
				✓														◒	●	◒	◒	◒	◒	◒	◒	◒					✓	✓	✓					Construct culvert at crossing (passes 50- to 25-year event)
					✓													◒	●	◒	◒	◒	◒	◒	○	◒							✓					Construct low water crossing (passes 2- to 10-year event)
						✓												○	●	○	○	○	◒	●	○	◒				Education	✓		✓					Education program on dangers of crossing flooded intersections
								✓										◒	●	○	●	●	◒	◒	○	◒				Devices	✓		✓					Construct flood warning system (signs, depth gauges, etc.)
																✓		○	○	○	○	●	◒	●	○	○												No action
	Grouping #2: Three Bridges (School House)		✓															●	●	◒	●	●	◒	●	◒	●				Bridges	✓	✓	✓					Construct Bridge at crossing (passes 50- to 100-year event)
				✓														◒	●	◒	◒	◒	◒	◒	◒	◒					✓	✓	✓					Construct culvert at crossing (passes 50- to 25-year event)
					✓													◒	●	◒	◒	◒	◒	◒	○	◒					✓		✓					Construct low water crossing (passes 2- to 10-year event)
						✓												○	●	○	○	○	◒	●	○	◒			Education		✓		✓					Education program on dangers of crossing flooded intersections
								✓										◒	●	○	●	●	◒	◒	○	◒			Devices		✓		✓					Construct flood warning system (signs, depth gauges, etc.)
																✓		○	○	○	○	●	◒	●	○	○												No action

CAVE CREEK DMP ALTERNATIVES EVALUATION

ID	ISSUES	IDENTIFIED PROBLEM	POSSIBLE SOLUTIONS															EVALUATION CRITERIA											RECOMMENDATION		RESPONSIBLE PARTY							NOTES
			Bridge	Culvert/Storm Drain	At grade/Low water crossing	Maintenance/Monitoring	Education	Bank Protection	Flood Warning/Response Plan	Channel	FCDMC's FPPAP	Conservation Easement	Erosion Hazard Setbacks/Education	Remove obstruction(s)	Re-map floodplain	No Action	Drainage Guidelines	Safety	Number of people impacted	Environmental Impact	Context Sensitive/Aesthetics	Public Acceptance	Agency Acceptance	Cost	Multi-use Facility	Degree of Improvement		Initial Concept	Team Suggestion	FCDMC	County (MCDOT, etc.)	Town	Resident/Owner	Flood Response Plan (Town)	Carefree	State Land	
24	Apache Wash between CF Hwy and Cloud Rd	Access	✓															●	●	◒	●	●	◒	●	◒	●					✓	✓							Construct Bridge at crossing (passes 50- to 100-year event)
				✓														◒	●	◒	◒	◒	◒	◒	◒	◒					✓	✓							Construct culvert at crossing (passes 50- to 25-year event)
					✓													◒	●	◒	◒	◒	◒	◒	○	◒													Construct low water crossing (passes 2- to 10-year event)
													✓					●	●	◒	○	●	◒	◒	●	●			Re-route road	Re-route road		✓					✓		Re-route roadway per Adobe/Desert Hills ADMP recommendation
						✓												○	●	○	○	○	◒	●	○	◒					✓								Education program on dangers of crossing flooded intersections
								✓										◒	●	○	●	●	◒	◒	○	◒					✓								Construct flood warning system (signs, depth gauges, etc.)
															✓			○	○	○	○	●	◒	●	○	○													No action
25	Andora Hills Wash at School House Road	Access	✓															●	●	◒	●	●	◒	●	◒	●					✓	✓	✓						Construct Bridge at crossing (passes 50- to 100-year event)
				✓														◒	●	◒	◒	◒	◒	◒	◒	◒					✓	✓	✓						Construct culvert at crossing (passes 50- to 25-year event)
					✓													◒	●	◒	◒	◒	◒	◒	○	◒							✓						Construct low water crossing (passes 2- to 10-year event)
							✓											○	●	○	○	○	◒	●	○	◒			Education	Education	✓		✓						Education program on dangers of crossing flooded intersections
								✓										◒	●	○	●	●	◒	◒	○	◒			Devices	Devices	✓		✓						Construct flood warning system (signs, depth gauges, etc.)
															✓			○	○	○	○	●	◒	●	○	○													No action
26	Galloway Wash at School House Road	Access	✓															●	●	◒	●	●	◒	●	◒	●				Bridge	✓	✓	✓						Construct Bridge at crossing (passes 50- to 100-year event)
				✓														◒	●	◒	◒	◒	◒	◒	◒	◒					✓	✓	✓						Construct culvert at crossing (passes 50- to 25-year event)
					✓													◒	●	◒	◒	◒	◒	◒	○	◒							✓						Construct low water crossing (passes 2- to 10-year event)
							✓											○	●	○	○	○	◒	●	○	◒			Education		✓		✓						Education program on dangers of crossing flooded intersections
								✓										◒	●	○	●	●	◒	◒	○	◒			Devices		✓		✓						Construct flood warning system (signs, depth gauges, etc.)
															✓			○	○	○	○	●	◒	●	○	○													No action
27	Rowe Wash at School House Road	Access	✓															●	●	◒	●	●	◒	●	◒	●				Bridge	✓	✓	✓						Construct Bridge at crossing (passes 50- to 100-year event)
				✓														◒	●	◒	◒	◒	◒	◒	◒	◒					✓	✓	✓						Construct culvert at crossing (passes 50- to 25-year event)
					✓													◒	●	◒	◒	◒	◒	◒	○	◒							✓						Construct low water crossing (passes 2- to 10-year event)
							✓											○	●	○	○	○	◒	●	○	◒			Education		✓		✓						Education program on dangers of crossing flooded intersections
								✓										◒	●	○	●	●	◒	◒	○	◒			Devices		✓		✓						Construct flood warning system (signs, depth gauges, etc.)
															✓			○	○	○	○	●	◒	●	○	○													No action
28	Ocotillo Wash at School House Road	Access	✓															●	●	◒	●	●	◒	●	◒	●				Bridge	✓	✓	✓						Construct Bridge at crossing (passes 50- to 100-year event)
				✓														◒	●	◒	◒	◒	◒	◒	◒	◒					✓	✓	✓						Construct culvert at crossing (passes 50- to 25-year event)
					✓													◒	●	◒	◒	◒	◒	◒	○	◒							✓						Construct low water crossing (passes 2- to 10-year event)
							✓											○	●	○	○	○	◒	●	○	◒			Education		✓		✓						Education program on dangers of crossing flooded intersections
								✓										◒	●	○	●	●	◒	◒	○	◒			Devices		✓		✓						Construct flood warning system (signs, depth gauges, etc.)
															✓			○	○	○	○	●	◒	●	○	○													No action
29	Willow Springs T5 at School House Road	Access	✓															●	●	◒	●	●	◒	●	◒	●					✓	✓	✓						Construct Bridge at crossing (passes 50- to 100-year event)
				✓														◒	●	◒	◒	◒	◒	◒	◒	◒					✓	✓	✓						Construct culvert at crossing (passes 50- to 25-year event)
					✓													◒	●	◒	◒	◒	◒	◒	○	◒							✓						Construct low water crossing (passes 2- to 10-year event)
							✓											○	●	○	○	○	◒	●	○	◒			Education	Education	✓		✓						Education program on dangers of crossing flooded intersections
								✓										◒	●	○	●	●	◒	◒	○	◒			Devices	Devices	✓		✓						Construct flood warning system (signs, depth gauges, etc.)
															✓			○	○	○	○	●	◒	●	○	○													No action

CAVE CREEK DMP ALTERNATIVES EVALUATION

ID	ISSUES	IDENTIFIED PROBLEM	POSSIBLE SOLUTIONS: Bridge	Culvert/Storm Drain	At grade/Low water crossing	Maintenance/Monitoring	Education	Bank Protection	Flood Warning/Response Plan	Channel	FCDMC's FPP/AP	Conservation Easement	Erosion Hazard Setback/Education	Remove obstruction(s)	Re-map floodplain	No Action	Drainage Guidelines	EVALUATION CRITERIA: Safety	Number of people impacted	Environmental Impact	Context Sensitive/Aesthetics	Public Acceptance	Agency Acceptance	Cost	Multi-use Facility	Degree of Improvement			RECOMMENDATION: Initial Concept	Team Suggestion	RESPONSIBLE PARTY: FCDMC	County (MCDOT, etc.)	Town	Resident/Owner	Flood Response Plan (Town)	Carefree	State Land	NOTES
30	Galloway Wash at Spur Cross Road	Access	✓															●	●	◒	●	●	◒	●	◒	●			Bridge		✓	✓	✓					Construct Bridge at crossing (passes 50- to 100-year event)
				✓														◒	●	◒	◒	◒	◒	◒	◒	◒					✓	✓	✓					Construct culvert at crossing (passes 50- to 25-year event)
					✓													◒	●	◒	◒	◒	◒	◒	○	◒							✓					Construct low water crossing (passes 2- to 10-year event)
							✓											○	●	○	○	○	◒	●	○	◒				Education	✓		✓					Education program on dangers of crossing flooded intersections
									✓									◒	●	○	●	●	◒	◒	○	◒				Devices	✓		✓					Construct flood warning system (signs, depth gauges, etc.)
															✓			○	○	○	○	●	◒	●	○	○												No action
31	Ocotillo Wash at Spur Cross Road	Access	✓															●	●	◒	●	●	◒	●	◒	●			Bridge		✓	✓	✓					Construct Bridge at crossing (passes 50- to 100-year event)
				✓														◒	●	◒	◒	◒	◒	◒	◒	◒					✓	✓	✓					Construct culvert at crossing (passes 50- to 25-year event)
					✓													◒	●	◒	◒	◒	◒	◒	○	◒							✓					Construct low water crossing (passes 2- to 10-year event)
							✓											○	●	○	○	○	◒	●	○	◒				Education	✓		✓					Education program on dangers of crossing flooded intersections
									✓									◒	●	○	●	●	◒	◒	○	◒				Devices	✓		✓					Construct flood warning system (signs, depth gauges, etc.)
															✓			○	○	○	○	●	◒	●	○	○												No action
32	Willow Springs T5 at Spur Cross Road	Access	✓															●	●	◒	●	●	◒	●	◒	●				Bridge	✓	✓	✓					Construct Bridge at crossing (passes 50- to 100-year event)
				✓														◒	●	◒	◒	◒	◒	◒	◒	◒					✓	✓	✓					Construct culvert at crossing (passes 50- to 25-year event)
					✓													◒	●	◒	◒	◒	◒	◒	○	◒							✓					Construct low water crossing (passes 2- to 10-year event)
							✓											○	●	○	○	○	◒	●	○	◒			Education		✓		✓					Education program on dangers of crossing flooded intersections
									✓									◒	●	○	●	●	◒	◒	○	◒			Devices		✓		✓					Construct flood warning system (signs, depth gauges, etc.)
															✓			○	○	○	○	●	◒	●	○	○												No action
33	Willow Springs Wash at Spur Cross Road	Access	✓															●	●	◒	●	●	◒	●	◒	●				Bridge	✓	✓	✓					Construct Bridge at crossing (passes 50- to 100-year event)
				✓														◒	●	◒	◒	◒	◒	◒	◒	◒					✓	✓	✓					Construct culvert at crossing (passes 50- to 25-year event)
					✓													◒	●	◒	◒	◒	◒	◒	○	◒							✓					Construct low water crossing (passes 2- to 10-year event)
							✓											○	●	○	○	○	◒	●	○	◒			Education		✓		✓					Education program on dangers of crossing flooded intersections
									✓									◒	●	○	●	●	◒	◒	○	◒			Devices		✓		✓					Construct flood warning system (signs, depth gauges, etc.)
															✓			○	○	○	○	●	◒	●	○	○												No action
34	Willow Springs T1 at Spur Cross Road	Access	✓															●	●	◒	●	●	◒	●	◒	●					✓	✓	✓					Construct Bridge at crossing (passes 50- to 100-year event)
				✓														◒	●	◒	◒	◒	◒	◒	◒	◒					✓	✓	✓					Construct culvert at crossing (passes 50- to 25-year event)
					✓													◒	●	◒	◒	◒	◒	◒	○	◒							✓					Construct low water crossing (passes 2- to 10-year event)
							✓											○	●	○	○	○	◒	●	○	◒			Education	Education	✓		✓					Education program on dangers of crossing flooded intersections
									✓									◒	●	○	●	●	◒	◒	○	◒			Devices	Devices	✓		✓					Construct flood warning system (signs, depth gauges, etc.)
															✓			○	○	○	○	●	◒	●	○	○												No action
	Minor Crossings (Local or Collector)																																					
35	Willow Springs T1 at Morning Star Rd	Access	✓															●	◒	◒	●	●	◒	●	◒	●					✓	✓	✓					Construct Bridge at crossing (passes 50- to 100-year event)
				✓														◒	◒	◒	◒	◒	◒	◒	◒	◒					✓	✓	✓					Construct culvert at crossing (passes 50- to 25-year event)
					✓													◒	◒	◒	◒	◒	◒	◒	○	◒							✓					Construct low water crossing (passes 2- to 10-year event)
							✓											○	◒	○	○	○	◒	●	○	◒			Education	Education	✓		✓					Education program on dangers of crossing flooded intersections
									✓									◒	◒	○	●	●	◒	◒	○	◒			Devices	Devices	✓		✓					Construct flood warning system (signs, depth gauges, etc.)
															✓			○	○	○	○	●	◒	●	○	○												No action

CAVE CREEK DMP ALTERNATIVES EVALUATION

		IDENTIFIED PROBLEM	POSSIBLE SOLUTIONS															EVALUATION CRITERIA										RECOMMENDATION	RESPONSIBLE PARTY							NOTES
ID	ISSUES		Bridge	Culvert/Storm Drain	At grade/Low water crossing	Maintenance/Monitoring	Education	Bank Protection	Flood Warning/Response Plan	Channel	FCDMC's FPPAP	Conservation Easement	Erosion Hazard Setbacks/Education	Remove obstruction(s)	Re-map floodplain	No Action	Drainage Guidelines	Safety	Number of people impacted	Environmental Impact	Context Sensitive/Aesthetics	Public Acceptance	Agency Acceptance	Cost	Multi-use Facility	Degree of Improvement	Initial Concept	Team Suggestion	FCDMC	County (MCDOT, etc.)	Town	Resident/Owner	Flood Response Plan (Town)	Carefree	State Land	
36	Willow Springs T1 at Cahava Ranch Rd	Access																										"								(Same as #35)
37	Willow Springs at Sierra Vista Dr	Access																										"								"
38	Willow Springs T5 at Rockaway Hills Rd	Access																										"								"
39	Willow Springs T5 at Azure Hills Dr	Access																										"								"
40	Willow Springs T5 at Highland Rd	Access																										"								"
41	Ocotillo Wash at Echo Canyon Rd	Access																										"								"
42	Ocotillo Wash at Continental Mountain Dr	Access																										"								"
43	Ocotillo Wash at 72nd St	Access																										"								"
44	Ocotillo Wash at Lone Mountain Rd	Access																										"								"
45	Rowe Wash at 73rd St	Access																										"								"
46	Rowe Wash at Ridgeway Drive	Access																										"								"
47	Rowe Wash at 62nd Street	Access																										"								"
48	Galloway Wash at Ocotillo Ridge Dr	Access																										"								"
49	Galloway Wash N Trib at Grapevine Rd	Access																										"								"
50	Andora Hills Wash at Skyline Dr	Access																										"								"
51	Andora Hills Wash at Basin Rd	Access																										Culverts?								Condos in area - would be nice to have all weather access
52	Andora Hills Wash at Mark Way	Access																										Culverts?								Condos in area - would be nice to have all weather access
53	Andora Hills Wash at Military Rd	Access																										Culverts?								Condos in area - would be nice to have all weather access
4	Andora Hills Wash at Linda Dr	Access																										Culverts?								Condos in area - would be nice to have all weather access
55	Andora Hills Wash at Hidden Valley/Ridge	Access																										Education								(same as #35)
56	Andora Hills Wash at Habitat Circle	Access																										"								"
57	Andora Hills Wash at Cave Creek Rd	Access																										"								"
58	Andora Hills Wash at Miramonte	Access																										"								"
59	Cave Creek Wash at Morning Star Rd	Access																										"								"
60	Cave Creek Wash at Rockaway Hills Rd	Access																										"								"
61	Cave Creek Wash at Desert Hills Drive	Access																										"								"
62	Cave Creek Wash at Ocotillo Rd	Access																										"								"
63	Cave Creek Wash at Creek Canyon Rd	Access																										"								"
																												"								"

APPENDIX E FLOODPLAIN MAPPING

Ocotillo Wash Floodplain Redelineation

- Summary Output Tables
- Workmaps

Galloway Wash Tributaries

- Summary Output Tables
- Workmaps

Willow Springs Tributaries

- Summary Output Tables
- Workmaps

Cave Creek Tributaries

- Summary Output Tables
- Workmaps

OCOTILLO WASH

Table 5.9.1.1
HEC-RAS OUTPUT
FLOODWAY/FLOODPLAIN

HEC-RAS Plan: OcotilloFPD Profile: PF 1 OcotilloWashFPD.prj

River	Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Ocotillo1	1	299.7892	4409	2234.08	2237.53	2237.53	2238.72	0.029665	8.78	502	213.48	1.01
Ocotillo1	1	439.8713	4409	2235.89	2241.26	2240.4	2241.82	0.016219	6.02	732.43	249.1	0.62
Ocotillo1	1	527.6098	4409	2238.55	2242.93		2243.72	0.027827	7.13	617.98	241.1	0.79
Ocotillo1	1	595.2144	4409	2239.19	2244.42		2244.99	0.013054	6.07	726.69	252.9	0.63
Ocotillo1	1	668.3362	4409	2240.72	2245.52	2245.52	2246.72	0.026174	8.78	501.89	210.07	1
Ocotillo1	1	749.2241	4409	2242.18	2247.85	2247.28	2248.77	0.02432	7.7	572.93	181.86	0.76
Ocotillo1	1	875.1199	4409	2244.84	2250.58		2251.62	0.020709	8.18	538.72	144.02	0.75
Ocotillo1	1	970.566	4409	2247.18	2252.47	2252.47	2254.52	0.023295	11.47	384.5	94.22	1
Ocotillo1	1	1047.364	4446	2248.51	2254.92		2255.26	0.003612	4.64	958.51	246.78	0.41
Ocotillo1	1	1112.638	4630	2249.49	2255.1		2255.82	0.015656	6.82	678.74	332.79	0.84
Ocotillo2	2	156.3713	2715	2254.19	2258.1	2258.03	2258.88	0.029989	7.1	382.32	221.88	0.95
Ocotillo2	2	180.6079	2791	2254.62	2258.93	2258.51	2259.46	0.018137	5.87	475.7	233.1	0.72
Ocotillo2	2	210.772	2742	2255.46	2259.57		2259.95	0.013512	4.94	554.6	259.67	0.6
Ocotillo2	2	238.5302	2693	2256.4	2259.92	2259.8	2260.57	0.030362	6.49	414.86	258.59	0.9
Ocotillo2	2	276.6784	2576	2257.26	2262.1		2262.39	0.008603	4.3	599.38	206.11	0.44
Ocotillo2	2	414.5065	2576	2259.95	2263.7		2264.45	0.025535	6.95	370.54	155.22	0.79
Ocotillo2	2	494.3954	2576	2261.33	2265.54		2265.95	0.014022	5.16	499.71	199.63	0.57
Ocotillo2	2	569.693	2576	2263.91	2267.31	2267.31	2268.25	0.046128	7.78	330.99	181.52	1.02
Ocotillo2	2	603	Inl Struct									
Ocotillo2	2	636.8529	2576	2266.69	2273.92	2269.61	2274	0.00105	2.24	1151.46	213.34	0.17
Ocotillo2	2	689.6463	2576	2267.55	2273.95		2274.1	0.001892	3.07	838.89	180.93	0.25
Ocotillo2	2	743.0997	2576	2268.66	2274.05		2274.25	0.003535	3.57	721.65	178.9	0.31
Ocotillo2	2	814.875	2576	2270.88	2274.34		2274.72	0.011328	4.95	520.31	200.84	0.54
Ocotillo2	2	905.6604	2576	2272.73	2275.96	2275.96	2276.85	0.035801	7.58	339.92	190.95	1
Ocotillo2	2	1001.524	2576	2274.97	2278.53		2279.04	0.015397	5.72	450.24	211.86	0.69
Ocotillo2	2	1153.302	2576	2278.91	2282.13	2282.13	2283.11	0.050148	7.94	324.28	169.32	1.01
Ocotillo2	2	1276.418	2576	2281.54	2285.52		2285.93	0.01247	5.13	502.57	211.35	0.59
Ocotillo2	2	1363.754	2576	2283.59	2286.82	2286.82	2287.69	0.028831	7.49	344.02	202.88	1.01
Ocotillo2	2	1474.264	2576	2286.38	2290.07	2289.82	2290.89	0.028939	7.31	352.62	155.64	0.86
Ocotillo2	2	1630.469	2576	2290.81	2294.41		2294.95	0.02352	5.88	437.79	216.81	0.73
Ocotillo2	2	1838.932	2576	2295.4	2299.92	2299.75	2300.76	0.032591	7.37	349.63	167.17	0.9
Ocotillo2	2	1893.224	2576	2297.55	2301.83		2302.43	0.028435	6.23	413.65	228.74	0.82
Ocotillo2	2	1961.665	2576	2300.18	2303.84	2303.72	2304.62	0.034261	7.1	362.86	193.91	0.91
Ocotillo2	2	2091.182	2576	2303.54	2307.48	2307.01	2307.97	0.020308	5.64	457.06	222.37	0.69
Ocotillo2	2	2138.547	2576	2304.53	2308.62		2309.08	0.026924	5.43	474.55	280.03	0.73
Ocotillo2	2	2250.737	2576	2306.24	2310.72	2310.05	2311.02	0.011971	4.39	587.42	300.4	0.55
Ocotillo2	2	2275	Inl Struct									
Ocotillo2	2	2300.616	2576	2308.44	2311.98	2311.42	2312.34	0.016007	4.77	540.38	318.14	0.64
Ocotillo3	3	114.4412	1934	2313.46	2316.97	2316.97	2317.66	0.038457	6.69	288.95	208.9	1
Ocotillo3	3	215.1731	1764	2316.62	2320.57	2320.57	2321.27	0.030184	6.75	261.22	187.61	1.01
Ocotillo3	3	321.5755	1906	2319.57	2322.57		2323.1	0.011239	5.82	327.77	155.23	0.71
Ocotillo3	3	384.3589	1964	2322.77	2325.62	2325.62	2326.46	0.032253	7.34	267.41	163.58	1.01
Ocotillo3	3	462.3848	2286	2325.82	2328.62	2328.62	2329.51	0.042469	7.6	300.78	168.26	1
Ocotillo3	3	671.1304	2277	2331.14	2335.31	2335	2335.83	0.022612	5.81	392.19	229.55	0.78
Ocotillo3	3	741.5216	2286	2334.58	2338.15	2338.15	2338.89	0.052464	6.92	330.35	223.63	1
Ocotillo3	3	826.0362	2283	2337.7	2341.46	2341.18	2342.11	0.028472	6.46	353.38	178.23	0.81
Ocotillo3	3	987.6464	2219	2341.59	2345.46	2345	2345.89	0.019316	5.2	426.34	232.77	0.68
Ocotillo3	3	1054.181	2209	2343.8	2347.27	2347.27	2348.01	0.047914	6.91	319.73	219.27	1.01
Ocotillo3	3	1159.029	2238	2347.7	2351.16		2351.56	0.024888	5.1	439.08	281.77	0.72
Ocotillo3	3	1241.236	2248	2351.59	2353.81	2353.81	2354.5	0.036696	6.65	337.97	248.97	1.01
Ocotillo3	3	1321.667	2274	2353.01	2356.6	2356.6	2357.44	0.025946	7.36	309.05	183.6	1
Ocotillo3	3	1382.931	2313	2354.69	2358.57	2358.57	2359.59	0.024824	8.1	285.71	141.44	1
Ocotillo3	3	1458.288	2304	2356.49	2360.79	2360.25	2361.37	0.021389	6.11	376.95	162.04	0.71
Ocotillo3	3	1510.756	2326	2358.55	2362.11	2362.11	2362.98	0.030499	7.47	311.55	177.33	0.99
Ocotillo3	3	1619.753	2532	2363.49	2366.67	2366.67	2367.31	0.050199	6.46	392.14	307.46	1.01
Ocotillo4	4	37.42422	2490	2364.92	2370.22	2369.6	2370.54	0.012443	4.52	550.76	384.98	0.67
Ocotillo4	4	168.9279	2490	2370.67	2374.3	2374.3	2374.99	0.02334	6.65	374.16	277.59	1.01
Ocotillo5	5	146.6624	2290	2375.06	2379.11	2379.11	2379.62	0.032612	5.69	402.3	421	1.03
Ocotillo5	5	210.8846	2290	2377.89	2381.65	2381.65	2382.3	0.04182	6.47	353.76	278.88	1.01
Ocotillo5	5	348.4933	2290	2385.6	2389	2389	2389.56	0.03051	5.98	383.22	350.88	1.01
Ocotillo5	5	539.3184	2290	2391.74	2395.59	2395.59	2396.41	0.023236	7.26	315.42	193.65	1
Ocotillo5	5	714.3696	2290	2398.55	2402.27	2402.27	2403.21	0.041677	7.78	294.28	155	1
Ocotillo5	5	844.1581	2290	2403.3	2406.84	2406.84	2407.66	0.024211	7.28	314.45	187.44	0.99
Ocotillo5	5	952.1411	2274	2407.62	2410.41	2410.41	2411.08	0.029261	6.56	346.65	254.54	0.99
Ocotillo5	5	1011.151	2320	2409.94	2413.42	2413.42	2414.16	0.029125	6.88	337.01	226.02	0.99
Ocotillo5	5	1064.645	2342	2411.98	2416.19	2416.19	2416.94	0.008196	6.98	335.72	218.42	0.99
Ocotillo5	5	1136.218	2342	2414.99	2418.53	2418.53	2419.23	0.020283	6.67	351.03	249.59	0.99
Ocotillo5	5	1223.727	2397	2418.37	2421.4	2421.4	2422.32	0.028774	7.75	312.35	166.43	0.99
Ocotillo5	5	1332.115	2441	2421.24	2425.2	2425.2	2426.3	0.025941	8.43	289.48	134.12	1.01
Ocotillo5	5	1491.168	2441	2426.69	2430.94	2430.81	2431.64	0.043325	6.69	364.85	213.77	0.9
Ocotillo5	5	1656.337	2441	2433.46	2436.53	2436.16	2436.87	0.02377	4.64	525.95	347.5	0.66
Ocotillo5	5	1793.631	2441	2440.44	2443.19	2443.19	2443.8	0.054363	6.26	390.23	332.94	1.02
OcotilloS1	Split1	119.2931	1115	2282.83	2284.84	2284.73	2285.36	0.02643	5.74	194.41	148.2	0.88
OcotilloS1	Split1	149.6742	867	2284.06	2285.7	2285.6	2286.13	0.023496	5.21	166.39	148.24	0.87
OcotilloS1	Split1	178.9694	711	2284.83	2286.47		2286.78	0.020079	4.43	160.49	154.41	0.77
OcotilloS1	Split1	199.1123	569	2285.57	2286.95	2286.95	2287.34	0.036124	5.01	113.61	147	1

Table 5.9.1.1
HEC-RAS OUTPUT
FLOODWAY/FLOODPLAIN

River	Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
OcotilloS1	Split1	224.0794	488	2286.24	2287.78	2287.72	2288.14	0.028188	4.82	101.27	116.78	0.91
OcotilloS1	Split1	253.381	491	2286.85	2288.62	2288.54	2289	0.028079	4.98	98.62	104.77	0.9
OcotilloS1	Split1	282.8606	558	2287.96	2290.15	2290.15	2290.74	0.031947	6.16	90.55	78.1	1.01
OcotilloS1	Split1	300.32	558	2288.92	2290.87	2290.87	2291.54	0.028543	6.55	85.21	64.49	1
OcotilloS1	Split1	371.2329	558	2291.15	2294.33		2294.41	0.003442	2.26	246.82	155.36	0.32
OcotilloS1	Split1	487.0553	558	2294.1	2295.97	2295.97	2296.42	0.048106	5.43	102.79	117.56	1.02
OcotilloS1	Split1	527.9043	487	2294.75	2297.68	2297.52	2298	0.031358	4.48	108.67	115.77	0.82
OcotilloS1	Split1	586.8272	487	2296.49	2299.45	2299.36	2299.9	0.031911	5.38	90.53	81.06	0.9
OcotilloS1	Split1	662.9047	487	2299.49	2301.45	2301.26	2301.86	0.021166	5.11	95.39	76.95	0.81
OcotilloS1	Split1	712.6492	487	2300.79	2302.66	2302.58	2303.2	0.032903	5.88	82.83	68.55	0.94
OcotilloS1	Split1	759.7467	487	2302.5	2304.61	2304.59	2305.09	0.049814	5.57	87.46	88.27	0.99
OcotilloS1	Split1	828.3519	487	2303.5	2306.38		2306.54	0.011012	3.21	151.5	112.7	0.49
OcotilloS1	Split1	863.3463	487	2304.17	2306.89		2307.17	0.0307	4.23	115.11	124.8	0.78
OcotilloS1	Split1	887	Inl Struct									
OcotilloS1	Split1	910.7199	487	2307.15	2309.19	2308.9	2309.37	0.021965	3.39	143.65	157.48	0.63
OcotilloS1	Split1	948.4852	487	2308.76	2310.53	2310.53	2310.89	0.06001	4.84	100.52	144.49	1.02
OcotilloS1	Split1	1038.222	487	2311.24	2313.26	2312.97	2313.5	0.016531	3.92	124.13	115.09	0.67
OcotilloS1	Split1	1099.415	487	2313.49	2315.73	2315.73	2316.22	0.056118	5.65	86.18	91.78	1.03
OcotilloS1	Split1	1168.193	487	2315.74	2318.22	2317.94	2318.39	0.019936	3.3	147.73	175.43	0.63
OcotilloS1	Split1	1255.985	487	2318.16	2320.17	2319.89	2320.34	0.023993	3.29	147.9	199.31	0.67
OcotilloS1	Split1	1457.32	487	2326	2327.84	2327.84	2328.08	0.031369	3.97	122.74	254.34	1.01
OcotilloS1	Split1	1523.987	487	2327.17	2329.69		2329.87	0.023586	3.48	139.81	193.2	0.72
OcotilloS1	Split1	1700.375	487	2331.76	2334.45	2334.42	2334.8	0.033039	4.75	102.53	129.26	0.94
OcotilloS1	Split1	1812.715	487	2335.55	2338.28		2338.47	0.031289	3.49	139.47	190.26	0.72
OcotilloS1	Split1	1886.663	487	2337.95	2340.81	2340.67	2341.09	0.038694	4.23	115.08	141.27	0.83
OcotilloS1	Split1	1969.317	490	2340.99	2344.03	2343.87	2344.29	0.037867	4.09	119.7	147.12	0.8
OcotilloS1	Split1	2040.078	554	2344.11	2346.62	2346.47	2346.86	0.034103	3.92	141.42	174.6	0.77
OcotilloS1	Split1	2079.058	564	2345.84	2348.1	2348.1	2348.65	0.050185	5.95	94.78	91.6	1.03
OcotilloS1	Split1	2140.933	535	2346.66	2350	2349.61	2350.17	0.01305	3.32	161.21	147.28	0.56
OcotilloS1	Split1	2236.837	525	2351.03	2353.02	2353.02	2353.56	0.028695	5.92	88.67	84.31	1.02
OcotilloS1	Split1	2299.916	499	2353.48	2355.91	2355.91	2356.53	0.034653	6.34	78.66	62.97	1
OcotilloS1	Split1	2366.44	460	2355.73	2358.52	2358.52	2359.17	0.032715	6.48	70.98	54.79	1
OcotilloS1	Split1	2426.608	469	2357.29	2360.41		2360.97	0.02727	5.98	78.37	47.79	0.82
OcotilloS1	Split1	2480.137	447	2359.18	2361.88	2361.88	2362.59	0.03239	6.78	65.97	47.86	1.02
OcotilloS1	Split1	2603.212	241	2362.43	2365.3		2365.48	0.014277	3.35	71.93	58.59	0.53
OcotilloS2	Split2	133.4816	1915	2252.85	2257.41		2257.89	0.01444	5.54	345.65	209.31	0.76
OcotilloS2	Split2	232.5308	1839	2254.76	2259.41		2259.8	0.027478	5.01	366.76	232.32	0.7
OcotilloS2	Split2	256.7089	1888	2255.39	2260.1		2260.46	0.026205	4.82	391.72	259.04	0.69
OcotilloS2	Split2	279.6261	1914	2255.92	2260.66		2260.94	0.016774	4.23	452.83	266.67	0.57
OcotilloS2	Split2	289.4215	1926	2256.03	2260.82		2261.13	0.019752	4.4	437.6	274.6	0.61
OcotilloS2	Split2	298.4141	1937	2256.16	2261.04		2261.28	0.015868	3.97	488.56	305.05	0.55
OcotilloS2	Split2	315.9728	1944	2256.39	2261.32	2260.99	2261.65	0.02473	4.65	417.75	289.79	0.68
OcotilloS2	Split2	360.0553	1944	2257.88	2262.05	2261.5	2262.29	0.009147	3.88	501.58	321.61	0.55
OcotilloS2	Split2	416.7438	2054	2258.75	2263.99	2262.96	2264.22	0.005402	3.87	530.75	273.37	0.49
OcotilloS2	Split2	509.5979	2054	2260.98	2264.66	2264.56	2265.41	0.034454	6.93	296.52	166.41	0.91
OcotilloS2	Split2	588.5838	2054	2262.08	2266.56	2266.23	2267.1	0.014169	5.89	348.66	185.51	0.76
OcotilloS2	Split2	678.3232	2054	2263.8	2268.64	2268.64	2269.32	0.018127	6.64	309.23	224.27	1
OcotilloS2	Split2	759.1032	2054	2264.97	2270.32		2270.6	0.013171	4.19	489.69	264.06	0.54
OcotilloS2	Split2	821.0404	2054	2266.01	2271.13		2271.42	0.013656	4.37	470.46	254.75	0.57
OcotilloS2	Split2	870.2011	2054	2267.74	2271.88		2272.25	0.019204	4.89	420.33	258.66	0.68
OcotilloS2	Split2	924.8907	2005	2269.94	2273.06		2273.58	0.028756	5.76	348.23	225.83	0.82
OcotilloS2	Split2	955	Inl Struct									
OcotilloS2	Split2	985.217	2005	2270.85	2274.63	2273.85	2274.93	0.015124	4.33	462.96	273.71	0.59
OcotilloS2	Split2	1087.704	2005	2274.77	2278.54	2278.54	2278.94	0.022258	5.08	394.45	385.77	0.89
OcotilloS2	Split2	1194.422	2005	2278.41	2281.02	2280.97	2281.53	0.026134	5.73	350.16	298.56	0.93
OcotilloT1	Trib1	137.927	840	2282.34	2285.82	2285.82	2286.43	0.016161	6.36	139.45	116.08	1.01
OcotilloT1	Trib1	164.5459	1088	2283	2286.58		2286.94	0.019671	4.76	228.5	133.44	0.64
OcotilloT1	Trib1	189.6257	1245	2283.7	2287.03		2287.52	0.023721	5.63	221.16	125.28	0.75
OcotilloT1	Trib1	226.2828	1386	2284.35	2287.63		2288.16	0.013279	5.84	237.35	138.55	0.79
OcotilloT1	Trib1	252.3619	1467	2285.16	2288.04	2287.51	2288.52	0.013337	5.53	265.41	123.18	0.66
OcotilloT1	Trib1	275.9736	1464	2285.56	2288.35	2288.2	2288.98	0.023522	6.36	230.34	137.53	0.87
OcotilloT1	Trib1	296.3438	1397	2286.03	2288.97	2288.69	2289.43	0.019553	5.48	255.01	158.6	0.76
OcotilloT1	Trib1	324.6569	1397	2286.62	2289.53	2289.09	2289.93	0.015402	5.07	275.75	155.1	0.67
OcotilloT1	Trib1	354.0213	1397	2287.71	2290.01		2290.46	0.020121	5.36	260.61	159.26	0.74
OcotilloT1	Trib1	381.6131	1397	2287.96	2290.71		2290.96	0.015327	4.03	346.99	253.61	0.61
OcotilloT1	Trib1	462.4158	1397	2289.75	2292.42	2292.42	2293.04	0.034596	6.31	221.34	178.08	1
OcotilloT1	Trib1	524.3047	1397	2290.93	2294.06	2293.4	2294.44	0.015535	4.94	282.91	152.05	0.64
OcotilloT5	Trib5	115.0657	590	2313.37	2316.02	2316.02	2316.63	0.064411	6.25	94.46	78.58	1
OcotilloT5	Trib5	248.3488	760	2317.75	2321.08	2320.81	2321.46	0.025385	4.96	153.89	113.31	0.75
OcotilloT5	Trib5	290.8772	618	2320.19	2322.13	2322.1	2322.64	0.026907	5.74	107.59	94.52	0.95
OcotilloT5	Trib5	365.7275	559	2321.64	2324.33	2324.24	2324.67	0.027322	4.66	120.14	131.74	0.86
OcotilloT5	Trib5	442.2927	238	2324.45	2326.69	2326.45	2326.89	0.035341	3.59	66.23	86.15	0.72
OcotilloT5	Trib5	601.2568	247	2330.45	2332.47	2332.24	2332.71	0.03709	3.87	63.9	72.12	0.72
OcotilloT5	Trib5	716.7944	238	2334.08	2336.67		2336.83	0.034018	3.27	72.8	99.04	0.67
OcotilloT5	Trib5	789.2246	238	2338.4	2339.88	2339.8	2340.11	0.061986	3.85	61.78	103.21	0.88
OcotilloT5	Trib5	970.8694	238	2343.75	2345.28	2344.99	2345.4	0.016781	2.79	85.19	107.89	0.55
OcotilloT5	Trib5	1031.889	238	2345.62	2347.58	2347.58	2347.94	0.030087	4.76	50.01	72.04	1.01

Table 5.9.1.1
HEC-RAS OUTPUT
FLOODWAY/FLOODPLAIN

River	Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
OcotilloT5	Trib5	1091.057	238	2347.01	2349.46	2349.17	2349.71	0.028759	4.05	58.73	55.28	0.69
OcotilloT5	Trib5	1203.024	238	2350.24	2352.79	2352.46	2353.2	0.033575	5.11	46.55	39.83	0.83
OcotilloT5	Trib5	1280.26	238	2352.39	2354.9	2354.49	2355.3	0.023327	5.04	47.26	29.99	0.71
OcotilloT5	Trib5	1354.337	238	2354.14	2356.77		2357.2	0.028567	5.25	45.3	32.14	0.78
OcotilloT5	Trib5	1379.424	238	2358.39	2359.36	2359.36	2359.58	0.05315	3.76	63.31	150.86	1.02
OcotilloT5	Trib5	1404.298	238	2357.17	2359.83		2359.94	0.006427	2.73	87.2	52.73	0.37
OcotilloT5	Trib5	1517.323	238	2359.87	2361.47	2361.47	2361.99	0.049779	5.81	40.97	39.41	1
OcotilloT5	Trib5	1593.698	238	2361.53	2363.78	2363.35	2364.05	0.017143	4.21	56.57	39.86	0.62
OcotilloT5	Trib5	1701.022	238	2364.12	2366.3	2366.3	2366.97	0.04074	6.59	36.1	26.24	0.99
OcotilloT5	Trib5	1775.716	238	2366.76	2368.97		2369.27	0.023166	4.4	54.07	42.61	0.69
OcotilloT5	Trib5	1883.052	238	2371.12	2373.36	2373.36	2373.66	0.068053	4.41	53.98	91.62	1.01
OcotilloT5	Trib5	1992.893	238	2374.26	2376.49	2376.3	2376.79	0.015761	4.4	54.04	54.73	0.78
OcotilloT5	Trib5	2078.39	238	2376.73	2378.77	2378.77	2379.21	0.058458	5.33	44.67	54.72	1.04
OcotilloT5	Trib5	2140.026	238	2378.54	2380.78	2380.62	2381.01	0.01765	3.84	62.04	75.13	0.74
OcotilloT5	Trib5	2213.957	238	2381.27	2382.72	2382.72	2383.15	0.043966	5.27	45.19	51.38	0.99
OcotilloT5	Trib5	2296.132	238	2383.49	2384.92		2385.12	0.015229	3.53	67.43	74.47	0.65
OcotilloT5	Trib5	2433.259	238	2387.79	2389.93	2389.93	2390.35	0.040976	5.23	45.55	51.83	0.98
OcotilloT5	Trib5	2510.794	238	2390.31	2392.5		2392.76	0.024808	4.12	57.79	49.98	0.67
OcotilloT5	Trib5	2624.559	238	2394.14	2396.28	2396.23	2396.65	0.049071	4.83	49.24	58.58	0.93
OcotilloT5	Trib5	2717.28	238	2398.21	2400.03	2399.85	2400.24	0.031748	3.68	64.62	82.78	0.73
OcotilloT5	Trib5	2800.556	238	2400.8	2403.41	2403.37	2403.84	0.060283	5.23	45.51	47.92	0.95
OcotilloT5	Trib5	2908.174	238	2404.57	2407.82	2407.37	2408.02	0.02743	3.66	65.05	64.37	0.64
OcotilloT5	Trib5	2978.538	208	2406.29	2409.53		2409.72	0.021142	3.5	59.35	50.4	0.57
OcotilloT5	Trib5	3053.924	208	2409.89	2412.21	2412.21	2412.58	0.053759	4.89	42.54	57.35	1
OcotilloT5	Trib5	3125.354	186	2412.99	2414.71	2414.32	2414.86	0.01961	3.1	59.99	75.56	0.61
OcotilloT5	Trib5	3189.152	186	2416.72	2417.85	2417.85	2418.14	0.051041	4.33	42.98	75.98	1.01
OcotilloT5	Trib5	3258.669	131	2419.29	2420.41		2420.49	0.021229	2.26	58.19	100.77	0.52
OcotilloT5	Trib5	3269.55	87	2419.49	2420.64		2420.69	0.015413	1.83	47.78	88.17	0.43
OcotilloT6	Trib6	164.7201	163	2374.57	2378.14		2378.19	0.00297	1.79	91.28	48.64	0.23
OcotilloT6	Trib6	231.6413	163	2375.81	2378.43		2378.61	0.015236	3.42	47.61	32.82	0.5
OcotilloT6	Trib6	325.1506	163	2378.02	2380.28		2380.54	0.028216	4.09	39.89	33.32	0.66
OcotilloT6	Trib6	405.3325	163	2378.54	2381.88		2382.07	0.013078	3.44	47.4	28.16	0.47
OcotilloT6	Trib6	482.4307	163	2379.58	2382.84		2383.03	0.011974	3.5	46.59	25.28	0.45
OcotilloT6	Trib6	582.8669	163	2381.53	2384.21		2384.42	0.016628	3.66	44.53	29.39	0.52
OcotilloT6	Trib6	698.9221	163	2383.53	2386.04		2386.3	0.015726	4.12	39.58	26.63	0.6

5.9.1.2
HEC-HAS OUTPUT
LATERAL STRUCTURES

HEC-RAS Plan: OcotilloFPD Profile: PF 1 OcotilloWashFPD.prj

River	Reach	River Sta	Q US	Q Leaving Total	Q DS	Q Weir	Q Gates	Wr Top Wdth	Weir Max Depth	Weir Avg Depth	Min El Weir Flow	E.G. US.	W.S. US.	E.G. DS	W.S. DS
			(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
Ocotillo1	1	1047	4445.97	37.4	4408.58	37.4		20.53	1.73	0.87	2253.19	2255.26	2254.92	2254.52	2252.48
Ocotillo1	1	1112	4630	184.08	4445.97	184.08		62.35	1.73	1.28	2253.19	2255.82	2255.1	2255.26	2254.92
Ocotillo3	3	215	1764.03	-169.61	1933.64	-169.61		91.52	2.22	0.83	2316.33	2321.27	2320.57	2317.66	2316.97
Ocotillo3	3	321	1905.78	141.76	1764.03	141.76		88.52	2.7	1.15	2319.82	2323.1	2322.57	2321.27	2320.57
Ocotillo3	3	384	1964.42	58.66	1905.78	58.66		69.63	2.88	0.97	2320.35	2326.46	2325.62	2323.1	2322.57
Ocotillo3	3	462	2285.66	319.96	1964.42	319.96		76.46	1.91	1.63	2324.15	2329.51	2328.6	2326.46	2325.62
Ocotillo3	3	671	2276.9	-9.14	2285.66	-9.14		176	2.33	0.68	2327.25	2335.84	2335.32	2329.51	2328.6
Ocotillo3	3	741	2285.71	9.15	2276.9	9.15		40.61	0.48	0.21	2334.91	2338.89	2338.15	2335.84	2335.32
Ocotillo3	3	825	2283.44	-2.26	2285.71	-2.26		11.21	0.36	0.2	2342.06	2342.11	2341.46	2338.89	2338.15
Ocotillo3	3	826	2283.44	0	2285.71						2341	2342.11	2341.46	2338.89	2338.15
Ocotillo3	3	986	2219.05	-64.91	2283.44	-64.91		89.05	0.98	0.47	2344.34	2345.89	2345.47	2342.11	2341.46
Ocotillo3	3	987	2219.05	0	2283.44						2344.03	2345.89	2345.47	2342.11	2341.46
Ocotillo3	3	1053	2208.65	-10.4	2219.05	-10.4		23.1	0.62	0.34	2346.74	2348.01	2347.26	2345.89	2345.47
Ocotillo3	3	1054	2208.65	0	2219.05						2348.51	2348.01	2347.26	2345.89	2345.47
Ocotillo3	3	1158	2237.91	29.25	2208.65	29.25		35.75	1.1	0.5	2348.92	2351.57	2351.17	2348.01	2347.26
Ocotillo3	3	1159	2237.91	0	2208.65						2352.44	2351.57	2351.17	2348.03	2347.27
Ocotillo3	3	1241	2247.92	10.43	2237.91	10.43		44.13	1.44	0.82	2350.07	2354.5	2353.81	2351.57	2351.17
Ocotillo3	3	1321	2273.63	26.01	2247.92	26.01		68.71	0.85	0.28	2354.33	2357.44	2356.6	2354.5	2353.81
Ocotillo3	3	1382	2312.8	40.14	2273.63	40.14		62.1	1.25	0.77	2355.96	2359.59	2358.59	2357.44	2356.6
Ocotillo3	3	1458	2303.89	-9.04	2312.8	-9.04		74.86	1.2	0.84	2358.27	2361.36	2360.77	2359.59	2358.59
Ocotillo3	3	1510	2325.88	21.09	2303.89	21.09		53.18	0.93	0.61	2360.22	2362.98	2362.1	2361.36	2360.77
Ocotillo3	3	1619	2532.08	206	2325.88	206		118.47	2.42	1.67	2361.17	2367.31	2366.67	2362.98	2362.1
Ocotillo5	5	952	2274.36	-15.18	2289.96	-15.18		50.31	0.43	0.27	2408.25	2411.08	2410.4	2407.66	2406.84
Ocotillo5	5	1011	2319.82	44.61	2274.36	44.61		41.3	1.14	0.61	2410.74	2414.16	2413.42	2411.08	2410.4
Ocotillo5	5	1064	2342.28	22.24	2319.82	22.24		20.94	1.14	0.62	2412.28	2416.94	2416.19	2414.16	2413.42
Ocotillo5	5	1136	2342.28	0	2342.28						2416.28	2419.23	2418.54	2416.94	2416.19
Ocotillo5	5	1223	2396.57	54.63	2342.28	54.63		78.44	1.16	0.48	2418.68	2422.32	2421.39	2419.23	2418.54
Ocotillo5	5	1332	2441	44.43	2396.57	44.43		33.61	1.19	0.72	2420.23	2426.3	2425.19	2422.32	2421.39
OcotilloS2	Split2	232	1838.69	-76.17	1914.84	-76.17		94.3	1.94	1.33	2256.57	2259.8	2259.41	2257.89	2257.41
OcotilloS2	Split2	256	1887.78	49.08	1838.69	49.08		23.03	1.21	1.04	2258.24	2260.46	2260.1	2259.8	2259.41
OcotilloS2	Split2	298	1936.86	49.08	1887.78	49.08		39.22	1.13	0.71	2258.97	2261.28	2261.04	2260.46	2260.1
OcotilloS2	Split2	416	2054.24	117.32	1936.86	117.32		170.03	0.93	0.46	2260.11	2264.22	2263.99	2261.28	2261.04
OcotilloT1	Trib1	164	1088.41	248.18	840.16	248.18		27.28	3.02	2.74	2282.82	2286.94	2286.58	2286.43	2285.82
OcotilloT1	Trib1	189	1244.73	156.23	1088.41	156.23		25.08	2.38	2.13	2284.2	2287.52	2287.03	2286.94	2286.58
OcotilloT1	Trib1	226	1386.02	141.25	1244.73	141.25		35.96	1.74	1.57	2285.29	2288.16	2287.63	2287.52	2287.03
OcotilloT1	Trib1	252	1467.36	81.33	1386.02	81.33		25.91	1.44	1.35	2286.19	2288.52	2288.04	2288.16	2287.63
OcotilloT1	Trib1	275	1463.97	-3.3	1467.36	-3.3		25.7	1.79	1.56	2286.49	2288.98	2288.35	2288.52	2288.04
OcotilloT1	Trib1	296	1397	-67	1463.97	-67		16.99	1.98	1.54	2287.4	2289.43	2288.97	2288.98	2288.35
OcotilloT1	Trib1	324	1397	0	1397						2290.7	2289.93	2289.53	2289.43	2288.97

CAVE CREEK DRAINAGE MASTER PLAN
FCDMC CONTRACT NUMBER 2004C072
OCOTILLO WASH FLOODPLAIN REDELINEATION
CAVE CREEK, ARIZONA

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

AUTHORITY FOR STUDY

THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY (FCDMC) HAS CONTRACTED HDR TO PREPARE THIS STUDY UNDER THE CONTRACT NUMBER 2004C072 AS PART OF THE CC DMP. PROJECT CONTROL NUMBER 690.02.20.

PROJECT LOCATION

THE PROJECT SITE IS LOCATED WITHIN THE TOWN OF CAVE CREEK, ARIZONA WITHIN SECTIONS 14, 15 AND 22 OF TOWNSHIP 6 NORTH, RANGE 4 EAST OF THE GILA AND SALT RIVER MERIDIAN WITHIN THE COUNTY OF MARICOPA IN THE STATE OF ARIZONA.

BENCHMARKS (NAVD 88)

BM #10 – ELEVATION 2275.856
LOCATED AT THE INTERSECTION OF FLEMING SPRINGS ROAD AND ROCKAWAY HILLS DRIVE (NE CORNER).

BM # 13 – ELEVATION 2306.736
LOCATED AT THE INTERSECTION OF ECHO CANYON DRIVE AND CONTINENTAL MOUNTAIN DRIVE (NE CORNER).

BM # 11 – ELEVATION 2320.194
LOCATED AT THE INTERSECTION OF FLEMING SPRINGS ROAD AND ECHO CANYON DRIVE (SE CORNER).

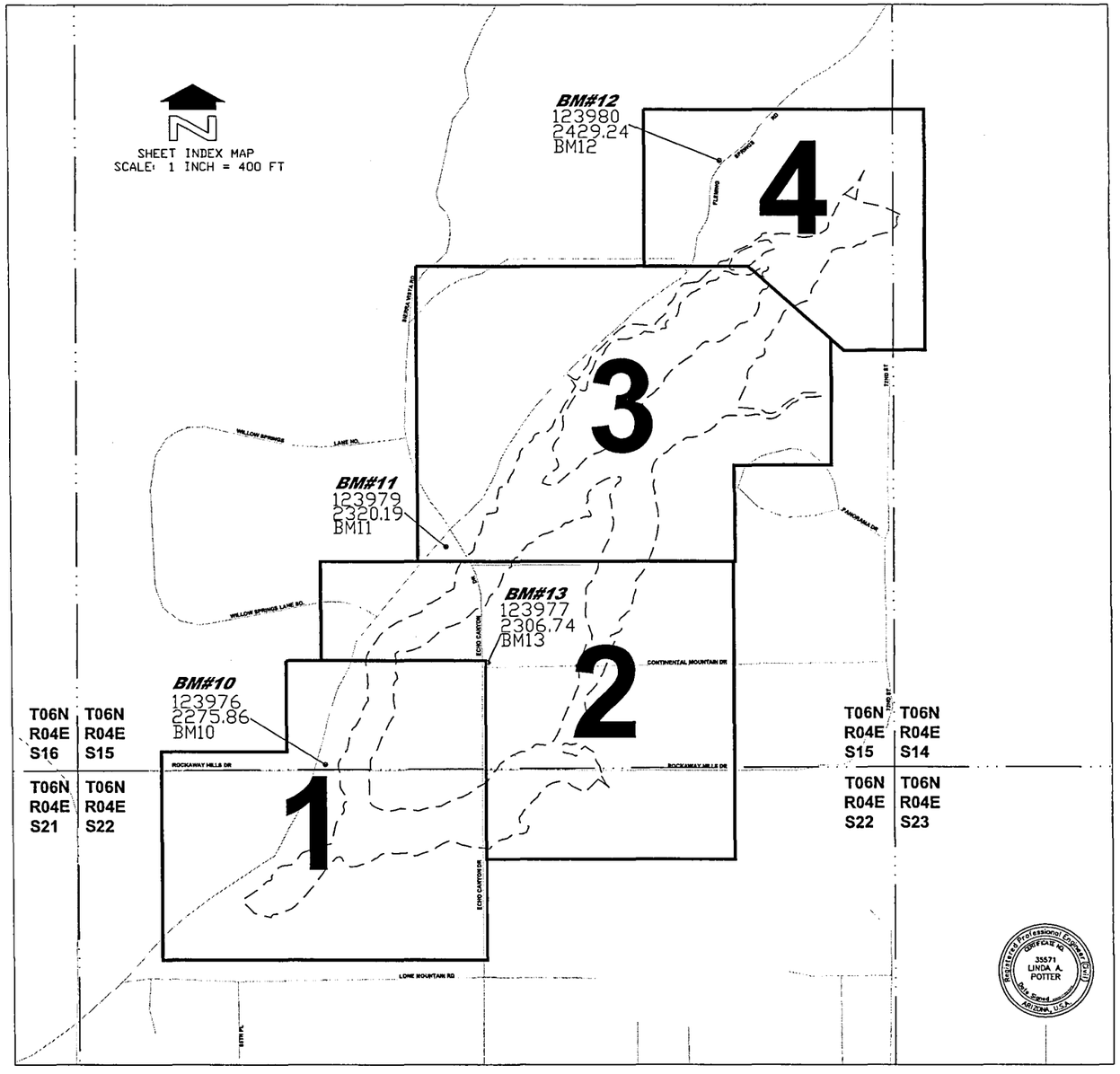
BM # 12 0 ELEVATION 2429.245
LOCATED ALONG FLEMING SPRINGS ROAD ALIGNMENT ADJACENT TO PARCEL NUMBER 21616025R OR 21616025S

SHEET INDEX

SHEET 1 – OCOTILLO WASH REACH 01, REACH 02 & SPLIT-2.
SHEET 2 – OCOTILLO WASH REACH 02, SPLIT-1 & SPLIT-2.
SHEET 3 – OCOTILLO WASH SPLIT-1, REACH 03, REACH 04, REACH 05, TRIB-5 & TRIB-6.
SHEET 4 – OCOTILLO WASH REACH 05 & TRIB-5.

ABBREVIATIONS

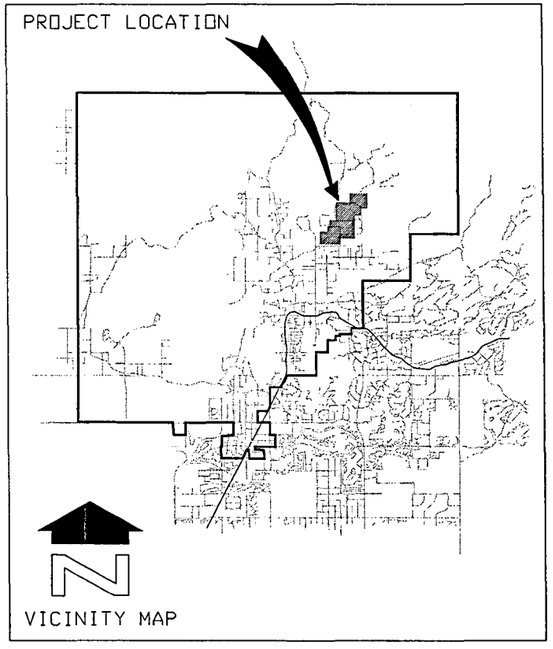
DMP	– DRAINAGE MASTER PLAN
CC	– CAVE CREEK
ROW	– RIGHT OF WAY
EXIST	– EXISTING
BCHH	– BRASS CAP HAND HOLE
T.	– TOWNSHIP
R.	– RANGE
S.	– SECTION
N.T.S.	– NOT TO SCALE
BM	– BENCHMARK



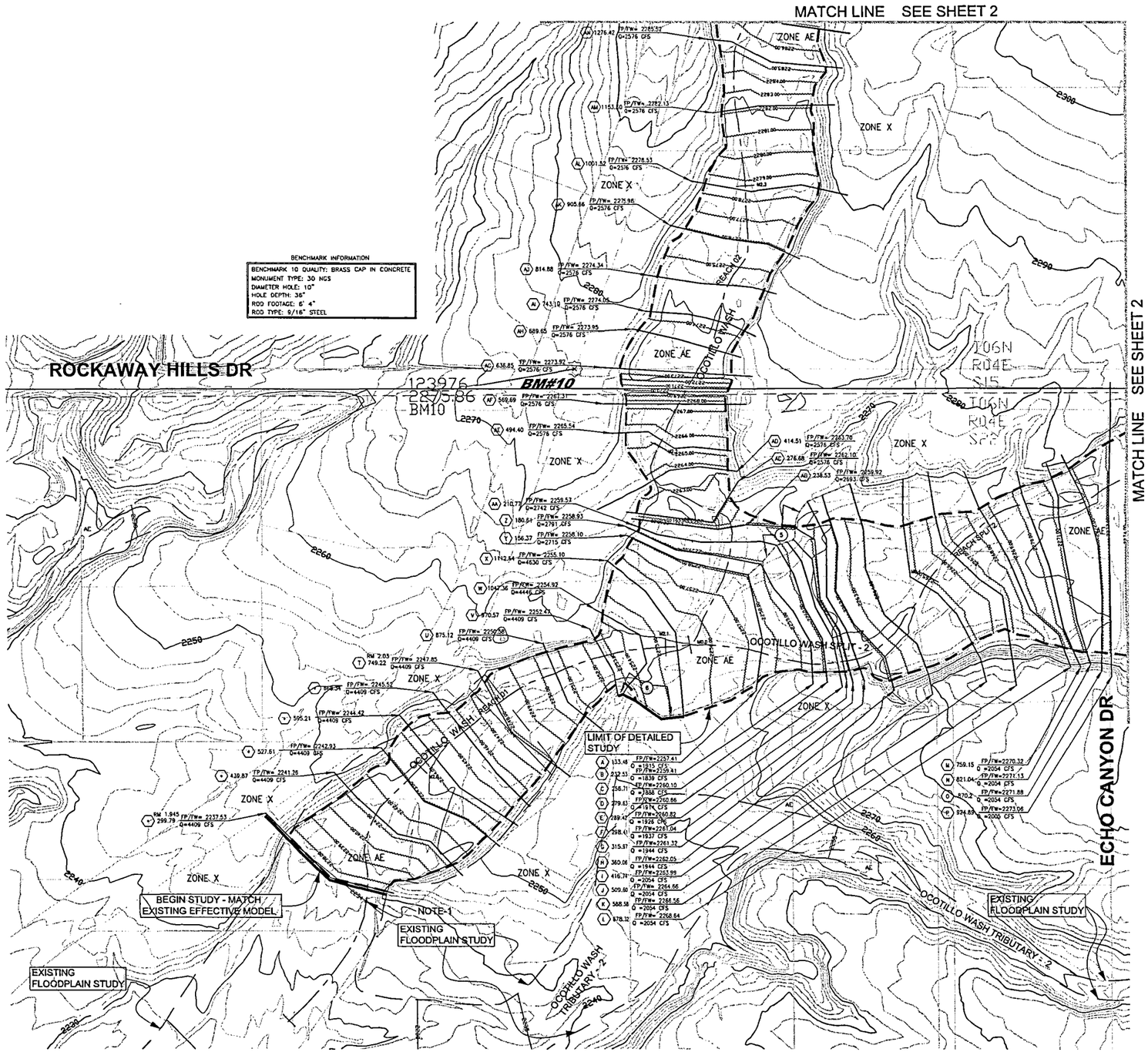
SURVEY STATEMENT

I, STONE E. WAHL, AN ARIZONA REGISTERED LAND SURVEYOR, CERTIFY THAT THE FIELD SURVEYS, DOCUMENTED HEREIN, ALONG WITH ALL FIELD, AND OFFICE PROCESS PROCEDURES, USED DURING THE COURSE OF THIS SURVEY, WERE PERFORMED UNDER MY DIRECT SUPERVISION, AND THAT THESE SURVEYS, ARE RETRACEABLE, AND REPEATABLE. FURTHER, I CERTIFY THAT THE SUREY REPORT WAS PREPARED UNDER MY DIRECT SUPERVISION.

STONE E. WAHL
AZ RLS #28237



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



THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1"= 100' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

COOPER AERIAL SURVEYS COMPANY

100' 0' 100' 200'

SCALE: 1" = 100'
CONTOUR INTERVAL = 2'
FLIGHT DATES: November 2003 through December 2005

GROUND CONTROL SURVEY DATA PROVIDED BY COOPER AERIAL SURVEYS COMPANY

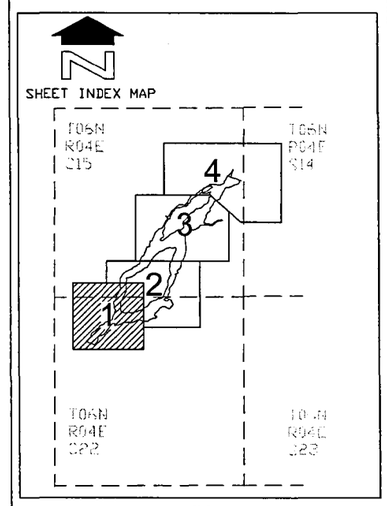
LEGEND

100-YR FLOODPLAIN AND FLOODWAY BOUNDARY	
LATERAL BASE LINES	
BASE FLOOD ELEVATION	
HYDRAULIC BASE LINE WITH RIVER MILE	M2.0 M2.5 M3.0
CROSS SECTION	A 144.44 FP= 2250.55 Q =4630 CFS
	RM 1.945
ELEVATION REFERENCE MARK	ERM 2400
ZONE DESIGNATION	ZONE AE
ZONE DESIGNATION	ZONE X
BENCHMARK DESIGNATION	BM#10

BENCHMARKS

NOTE: ALL ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88). CONVERSION FACTOR TO THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29) IS = -2.07 FOOT.

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
BM #10	2275.856	THE INTERSECTION OF FLEMING SPRINGS ROAD AND ROCKAWAY HILLS DRIVE. (NE CORNER)



NOTES

1-THE HYDRAULIC BASE LINE FOR OCOTILLO WASH TIES INTO THE EXISTING RIVER MILE 1.945 PER THE FIS FLOOD PROFILE DATED SEPTEMBER 30, 2005

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

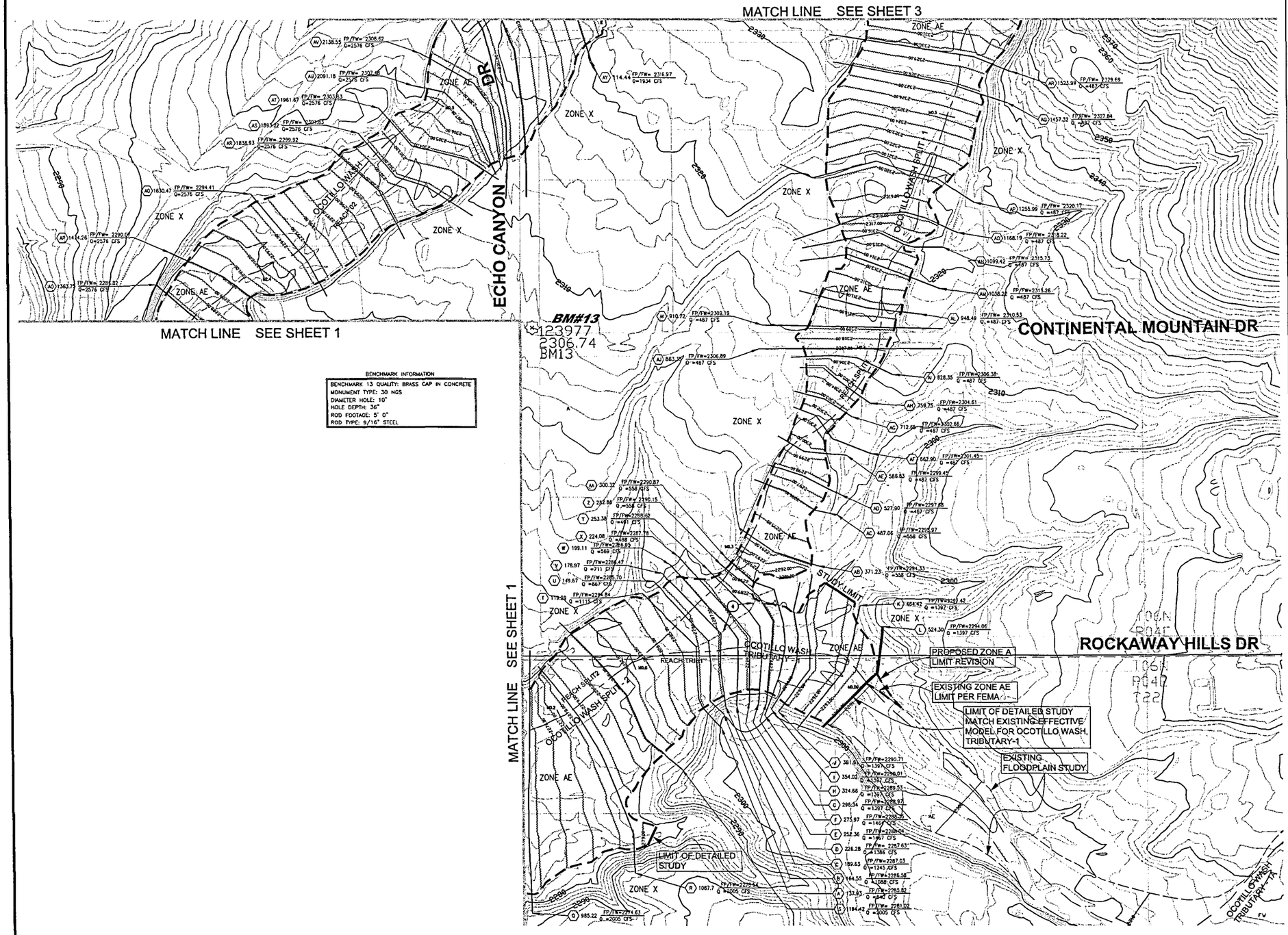
OCOTILLO WASH FLOODPLAIN DELINEATION, CAVE CREEK, AZ

Registered Professional Engineer (Civil) CERTIFICATE NO. 35571 LINDA A. POTTER ARIZONA, U.S.A.

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

	BY	DATE
DESIGN	M. FOUNTAIN	10-25-07
DESIGN CHK.	L. POTTER	10-25-07
PLANS	MC/MF	10-25-07
PLANS CHK.	L. POTTER	10-25-07

SHEET 1 OF 4



BENCHMARK INFORMATION

BENCHMARK 13 QUALITY: BRASS CAP IN CONCRETE
MONUMENT TYPE: 30 NGS
DIAMETER HOLE: 10"
HOLE DEPTH: 36"
ROD FOOTAGE: 5' 0"
ROD TYPE: 9/16" STEEL

LEGEND

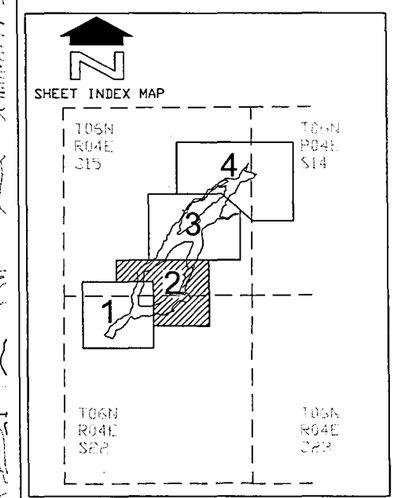
100-YR FLOODPLAIN AND FLOODWAY BOUNDARY	
LATERAL BASE LINES	S
BASE FLOOD ELEVATION	2265.00
HYDRAULIC BASE LINE WITH RIVER MILE	M2.0 — M2.5 — M3.0
CROSS SECTION	A 144.44 FP= 2250.55 Q =4630 CFS
	RM 1.945
ELEVATION REFERENCE MARK	ERM 2400
ZONE DESIGNATION	ZONE AE
ZONE DESIGNATION	ZONE X
BENCHMARK DESIGNATION	BM#10

BENCHMARKS

NOTE: ALL ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88). CONVERSION FACTOR TO THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29) IS = -2.07 FOOT.

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
BM #13	2306.736	THE INTERSECTION OF ECHO CANYON DRIVE AND CONTINENTAL MOUNTAIN DRIVE. (NE CORNER)

SHEET INDEX MAP



NOTES

1-THE HYDRAULIC BASE LINE FOR OCOTILLO WASH TIES INTO THE EXISTING RIVER MILE 1.945 PER THE FIS FLOOD PROFILE DATED SEPTEMBER 30, 2005

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

OCOTILLO WASH FLOODPLAIN DELINEATION, CAVE CREEK, AZ

100' 0' 100' 200'

SCALE: 1" = 100'
CONTOUR INTERVAL = 2'
FLIGHT DATES: November 2003 through December 2005

GROUND CONTROL SURVEY DATA PROVIDED BY COOPER AERIAL SURVEYS COMPANY

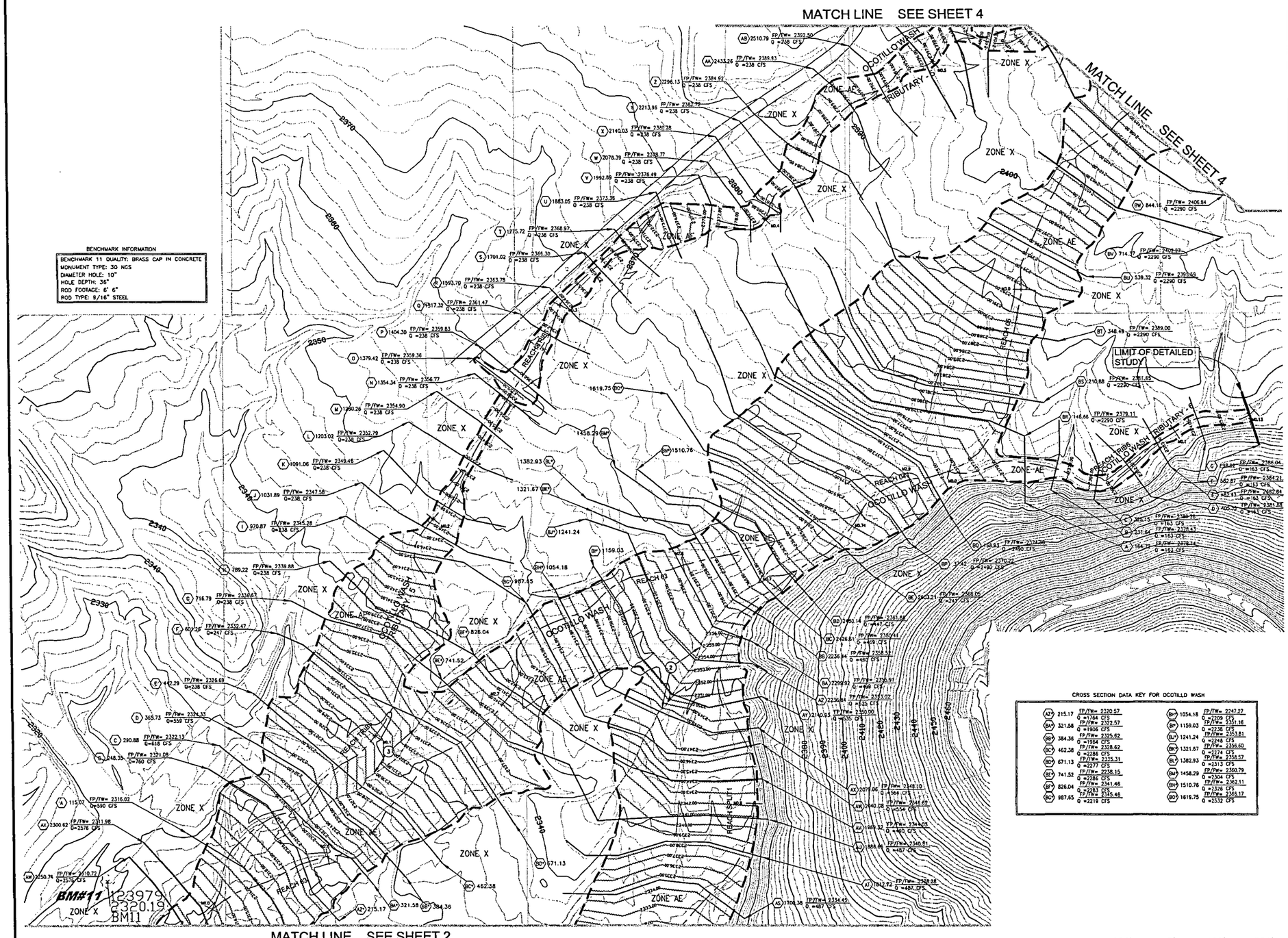
THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1"= 100' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

COOPER AERIAL SURVEYS COMPANY

Registered Professional Engineer (Civil) CERTIFICATE NO. 35571 LINDA A. POTTER Date Signed 10-25-07 ARIZONA, U.S.A.

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

	BY	DATE
DESIGN	M. FOUNTAIN	10-25-07
DESIGN CHK.	L. POTTER	10-25-07
PLANS	MC/MF	10-25-07
PLANS CHK.	L. POTTER	10-25-07



LEGEND

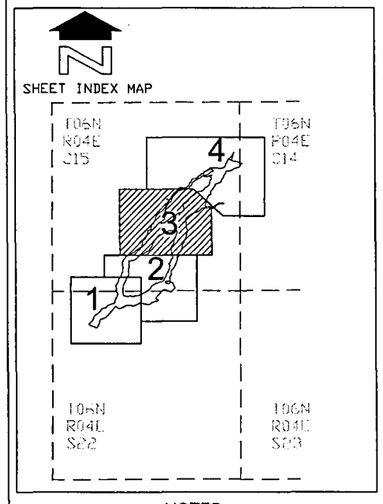
100-YR FLOODPLAIN AND FLOODWAY BOUNDARY	
LATERAL BASE LINES	
BASE FLOOD ELEVATION	
HYDRAULIC BASE LINE WITH RIVER MILE	M2.0 M2.5 M3.0
CROSS SECTION	A 144.44 FP= 2250.55 Q =4630 CFS
	RM 1.945
ELEVATION REFERENCE MARK	ERM 2400
ZONE DESIGNATION	ZONE AE
ZONE DESIGNATION	ZONE X
BENCHMARK DESIGNATION	BM#10

BENCHMARKS

NOTE: ALL ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88). CONVERSION FACTOR TO THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29) IS = -2.07 FOOT.

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
BM #11	2320.194	THE INTERSECTION OF FLEMING SPRINGS ROAD AND ECHO CANYON DRIVE. (SE CORNER)

SHEET INDEX MAP



CROSS SECTION DATA KEY FOR OCOTILLO WASH

AZ 215.17	FP/TW= 2320.57 Q =1764 CFS		BW 1054.18	FP/TW= 2247.27 Q =229 CFS	
BA 321.58	FP/TW= 2322.57 Q =1906 CFS		BR 1159.03	FP/TW= 2351.16 Q =2236 CFS	
BN 384.36	FP/TW= 2325.62 Q =1954 CFS		BU 1241.24	FP/TW= 2353.81 Q =2248 CFS	
BC 462.38	FP/TW= 2328.62 Q =2286 CFS		BK 1321.67	FP/TW= 2356.60 Q =2274 CFS	
BO 671.13	FP/TW= 2335.31 Q =2277 CFS		BL 1382.93	FP/TW= 2358.57 Q =2313 CFS	
BE 741.52	FP/TW= 2338.15 Q =2286 CFS		BM 1458.29	FP/TW= 2360.79 Q =2304 CFS	
BF 826.04	FP/TW= 2341.46 Q =2283 CFS		BP 1510.76	FP/TW= 2362.11 Q =2326 CFS	
BC 987.65	FP/TW= 2345.46 Q =2219 CFS		BO 1619.75	FP/TW= 2368.17 Q =2532 CFS	

NOTES

1-THE HYDRAULIC BASE LINE FOR OCOTILLO WASH TIES INTO THE EXISTING RIVER MILE 1.945 PER THE FIS FLOOD PROFILE DATED SEPTEMBER 30, 2005

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

OCOTILLO WASH FLOODPLAIN DELINEATION, CAVE CREEK, AZ

100' 0' 100' 200'

SCALE: 1" = 100'
CONTOUR INTERVAL = 2'
FLIGHT DATES: November 2003 through December 2005

GROUND CONTROL SURVEY DATA PROVIDED BY COOPER AERIAL SURVEYS COMPANY

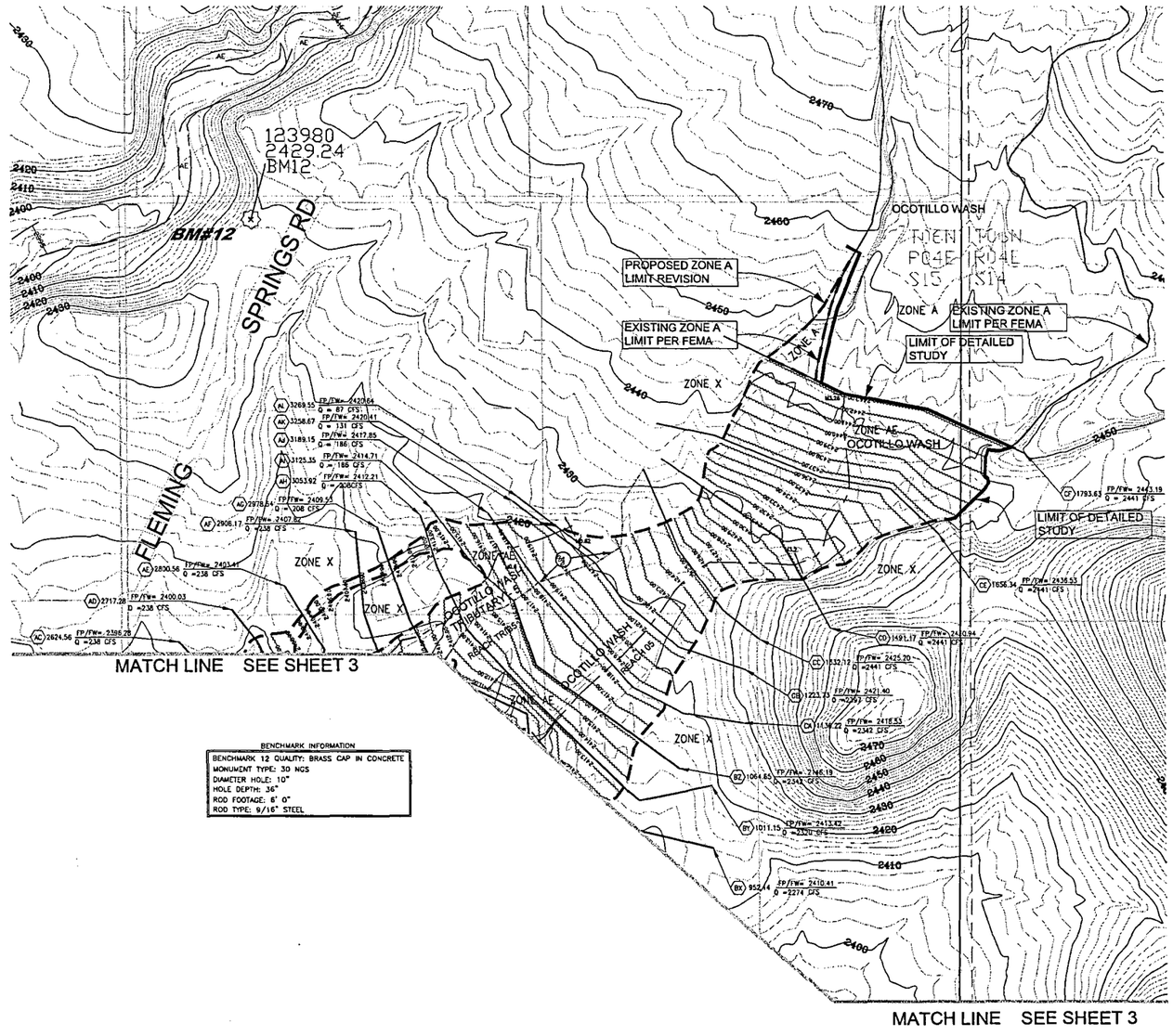
THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1"= 100' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

COOPER AERIAL SURVEYS COMPANY

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

Registered Professional Engineer (Civil) CERTIFICATE NO. 35571 LINDA A. POTTER Date Signed 10/25/07 ARIZONA, U.S.A.

	BY	DATE
DESIGN	M. FOUNTAIN	10-25-07
DESIGN CHK.	L. POTTER	10-25-07
PLANS	MC/MF	10-25-07
PLANS CHK.	L. POTTER	10-25-07



BENCHMARK INFORMATION

BENCHMARK 12 QUALITY: BRASS CAP IN CONCRETE
MONUMENT TYPE: 30 NGS
DIAMETER HOLE: 10"
HOLE DEPTH: 36"
ROD FOOTAGE: 6' 0"
ROD TYPE: 9/16" STEEL

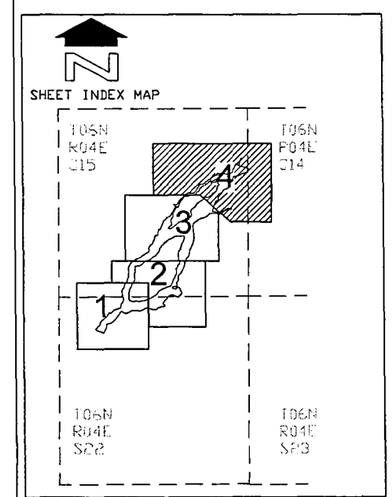
LEGEND

100-YR FLOODPLAIN AND FLOODWAY BOUNDARY	
LATERAL BASE LINES	
BASE FLOOD ELEVATION	
HYDRAULIC BASE LINE WITH RIVER MILE	M2.0 M3.0
CROSS SECTION	A 144.44 FP= 2250.55 Q =4630 CFS
	RM 1.945
ELEVATION REFERENCE MARK	ERM 2400
ZONE DESIGNATION	ZONE AE
ZONE DESIGNATION	ZONE X
BENCHMARK DESIGNATION	BM#10

BENCHMARKS

NOTE: ALL ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88). CONVERSION FACTOR TO THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29) IS = -2.07 FOOT.

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
BM #12	2429.245	ALONG FLEMING SPRINGS ROAD ADJACENT TO PARCEL NUMBER 21616025R OR 21616025S



NOTES

1-THE HYDRAULIC BASE LINE FOR OCOTILLO WASH TIES INTO THE EXISTING RIVER MILE 1.945 PER THE FIS FLOOD PROFILE DATED SEPTEMBER 30, 2005

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
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100' 0' 100' 200'

SCALE: 1" = 100'
CONTOUR INTERVAL = 2'
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GROUND CONTROL SURVEY DATA PROVIDED BY COOPER AERIAL SURVEYS COMPANY

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1"= 100' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

COOPER AERIAL SURVEYS COMPANY

Registered Professional Engineer (Civil) CERTIFICATE NO. 35571 LINDA A. POTTER Date Signed 10-25-07 ARIZONA, U.S.A.

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

	BY	DATE
DESIGN	M. FOUNTAIN	10-25-07
DESIGN CHK.	L. POTTER	10-25-07
PLANS	MC/MF	10-25-07
PLANS CHK.	L. POTTER	10-25-07

GALLOWAY TRIBUTARIES

Table 5.9.2.1
HEC-RAS OUTPUT
FLOODWAY AND FLOODPLAIN

GWTribFPDSP.prj
HEC-RAS Plan: M4E
PF 1 = Floodplain
PF 2 = Floodway

River	Reach	River Sta	Profile #	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Galloway1	Tributary2.1	51.84	1	180	2245.89	2253.77		2253.78	0.000007	0.32	568.53	102.47	0.02
Galloway1	Tributary2.1	51.84	2	180	2245.89	2253.77		2253.78	0.000007	0.32	568.56	102.47	0.02
Galloway1	Tributary2.1	99.49	1	180	2247.19	2253.77		2253.78	0.00006	0.47	380.37	91.17	0.04
Galloway1	Tributary2.1	99.49	2	180	2247.19	2253.77		2253.78	0.00006	0.47	380.4	91.17	0.04
Galloway1	Tributary2.1	148.99	1	180	2247.99	2253.77		2253.78	0.000144	0.67	270.23	75.8	0.06
Galloway1	Tributary2.1	148.99	2	180	2247.99	2253.78		2253.78	0.000144	0.67	270.24	75.8	0.06
Galloway1	Tributary2.1	199.93	1	180	2249.04	2253.78		2253.8	0.000566	1.05	171.38	62.26	0.11
Galloway1	Tributary2.1	199.93	2	180	2249.04	2253.78		2253.8	0.000566	1.05	171.39	62.26	0.11
Galloway1	Tributary2.1	249.04	1	180	2250.56	2253.81		2253.86	0.00255	1.8	100.08	50.36	0.22
Galloway1	Tributary2.1	249.04	2	180	2250.56	2253.81		2253.86	0.002549	1.8	100.09	50.36	0.22
Galloway1	Tributary2.1	299.42	1	180	2252.29	2254.14	2254.14	2254.65	0.052171	5.77	31.18	30.78	1.01
Galloway1	Tributary2.1	299.42	2	180	2252.29	2254.14	2254.14	2254.65	0.052171	5.77	31.18	30.78	1.01
Galloway1	Tributary2.1	348.88	1	180	2253.31	2255.57	2255.09	2255.82	0.012695	3.96	45.44	33.03	0.59
Galloway1	Tributary2.1	348.88	2	180	2253.31	2255.57	2255.09	2255.82	0.012695	3.96	45.44	33.03	0.59
Galloway1	Tributary2.1	396.87	1	180	2254.88	2256.72	2256.72	2257.14	0.040295	5.23	34.43	42.55	1.02
Galloway1	Tributary2.1	396.87	2	180	2254.88	2256.72	2256.72	2257.14	0.040295	5.23	34.43	42.55	1.02
Galloway1	Tributary2.1	446.17	1	180	2257.29	2258.84	2258.84	2259.3	0.034939	5.42	33.18	37.38	1.01
Galloway1	Tributary2.1	446.17	2	180	2257.29	2258.84	2258.84	2259.3	0.034939	5.42	33.18	37.38	1.01
Galloway1	Tributary2.1	479.46	1	180	2258.74	2260.24	2260.24	2260.62	0.037461	4.94	36.4	49.34	1.01
Galloway1	Tributary2.1	479.46	2	180	2258.74	2260.24	2260.24	2260.62	0.037461	4.94	36.4	49.34	1.01
Galloway1	Tributary2.1	519.57	1	180	2259.97	2261.95	2261.95	2262.41	0.037792	5.45	33.05	37.09	1.02
Galloway1	Tributary2.1	519.57	2	180	2259.97	2261.95	2261.95	2262.41	0.037792	5.45	33.05	37.09	1.02
lloway1	Tributary2.1	549.45	1	180	2261.29	2262.93		2263.2	0.019033	4.14	43.43	45.7	0.75
loway1	Tributary2.1	549.45	2	180	2261.29	2262.93		2263.2	0.019033	4.14	43.43	45.7	0.75
Galloway1	Tributary2.1	599.63	1	180	2263.36	2264.89	2264.89	2265.32	0.037954	5.24	34.37	41.03	1.01
Galloway1	Tributary2.1	599.63	2	180	2263.36	2264.89	2264.89	2265.32	0.037954	5.24	34.37	41.03	1.01
Galloway1	Tributary2.1	648.71	1	180	2265.15	2266.63	2266.51	2266.97	0.02972	4.69	38.36	40.47	0.85
Galloway1	Tributary2.1	648.71	2	180	2265.15	2266.63	2266.51	2266.97	0.02972	4.69	38.36	40.47	0.85
Galloway1	Tributary2.1	700	1	180	2266.83	2268.59	2268.59	2269.09	0.036427	5.71	31.5	31.78	1.01
Galloway1	Tributary2.1	700	2	180	2266.83	2268.59	2268.59	2269.09	0.036427	5.71	31.5	31.78	1.01
Galloway1	Tributary2.1	749.36	1	180	2267.28	2269.98		2270.18	0.014104	3.61	49.86	42.86	0.59
Galloway1	Tributary2.1	749.36	2	180	2267.28	2269.98		2270.18	0.014104	3.61	49.86	42.86	0.59
Galloway1	Tributary2.1	798.58	1	180	2268.69	2270.79	2270.7	2271.16	0.02699	4.9	36.72	39.75	0.9
Galloway1	Tributary2.1	798.58	2	180	2268.69	2270.79	2270.7	2271.16	0.02699	4.9	36.72	39.75	0.9
Galloway1	Tributary2.1	849.6	1	180	2270.33	2272.31	2272.31	2272.9	0.031188	6.15	29.29	25.16	1
Galloway1	Tributary2.1	849.6	2	180	2270.33	2272.31	2272.31	2272.9	0.031188	6.15	29.29	25.16	1
Galloway1	Tributary2.1	901.12	1	180	2272.41	2274.14	2274.14	2274.63	0.031252	5.63	31.98	33.29	1.01
Galloway1	Tributary2.1	901.12	2	180	2272.41	2274.14	2274.14	2274.63	0.031252	5.63	31.98	33.29	1.01
Galloway1	Tributary2.1	950.21	1	180	2274.18	2276.29	2276.29	2276.72	0.036689	5.3	33.98	39.39	1
Galloway1	Tributary2.1	950.21	2	180	2274.18	2276.29	2276.29	2276.72	0.036689	5.3	33.98	39.39	1
Galloway1	Tributary2.1	999.06	1	180	2275.96	2277.96	2277.85	2278.35	0.029946	4.99	36.05	35.84	0.87
Galloway1	Tributary2.1	999.06	2	180	2275.96	2277.96	2277.85	2278.35	0.029946	4.99	36.05	35.84	0.87
Galloway1	Tributary2.1	1040.95	1	180	2278.23	2279.94	2279.94	2280.33	0.043068	4.95	36.35	50.04	1.02
Galloway1	Tributary2.1	1040.95	2	180	2278.23	2279.94	2279.94	2280.33	0.043068	4.95	36.35	50.04	1.02
Galloway1	Tributary2.1	1098.06	1	180	2280.07	2282.05	2281.95	2282.34	0.0291	4.31	41.74	51.54	0.84
Galloway1	Tributary2.1	1098.06	2	180	2280.07	2282.05	2281.95	2282.34	0.0291	4.31	41.74	51.54	0.84
Galloway1	Tributary2.1	1149.14	1	180	2281.82	2283.55	2283.5	2283.95	0.032624	5.08	35.43	40.21	0.94
lloway1	Tributary2.1	1149.14	2	180	2281.82	2283.55	2283.5	2283.95	0.032624	5.08	35.43	40.21	0.94
way1	Tributary2.1	1200.13	1	180	2283.28	2285.2	2285.1	2285.5	0.028108	4.43	40.63	49.47	0.86

Table 5.9.2.1
HEC-RAS OUTPUT
FLOODWAY AND FLOODPLAIN

River	Reach	River Sta	Profile #	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
lloway1	Tributary2.1	1200.13	2	180	2283.28	2285.2	2285.1	2285.5	0.028108	4.43	40.63	49.47	0.86
Galloway1	Tributary2.1	1249.67	1	180	2284.85	2286.59	2286.59	2287.2	0.032813	6.28	28.66	23.2	0.99
Galloway1	Tributary2.1	1249.67	2	180	2284.85	2286.59	2286.59	2287.2	0.032813	6.28	28.66	23.2	0.99
Galloway1	Tributary2.1	1299.5	1	180	2285.99	2288.04		2288.29	0.014811	3.99	45.13	37.02	0.63
Galloway1	Tributary2.1	1299.5	2	180	2285.99	2288.04		2288.29	0.014811	3.99	45.13	37.02	0.63
Galloway1	Tributary2.1	1349.34	1	180	2288.39	2289.96	2289.96	2290.49	0.035441	5.81	31	30.21	1.01
Galloway1	Tributary2.1	1349.34	2	180	2288.39	2289.96	2289.96	2290.49	0.035441	5.81	31	30.21	1.01
Galloway1	Tributary2.1	1398.57	1	180	2291.65	2293.28	2293.28	2293.67	0.040294	5.04	35.73	47.26	1.02
Galloway1	Tributary2.1	1398.57	2	180	2291.65	2293.28	2293.28	2293.67	0.040294	5.04	35.73	47.26	1.02
Galloway1	Tributary2.1	1449.01	1	180	2293.56	2295.42	2295.42	2295.96	0.042685	5.91	30.44	28.71	1.01
Galloway1	Tributary2.1	1449.01	2	180	2293.56	2295.42	2295.42	2295.96	0.042685	5.91	30.44	28.71	1.01
Galloway1	Tributary2.1	1499.97	1	180	2296.97	2298.38	2298.38	2298.79	0.039011	5.11	35.2	44.48	1.01
Galloway1	Tributary2.1	1499.97	2	180	2296.97	2298.38	2298.38	2298.79	0.039011	5.11	35.2	44.48	1.01
Galloway1	Tributary2.1	1524.43	1	180	2298.55	2299.95	2299.95	2300.39	0.040675	5.33	33.8	38.98	1.01
Galloway1	Tributary2.1	1524.43	2	180	2298.55	2299.95	2299.95	2300.39	0.040675	5.33	33.8	38.98	1.01
Galloway1	Tributary2.1	1658.06	1	180	2314.85	2316.29	2316.29	2316.55	0.042997	4.06	44.3	92.65	1.04
Galloway1	Tributary2.1	1658.06	2	180	2314.85	2316.29	2316.29	2316.55	0.042997	4.06	44.3	92.65	1.04
Galloway1	Tributary2.1	1668.4	Inl Struct										
Galloway1	Tributary2.1	1678.78	1	180	2315.62	2317.53	2316.69	2317.56	0.001511	1.45	123.77	116.77	0.25
Galloway1	Tributary2.1	1678.78	2	180	2315.62	2317.53	2316.69	2317.56	0.001511	1.45	123.77	116.77	0.25
Galloway1	Tributary2.1	1695.02	1	180	2311.84	2317.56		2317.56	0.000021	0.35	509.05	126.65	0.03
Galloway1	Tributary2.1	1695.02	2	180	2311.84	2317.56		2317.56	0.000021	0.35	509.05	126.65	0.03
Galloway1	Tributary2.1	1721.45	1	180	2307.99	2317.56		2317.56	0.000005	0.24	760.65	122.27	0.02
Galloway1	Tributary2.1	1721.45	2	180	2307.99	2317.56		2317.56	0.000005	0.24	760.65	122.27	0.02
lloway1	Tributary2.1	1748.98	1	180	2308.79	2317.56		2317.56	0.000007	0.28	631.84	102.87	0.02
loway1	Tributary2.1	1748.98	2	180	2308.79	2317.56		2317.56	0.000007	0.28	631.84	102.87	0.02
Galloway1	Tributary2.1	1799.29	1	180	2310.42	2317.56		2317.57	0.00003	0.46	391.4	80.72	0.04
Galloway1	Tributary2.1	1799.29	2	180	2310.42	2317.56		2317.57	0.00003	0.46	391.4	80.72	0.04
Galloway1	Tributary2.1	1850.25	1	180	2312.48	2317.56		2317.57	0.000419	0.99	181.08	64.39	0.1
Galloway1	Tributary2.1	1850.25	2	180	2312.48	2317.56		2317.57	0.000419	0.99	181.08	64.39	0.1
Galloway1	Tributary2.1	1898.05	1	180	2313.38	2317.57		2317.62	0.001775	1.82	99.06	45.99	0.22
Galloway1	Tributary2.1	1898.05	2	180	2313.38	2317.57		2317.62	0.001775	1.82	99.06	45.99	0.22
Galloway1	Tributary2.1	1949.36	1	180	2316.25	2317.85	2317.85	2318.32	0.030446	5.52	32.65	36.1	1.02
Galloway1	Tributary2.1	1949.36	2	180	2316.25	2317.85	2317.85	2318.32	0.030446	5.52	32.65	36.1	1.02
Galloway1	Tributary2.1	1999.51	1	180	2318.65	2319.93	2319.93	2320.41	0.029487	5.54	32.5	35.48	1.01
Galloway1	Tributary2.1	1999.51	2	180	2318.65	2319.93	2319.93	2320.41	0.029487	5.54	32.5	35.48	1.01
Galloway1	Tributary2.1	2049.22	1	180	2320.26	2321.65	2321.65	2322.13	0.029725	5.55	32.45	35.73	1.01
Galloway1	Tributary2.1	2049.22	2	180	2320.26	2321.65	2321.65	2322.13	0.029725	5.55	32.45	35.73	1.01
Galloway1	Tributary2.1	2098.99	1	180	2321.35	2323.1	2323.1	2323.62	0.027966	5.8	31.06	31.46	1.01
Galloway1	Tributary2.1	2098.99	2	180	2321.35	2323.1	2323.1	2323.62	0.027966	5.8	31.06	31.46	1.01
Galloway1	Tributary2.1	2150.08	1	180	2323.15	2324.69	2324.68	2325.14	0.031341	5.34	33.75	38.15	0.99
Galloway1	Tributary2.1	2150.08	2	180	2323.15	2324.69	2324.68	2325.14	0.031341	5.34	33.75	38.15	0.99
Galloway1	Tributary2.1	2199.3	1	180	2325.57	2327.08	2327.08	2327.43	0.029434	4.74	37.99	56.35	1.01
Galloway1	Tributary2.1	2199.3	2	180	2325.57	2327.08	2327.08	2327.43	0.029434	4.74	37.99	56.35	1.01
Galloway1	Tributary2.1	2325.23	1	180	2339.31	2342.34	2342.34	2343.15	0.02693	7.24	24.92	16.4	1.01
Galloway1	Tributary2.1	2325.23	2	180	2339.31	2342.34	2342.34	2343.15	0.02693	7.24	24.92	16.4	1.01
Galloway1	Tributary2.1	2330.42	Inl Struct										
Galloway1	Tributary2.1	2334.18	1	180	2339.87	2343.32	2342.76	2343.68	0.009454	4.8	37.63	21.61	0.62
Galloway1	Tributary2.1	2334.18	2	180	2339.87	2343.32	2342.76	2343.68	0.009454	4.8	37.63	21.61	0.62
loway1	Tributary2.1	2346.04	1	180	2340.1	2343.72		2343.72	0.000039	0.36	497.03	190.43	0.04
oway1	Tributary2.1	2346.04	2	180	2340.1	2343.72		2343.72	0.000039	0.36	497.03	190.43	0.04

Table 5.9.2.1
HEC-RAS OUTPUT
FLOODWAY AND FLOODPLAIN

River	Reach	River Sta	Profile #	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
loway1	Tributary2.1	2367.96	1	180	2334.45	2343.72		2343.72	0.000002	0.14	1293.42	191.52	0.01
Galloway1	Tributary2.1	2367.96	2	180	2334.45	2343.72		2343.72	0.000002	0.14	1293.42	191.52	0.01
Galloway1	Tributary2.1	2399.52	1	180	2333.21	2343.72		2343.72	0.000001	0.13	1437.71	180.36	0.01
Galloway1	Tributary2.1	2399.52	2	180	2333.21	2343.72		2343.72	0.000001	0.13	1437.71	180.36	0.01
Galloway1	Tributary2.1	2448.75	1	180	2333.49	2343.72		2343.72	0.000004	0.19	924.55	129.57	0.01
Galloway1	Tributary2.1	2448.75	2	180	2333.49	2343.72		2343.72	0.000004	0.19	924.55	129.57	0.01
Galloway1	Tributary2.1	2500.27	1	180	2335.01	2343.72		2343.72	0.000024	0.35	510.95	104.34	0.03
Galloway1	Tributary2.1	2500.27	2	180	2335.01	2343.72		2343.72	0.000024	0.35	510.95	104.34	0.03
Galloway1	Tributary2.1	2550.01	1	180	2336.34	2343.72		2343.72	0.000101	0.57	316.35	78.19	0.05
Galloway1	Tributary2.1	2550.01	2	180	2336.34	2343.72		2343.72	0.000101	0.57	316.35	78.19	0.05
Galloway1	Tributary2.1	2599.7	1	180	2337.49	2343.72		2343.74	0.000379	0.94	190.84	58.16	0.09
Galloway1	Tributary2.1	2599.7	2	180	2337.49	2343.72		2343.74	0.000379	0.94	190.84	58.16	0.09
Galloway1	Tributary2.1	2649.51	1	180	2339.33	2343.74		2343.77	0.001301	1.47	122.38	48.4	0.16
Galloway1	Tributary2.1	2649.51	2	180	2339.33	2343.74		2343.77	0.001301	1.47	122.38	48.4	0.16
Galloway2	Tributary2.2	1.65	1	579	2139.91	2145.23	2145.23	2146.57	0.023307	9.29	62.31	23.28	1
Galloway2	Tributary2.2	1.65	2	579	2139.91	2146.23	2145.23	2146.93	0.008915	6.72	86.21	23.95	0.62
Galloway2	Tributary2.2	48.99	1	579	2141.53	2146.71		2147.42	0.011765	6.86	92.29	39.75	0.62
Galloway2	Tributary2.2	48.99	2	579	2141.53	2146.7		2147.46	0.012386	7.03	83.81	22.55	0.63
Galloway2	Tributary2.2	97.12	1	579	2142.34	2147.62		2147.9	0.007363	4.5	166.15	115.33	0.44
Galloway2	Tributary2.2	97.12	2	579	2142.34	2147.68		2148.04	0.010055	4.88	125.22	42.4	0.47
Galloway2	Tributary2.2	149.4	1	579	2143.82	2147.98		2148.51	0.015037	6.3	115.73	96.03	0.8
Galloway2	Tributary2.2	149.4	2	579	2143.82	2148.12		2148.85	0.018201	6.87	84.23	40.33	0.84
Galloway2	Tributary2.2	198.8	1	579	2146.06	2148.68	2148.59	2149.26	0.016697	6.57	114.51	86.52	0.85
Galloway2	Tributary2.2	198.8	2	579	2146.06	2149.01	2148.69	2149.67	0.014835	6.51	88.94	40.73	0.78
lloway2	Tributary2.2	249.17	1	579	2146.59	2149.52	2149.48	2150.41	0.025408	7.94	82.58	54.52	1.04
oway2	Tributary2.2	249.17	2	579	2146.59	2149.75	2149.75	2150.77	0.025823	8.1	71.49	35.13	1
Galloway2	Tributary2.2	301.42	1	579	2146.87	2150.76		2151.18	0.007957	5.67	126.74	73.05	0.59
Galloway2	Tributary2.2	301.42	2	579	2146.87	2151.03		2151.74	0.013131	6.74	85.93	27.07	0.67
Galloway2	Tributary2.2	349.19	1	579	2147.15	2151.35	2151.35	2152.14	0.014354	7.74	112.3	84.04	0.74
Galloway2	Tributary2.2	349.19	2	579	2147.15	2151.59		2152.47	0.015556	7.87	88.57	34.26	0.72
Galloway2	Tributary2.2	400.73	1	579	2147.95	2152.26	2151.8	2152.96	0.017206	6.97	98.96	56.25	0.69
Galloway2	Tributary2.2	400.73	2	579	2147.95	2152.65	2151.69	2153.35	0.016606	6.7	86.44	24.17	0.62
Galloway2	Tributary2.2	450.71	1	579	2149.34	2153.18	2152.75	2153.63	0.010234	5.6	115.14	79.76	0.65
Galloway2	Tributary2.2	450.71	2	579	2149.34	2153.51	2152.72	2153.93	0.007808	5.26	111.88	43.92	0.57
Galloway2	Tributary2.2	502.28	1	579	2149.04	2153.95	2153.58	2154.25	0.015011	4.5	133.85	118.06	0.72
Galloway2	Tributary2.2	502.28	2	579	2149.04	2154.16	2153.61	2154.43	0.011837	4.21	137.53	97.83	0.63
Galloway2	Tributary2.2	549.8	1	579	2150.36	2154.61	2154.22	2154.87	0.011799	4.03	146.94	129.22	0.63
Galloway2	Tributary2.2	549.8	2	579	2150.36	2154.75	2154.46	2155.08	0.015106	4.65	124.75	89.61	0.69
Galloway2	Tributary2.2	600.23	1	579	2151.13	2155.29	2155.09	2155.63	0.018618	4.94	131.97	123.22	0.77
Galloway2	Tributary2.2	600.23	2	579	2151.13	2155.51	2155.27	2155.96	0.018612	5.36	108.56	71.78	0.77
Galloway2	Tributary2.2	652.61	1	579	2152	2156.03	2155.48	2156.41	0.012654	5.03	126.4	101.69	0.67
Galloway2	Tributary2.2	652.61	2	579	2152	2156.33	2155.46	2156.62	0.008794	4.35	137.67	75.6	0.56
Galloway2	Tributary2.2	678.38	1	579	2152.96	2156.41	2155.82	2156.71	0.009944	4.51	144.09	122.05	0.6
Galloway2	Tributary2.2	678.38	2	579	2152.96	2156.6	2155.79	2156.86	0.009679	4.16	142.56	91.25	0.59
Galloway2	Tributary2.2	699.26	1	579	2153.54	2156.73	2155.78	2156.9	0.007022	3.39	184.71	166.42	0.49
Galloway2	Tributary2.2	699.26	2	579	2153.54	2156.87	2155.78	2157.03	0.005608	3.21	182.17	112.88	0.45
Galloway2	Tributary2.2	721.95	Culvert										
Galloway2	Tributary2.2	731.57	1	579	2156.2	2158.52	2157.52	2158.57	0.001058	1.93	314.5	204.42	0.26
Galloway2	Tributary2.2	731.57	2	579	2156.2	2158.74	2157.64	2158.83	0.001309	2.29	252.83	130.18	0.29
loway2	Tributary2.2	743.18	1	579	2155.79	2158.51	2157.39	2158.59	0.001205	2.29	261.17	160.83	0.29
oway2	Tributary2.2	743.18	2	579	2155.79	2158.78	2157.39	2158.84	0.000774	2	298.27	149.97	0.24

Table 5.9.2.1
HEC-RAS OUTPUT
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River	Reach	River Sta	Profile #	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
'loway2	Tributary2.2	805.12	Culvert										
Galloway2	Tributary2.2	826.23	1	579	2158.56	2161.33	2161.33	2161.53	0.016375	3.64	159.24	109.18	0.53
Galloway2	Tributary2.2	826.23	2	579	2158.56	2161.33	2161.33	2161.53	0.016375	3.64	159.24	109.18	0.53
Galloway2	Tributary2.2	848.99	1	579	2157.2	2161.55		2161.76	0.006558	3.71	162.95	87.84	0.46
Galloway2	Tributary2.2	848.99	2	579	2157.2	2161.56		2161.79	0.007681	3.8	152.56	75.07	0.47
Galloway2	Tributary2.2	898.04	1	579	2157.93	2161.81		2162.05	0.005098	3.94	155.07	75.7	0.44
Galloway2	Tributary2.2	898.04	2	579	2157.93	2161.86		2162.1	0.005226	3.96	146.14	57.63	0.44
Galloway2	Tributary2.2	950.14	1	579	2159.53	2162.12		2162.49	0.013321	4.99	123.42	66.26	0.61
Galloway2	Tributary2.2	950.14	2	579	2159.53	2162.16		2162.58	0.015038	5.19	111.49	52.1	0.63
Galloway2	Tributary2.2	999.47	1	579	2159.86	2162.89	2162.89	2163.74	0.018189	8.06	95.58	59.23	0.91
Galloway2	Tributary2.2	999.47	2	579	2159.86	2163.07	2163.07	2164.41	0.024485	9.28	62.4	23.66	1.01
Galloway2	Tributary2.2	1049.33	1	579	2160.58	2164	2164	2164.87	0.027834	7.8	87.16	56.56	0.87
Galloway2	Tributary2.2	1049.33	2	579	2160.58	2164.85	2163.95	2165.5	0.017404	6.47	89.42	26.79	0.62
Galloway2	Tributary2.2	1100.11	1	579	2161.18	2165.11		2165.21	0.002415	2.94	254.62	104.51	0.29
Galloway2	Tributary2.2	1100.11	2	579	2161.18	2165.71		2165.94	0.004449	3.83	151.02	39.16	0.34
Galloway2	Tributary2.2	1148.77	1	579	2161.44	2165.19		2165.28	0.000935	2.65	292.29	128.22	0.27
Galloway2	Tributary2.2	1148.77	2	579	2161.44	2165.9		2166.05	0.001164	3.09	187.47	51.18	0.28
Galloway2	Tributary2.2	1199.79	1	579	2162.54	2164.99	2164.99	2165.59	0.011721	6.77	104.56	98.36	0.87
Galloway2	Tributary2.2	1199.79	2	579	2162.54	2165.72		2166.3	0.007003	6.07	95.32	36.49	0.66
Galloway2	Tributary2.2	1222.37	Inl Struct										
Galloway2	Tributary2.2	1250.1	1	579	2164.24	2166.93	2166.34	2167.15	0.005528	3.76	154.2	104.19	0.54
Galloway2	Tributary2.2	1250.1	2	579	2164.24	2166.93	2166.34	2167.15	0.005528	3.76	154.2	104.19	0.54
Galloway2	Tributary2.2	1304.43	1	579	2164.88	2167.17		2167.55	0.010489	5.16	119.61	87.64	0.7
Galloway2	Tributary2.2	1304.43	2	579	2164.88	2167.24	2167.24	2168.14	0.023251	7.62	75.95	42.83	1.01
'loway2	Tributary2.2	1350.06	1	579	2165.54	2167.7	2167.7	2168.37	0.018454	7.33	106.64	83.68	1
.oway2	Tributary2.2	1350.06	2	579	2165.54	2168.2	2168	2169.03	0.01631	7.31	79.16	36.49	0.88
Galloway2	Tributary2.2	1400.52	1	579	2166.04	2168.64	2168.62	2169.41	0.021614	7.45	97.17	69.09	0.92
Galloway2	Tributary2.2	1400.52	2	579	2166.04	2169.11		2169.84	0.015459	6.84	84.68	33.56	0.76
Galloway2	Tributary2.2	1449.27	1	579	2166.45	2170.04		2170.37	0.016829	5.03	140.02	87.44	0.57
Galloway2	Tributary2.2	1449.27	2	579	2166.45	2170.28		2170.68	0.017682	5.19	117.81	48.54	0.56
Galloway2	Tributary2.2	1498.71	1	579	2166.96	2170.5		2170.92	0.008207	5.54	134.99	96.4	0.71
Galloway2	Tributary2.2	1498.71	2	579	2166.96	2170.82		2171.26	0.008622	5.36	110.13	50.7	0.63
Galloway2	Tributary2.2	1548.81	1	579	2167.48	2171.2		2171.58	0.024461	5.18	128.15	91.36	0.66
Galloway2	Tributary2.2	1548.81	2	579	2167.48	2171.54		2171.86	0.017099	4.64	132.17	64.35	0.54
Galloway2	Tributary2.2	1599.18	1	579	2168.3	2171.94	2171.94	2172.61	0.010231	6.88	105.79	80.78	0.97
Galloway2	Tributary2.2	1599.18	2	579	2168.3	2172	2172	2172.82	0.014066	7.27	79.66	48.89	1
Galloway2	Tributary2.2	1651.43	1	579	2168.74	2173.01		2173.45	0.028411	5.44	116.34	73.57	0.66
Galloway2	Tributary2.2	1651.43	2	579	2168.74	2173.37		2173.72	0.019349	4.8	124.72	54.77	0.54
Galloway2	Tributary2.2	1700.68	1	579	2169.82	2173.86		2174.15	0.008624	4.43	147.68	80.08	0.48
Galloway2	Tributary2.2	1700.68	2	579	2169.82	2174.01		2174.32	0.008522	4.43	130.6	45.96	0.46
Galloway2	Tributary2.2	1799.36	1	579	2171.94	2175.05		2175.2	0.018668	2.76	189.42	141.5	0.46
Galloway2	Tributary2.2	1799.36	2	579	2171.94	2175.42		2175.64	0.024589	3.81	152.85	98.78	0.55
Galloway2	Tributary2.2	1850.51	1	579	2172.73	2175.6		2175.74	0.013213	2.05	205.96	145.79	0.37
Galloway2	Tributary2.2	1850.51	2	579	2172.73	2176.42		2176.59	0.015325	3.32	175.06	95.18	0.44
Galloway2	Tributary2.2	1900.23	1	579	2173.69	2176.2		2176.37	0.016929	3.54	171.44	139.7	0.71
Galloway2	Tributary2.2	1900.23	2	579	2173.69	2177.12		2177.4	0.016314	4.29	138.51	81.13	0.58
Galloway2	Tributary2.2	1949.31	1	579	2175.05	2177.66		2177.89	0.026648	4.35	151.91	130.44	0.77
Galloway2	Tributary2.2	1949.31	2	579	2175.05	2178.17		2178.51	0.026012	4.89	127.07	85.83	0.71
lloway2	Tributary2.2	1998.81	1	579	2176.16	2178.56		2178.77	0.022895	4.08	159.33	129.59	0.71
loway2	Tributary2.2	1998.81	2	579	2176.16	2179.19		2179.45	0.017906	4.35	143.64	84.02	0.6

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lloway2	Tributary2.2	2049.56	1	579	2177.18	2179.89		2180.04	0.013889	3.52	189.81	129.29	0.5
lloway2	Tributary2.2	2049.56	2	579	2177.18	2180.26		2180.65	0.024101	5.02	115.25	62.41	0.65
Galloway2	Tributary2.2	2100.01	1	579	2177.98	2180.94	2180.84	2181.47	0.042329	6.91	115.22	91.86	0.85
Galloway2	Tributary2.2	2100.01	2	579	2177.98	2181.5		2182.38	0.040523	7.8	78.88	30.7	0.85
Galloway2	Tributary2.2	2149.23	1	579	2178.69	2182.84	2182.29	2183.1	0.017129	4.67	157.01	95.74	0.54
Galloway2	Tributary2.2	2149.23	2	579	2178.69	2183.36		2183.76	0.017024	5.26	118.5	45.32	0.55
Galloway2	Tributary2.2	2198.42	1	579	2179.03	2183.24		2183.79	0.016147	6.75	127.45	85.49	0.74
Galloway2	Tributary2.2	2198.42	2	579	2179.03	2183.88		2184.65	0.016334	7.09	84.25	26.34	0.69
Galloway2	Tributary2.2	2251.35	1	579	2180.4	2184.05		2184.84	0.023765	8.02	109.65	83.61	0.87
Galloway2	Tributary2.2	2251.35	2	579	2180.4	2184.75		2185.81	0.025778	8.25	70.2	20.95	0.79
Galloway2	Tributary2.2	2300.64	1	579	2181.08	2185.45		2185.78	0.015121	5.39	152.51	94.07	0.55
Galloway2	Tributary2.2	2300.64	2	579	2181.08	2186.24		2186.72	0.012764	5.79	110.65	31.17	0.53
Galloway2	Tributary2.2	2350.01	1	579	2182.6	2185.96		2186.64	0.014461	6.96	104.77	61.14	0.73
Galloway2	Tributary2.2	2350.01	2	579	2182.6	2186.73		2187.32	0.010369	6.19	93.5	26.01	0.58
Galloway2	Tributary2.2	2398.77	1	579	2184.69	2186.99	2186.99	2187.76	0.027425	7.53	97.2	74.48	0.92
Galloway2	Tributary2.2	2398.77	2	579	2184.69	2187.26	2187.13	2188.25	0.030527	8	72.35	31.03	0.92
Galloway2	Tributary2.2	2449.58	1	579	2185.48	2188.35		2188.58	0.01088	4.17	170.28	117.38	0.53
Galloway2	Tributary2.2	2449.58	2	579	2185.48	2188.81		2189.06	0.008409	4.05	143.12	60.06	0.46
Galloway2	Tributary2.2	2500.04	1	579	2186.7	2189.17		2189.47	0.017412	3.64	143.04	105.81	0.51
Galloway2	Tributary2.2	2500.04	2	579	2186.7	2189.43		2189.79	0.026659	4.83	119.86	65.71	0.63
Galloway2	Tributary2.2	2549.84	1	579	2188.49	2190.32		2190.79	0.042058	5.88	110.07	91	0.89
Galloway2	Tributary2.2	2549.84	2	579	2188.49	2190.75		2191.22	0.029522	5.5	105.36	59.42	0.73
Galloway2	Tributary2.2	2599.75	1	579	2189.14	2191.92	2191.92	2192.76	0.024072	7.74	91.53	61.43	0.94
Galloway2	Tributary2.2	2599.75	2	579	2189.14	2192.01	2192.01	2193.11	0.029511	8.41	68.82	31.61	1
alloway2	Tributary2.2	2648.64	1	579	2189.86	2192.99		2193.47	0.009115	6.23	128.85	82.79	0.77
lloway2	Tributary2.2	2648.64	2	579	2189.86	2193.2	2193.02	2194.07	0.013467	7.46	77.59	34.9	0.88
loway2	Tributary2.2	2700.26	1	579	2191.68	2194.64	2194.64	2195.28	0.010871	7.61	144.56	112.69	0.84
Galloway2	Tributary2.2	2700.26	2	579	2191.68	2194.97	2194.97	2196.43	0.015874	9.71	59.65	20.67	1.01
Galloway2	Tributary2.2	2748.93	1	579	2192.77	2195.86	2195.86	2196.52	0.012827	7.57	132.63	102.05	0.86
Galloway2	Tributary2.2	2748.93	2	579	2192.77	2196.17	2196.17	2197.55	0.022059	9.43	61.41	22.5	1.01
Galloway2	Tributary2.2	2800.47	1	579	2193.76	2196.86	2196.86	2197.65	0.013446	8.04	122.38	99.78	0.87
Galloway2	Tributary2.2	2800.47	2	579	2193.76	2197.33	2197.1	2198.58	0.017828	8.97	64.56	20.72	0.9
Galloway2	Tributary2.2	2849.49	1	579	2194.93	2198.05	2198.05	2198.97	0.015817	8.73	108.85	69.99	0.89
Galloway2	Tributary2.2	2849.49	2	579	2194.93	2198.36	2198.36	2200.01	0.028437	10.3	56.19	17.2	1
Galloway2	Tributary2.2	2901.88	1	579	2196.79	2199.47	2199.47	2200.38	0.01824	8.13	96.75	69.74	0.93
Galloway2	Tributary2.2	2901.88	2	579	2196.79	2200.25		2201.03	0.012152	7.05	82.09	25.9	0.7
Galloway2	Tributary2.2	2935.93	1	579	2198.78	2200.78	2200.78	2201.41	0.020639	7.09	98.52	83.83	0.94
Galloway2	Tributary2.2	2935.93	2	579	2198.78	2201.19	2201.19	2202.28	0.025536	8.39	68.98	31.79	1
Galloway2	Tributary2.2	2955.8	Inl Struct										
Galloway2	Tributary2.2	2971.59	1	579	2200.25	2203.26	2202.28	2203.4	0.003287	2.98	194.61	111.38	0.4
Galloway2	Tributary2.2	2971.59	2	579	2200.25	2203.25	2202.28	2203.39	0.003315	2.98	194.01	111.28	0.4
Galloway2	Tributary2.2	2999.06	1	579	2200.36	2203.3		2203.55	0.006329	4.02	143.87	76.44	0.52
Galloway2	Tributary2.2	2999.06	2	579	2200.36	2203.3		2203.55	0.006375	4.03	143.52	76.39	0.52
Galloway2	Tributary2.2	3048.61	1	579	2200.48	2203.66		2203.96	0.010111	4.38	139.91	76.79	0.53
Galloway2	Tributary2.2	3048.61	2	579	2200.48	2203.66		2203.98	0.011267	4.5	128.72	60.65	0.54
Galloway2	Tributary2.2	3099.58	1	579	2201.29	2204.35	2204.35	2205.09	0.017762	7.83	109.38	73.08	0.93
Galloway2	Tributary2.2	3099.58	2	579	2201.29	2204.67	2204.67	2205.97	0.023518	9.13	63.4	24.93	1.01
Galloway2	Tributary2.2	3150.83	1	579	2202.38	2205.39		2206.14	0.018117	7.82	104.44	63.18	0.89
Galloway2	Tributary2.2	3150.83	2	579	2202.38	2206.03	2205.64	2207.04	0.017795	8.09	71.61	23.65	0.82
lloway2	Tributary2.2	3199.35	1	579	2203.02	2206.21		2206.98	0.017973	7.73	98.25	61.47	0.87
loway2	Tributary2.2	3199.35	2	579	2203.02	2207		2207.87	0.015766	7.48	77.42	23.91	0.73

Table 5.9.2.1
HEC-RAS OUTPUT
FLOODWAY AND FLOODPLAIN

River	Reach	River Sta	Profile #	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
alloway2	Tributary2.2	3249.78	1	579	2204.15	2207.12	2207.12	2208.08	0.01846	8.76	91.98	51.71	0.98
lloway2	Tributary2.2	3249.78	2	579	2204.15	2207.55	2207.55	2209.01	0.022852	9.71	59.65	20.41	1
Galloway2	Tributary2.2	3300.27	1	579	2204.93	2208.24	2208.24	2209.23	0.014239	8.85	90.97	51.41	0.94
Galloway2	Tributary2.2	3300.27	2	579	2204.93	2208.58	2208.56	2210.12	0.020118	9.95	58.22	18.65	0.99
Galloway2	Tributary2.2	3349.93	1	579	2205.63	2209.12	2209.12	2210.08	0.013444	8.68	90.38	50.13	0.9
Galloway2	Tributary2.2	3349.93	2	579	2205.63	2209.85		2210.82	0.008845	8.16	79.07	22.92	0.75
Galloway2	Tributary2.2	3400.58	1	579	2206.77	2210.09		2210.68	0.010192	6.69	105.66	56.06	0.74
Galloway2	Tributary2.2	3400.58	2	579	2206.77	2210.58		2211.39	0.014201	7.21	80.32	26.56	0.73
Galloway2	Tributary2.2	3449.68	1	579	2207.6	2211.16	2211.16	2212.11	0.014679	8.72	100.37	59.98	0.95
Galloway2	Tributary2.2	3449.68	2	579	2207.6	2211.52	2211.52	2213.03	0.021421	9.86	58.73	19.69	1.01
Galloway2	Tributary2.2	3499.86	1	579	2208.74	2212.25	2212.25	2213.24	0.015661	8.29	88.14	57.15	0.9
Galloway2	Tributary2.2	3499.86	2	579	2208.74	2213		2213.76	0.008781	6.98	82.9	24.58	0.67
Galloway2	Tributary2.2	3549.97	1	579	2209.77	2213.34	2213.34	2214.41	0.016656	8.8	84.05	51.71	0.91
Galloway2	Tributary2.2	3549.97	2	579	2209.77	2213.4	2213.4	2214.89	0.026013	9.81	58.99	19.93	1.01
Galloway2	Tributary2.2	3599.58	1	579	2211.94	2214.66		2215.07	0.009226	5.67	124.95	75.39	0.66
Galloway2	Tributary2.2	3599.58	2	579	2211.94	2215.16		2215.74	0.010061	6.15	94.22	33.36	0.64
Galloway2	Tributary2.2	3649.93	1	579	2213.41	2216.03	2216.03	2216.69	0.035178	7.2	100.17	84.32	0.99
Galloway2	Tributary2.2	3649.93	2	579	2213.41	2216.52	2216.52	2217.61	0.037985	8.39	69.05	32.25	1.01
Galloway2	Tributary2.2	3699.41	1	579	2215.06	2217.5		2217.93	0.01791	5.88	127.41	86.45	0.72
Galloway2	Tributary2.2	3699.41	2	579	2215.06	2218.22		2218.81	0.015723	6.2	94.45	33.67	0.65
Galloway2	Tributary2.2	3750.49	1	579	2215.9	2218.29		2218.93	0.021038	7.31	108.53	78.16	0.92
Galloway2	Tributary2.2	3750.49	2	579	2215.9	2218.86	2218.63	2219.83	0.020223	7.92	73.14	28.67	0.87
Galloway2	Tributary2.2	3799.2	1	579	2217.44	2219.61	2219.61	2220.41	0.01999	7.59	85.7	57.51	0.94
Galloway2	Tributary2.2	3799.2	2	579	2217.44	2219.87	2219.75	2220.84	0.021338	7.92	73.14	32.26	0.93
Galloway2	Tributary2.2	3849.68	1	579	2218.8	2220.91	2220.91	2221.42	0.023233	6.39	105.88	103.26	0.96
alloway2	Tributary2.2	3849.68	2	579	2218.8	2221.36	2221.36	2222.3	0.025857	7.78	74.46	40.42	1.01
loway2	Tributary2.2	3897.87	1	579	2220.7	2222.18	2222.18	2222.75	0.02695	5.91	97.26	86.53	0.98
Galloway2	Tributary2.2	3897.87	2	579	2220.7	2222.73	2222.7	2223.55	0.0254	7.26	79.78	47.4	0.99
Galloway2	Tributary2.2	3949.48	1	579	2221.61	2224.12	2224.12	2224.85	0.022206	7.38	89.07	62.76	0.97
Galloway2	Tributary2.2	3949.48	2	579	2221.61	2224.58	2224.58	2225.73	0.02609	8.58	67.46	30.04	1.01
Galloway2	Tributary2.2	3999.05	1	579	2222.66	2225.6	2225.6	2226.48	0.018073	8.2	82.31	48.18	0.93
Galloway2	Tributary2.2	3999.05	2	579	2222.66	2225.98	2225.98	2227.38	0.026059	9.52	60.79	21.61	1
Galloway2	Tributary2.2	4050.06	1	579	2223.87	2226.87	2226.87	2227.6	0.016593	7.61	93.53	65.29	0.88
Galloway2	Tributary2.2	4050.06	2	579	2223.87	2227.48		2228.5	0.017341	8.11	71.42	24.34	0.83
Galloway2	Tributary2.2	4100.09	1	579	2225.35	2228.11	2228.11	2228.79	0.019897	7.29	92.34	68.98	0.93
Galloway2	Tributary2.2	4100.09	2	579	2225.35	2228.45	2228.45	2229.6	0.026127	8.6	67.34	29.94	1.01
Galloway2	Tributary2.2	4149.84	1	579	2226.24	2229.07	2229.07	2229.84	0.015992	7.67	88.69	55.75	0.87
Galloway2	Tributary2.2	4149.84	2	579	2226.24	2229.64		2230.65	0.016982	8.08	71.65	23.96	0.82
Galloway2	Tributary2.2	4198.92	1	579	2228.18	2231.07	2231.07	2231.79	0.020687	7.4	87.74	59.22	0.94
Galloway2	Tributary2.2	4198.92	2	579	2228.18	2231.48	2231.48	2232.66	0.024765	8.73	66.3	28.58	1.01
Galloway2	Tributary2.2	4249.63	1	579	2230.46	2232.63	2232.63	2233.44	0.021604	7.88	86.26	57.59	0.98
Galloway2	Tributary2.2	4249.63	2	579	2230.46	2233.13	2233.13	2234.39	0.02629	9.01	64.29	25.77	1
Galloway2	Tributary2.2	4302.3	1	579	2231.17	2233.99	2233.99	2234.79	0.01858	7.93	89.07	57.98	0.93
Galloway2	Tributary2.2	4302.3	2	579	2231.17	2234.46	2234.34	2235.67	0.022584	8.82	65.62	23.91	0.94
Galloway2	Tributary2.2	4350.09	1	579	2232.13	2235.14	2234.96	2235.63	0.013489	6.21	110.88	83.46	0.77
Galloway2	Tributary2.2	4350.09	2	579	2232.13	2235.83		2236.51	0.012521	6.62	87.44	32.46	0.71
Galloway2	Tributary2.2	4399.58	1	579	2233.48	2235.77	2235.77	2236.41	0.018875	7.18	99.42	80.95	0.91
Galloway2	Tributary2.2	4399.58	2	579	2233.48	2236.39		2237.35	0.018951	7.86	73.63	28.92	0.87
Galloway2	Tributary2.2	4447.51	1	579	2234.41	2237.08	2237.08	2237.78	0.021117	7.36	90.55	64.37	0.95
Galloway2	Tributary2.2	4447.51	2	579	2234.41	2237.51	2237.51	2238.67	0.026138	8.64	67.05	29.52	1.01
lloway2	Tributary2.2	4499.73	1	579	2236.29	2238.8	2238.8	2239.53	0.018909	7.68	102.31	76.86	0.93
oway2	Tributary2.2	4499.73	2	579	2236.29	2239.18	2239.18	2240.44	0.026065	9.03	64.13	25.61	1.01

Table 5.9.2.1
HEC-RAS OUTPUT
FLOODWAY AND FLOODPLAIN

River	Reach	River Sta	Profile #	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
loway2	Tributary2.2	4549.5	1	579	2237.15	2239.94		2240.31	0.013488	5.55	136.11	91.51	0.66
alloway2	Tributary2.2	4549.5	2	579	2237.15	2240.81		2241.27	0.009906	5.53	111.2	37.22	0.56
Galloway2	Tributary2.2	4599.88	1	579	2237.82	2240.7	2240.7	2241.56	0.016376	8.15	86.29	52.52	0.89
Galloway2	Tributary2.2	4599.88	2	579	2237.82	2240.96	2240.96	2242.4	0.026683	9.63	60.14	21.07	1
Galloway2	Tributary2.2	4650.25	1	579	2239.61	2242.23	2242.23	2243.06	0.01895	7.91	83.79	52.19	0.93
Galloway2	Tributary2.2	4650.25	2	579	2239.61	2242.53	2242.53	2243.81	0.0258	9.08	63.77	25.23	1.01
Galloway2	Tributary2.2	4732.87	1	579	2249.03	2251.81	2251.81	2252.32	0.036639	5.71	101.46	103.63	1.02
Galloway2	Tributary2.2	4732.87	2	579	2249.03	2251.81	2251.81	2252.32	0.036725	5.71	101.36	103.57	1.02
Galloway2	Tributary2.2	4747.72	Inl Struct										
Galloway2	Tributary2.2	4762.7	1	579	2249.37	2253.72	2252.12	2253.76	0.001131	1.74	333.13	159.19	0.21
Galloway2	Tributary2.2	4762.7	2	579	2249.37	2253.72	2252.12	2253.77	0.00113	1.74	333.17	159.19	0.21
Galloway2	Tributary2.2	4777.8	1	579	2247.92	2253.76		2253.77	0.000082	0.87	664.36	160.17	0.08
Galloway2	Tributary2.2	4777.8	2	579	2247.92	2253.76		2253.77	0.000082	0.87	664.4	160.17	0.08
Galloway2	Tributary2.2	4799.61	1	579	2244.7	2253.77		2253.77	0.000037	0.6	964.19	149.77	0.04
Galloway2	Tributary2.2	4799.61	2	579	2244.7	2253.77		2253.77	0.000037	0.6	964.23	149.77	0.04
Galloway3	Tributary2A.1	49.46	1	81	2270.66	2277.25		2277.26	0.000006	0.19	437.25	93.35	0.02
Galloway3	Tributary2A.1	49.46	2	81	2270.66	2277.25		2277.26	0.000006	0.19	437.25	93.35	0.02
Galloway3	Tributary2A.1	100.05	1	81	2274.3	2277.24		2277.27	0.001482	1.37	59.32	40.09	0.2
Galloway3	Tributary2A.1	100.05	2	81	2274.3	2277.24		2277.27	0.001482	1.37	59.32	40.09	0.2
Galloway3	Tributary2A.1	148.26	1	81	2276.37	2277.82	2277.82	2278.19	0.044218	4.86	16.67	23.16	1.01
Galloway3	Tributary2A.1	148.26	2	81	2276.37	2277.82	2277.82	2278.19	0.044218	4.86	16.67	23.16	1.01
Galloway3	Tributary2A.1	200.06	1	81	2278.41	2280	2279.91	2280.4	0.040821	5.1	15.87	15.82	0.9
Galloway3	Tributary2A.1	200.06	2	81	2278.41	2280	2279.91	2280.4	0.040821	5.1	15.87	15.82	0.9
alloway3	Tributary2A.1	249.3	1	81	2281.15	2282.87	2282.87	2283.38	0.030692	5.73	14.13	14.04	1.01
loway3	Tributary2A.1	249.3	2	81	2281.15	2282.87	2282.87	2283.38	0.030692	5.73	14.13	14.04	1.01
loway3	Tributary2A.1	300.43	1	81	2283.64	2285.58	2285.58	2286.1	0.038212	5.77	14.03	13.66	1
Galloway3	Tributary2A.1	300.43	2	81	2283.64	2285.58	2285.58	2286.1	0.038212	5.77	14.03	13.66	1
Galloway3	Tributary2A.1	349.82	1	81	2285.84	2287.85	2287.85	2288.37	0.030145	5.81	13.95	13.54	1.01
Galloway3	Tributary2A.1	349.82	2	81	2285.84	2287.85	2287.85	2288.37	0.030145	5.81	13.95	13.54	1.01
Galloway3	Tributary2A.1	399.72	1	81	2288.97	2290.77	2290.77	2291.21	0.051547	5.32	15.22	17.74	1.01
Galloway3	Tributary2A.1	399.72	2	81	2288.97	2290.77	2290.77	2291.21	0.051547	5.32	15.22	17.74	1.01
Galloway3	Tributary2A.1	597.02	1	81	2313.21	2314.01	2314.01	2314.22	0.051253	3.71	21.82	52.66	1.02
Galloway3	Tributary2A.1	597.02	2	81	2313.21	2314.01	2314.01	2314.22	0.051253	3.71	21.82	52.66	1.02
Galloway3	Tributary2A.1	604.11	Inl Struct										
Galloway3	Tributary2A.1	613.42	1	81	2312.65	2315.19	2314.04	2315.2	0.000418	0.6	135.09	112.38	0.1
Galloway3	Tributary2A.1	613.42	2	81	2312.65	2315.19	2314.04	2315.2	0.000418	0.6	135.09	112.38	0.1
Galloway3	Tributary2A.1	616.68	1	81	2310.9	2315.2		2315.2	0.000059	0.31	261.46	116.23	0.04
Galloway3	Tributary2A.1	616.68	2	81	2310.9	2315.2		2315.2	0.000059	0.31	261.46	116.23	0.04
Galloway3	Tributary2A.1	635.5	1	81	2307.68	2315.2		2315.2	0.000002	0.12	697.75	115.76	0.01
Galloway3	Tributary2A.1	635.5	2	81	2307.68	2315.2		2315.2	0.000002	0.12	697.75	115.76	0.01
Galloway3	Tributary2A.1	650.58	1	81	2305.38	2315.2		2315.2	0.000001	0.1	775.19	102	0.01
Galloway3	Tributary2A.1	650.58	2	81	2305.38	2315.2		2315.2	0.000001	0.1	775.19	102	0.01
Galloway3	Tributary2A.1	700.45	1	81	2306.38	2315.2		2315.2	0.000003	0.16	518.97	81.46	0.01
Galloway3	Tributary2A.1	700.45	2	81	2306.38	2315.2		2315.2	0.000003	0.16	518.97	81.46	0.01
Galloway3	Tributary2A.1	749.78	1	81	2307.29	2315.2		2315.2	0.000011	0.25	322.2	63.45	0.02
Galloway3	Tributary2A.1	749.78	2	81	2307.29	2315.2		2315.2	0.000011	0.25	322.2	63.45	0.02
Galloway3	Tributary2A.1	799.87	1	81	2308.77	2315.2		2315.2	0.000027	0.35	231.98	55.78	0.03
Galloway3	Tributary2A.1	799.87	2	81	2308.77	2315.2		2315.2	0.000027	0.35	231.98	55.78	0.03
loway3	Tributary2A.1	847.48	1	81	2312.09	2314.98	2314.98	2315.72	0.026061	6.9	11.75	7.95	1
loway3	Tributary2A.1	847.48	2	81	2312.09	2314.98	2314.98	2315.72	0.026061	6.9	11.75	7.95	1

Table 5.9.2.1
HEC-RAS OUTPUT
FLOODWAY AND FLOODPLAIN

River	Reach	River Sta	Profile #	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
lloway3	Tributary2A.1	900.14	1	81	2317.93	2319.72	2319.72	2320.2	0.024135	5.51	14.71	15.98	1.01
loway3	Tributary2A.1	900.14	2	81	2317.93	2319.72	2319.72	2320.2	0.024135	5.51	14.71	15.98	1.01
Galloway3	Tributary2A.1	949.37	1	81	2321.01	2322.57	2322.57	2323	0.025808	5.28	15.35	18.11	1.01
Galloway3	Tributary2A.1	949.37	2	81	2321.01	2322.57	2322.57	2323	0.025808	5.28	15.35	18.11	1.01
Galloway3	Tributary2A.1	1000.7	1	81	2324.08	2326.31	2326.31	2326.89	0.029575	6.1	13.28	11.87	1.02
Galloway3	Tributary2A.1	1000.7	2	81	2324.08	2326.31	2326.31	2326.89	0.029575	6.1	13.28	11.87	1.02
Galloway3	Tributary2A.1	1049.91	1	81	2327.36	2329.29	2329.29	2329.83	0.02954	5.91	13.7	12.71	1
Galloway3	Tributary2A.1	1049.91	2	81	2327.36	2329.29	2329.29	2329.83	0.02954	5.91	13.7	12.71	1
Galloway3	Tributary2A.1	1098.25	1	81	2332.39	2334.54	2334.54	2335.09	0.0257	5.93	13.66	12.72	1.01
Galloway3	Tributary2A.1	1098.25	2	81	2332.39	2334.54	2334.54	2335.09	0.0257	5.93	13.66	12.72	1.01
Galloway3	Tributary2A.1	1149.58	1	81	2337.05	2339.16	2339.16	2339.7	0.027419	5.88	13.77	13.03	1.01
Galloway3	Tributary2A.1	1149.58	2	81	2337.05	2339.16	2339.16	2339.7	0.027419	5.88	13.77	13.03	1.01
Galloway3	Tributary2A.1	1199.68	1	81	2341.96	2343.82	2343.82	2344.3	0.0288	5.57	14.55	15.37	1.01
Galloway3	Tributary2A.1	1199.68	2	81	2341.96	2343.82	2343.82	2344.3	0.0288	5.57	14.55	15.37	1.01
Galloway3	Tributary2A.1	1249.07	1	81	2347.83	2349.63	2349.63	2350.09	0.034239	5.49	14.76	16.09	1.01
Galloway3	Tributary2A.1	1249.07	2	81	2347.83	2349.63	2349.63	2350.09	0.034239	5.49	14.76	16.09	1.01
Galloway4	Tributary2A.2	32.15	1	146	2244.96	2253.77		2253.77	0.000002	0.19	781.74	111.85	0.01
Galloway4	Tributary2A.2	32.15	2	146	2244.96	2253.77		2253.77	0.000002	0.19	781.76	111.85	0.01
Galloway4	Tributary2A.2	49.52	1	146	2245.23	2253.77		2253.77	0.000004	0.19	750.19	126.11	0.01
Galloway4	Tributary2A.2	49.52	2	146	2245.23	2253.77		2253.77	0.000004	0.19	750.22	126.11	0.01
Galloway4	Tributary2A.2	98.37	1	146	2246.28	2253.77		2253.78	0.000006	0.29	509.32	103.99	0.02
Galloway4	Tributary2A.2	98.37	2	146	2246.28	2253.77		2253.78	0.000006	0.29	509.35	103.99	0.02
Galloway4	Tributary2A.2	148.43	1	146	2248.14	2253.77		2253.78	0.000038	0.45	323.37	82.71	0.04
Galloway4	Tributary2A.2	148.43	2	146	2248.14	2253.77		2253.78	0.000038	0.45	323.39	82.71	0.04
Galloway4	Tributary2A.2	199.27	1	146	2250.15	2253.77		2253.78	0.000219	0.87	168.09	75.81	0.1
lloway4	Tributary2A.2	199.27	2	146	2250.15	2253.77		2253.78	0.000219	0.87	168.11	75.81	0.1
oway4	Tributary2A.2	248.87	1	146	2251.33	2253.76		2253.82	0.002967	1.97	73.94	63.63	0.32
Galloway4	Tributary2A.2	248.87	2	146	2251.33	2253.76		2253.82	0.002966	1.97	73.96	63.64	0.32
Galloway4	Tributary2A.2	299.47	1	146	2252.74	2254.39	2254.39	2254.84	0.027612	5.41	26.99	30.33	1.01
Galloway4	Tributary2A.2	299.47	2	146	2252.74	2254.39	2254.39	2254.84	0.027612	5.41	26.99	30.33	1.01
Galloway4	Tributary2A.2	356.94	1	146	2254.74	2256.67	2256.67	2257.13	0.034315	5.44	26.85	29.85	1.01
Galloway4	Tributary2A.2	356.94	2	146	2254.74	2256.67	2256.67	2257.13	0.034315	5.44	26.85	29.85	1.01
Galloway4	Tributary2A.2	599.06	1	146	2273.66	2275.1	2275.1	2275.31	0.04915	3.66	39.9	97.3	1.01
Galloway4	Tributary2A.2	599.06	2	146	2273.66	2275.1	2275.1	2275.31	0.04915	3.66	39.9	97.3	1.01
Galloway4	Tributary2A.2	611.95	Inl Struct										
Galloway4	Tributary2A.2	624.67	1	146	2274.18	2277.25	2275.42	2277.25	0.000125	0.5	291.75	163.03	0.07
Galloway4	Tributary2A.2	624.67	2	146	2274.18	2277.25	2275.42	2277.25	0.000125	0.5	291.75	163.03	0.07
Galloway4	Tributary2A.2	649.97	1	146	2269.15	2277.25		2277.26	0.000003	0.15	950.27	145.1	0.01
Galloway4	Tributary2A.2	649.97	2	146	2269.15	2277.25		2277.26	0.000003	0.15	950.27	145.1	0.01
Galloway4	Tributary2A.2	699.72	1	146	2267.69	2277.25		2277.26	0.000003	0.13	1097.7	155.98	0.01
Galloway4	Tributary2A.2	699.72	2	146	2267.69	2277.25		2277.26	0.000003	0.13	1097.7	155.98	0.01
Galloway5	Tributary2B	39.61	1	69	2268.94	2277.26		2277.26	0.000004	0.14	481.25	84.48	0.01
Galloway5	Tributary2B	39.61	2	69	2268.94	2277.26		2277.26	0.000004	0.14	481.25	84.48	0.01
Galloway5	Tributary2B	99.47	1	69	2271.43	2277.25		2277.26	0.00004	0.37	187.3	58.72	0.04
Galloway5	Tributary2B	99.47	2	69	2271.43	2277.25		2277.26	0.00004	0.37	187.3	58.72	0.04
Galloway5	Tributary2B	148.35	1	69	2272.71	2277.25		2277.26	0.00021	0.66	104.26	39.64	0.07
Galloway5	Tributary2B	148.35	2	69	2272.71	2277.25		2277.26	0.00021	0.66	104.26	39.64	0.07
Galloway5	Tributary2B	199.05	1	69	2274.52	2277.26		2277.29	0.001713	1.53	45.14	32.28	0.23
Galloway5	Tributary2B	199.05	2	69	2274.52	2277.26		2277.29	0.001713	1.53	45.14	32.28	0.23
lloway5	Tributary2B	248.98	1	69	2277.03	2278.35	2278.35	2278.77	0.031255	5.17	13.34	16.26	1.01
loway5	Tributary2B	248.98	2	69	2277.03	2278.35	2278.35	2278.77	0.031255	5.17	13.34	16.26	1.01

Table 5.9.2.1
HEC-RAS OUTPUT
FLOODWAY AND FLOODPLAIN

River	Reach	River Sta	Profile #	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
lloway5	Tributary2B	299.03	1	69	2279.28	2280.23	2280.23	2280.58	0.036033	4.77	14.48	20.85	1.01
lloway5	Tributary2B	299.03	2	69	2279.28	2280.23	2280.23	2280.58	0.036033	4.77	14.48	20.85	1.01
Galloway5	Tributary2B	349.98	1	69	2281.64	2282.88	2282.88	2283.27	0.033915	5	13.8	18.13	1.01
Galloway5	Tributary2B	349.98	2	69	2281.64	2282.88	2282.88	2283.27	0.033915	5	13.8	18.13	1.01
Galloway5	Tributary2B	399.08	1	69	2299	2300.73	2300.73	2301.14	0.032984	5.1	13.54	17.17	1.01
Galloway5	Tributary2B	399.08	2	69	2299	2300.73	2300.73	2301.14	0.032984	5.1	13.54	17.17	1.01
Galloway5	Tributary2B	470.42	1	69	2300.67	2302.27	2301.97	2302.47	0.011672	3.6	19.18	19.07	0.63
Galloway5	Tributary2B	470.42	2	69	2300.67	2302.27	2301.97	2302.47	0.011672	3.6	19.18	19.07	0.63
Galloway5	Tributary2B	479.33	Inl Struct										
Galloway5	Tributary2B	486.62	1	69	2300.72	2302.4	2301.83	2302.49	0.004855	2.41	28.68	27.29	0.41
Galloway5	Tributary2B	486.62	2	69	2300.72	2302.4	2301.83	2302.49	0.004855	2.41	28.68	27.29	0.41
Galloway5	Tributary2B	516.28	1	69	2298.66	2302.5		2302.5	0.000011	0.2	338.42	114.82	0.02
Galloway5	Tributary2B	516.28	2	69	2298.66	2302.5		2302.5	0.000011	0.2	338.42	114.82	0.02
Galloway5	Tributary2B	548.9	1	69	2290.83	2302.5		2302.5	0.000001	0.09	790.76	106.14	0.01
Galloway5	Tributary2B	548.9	2	69	2290.83	2302.5		2302.5	0.000001	0.09	790.76	106.14	0.01
Galloway5	Tributary2B	599.31	1	69	2291.7	2302.5		2302.5	0.000002	0.11	627.93	87.26	0.01
Galloway5	Tributary2B	599.31	2	69	2291.7	2302.5		2302.5	0.000002	0.11	627.93	87.26	0.01
Galloway5	Tributary2B	701.05	1	69	2298.65	2302.5		2302.5	0.000033	0.29	241.78	87.35	0.03
Galloway5	Tributary2B	701.05	2	69	2298.65	2302.5		2302.5	0.000033	0.29	241.78	87.35	0.03
Galloway5	Tributary2B	751.53	1	69	2300.33	2302.47		2302.53	0.004876	2.01	34.4	36.77	0.37
Galloway5	Tributary2B	751.53	2	69	2300.33	2302.47		2302.53	0.004876	2.01	34.4	36.77	0.37
Galloway5	Tributary2B	799.64	1	69	2302.07	2303.63	2303.63	2304.05	0.049889	5.22	13.22	15.69	1
Galloway5	Tributary2B	799.64	2	69	2302.07	2303.63	2303.63	2304.05	0.049889	5.22	13.22	15.69	1
Galloway5	Tributary2B	849.9	1	69	2304.02	2305.18	2304.99	2305.37	0.015448	3.47	19.91	26.4	0.7
Galloway5	Tributary2B	849.9	2	69	2304.02	2305.18	2304.99	2305.37	0.015448	3.47	19.91	26.4	0.7
loway5	Tributary2B	899.75	1	69	2305.29	2306.08	2305.97	2306.22	0.018368	2.92	23.66	46.44	0.72
loway5	Tributary2B	899.75	2	69	2305.29	2306.08	2305.97	2306.22	0.018368	2.92	23.66	46.44	0.72
Galloway5	Tributary2B	981.91	Culvert										
Galloway5	Tributary2B	999.86	1	69	2321.42	2325.44	2322	2325.44	0.000007	0.14	476.59	150.8	0.01
Galloway5	Tributary2B	999.86	2	69	2321.42	2325.44	2322	2325.44	0.000007	0.14	476.59	150.8	0.01
Galloway5	Tributary2B	1011.78	1	69	2316.86	2325.44		2325.44	0.000001	0.07	921.74	141.82	0.01
Galloway5	Tributary2B	1011.78	2	69	2316.86	2325.44		2325.44	0.000001	0.07	921.74	141.82	0.01
Galloway5	Tributary2B	1048.29	1	69	2310.99	2325.44		2325.44	0	0.05	1300.59	128.26	0
Galloway5	Tributary2B	1048.29	2	69	2310.99	2325.44		2325.44	0	0.05	1300.59	128.26	0
Galloway5	Tributary2B	1099.22	1	69	2312.5	2325.44		2325.44	0.000001	0.07	960.5	115.35	0
Galloway5	Tributary2B	1099.22	2	69	2312.5	2325.44		2325.44	0.000001	0.07	960.5	115.35	0
Galloway5	Tributary2B	1148.76	1	69	2313.35	2325.44		2325.44	0.000001	0.09	737.14	104.2	0.01
Galloway5	Tributary2B	1148.76	2	69	2313.35	2325.44		2325.44	0.000001	0.09	737.14	104.2	0.01
Galloway5	Tributary2B	1199.48	1	69	2314.42	2325.44		2325.44	0.000004	0.12	553.71	95.61	0.01
Galloway5	Tributary2B	1199.48	2	69	2314.42	2325.44		2325.44	0.000004	0.12	553.71	95.61	0.01
Galloway5	Tributary2B	1250.9	1	69	2315.95	2325.44		2325.44	0.000008	0.16	418.48	85.52	0.01
Galloway5	Tributary2B	1250.9	2	69	2315.95	2325.44		2325.44	0.000008	0.16	418.48	85.52	0.01
Galloway5	Tributary2B	1267.35	1	69	2316.43	2325.44		2325.44	0.000006	0.16	442.06	83.47	0.01
Galloway5	Tributary2B	1267.35	2	69	2316.43	2325.44		2325.44	0.000006	0.16	442.06	83.47	0.01
Galloway5	Tributary2B	1300.17	1	69	2318.27	2325.44		2325.44	0.000007	0.19	371.38	73.08	0.01
Galloway5	Tributary2B	1300.17	2	69	2318.27	2325.44		2325.44	0.000007	0.19	371.38	73.08	0.01
Galloway5	Tributary2B	1347.03	1	69	2319.28	2325.44		2325.44	0.000026	0.33	211.6	52.49	0.03
Galloway5	Tributary2B	1347.03	2	69	2319.28	2325.44		2325.44	0.000026	0.33	211.6	52.49	0.03
Galloway5	Tributary2B	1399.79	1	69	2321.11	2325.44		2325.44	0.000071	0.43	159.9	57.53	0.05
lloway5	Tributary2B	1399.79	2	69	2321.11	2325.44		2325.44	0.000071	0.43	159.9	57.53	0.05

Table 5.9.2.2
HEC-RAS OUTPUT
Structures

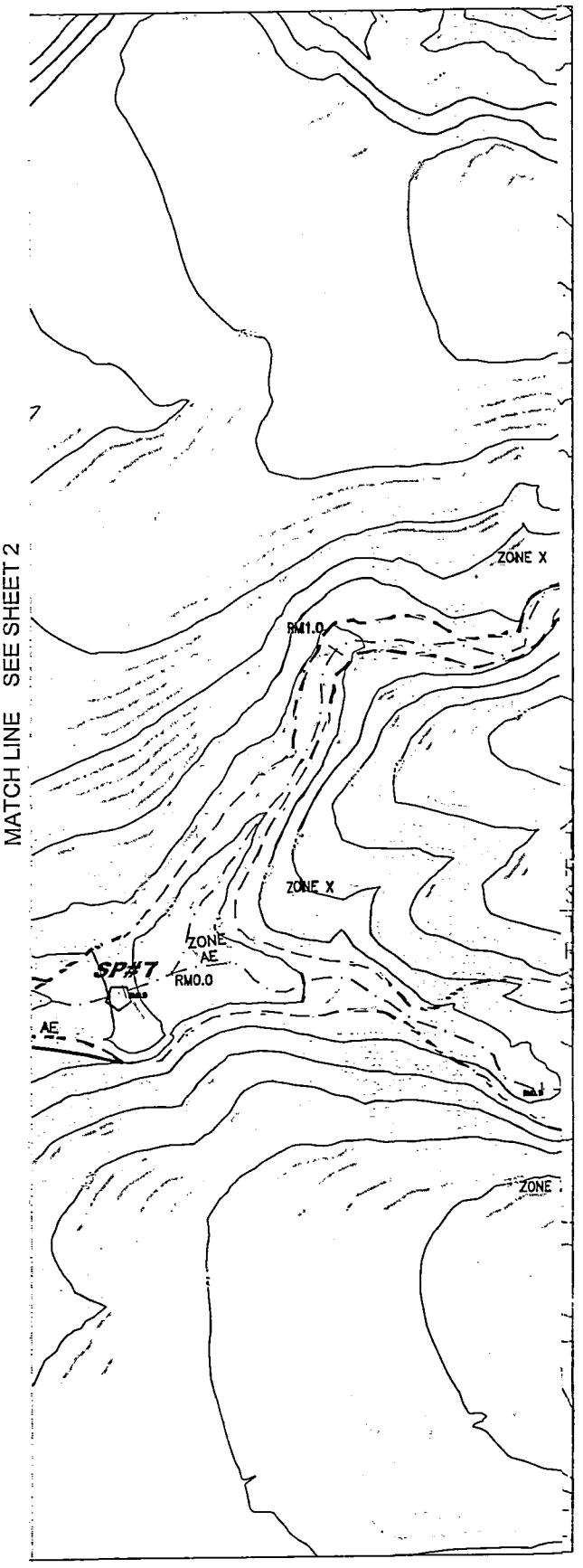
GWTribFPDSP.prj
HEC-RAS Plan: M4E
PF 1 = Floodplain
PF 2 = Floodway

CULVERTS

River	Reach	River Sta	Profile #	E.G. US. (ft)	W.S. US. (ft)	E.G. IC (ft)	E.G. OC (ft)	Min El Weir Flow (ft)	Q Culv Group (cfs)	Q Weir (cfs)	Delta WS (ft)	Culv Vel US (ft/s)	Culv Vel DS (ft/s)
Galloway2	Tributary2.2	721.95 Culvert #2	1	2158.57	2158.52	2158.58	2158.57	2157.16	34.93	544.07	1.79	7.51	7.51
Galloway2	Tributary2.2	721.95 Culvert #2	2	2158.83	2158.74	2158.82	2158.83	2157.16	36.06	541.54	1.88	7.75	7.75
Galloway2	Tributary2.2	805.12 Culvert #1	1	2161.45	2161.33	2161.44	2161.45	2160.15	18.03	560.34	2.82	5.74	5.74
Galloway2	Tributary2.2	805.12 Culvert #1	2	2161.45	2161.33	2161.45	2161.45	2160.15	17.21	562.08	2.55	5.48	5.48
Galloway5	Tributary2B	981.91 Culvert #3	1	2325.44	2325.44	2325.26	2325.44	2325.06	39.77	29.23	19.36	7.71	10.15
Galloway5	Tributary2B	981.91 Culvert #3	2	2325.44	2325.44	2325.26	2325.44	2325.06	39.77	29.23	19.36	7.71	10.15

INLINE STRUCTURES

River	Reach	River Sta	Profile #	E.G. Elev (ft)	W.S. Elev (ft)	Q Total (cfs)	Q Weir (cfs)
Galloway1	Tributary2.1	1668.4	1	2317.56	2317.53	180	180
Galloway1	Tributary2.1	1668.4	2	2317.56	2317.53	180	180
Galloway1	Tributary2.1	2330.42	1	2343.68	2343.32	180	180
Galloway1	Tributary2.1	2330.42	2	2343.68	2343.32	180	180
Galloway2	Tributary2.2	1222.37	1	2167.15	2166.93	579	579
Galloway2	Tributary2.2	1222.37	2	2167.15	2166.93	579	579
Galloway2	Tributary2.2	2955.8	1	2203.4	2203.26	579	579
Galloway2	Tributary2.2	2955.8	2	2203.39	2203.25	579	579
Galloway2	Tributary2.2	4747.72	1	2253.76	2253.72	579	579
Galloway2	Tributary2.2	4747.72	2	2253.77	2253.72	579	579
Galloway3	Tributary2A.1	604.11	1	2315.2	2315.19	81	81
Galloway3	Tributary2A.1	604.11	2	2315.2	2315.19	81	81
Galloway4	Tributary2A.2	611.95	1	2277.25	2277.25	146	146
Galloway4	Tributary2A.2	611.95	2	2277.25	2277.25	146	146
Galloway5	Tributary2B	479.33	1	2302.49	2302.4	69	69
Galloway5	Tributary2B	479.33	2	2302.49	2302.4	69	69



200'

r 2003
r 2005

THIS MAP WAS PREPARED BY P
1"= 100' HORIZONTAL SCALE A YS COMPANY

LEGEND

100-YR FLOODPLAIN BOUNDARY

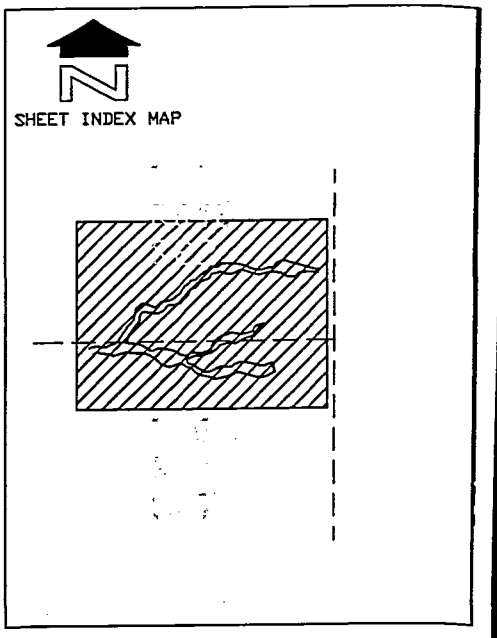
100-YR FLOODWAY BOUNDARY

STOCK POND DESIGNATION — SP#1

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88). CONVERSION FACTOR TO THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29) IS = -2.04 FOOT.

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION



NOTES

FIGURE B.1

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

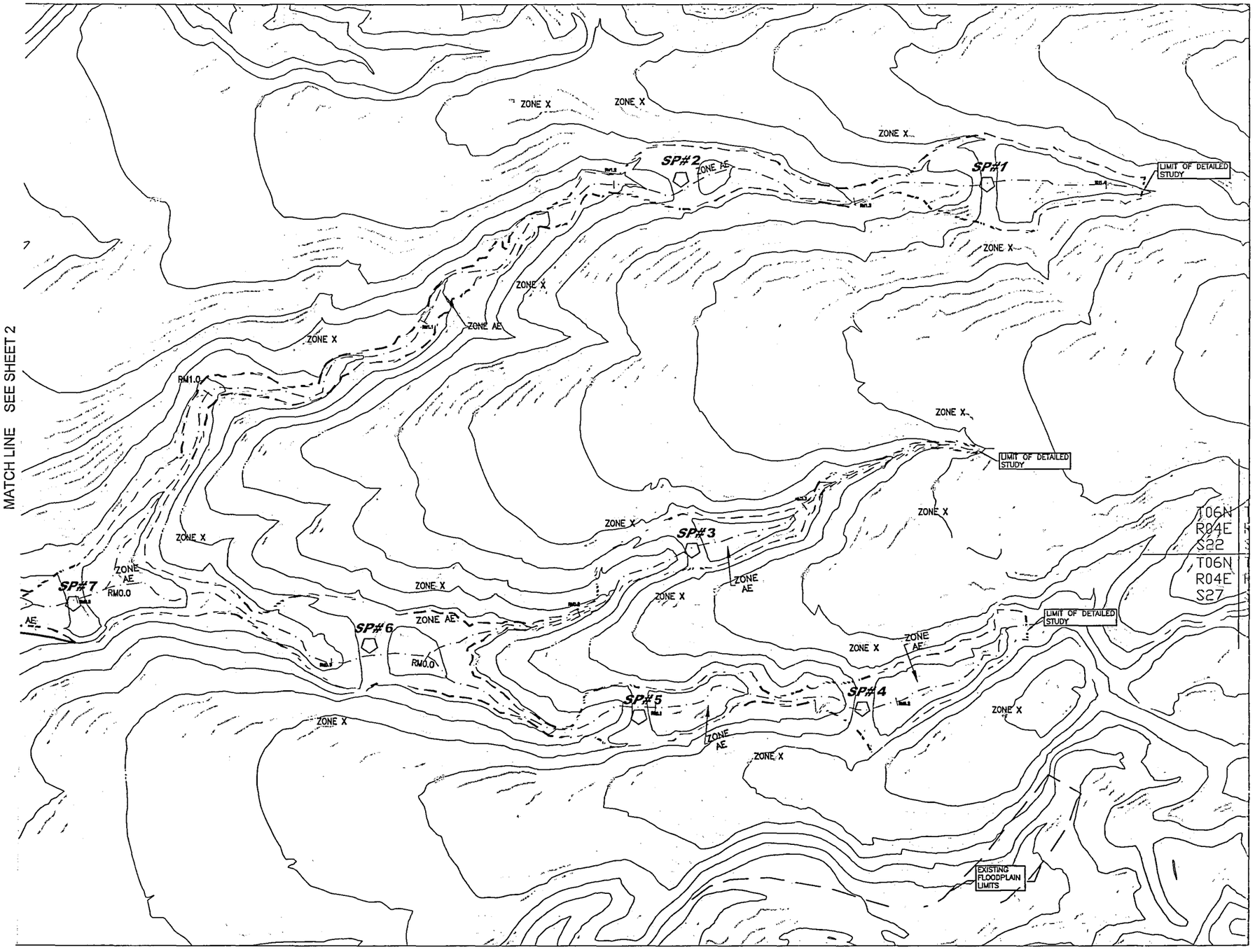
CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

GALLOWAY WASH TRIBUTARIES
WITH STOCK POND IDENTIFICATION

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

	BY	DATE
DESIGN	M. FOUNTAIN	12-21-07
DESIGN CHK.	L. POTTER	12-21-07
PLANS	MC/MF	12-21-07
PLANS CHK.	L. POTTER	12-21-07

SHEET 1 OF 1



LEGEND

100-YR FLOODPLAIN BOUNDARY

100-YR FLOODWAY BOUNDARY

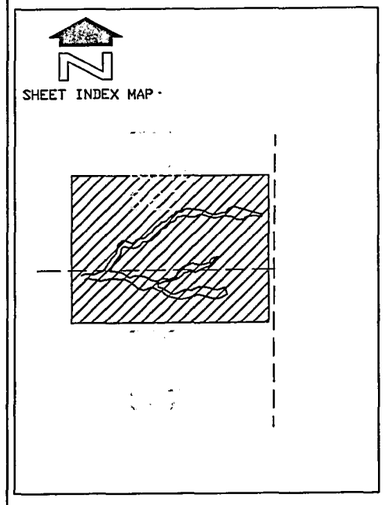
STOCK POND DESIGNATION SP#1

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88). CONVERSION FACTOR TO THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29) IS = -2.04 FOOT.

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION

SHEET INDEX MAP



NOTES

FIGURE B.1

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

GALLOWAY WASH TRIBUTARIES
WITH STOCK POND IDENTIFICATION

100' 0' 100' 200'

SCALE: 1" = 100'
CONTOUR INTERVAL = 2'
FLIGHT DATES: November 2003 through December 2005

GROUND CONTROL SURVEY DATA PROVIDED BY COOPER AERIAL SURVEYS COMPANY

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1"= 100' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

COOPER AERIAL SURVEYS COMPANY
CONTRACT NUMBER: FCD20030048, Assignment #4
FCD20050030

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

	BY	DATE
DESIGN	M. FOUNTAIN	12-21-07
DESIGN CHK.	L. POTTER	12-21-07
PLANS	MC/MF	12-21-07
PLANS CHK.	L. POTTER	12-21-07

SHEET 1 OF 1

CAVE CREEK DRAINAGE MASTER PLAN
FCDMC CONTRACT NUMBER 2004C072
FLOODPLAIN DELINEATION OF GALLOWAY WASH TRIBUTARIES, WILLOW SPRINGS WASH TRIBUTARIES, AND CAVE CREEK TRIBUTARIES WITHIN CAVE CREEK, ARIZONA

AUTHORITY FOR STUDY

THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY (FCDMC) HAS CONTRACTED HDR TO PREPARE THIS STUDY UNDER THE CONTRACT NUMBER 2004C072 AS PART OF THE CC DMP. PROJECT CONTROL NUMBER 690.02.20.

PROJECT LOCATION

THE PROJECT SITE IS LOCATED IN THE TOWN OF CAVE CREEK, ARIZONA WITHIN SECTION 13 OF TOWNSHIP 6 NORTH, RANGE 3 EAST, AND SECTIONS 8, 9, 16, 17, 18, 19, 22, 27 AND 28 OF TOWNSHIP 6 NORTH, RANGE 4 EAST OF THE GILA AND SALT RIVER MERIDIAN WITHIN THE COUNTY OF MARICOPA IN THE STATE OF ARIZONA.

BENCHMARKS (NAVD 88)

BM #7 – ELEVATION 2193.74
LOCATED AT THE INTERSECTION OF MORNING STAR ROAD AND 54TH STREET (NE CORNER).

BM #8 – ELEVATION 2215.21
LOCATED AT THE INTERSECTION OF SPUR CROSS ROAD AND HONDA BOW ROAD (NE CORNER).

BM #9 – ELEVATION 2224.10
LOCATED AT THE INTERSECTION OF MESQUITE ROAD AND RIDGEWAY ROAD (SW CORNER).

BM #14– ELEVATION 2288.26
LOCATED AT THE INTERSECTION OF GRAPEVINE ROAD AND GALLOWAY DRIVE (SE CORNER)

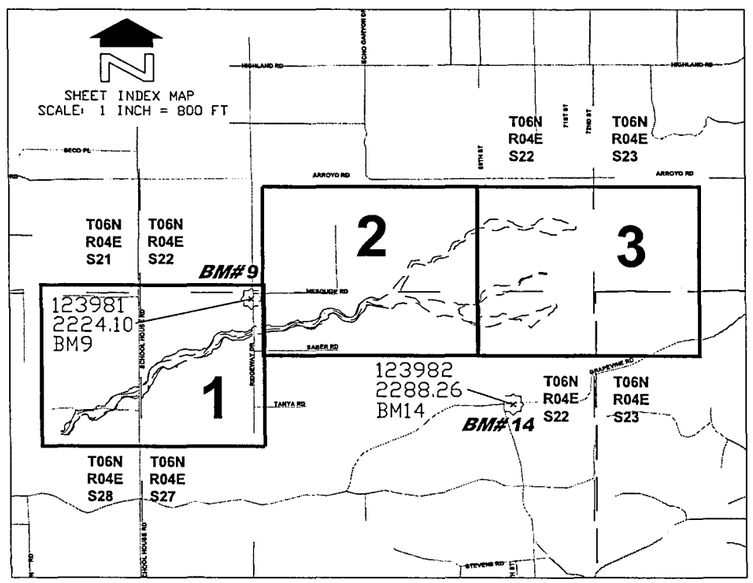
SHEET INDEX

GALLOWAY WASH TRIBUTARIES:
- SHEET 1 – GALLOWAY WASH TRIBUTARY 2
- SHEET 2 – GALLOWAY WASH TRIBUTARIES 2, 2A AND 2B
- SHEET 3 – GALLOWAY WASH TRIBUTARIES 2, 2A AND 2B

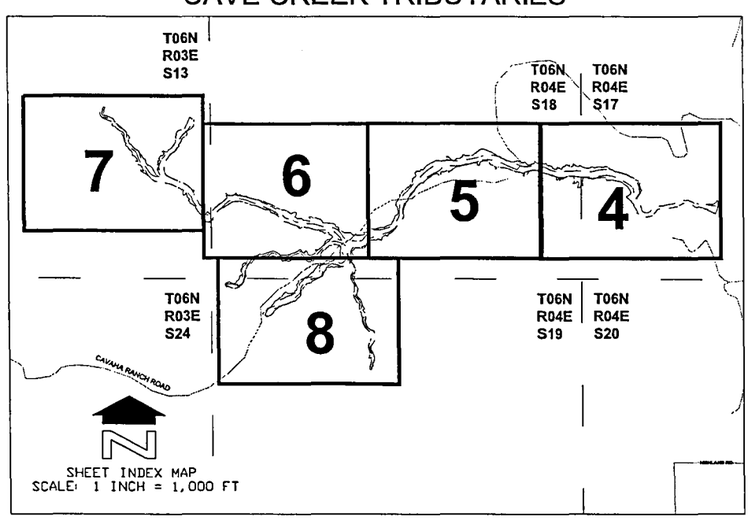
CAVE CREEK TRIBUTARIES:
- SHEET 4 – CAVE CREEK TRIBUTARY 1
- SHEET 5 – CAVE CREEK TRIBUTARY 1
- SHEET 6 – CAVE CREEK TRIBUTARIES 1, 1B AND 1C
- SHEET 7 – CAVE CREEK TRIBUTARIES 1 AND 1A
- SHEET 8 – CAVE CREEK TRIBUTARIES 1B, 1C AND 1D

WILLOW SPRINGS WASH TRIBUTARIES:
- SHEET 9 – WILLOW SPRINGS WASH TRIBUTARIES 6 AND 6C
- SHEET 10 – WILLOW SPRINGS WASH TRIBUTARIES 6, 6A, 6B AND 6C

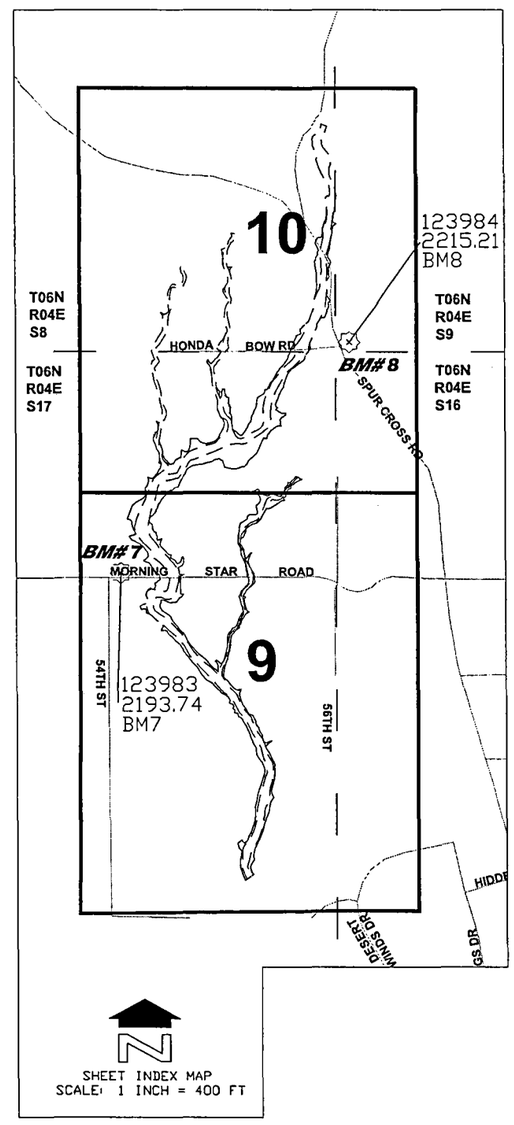
GALLOWAY WASH TRIBUTARIES



CAVE CREEK TRIBUTARIES



WILLOW SPRINGS WASH TRIBUTARIES



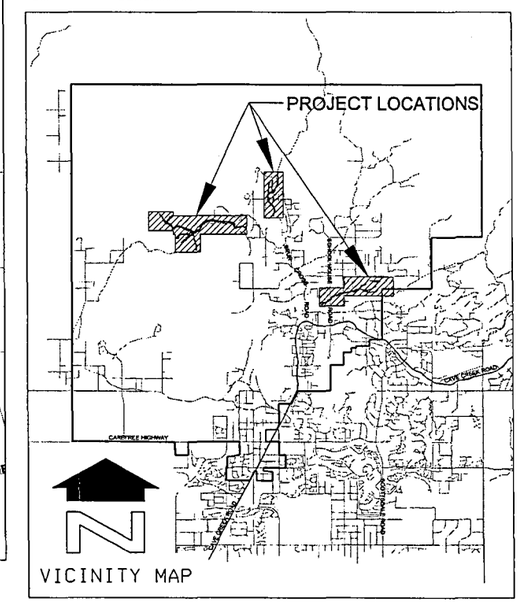
SURVEY STATEMENT

I, STONE E. WAHL, AN ARIZONA REGISTERED LAND SURVEYOR, CERTIFY THAT THE FIELD SURVEYS, DOCUMENTED HEREIN, ALONG WITH ALL FIELD, AND OFFICE PROCESS PROCEDURES, USED DURING THE COURSE OF THIS SURVEY, WERE PERFORMED UNDER MY DIRECT SUPERVISION, AND THAT THESE SURVEYS, ARE RETRACEABLE, AND REPEATABLE. FURTHER, I CERTIFY THAT THE SUREY REPORT WAS PREPARED UNDER MY DIRECT SUPERVISION.

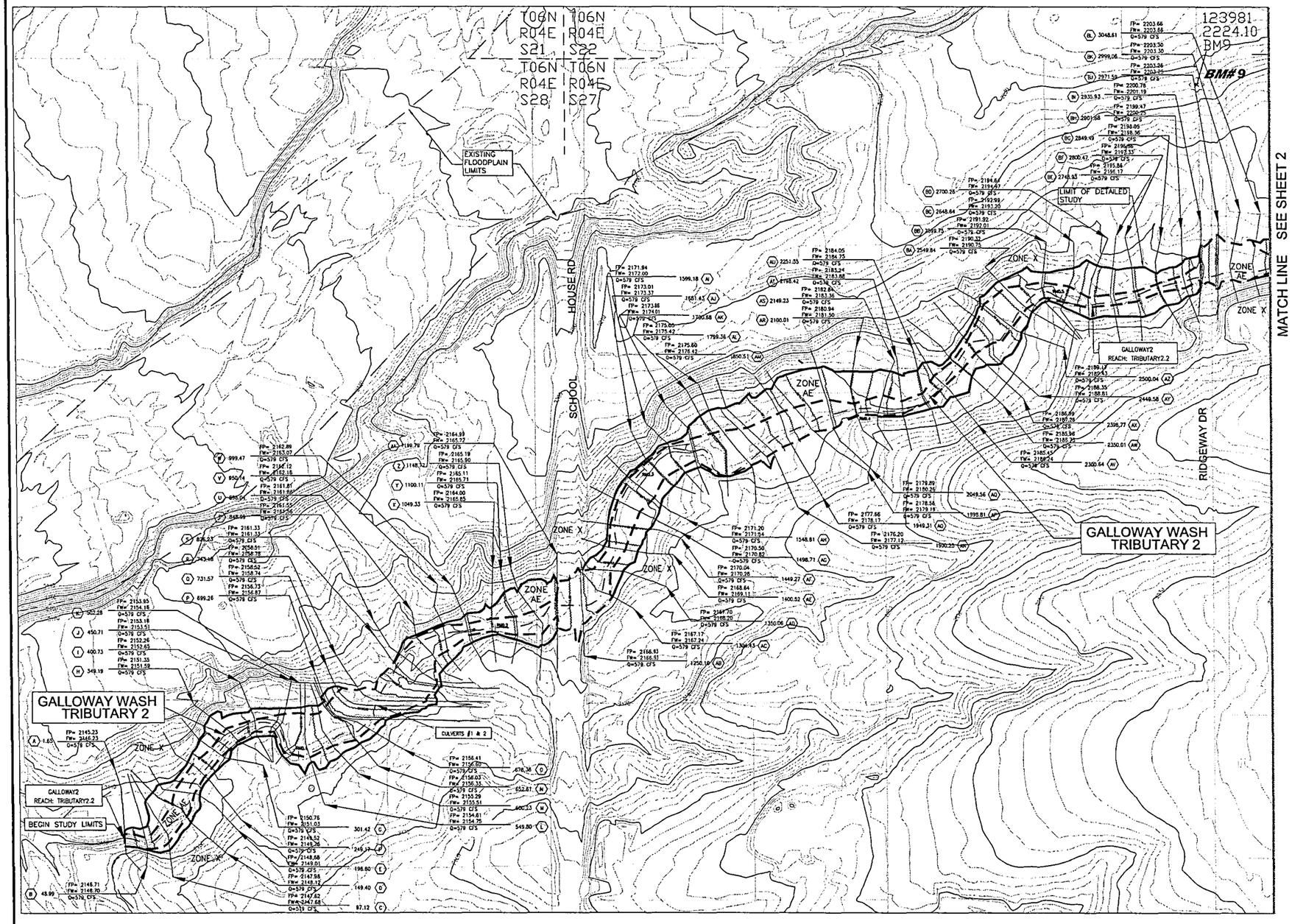
STONE E. WAHL
AZ RLS #28237

ABBREVIATIONS

DMP	– DRAINAGE MASTER PLAN
CC	– CAVE CREEK
ROW	– RIGHT OF WAY
EXIST	– EXISTING
BCHH	– BRASS CAP HAND HOLE
T.	– TOWNSHIP
R.	– RANGE
S.	– SECTION
N.T.S.	– NOT TO SCALE
BM	– BENCHMARK



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



LEGEND

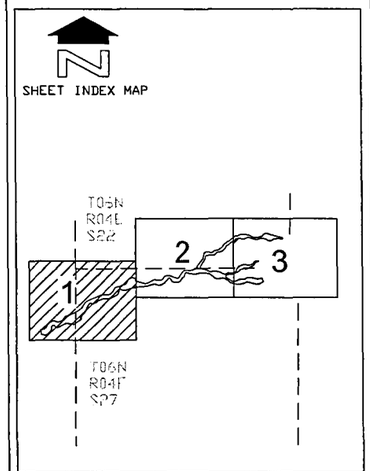
100-YR FLOODPLAIN BOUNDARY	
100-YR FLOODWAY BOUNDARY	
RIVER MILE	RM2.0 RM2.5 RM3.0
CROSS SECTION	(A) 144.44 — CROSS SECTION STATION (FEET); FP= 2250.55 FLOODPLAIN WATER SURFACE ELEVATION; FW= 2250.55 FLOODWAY WATER SURFACE ELEVATION; Q =4630 CFS 100 YEAR DISCHARGE; PROPOSED FEMA CROSS SECTION DESIGNATION
BASE FLOOD ELEVATION	2265.00
ELEVATION REFERENCE MARK	ERM 2400
ZONE DESIGNATION	ZONE AE
ZONE DESIGNATION	ZONE X
BENCHMARK DESIGNATION	BM#10

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88). CONVERSION FACTOR TO THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29) IS = -2.04 FOOT.

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
BM # 9	2224.10	THE INTERSECTION OF RIDGEWAY DRIVE AND MESQUITE ROAD (SW CORNER)

SHEET INDEX MAP



NOTES

1- THIS MODEL HAS BEEN PREPARED TO TIE INTO THE EXISTING GALLOWAY WASH FLOOD PROFILE AT RIVER MILE 5808, LOCATED BETWEEN THE EXISTING CROSS SECTIONS OF "G" AND "I". REFER TO PROFILE PANEL 144P, AND REFER TO FIRM PANEL # 04013C0805H, DATED SEPTEMBER 30, 2005.

2- CROSS SECTION STATIONS DENOTED WITH "**" UTILIZE TOP WIDTHS THAT DIFFER FROM THE PROPOSED HEC-RAS MODEL. REFER TO SECTION 5.7 OF THE PHASE II TDN FOR FURTHER DISCUSSION RELATING TO THIS TOPIC.

3- CROSS SECTIONS IMMEDIATELY DOWNSTREAM OF THE STOCK PONDS HAVE BEEN PRESENTED GRAPHICALLY WITH INTERVALS OF FIVE FOOT FOR IMPROVED LEGIBILITY. A ONE FOOT ANALYSIS HAS BEEN CONDUCTED TO SUPPORT THE DELINEATION MODEL.

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072
GALLOWAY WASH TRIBUTARY FLOODPLAIN DELINEATION, CAVE CREEK, AZ
STOCK POND ALTERNATIVE

BENCHMARK INFORMATION

BENCHMARK 9 QUALITY: BRASS CAP IN CONCRETE MONUMENT
TYPE: 30 NGS
DIAMETER HOLE: 10"
HOLE DEPTH: 36"
ROD FOOTAGE: 5' 6"
ROD TYPE: 9/16" STEEL

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1"= 100' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

COOPER AERIAL SURVEYS COMPANY
CONTRACT NUMBER: FCD2003C048, Assignment #4
FCD2005C030

100' 0' 100' 200'
SCALE: 1" = 100'
CONTOUR INTERVAL = 2'
FLIGHT DATES: November 2003 through December 2005

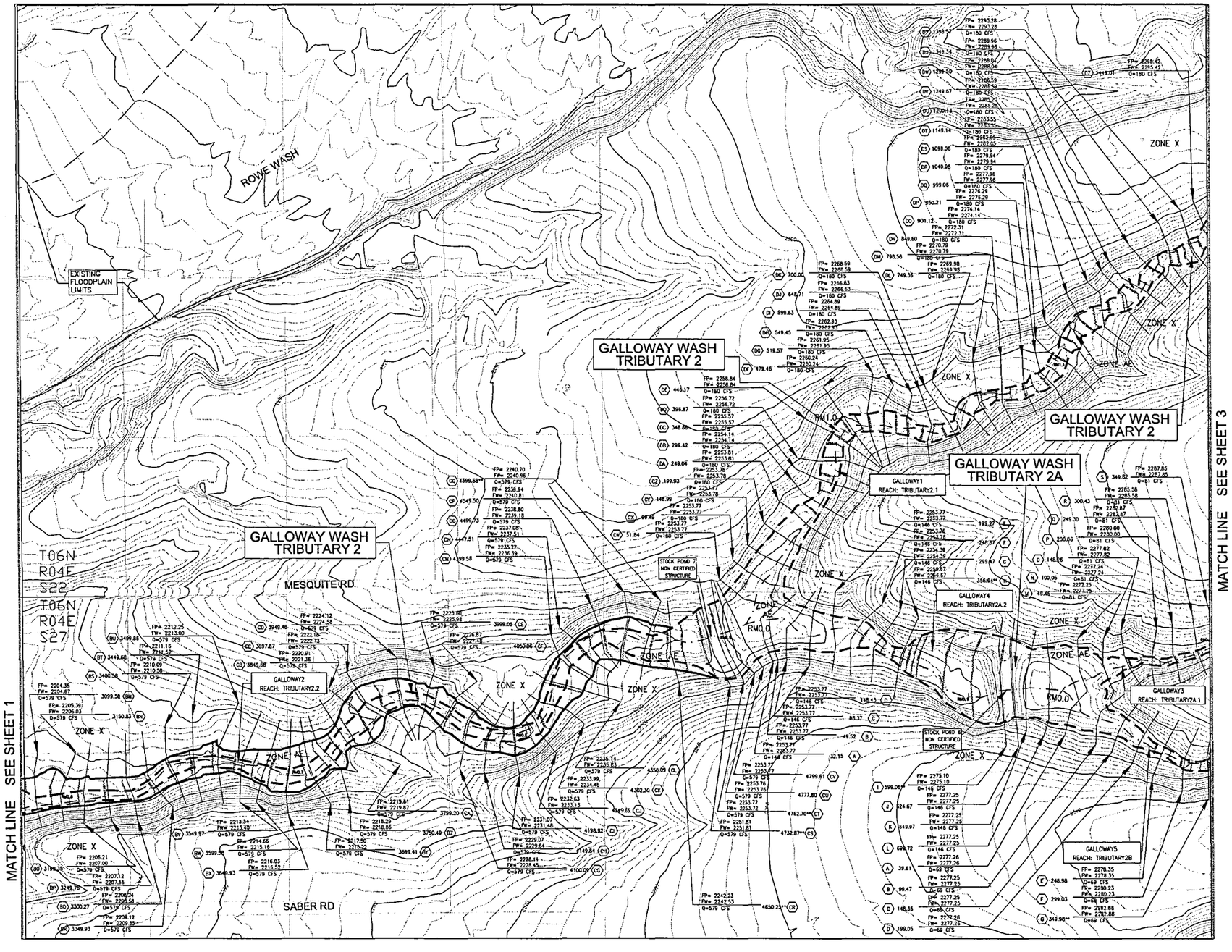
GROUND CONTROL SURVEY DATA PROVIDED BY COOPER AERIAL SURVEYS COMPANY

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

Registered Professional Engineer (Civil) CERTIFICATE NO. 35571 LINDA A. POTTER Date Signed August 31, 2007 ARIZONA, U.S.A.

	BY	DATE
DESIGN	M. FOUNTAIN	12-21-07
DESIGN CHK.	L. POTTER	12-21-07
PLANS	MC/MF	12-21-07
PLANS CHK.	L. POTTER	12-21-07

SHEET 1 OF 10



LEGEND

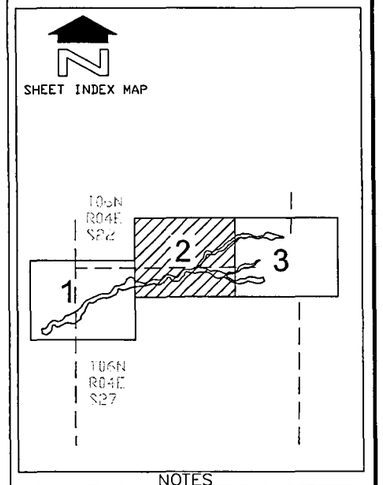
100-YR FLOODPLAIN BOUNDARY	
100-YR FLOODWAY BOUNDARY	
RIVER MILE	RM2.0 RM2.5 RM3.0
CROSS SECTION	(A) 144.44 — CROSS SECTION STATION (FEET); FP= 2250.55 — FLOODPLAIN WATER SURFACE ELEVATION; FW= 2250.55 — FLOODWAY WATER SURFACE ELEVATION; Q =4630 CFS — 100 YEAR DISCHARGE; PROPOSED FEMA CROSS SECTION DESIGNATION
BASE FLOOD ELEVATION	2265.00
ELEVATION REFERENCE MARK	ERM 2400
ZONE DESIGNATION	ZONE AE
ZONE DESIGNATION	ZONE X
BENCHMARK DESIGNATION	BM#10

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88). CONVERSION FACTOR TO THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29) IS = -2.04 FOOT.

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
NO BENCHMARK INSTALLED WITHIN THIS WORK MAP		

SHEET INDEX MAP



NOTES

1- THIS MODEL HAS BEEN PREPARED TO TIE INTO THE EXISTING GALLOWAY WASH FLOOD PROFILE AT RIVER MILE 5808, LOCATED BETWEEN THE EXISTING CROSS SECTIONS OF "G" AND "I". REFER TO PROFILE PANEL 144P, AND REFER TO FIRM PANEL # 04013C0805H, DATED SEPTEMBER 30, 2005.

2- CROSS SECTION STATIONS DENOTED WITH "**" UTILIZE TOP WIDTHS THAT DIFFER FROM THE PROPOSED HEC-RAS MODEL. REFER TO SECTION 5.7 OF THE PHASE II TDN FOR FURTHER DISCUSSION RELATING TO THIS TOPIC.

3- CROSS SECTIONS IMMEDIATELY DOWNSTREAM OF THE STOCK PONDS HAVE BEEN PRESENTED GRAPHICALLY WITH INTERVALS OF FIVE FOOT FOR IMPROVED LEGIBILITY. A ONE FOOT ANALYSIS HAS BEEN CONDUCTED TO SUPPORT THE DELINEATION MODEL.

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072
GALLOWAY WASH TRIBUTARY FLOODPLAIN DELINEATION, CAVE CREEK, AZ
STOCK POND ALTERNATIVE

100' 0' 100' 200'

SCALE: 1" = 100'
CONTOUR INTERVAL = 2'
FLIGHT DATES: November 2003 through December 2005

GROUND CONTROL SURVEY DATA PROVIDED BY COOPER AERIAL SURVEYS COMPANY

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1"= 100' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

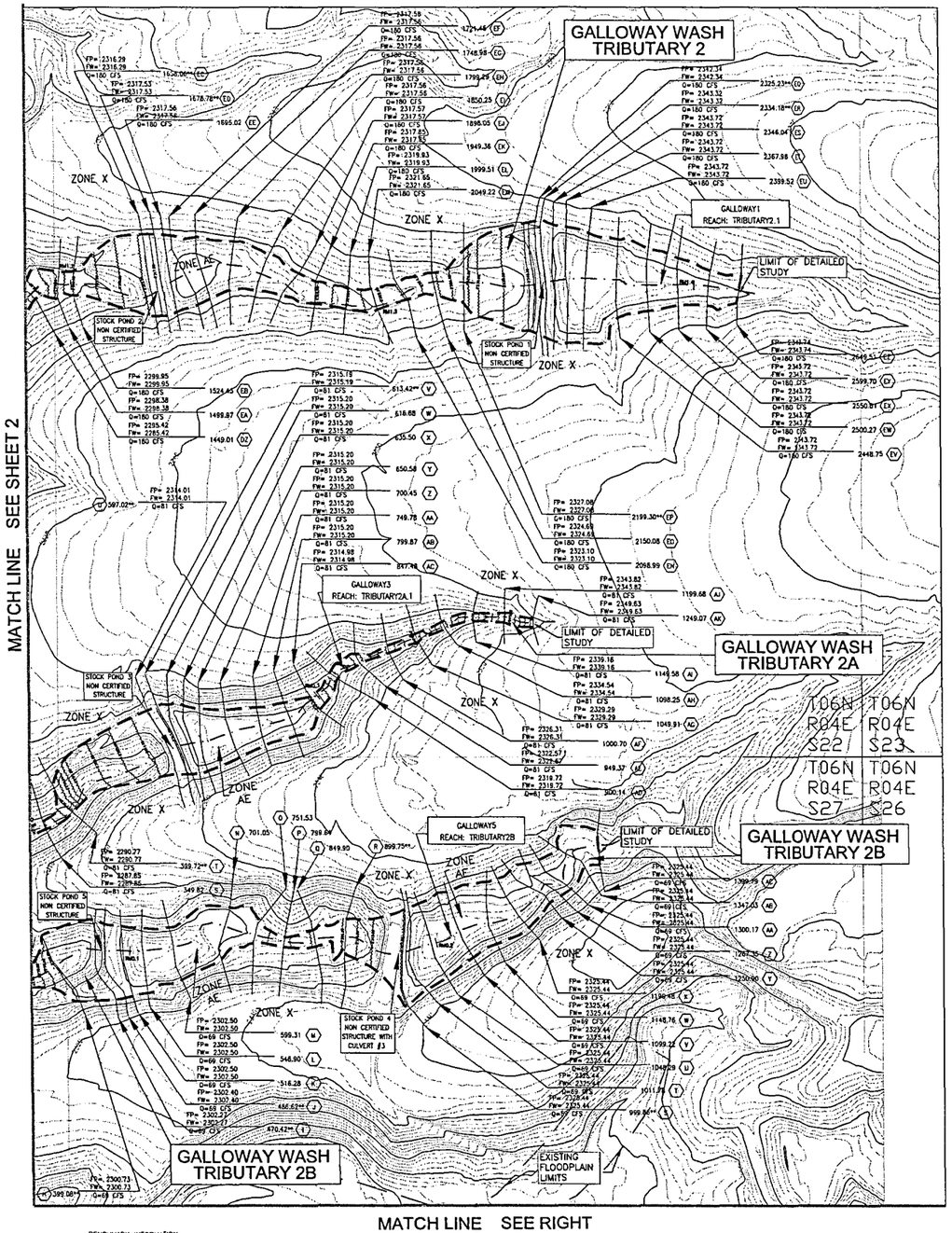
COOPER AERIAL SURVEYS COMPANY
CONTRACT NUMBER: FCD2003C048, Assignment #4
FCD2005C030

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

Registered Professional Engineer (Civil) — Certificate No. 35571 — LINDA A. POTTER — Date Signed 12-21-07 — ARIZONA, U.S.A.

	BY	DATE
DESIGN	M. FOUNTAIN	12-21-07
DESIGN CHK.	L. POTTER	12-21-07
PLANS	MC/MF	12-21-07
PLANS CHK.	L. POTTER	12-21-07

MATCH LINE SEE SHEET 2



MATCH LINE SEE RIGHT

BENCHMARK INFORMATION

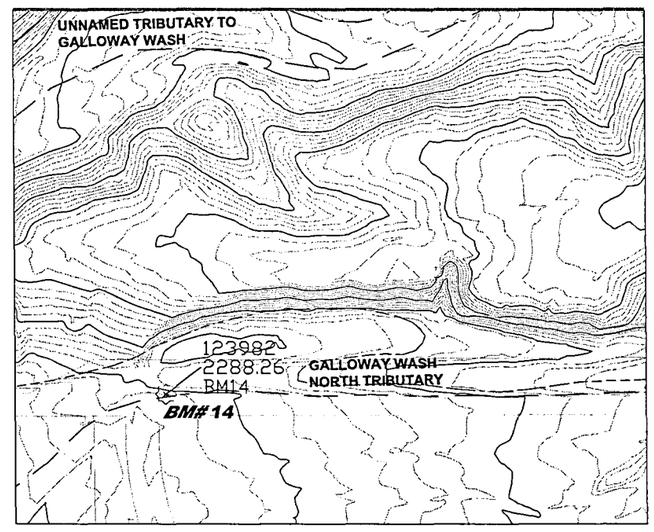
BENCHMARK 14 QUALITY: BRASS CAP IN CONCRETE
MONUMENT TYPE: 30 NGS
DIAMETER HOLE: 10"
HOLE DEPTH: 36"
ROD FOOTAGE: 12' 6"
ROD TYPE: 9/16" STEEL

** SEE NOTE NUMBER 2

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1"= 100' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

BENCHMARK LOCATION REFERENCE

MATCH LINE SEE LEFT



CROSS SECTION DATA KEY FOR GALLOWAY WASH TRIBUTARY 2B

N 701.05	FP= 2302.50 FW= 2302.50 Q=69 CFS
O 751.53	FP= 2302.47 FW= 2302.47 Q=69 CFS
P 799.84	FP= 2303.63 FW= 2303.63 Q=69 CFS
Q 849.90	FP= 2305.18 FW= 2305.18 Q=69 CFS
R 899.75**	FP= 2306.08 FW= 2306.08 Q=69 CFS

COOPER AERIAL SURVEYS COMPANY
CONTRACT NUMBER: FCD2003C048, Assignment #4
FCD2005C030

SCALE: 1" = 100'
CONTOUR INTERVAL = 2'
FLIGHT DATES: November 2003 through December 2005

GROUND CONTROL SURVEY DATA PROVIDED BY COOPER AERIAL SURVEYS COMPANY

LEGEND

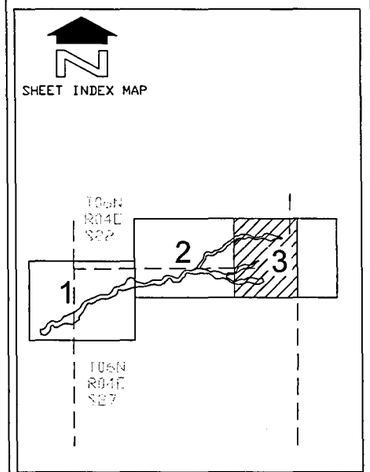
100-YR FLOODPLAIN BOUNDARY
100-YR FLOODWAY BOUNDARY
RIVER MILE — RM2.0 RM2.5 RM3.0
CROSS SECTION — A 144.44 — CROSS SECTION STATION (FEET); FP= 2250.55 FLOODPLAIN WATER SURFACE ELEVATION; FW= 2250.55 FLOODWAY WATER SURFACE ELEVATION; Q =4630 CFS 100 YEAR DISCHARGE; PROPOSED FEMA CROSS SECTION DESIGNATION
BASE FLOOD ELEVATION — 2265.00
ELEVATION REFERENCE MARK — ERM 2400
ZONE DESIGNATION — ZONE AE
ZONE DESIGNATION — ZONE X
BENCHMARK DESIGNATION — BM#10

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88). CONVERSION FACTOR TO THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29) IS = -2.04 FOOT.

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
BM # 14	2288.26	THE INTERSECTION OF GALLOWAY DRIVE AND GRAPEVINE ROAD (NE CORNER)

SHEET INDEX MAP



NOTES

1- THIS MODEL HAS BEEN PREPARED TO TIE INTO THE EXISTING GALLOWAY WASH FLOOD PROFILE AT RIVER MILE 58.08, LOCATED BETWEEN THE EXISTING CROSS SECTIONS OF "G" AND "I". REFER TO PROFILE PANEL 144P, AND REFER TO FIRM PANEL # 04013C0805H, DATED SEPTEMBER 30, 2005.

2- CROSS SECTION STATIONS DENOTED WITH "**" UTILIZE TOP WIDTHS THAT DIFFER FROM THE PROPOSED HEC-RAS MODEL. REFER TO SECTION 5.7 OF THE PHASE II TDN FOR FURTHER DISCUSSION RELATING TO THIS TOPIC.

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NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072
GALLOWAY WASH TRIBUTARY FLOODPLAIN DELINEATION, CAVE CREEK, AZ
STOCK POND ALTERNATIVE

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

Registered Professional Engineer (Civil) CERTIFICATE NO. 35571 LINDA A. POTTER Date Signed 12-21-07 ARIZONA, U.S.A.

	BY	DATE
DESIGN	M. FOUNTAIN	12-21-07
DESIGN CHK.	L. POTTER	12-21-07
PLANS	MC/MF	12-21-07
PLANS CHK.	L. POTTER	12-21-07

WILLOW SPRINGS TRIBUTARIES

Table 5.9.2.3
HEC-RAS OUTPUT
FLOODWAY AND FLOODPLAIN

WSTribFPD.prj
HEC-RAS Plan: M4
PF 1 = Floodplain
PF 2 = Floodway

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude #
			#	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	Chl
WillowSprings1	Tributary6.1	51.24	1	548	2194.57	2197.94		2198.25	0.012257	5.47	172.32	194.67	0.74
WillowSprings1	Tributary6.1	51.24	2	548	2194.57	2198.39		2199.08	0.015048	6.7	84.02	39.55	0.8
WillowSprings1	Tributary6.1	74.47	1	548	2194.85	2198.27	2198.27	2198.73	0.015141	6.18	135.39	151.37	0.75
WillowSprings1	Tributary6.1	74.47	2	548	2194.85	2198.75		2199.44	0.016344	6.68	82.08	31.49	0.73
WillowSprings1	Tributary6.1	99.74	1	548	2195.13	2198.79	2198.67	2199.22	0.02446	5.86	129.11	143.28	0.74
WillowSprings1	Tributary6.1	99.74	2	548	2195.13	2199.39		2199.91	0.019519	5.78	94.76	37.02	0.64
WillowSprings1	Tributary6.1	149.94	1	548	2195.98	2199.66		2200.16	0.014026	6.34	125.22	99.59	0.73
WillowSprings1	Tributary6.1	149.94	2	548	2195.98	2200.09		2200.8	0.014098	6.78	82.8	30.61	0.72
WillowSprings1	Tributary6.1	192.58	1	548	2196.54	2200.12		2200.88	0.016131	7.66	106.26	93.4	0.89
WillowSprings1	Tributary6.1	192.58	2	548	2196.54	2200.52	2200.26	2201.53	0.016119	8.06	67.98	25.38	0.87
WillowSprings1	Tributary6.1	247.92	1	548	2197.96	2201.14		2201.51	0.008348	5.52	159.84	146.81	0.62
WillowSprings1	Tributary6.1	247.92	2	548	2197.96	2201.66		2202.18	0.0078	5.81	94.37	31.47	0.59
WillowSprings1	Tributary6.1	299.63	1	548	2198.26	2201.81		2202.02	0.010928	4.51	181.96	161.97	0.62
WillowSprings1	Tributary6.1	299.63	2	548	2198.26	2202.21		2202.74	0.016006	5.85	93.71	46.04	0.72
WillowSprings1	Tributary6.1	349.58	1	548	2199.17	2202.25		2202.82	0.018308	6.49	112.73	113.1	0.9
WillowSprings1	Tributary6.1	349.58	2	548	2199.17	2202.89		2203.34	0.009004	5.39	101.68	45.48	0.64
WillowSprings1	Tributary6.1	400.48	1	548	2199.73	2203.34	2203.1	2203.77	0.018899	5.61	117.02	86.31	0.73
WillowSprings1	Tributary6.1	400.48	2	548	2199.73	2203.47	2203.19	2204.08	0.023385	6.27	87.46	44.8	0.79
WillowSprings1	Tributary6.1	449.73	1	548	2200.45	2204.2		2204.64	0.0168	5.79	113.77	77.05	0.74
WillowSprings1	Tributary6.1	449.73	2	548	2200.45	2204.51		2205.12	0.018954	6.28	87.31	39.18	0.74
WillowSprings1	Tributary6.1	499.35	1	548	2201.45	2204.87		2205.35	0.012637	5.78	109.7	72.54	0.73
WillowSprings1	Tributary6.1	499.35	2	548	2201.45	2205.34		2205.74	0.008433	5.09	107.75	44.73	0.58
WillowSprings1	Tributary6.1	550.49	1	548	2201.97	2205.44		2205.98	0.011479	6.12	106.42	64.13	0.7
WillowSprings1	Tributary6.1	550.49	2	548	2201.97	2205.71		2206.27	0.010517	6.01	91.2	34.41	0.65
WillowSprings1	Tributary6.1	599.55	1	548	2202.69	2206.08	2205.99	2206.85	0.024921	7.24	84.38	53.94	0.88
WillowSprings1	Tributary6.1	599.55	2	548	2202.69	2206.33		2207.07	0.023828	6.9	79.42	33.54	0.79
WillowSprings1	Tributary6.1	649.64	1	548	2203.07	2207.54	2206.97	2208	0.019925	5.62	108.53	61.01	0.62
WillowSprings1	Tributary6.1	649.64	2	548	2203.07	2207.71		2208.21	0.021066	5.7	96.11	34.98	0.61
WillowSprings1	Tributary6.1	699.83	1	548	2203.8	2208.41		2208.61	0.008483	3.86	166.05	95.54	0.42
WillowSprings1	Tributary6.1	699.83	2	548	2203.8	2208.66		2208.92	0.009607	4.12	133	46	0.43
WillowSprings1	Tributary6.1	721.14	1	548	2204.2	2208.61		2208.87	0.016202	4.21	141.65	88.55	0.53
WillowSprings1	Tributary6.1	721.14	2	548	2204.2	2208.92		2209.17	0.01383	4.04	135.77	62.26	0.48
WillowSprings1	Tributary6.1	748.12	Culvert										
WillowSprings1	Tributary6.1	761.86	1	548	2205.03	2210.2	2209.01	2210.33	0.003834	2.96	196.4	104.97	0.35
WillowSprings1	Tributary6.1	761.86	2	548	2205.03	2210.32	2209	2210.46	0.003629	2.91	188.36	79.71	0.33
WillowSprings1	Tributary6.1	803.2	1	548	2206.04	2210.33		2210.61	0.008713	4.24	132.45	71.36	0.5
WillowSprings1	Tributary6.1	803.2	2	548	2206.04	2210.45		2210.7	0.007689	4.05	135.22	57.95	0.47
WillowSprings1	Tributary6.1	839.52	1	548	2206.45	2210.65		2210.86	0.005318	3.7	154.72	85.17	0.41
WillowSprings1	Tributary6.1	839.52	2	548	2206.45	2210.73		2210.94	0.005185	3.64	150.56	58.2	0.4
WillowSprings1	Tributary6.1	852.96	1	548	2207.15	2210.56	2210.56	2211.25	0.063921	6.88	84.34	67.41	1.04
WillowSprings1	Tributary6.1	852.96	2	548	2207.15	2210.74	2210.74	2211.49	0.061128	6.93	79.11	53.43	1
WillowSprings1	Tributary6.1	873.68	1	548	2209.1	2211.57		2211.99	0.021559	5.42	110.88	82.19	0.8
WillowSprings1	Tributary6.1	873.68	2	548	2209.1	2211.75		2212.22	0.021592	5.51	99.49	63.4	0.77
WillowSprings1	Tributary6.1	892.66	1	548	2209.45	2212.06		2212.31	0.012076	4.2	140.4	83.89	0.56
WillowSprings1	Tributary6.1	892.66	2	548	2209.45	2212.24		2212.55	0.012919	4.42	123.94	65.92	0.57
WillowSprings1	Tributary6.1	912.45	1	548	2209.06	2212.27		2212.68	0.019883	5.13	106.74	61.57	0.69
WillowSprings1	Tributary6.1	912.45	2	548	2209.06	2212.5		2212.82	0.014256	4.53	121.07	65	0.58
WillowSprings1	Tributary6.1	960.37	1	548	2209.33	2213.18		2213.43	0.012064	4.02	136.17	57.14	0.46
WillowSprings1	Tributary6.1	960.37	2	548	2209.33	2213.2		2213.45	0.011787	3.99	137.32	57.33	0.45

Table 5.9.2.3
HEC-RAS OUTPUT
FLOODWAY AND FLOODPLAIN

River	Reach	River Sta	Profile #	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
WillowSprings1	Tributary6.1	1034.46	1	548	2210.18	2213.88		2214.03	0.005587	3.19	180.46	81.67	0.37
WillowSprings1	Tributary6.1	1034.46	2	548	2210.18	2213.91		2214.09	0.006625	3.43	159.82	67.4	0.39
WillowSprings1	Tributary6.1	1088.19	1	548	2210.68	2214.2		2214.37	0.00692	3.45	162.94	85.14	0.41
WillowSprings1	Tributary6.1	1088.19	2	548	2210.68	2214.28		2214.5	0.008277	3.78	144.97	64.43	0.44
WillowSprings1	Tributary6.1	1153.74	1	548	2211.26	2214.79		2215.3	0.030075	5.99	99.25	57.48	0.75
WillowSprings1	Tributary6.1	1153.74	2	548	2211.26	2214.94		2215.59	0.0325	6.48	85.1	40.17	0.78
WillowSprings1	Tributary6.1	1199.65	1	548	2211.85	2216.01	2215.44	2216.39	0.019463	5.29	114.74	63.74	0.61
WillowSprings1	Tributary6.1	1199.65	2	548	2211.85	2216.3	2215.57	2216.8	0.021596	5.72	95.75	36.53	0.62
WillowSprings1	Tributary6.1	1248.76	1	548	2212.31	2216.85		2217.15	0.01211	4.67	136.84	74.06	0.49
WillowSprings1	Tributary6.1	1248.76	2	548	2212.31	2217.25		2217.63	0.01309	4.97	110.17	34.5	0.49
WillowSprings1	Tributary6.1	1299.88	1	548	2212.69	2217.52		2217.9	0.016144	5.35	129.1	93.12	0.57
WillowSprings1	Tributary6.1	1299.88	2	548	2212.69	2217.94		2218.45	0.018171	5.76	95.11	29.87	0.57
WillowSprings1	Tributary6.1	1311.47	1	548	2213.03	2217.78		2218.06	0.009888	4.56	146.81	91.64	0.46
WillowSprings1	Tributary6.1	1311.47	2	548	2213.03	2218.31		2218.61	0.008692	4.42	124.1	34.95	0.41
WillowSprings1	Tributary6.1	1314.76	1	548	2215.95	2217.88	2217.88	2218.58	0.017063	5.16	100.77	90.33	0.7
WillowSprings1	Tributary6.1	1314.76	2	548	2215.95	2218.16	2218.16	2219.16	0.03812	8.05	68.03	34.29	1.01
WillowSprings1	Tributary6.1	1350.42	1	548	2216.32	2218.6	2218.6	2219.44	0.01957	7.42	80.57	59.12	0.95
WillowSprings1	Tributary6.1	1350.42	2	548	2216.32	2219.33		2219.8	0.008918	5.49	99.9	38.27	0.6
WillowSprings1	Tributary6.1	1400.87	1	548	2217.17	2219.89		2220.15	0.009429	4.38	147.76	80.69	0.52
WillowSprings1	Tributary6.1	1400.87	2	548	2217.17	2219.93		2220.36	0.014265	5.28	103.76	45.84	0.62
WillowSprings1	Tributary6.1	1450.19	1	548	2218.05	2220.36	2220.24	2221.06	0.030687	6.76	83.1	51.5	0.89
WillowSprings1	Tributary6.1	1450.19	2	548	2218.05	2220.68		2221.2	0.019304	5.79	94.69	44.8	0.7
WillowSprings1	Tributary6.1	1497.15	1	548	2218.05	2221.46		2221.81	0.009034	4.81	121.4	56.16	0.52
WillowSprings1	Tributary6.1	1497.15	2	548	2218.05	2221.47		2221.85	0.009941	4.93	111.25	41.62	0.53
WillowSprings1	Tributary6.1	1549.82	1	548	2218.35	2221.84		2222.49	0.014319	6.55	88.59	45.31	0.72
WillowSprings1	Tributary6.1	1549.82	2	548	2218.35	2221.89		2222.54	0.013743	6.49	85.58	33.53	0.71
WillowSprings1	Tributary6.1	1600.01	1	548	2219.16	2222.62		2223.22	0.01455	6.27	90.92	44.47	0.72
WillowSprings1	Tributary6.1	1600.01	2	548	2219.16	2222.65		2223.26	0.014642	6.28	88.04	36.98	0.72
WillowSprings1	Tributary6.1	1649.18	1	548	2219.23	2223.65		2224.1	0.021241	5.41	104.11	50.67	0.61
WillowSprings1	Tributary6.1	1649.18	2	548	2219.23	2223.68		2224.12	0.020216	5.32	105.86	50.99	0.6
WillowSprings1	Tributary6.1	1702.62	1	548	2219.83	2224.75		2225.26	0.021593	5.71	95.94	36.86	0.62
WillowSprings1	Tributary6.1	1702.62	2	548	2219.83	2224.75		2225.26	0.021656	5.72	95.84	36.84	0.62
WillowSprings1	Tributary6.1	1749.23	1	548	2221.01	2225.83	2225.72	2226.93	0.052278	8.39	65.3	27.28	0.96
WillowSprings1	Tributary6.1	1749.23	2	548	2221.01	2225.83	2225.73	2226.93	0.052251	8.39	65.31	27.28	0.96
WillowSprings1	Tributary6.1	1795.8	1	548	2222.1	2228.11	2227.47	2228.79	0.030511	6.64	82.5	32.44	0.73
WillowSprings1	Tributary6.1	1795.8	2	548	2222.1	2228.11	2227.47	2228.79	0.030519	6.64	82.5	32.44	0.73
WillowSprings1	Tributary6.1	1849.32	1	548	2223.63	2229.42		2229.64	0.00878	3.77	145.42	51.61	0.4
WillowSprings1	Tributary6.1	1849.32	2	548	2223.63	2229.42		2229.64	0.00878	3.77	145.42	51.61	0.4
WillowSprings1	Tributary6.1	1950.55	1	548	2226.73	2230.69		2230.94	0.020199	4.01	136.49	81.82	0.55
WillowSprings1	Tributary6.1	1950.55	2	548	2226.73	2230.69		2230.94	0.020199	4.01	136.49	81.82	0.55
WillowSprings1	Tributary6.1	1999.91	1	548	2228.39	2231.78		2232.29	0.034041	5.71	96.05	52.13	0.74
WillowSprings1	Tributary6.1	1999.91	2	548	2228.39	2231.78		2232.29	0.034041	5.71	96.05	52.13	0.74
WillowSprings1	Tributary6.1	2049.58	1	548	2230.46	2233.65	2233.48	2234.27	0.045847	6.31	86.81	53.02	0.87
WillowSprings1	Tributary6.1	2049.58	2	548	2230.46	2233.65	2233.48	2234.27	0.045847	6.31	86.81	53.02	0.87
WillowSprings1	Tributary6.1	2099.7	1	548	2232.89	2236.69	2236.69	2237.75	0.054322	8.26	66.31	31.28	1
WillowSprings1	Tributary6.1	2099.7	2	548	2232.89	2236.69	2236.69	2237.75	0.054322	8.26	66.31	31.28	1
WillowSprings1	Tributary6.1	2150.19	1	548	2234.24	2239.08		2239.67	0.027009	6.18	88.73	35.88	0.69
WillowSprings1	Tributary6.1	2150.19	2	548	2234.24	2239.08		2239.67	0.027009	6.18	88.73	35.88	0.69
WillowSprings2	Tributary6.2	48.03	1	606	2187.47	2191.95		2192.12	0.005589	3.77	207.16	108.35	0.4
WillowSprings2	Tributary6.2	48.03	2	606	2187.47	2192.6		2192.93	0.006996	4.57	132.64	38.82	0.44
WillowSprings2	Tributary6.2	82.26	1	606	2187.34	2192.1		2192.31	0.004926	4.25	199.79	107.9	0.44
WillowSprings2	Tributary6.2	82.26	2	606	2187.34	2192.77		2193.18	0.006285	5.11	118.69	33.12	0.48

Table 5.9.2.3
HEC-RAS OUTPUT
FLOODWAY AND FLOODPLAIN

River	Reach	River Sta	Profile #	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
WillowSprings2	Tributary6.2	129.88	1	606	2188.18	2192.26		2192.69	0.009074	6	149.95	106.77	0.66
WillowSprings2	Tributary6.2	129.88	2	606	2188.18	2192.97		2193.6	0.008892	6.38	94.95	28.82	0.62
WillowSprings2	Tributary6.2	206	1	606	2190.16	2193.03		2193.54	0.0173	6.52	127.86	96.51	0.81
WillowSprings2	Tributary6.2	206	2	606	2190.16	2193.75		2194.43	0.013103	6.59	91.96	33.42	0.7
WillowSprings2	Tributary6.2	249.64	1	606	2190.81	2193.89		2194.34	0.019745	5.99	130.13	100.82	0.76
WillowSprings2	Tributary6.2	249.64	2	606	2190.81	2194.49		2195.06	0.015758	6.12	101.21	40.44	0.68
WillowSprings2	Tributary6.2	306.53	1	606	2191.28	2194.92		2195.12	0.010328	3.87	182.36	116.64	0.47
WillowSprings2	Tributary6.2	306.53	2	606	2191.28	2195.51		2195.75	0.008763	3.94	153.64	56.83	0.42
WillowSprings2	Tributary6.2	399.34	1	606	2192.6	2195.8		2196.08	0.010254	4.67	160.3	107.08	0.57
WillowSprings2	Tributary6.2	399.34	2	606	2192.6	2196.25		2196.61	0.009074	4.83	125.57	49.59	0.53
WillowSprings2	Tributary6.2	450.33	1	606	2192.91	2196.32		2196.66	0.011651	5.2	151.84	103.46	0.63
WillowSprings2	Tributary6.2	450.33	2	606	2192.91	2196.71		2197.21	0.013262	5.76	108.04	44.02	0.64
WillowSprings2	Tributary6.2	498.92	1	606	2193.81	2196.98		2197.16	0.008125	3.98	219.96	205.96	0.52
WillowSprings2	Tributary6.2	498.92	2	606	2193.81	2197.43		2197.76	0.009036	4.59	132.04	58.94	0.54
WillowSprings3	Tributary6.3	55.31	1	1017	2171.51	2174.47		2175.24	0.013514	7.29	144.96	60.2	0.81
WillowSprings3	Tributary6.3	55.31	2	1017	2171.51	2174.79	2174.58	2175.91	0.016414	8.63	122.27	43.85	0.9
WillowSprings3	Tributary6.3	95.43	1	1017	2171.59	2175.19		2175.63	0.006313	5.61	194.15	78.6	0.59
WillowSprings3	Tributary6.3	95.43	2	1017	2171.59	2175.73		2176.41	0.008145	6.58	154.49	45.88	0.63
WillowSprings3	Tributary6.3	122.08	1	1017	2171.87	2175.29	2174.72	2175.86	0.008127	6.54	175.52	72.83	0.68
WillowSprings3	Tributary6.3	122.08	2	1017	2171.87	2175.92	2175.02	2176.63	0.007846	6.73	151.06	43.47	0.64
WillowSprings3	Tributary6.3	150.2	1	1017	2172.15	2175.47	2175.04	2176.15	0.009879	7.09	163.39	69.94	0.73
WillowSprings3	Tributary6.3	150.2	2	1017	2172.15	2176.08	2175.3	2176.92	0.010114	7.35	138.3	38.97	0.69
WillowSprings3	Tributary6.3	199.81	1	1017	2172.36	2175.9		2176.79	0.013465	8.12	143.63	64.11	0.84
WillowSprings3	Tributary6.3	199.81	2	1017	2172.36	2176.48		2177.58	0.013938	8.44	120.49	34.55	0.8
WillowSprings3	Tributary6.3	250.04	1	1017	2173	2176.45		2177.43	0.011136	8.41	135.64	55.7	0.85
WillowSprings3	Tributary6.3	250.04	2	1017	2173	2177.11		2178.2	0.010856	8.4	121.09	32.86	0.77
WillowSprings3	Tributary6.3	300.22	1	1017	2172.73	2176.85	2176.82	2178.17	0.014556	9.73	122.16	49.05	0.93
WillowSprings3	Tributary6.3	300.22	2	1017	2172.73	2177.57		2178.85	0.01283	9.08	112.05	27.12	0.79
WillowSprings3	Tributary6.3	351	1	1017	2173.28	2177.89	2177.51	2178.82	0.01028	8.18	146.04	57.07	0.76
WillowSprings3	Tributary6.3	351	2	1017	2173.28	2178.43		2179.44	0.009511	8.06	126.16	30.64	0.7
WillowSprings3	Tributary6.3	398.51	1	1017	2173.56	2178.69		2179.25	0.006805	6.3	186.05	62.25	0.56
WillowSprings3	Tributary6.3	398.51	2	1017	2173.56	2179.29		2179.87	0.007182	6.11	166.42	36.12	0.5
WillowSprings3	Tributary6.3	448.5	1	1017	2173.92	2179.11		2179.6	0.007255	5.92	199.58	72.69	0.53
WillowSprings3	Tributary6.3	448.5	2	1017	2173.92	2179.72		2180.21	0.00629	5.64	180.16	40.47	0.47
WillowSprings3	Tributary6.3	499.93	1	1017	2174.24	2179.62		2180.05	0.01013	5.58	202.41	67.97	0.52
WillowSprings3	Tributary6.3	499.93	2	1017	2174.24	2180.11		2180.65	0.01102	5.87	173.15	42.78	0.51
WillowSprings3	Tributary6.3	551.23	1	1017	2175.25	2180.1		2180.74	0.015455	6.79	168.48	62.59	0.65
WillowSprings3	Tributary6.3	551.23	2	1017	2175.25	2180.64		2181.37	0.015481	6.88	147.79	38.7	0.62
WillowSprings3	Tributary6.3	599.32	1	1017	2175.25	2180.79		2181.35	0.011542	6.4	190.13	77.14	0.59
WillowSprings3	Tributary6.3	599.32	2	1017	2175.25	2181.36		2182.03	0.012045	6.57	154.8	37.36	0.57
WillowSprings3	Tributary6.3	651.56	1	1017	2175.81	2181.42		2181.99	0.015663	6.35	184.35	85.25	0.61
WillowSprings3	Tributary6.3	651.56	2	1017	2175.81	2182.18		2182.68	0.01208	5.68	179.17	47.94	0.52
WillowSprings3	Tributary6.3	700.59	1	1017	2176.27	2182.18		2182.38	0.004378	3.76	305.97	101.2	0.34
WillowSprings3	Tributary6.3	700.59	2	1017	2176.27	2182.8		2183.05	0.004528	3.98	255.83	57.71	0.33
WillowSprings3	Tributary6.3	729.75	1	1017	2176.37	2182.25		2182.56	0.008351	4.68	236.45	82.19	0.46
WillowSprings3	Tributary6.3	729.75	2	1017	2176.37	2182.88		2183.27	0.00873	5.04	201.73	53.24	0.46
WillowSprings3	Tributary6.3	771.87	1	1017	2177.22	2182.4		2182.95	0.010064	6.51	201.22	96.5	0.63
WillowSprings3	Tributary6.3	771.87	2	1017	2177.22	2183.04		2183.76	0.010045	6.79	149.73	38.08	0.6
WillowSprings3	Tributary6.3	823.09	1	1017	2177.5	2183.11		2183.37	0.007822	4.51	281.7	138.49	0.44
WillowSprings3	Tributary6.3	823.09	2	1017	2177.5	2183.89		2184.25	0.007921	4.81	211.38	51.71	0.42
WillowSprings3	Tributary6.3	865.92	1	1017	2178.34	2183.37		2183.62	0.004684	4.46	311.73	167.47	0.45
WillowSprings3	Tributary6.3	865.92	2	1017	2178.34	2184.16		2184.49	0.004118	4.63	221.12	58.29	0.42

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HEC-RAS OUTPUT
FLOODWAY AND FLOODPLAIN

River	Reach	River Sta	Profile #	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
WillowSprings3	Tributary6.3	903.9	1	1017	2178.62	2183.53		2184	0.016753	6.08	216.72	144.74	0.65
WillowSprings3	Tributary6.3	903.9	2	1017	2178.62	2184.26		2184.82	0.012986	6.02	171.44	50.81	0.57
WillowSprings3	Tributary6.3	947.58	1	1017	2179.19	2184.19		2184.68	0.014458	5.92	204.06	117.37	0.61
WillowSprings3	Tributary6.3	947.58	2	1017	2179.19	2184.87		2185.31	0.00947	5.35	191.97	53.91	0.5
WillowSprings3	Tributary6.3	962.45	1	1017	2179.74	2184.45		2184.87	0.011311	5.47	226.31	131.87	0.55
WillowSprings3	Tributary6.3	962.45	2	1017	2179.74	2185.03		2185.45	0.009441	5.23	194.38	53.28	0.48
WillowSprings3	Tributary6.3	976.01	Inl Struct										
WillowSprings3	Tributary6.3	989.5	1	1017	2179.75	2184.54	2183.91	2184.95	0.012784	5.6	225.09	125.2	0.58
WillowSprings3	Tributary6.3	989.5	2	1017	2179.75	2185.12	2183.91	2185.64	0.010863	5.82	178.49	53.28	0.55
WillowSprings3	Tributary6.3	1023.98	1	1017	2180.23	2185.02		2185.24	0.005958	4.06	295.02	132.08	0.39
WillowSprings3	Tributary6.3	1023.98	2	1017	2180.23	2185.66		2185.92	0.005359	4.08	249.05	62.9	0.36
WillowSprings3	Tributary6.3	1099.74	1	1017	2180.72	2185.49		2185.77	0.008474	4.58	269.82	137.44	0.45
WillowSprings3	Tributary6.3	1099.74	2	1017	2180.72	2186.08		2186.43	0.007609	4.7	216.62	57.74	0.43
WillowSprings3	Tributary6.3	1149.01	1	1017	2180.87	2185.94		2186.3	0.013067	5.2	231.34	128.94	0.54
WillowSprings3	Tributary6.3	1149.01	2	1017	2180.87	2186.49		2186.89	0.01099	5.14	199.68	59.55	0.49
WillowSprings3	Tributary6.3	1191.11	1	1017	2181.15	2186.41		2186.89	0.012659	5.76	200.56	90.14	0.55
WillowSprings3	Tributary6.3	1191.11	2	1017	2181.15	2186.91		2187.38	0.011063	5.5	184.85	48.03	0.49
WillowSprings3	Tributary6.3	1255.73	1	1017	2182.28	2187.25		2187.65	0.011413	5.33	216.86	101.04	0.54
WillowSprings3	Tributary6.3	1255.73	2	1017	2182.28	2187.64		2188.07	0.010224	5.24	195.35	56.63	0.5
WillowSprings3	Tributary6.3	1301.62	1	1017	2182.56	2187.68		2187.9	0.002873	3.97	297.14	137.07	0.39
WillowSprings3	Tributary6.3	1301.62	2	1017	2182.56	2188.07		2188.3	0.002671	3.87	263.51	72.39	0.36
WillowSprings3	Tributary6.3	1349.91	1	1017	2182.84	2187.84		2188.14	0.007478	4.54	247.43	113.78	0.48
WillowSprings3	Tributary6.3	1349.91	2	1017	2182.84	2188.22		2188.51	0.006375	4.33	234.64	74.3	0.43
WillowSprings3	Tributary6.3	1400.05	1	1017	2183.62	2188.29		2188.52	0.007699	4	267.87	100.98	0.42
WillowSprings3	Tributary6.3	1400.05	2	1017	2183.62	2188.58		2188.88	0.00871	4.38	232.27	74.61	0.44
WillowSprings3	Tributary6.3	1455.49	1	1017	2184.42	2188.67		2189.06	0.008977	5.4	234.42	134.42	0.58
WillowSprings3	Tributary6.3	1455.49	2	1017	2184.42	2188.94		2189.46	0.009786	5.76	176.43	59.5	0.59
WillowSprings3	Tributary6.3	1506.59	1	1017	2184.81	2189.05		2189.69	0.012988	6.62	177.39	99.76	0.71
WillowSprings3	Tributary6.3	1506.59	2	1017	2184.81	2189.4		2189.99	0.010133	6.18	168.56	56.2	0.62
WillowSprings3	Tributary6.3	1552.26	1	1017	2185.23	2189.65		2190.34	0.015195	7.04	172.72	100.57	0.78
WillowSprings3	Tributary6.3	1552.26	2	1017	2185.23	2189.81		2190.65	0.016834	7.37	137.93	51.82	0.8
WillowSprings3	Tributary6.3	1598.41	1	1017	2185.97	2190.45		2190.96	0.011468	6.26	214.55	128.44	0.65
WillowSprings3	Tributary6.3	1598.41	2	1017	2185.97	2190.57		2191.41	0.016073	7.39	137.63	46.23	0.75
WillowSprings3	Tributary6.3	1642.19	1	1017	2186.46	2190.88		2191.58	0.015205	7.38	188.55	123.56	0.8
WillowSprings3	Tributary6.3	1642.19	2	1017	2186.46	2191.15	2190.85	2192.24	0.018595	8.38	121.38	41.25	0.86
WillowSprings4	Tributary6.4	28.8	1	1182	2150.36	2156.08	2155.05	2156.82	0.011524	7.11	187.95	59.72	0.6
WillowSprings4	Tributary6.4	28.8	2	1182	2150.36	2157.08	2154.96	2157.67	0.007485	6.15	192.25	36.18	0.47
WillowSprings4	Tributary6.4	54.32	1	1182	2150.63	2156.25		2157.17	0.011164	8.04	176.28	54.34	0.67
WillowSprings4	Tributary6.4	54.32	2	1182	2150.63	2157.1		2157.97	0.009874	7.51	157.45	29.53	0.57
WillowSprings4	Tributary6.4	99.15	1	1182	2152.09	2156.9		2157.82	0.020272	8.27	171.6	58.71	0.73
WillowSprings4	Tributary6.4	99.15	2	1182	2152.09	2157.56		2158.66	0.020874	8.41	140.51	30.47	0.69
WillowSprings4	Tributary6.4	149.37	1	1182	2152.46	2158		2158.54	0.010179	6.27	225.35	73.78	0.55
WillowSprings4	Tributary6.4	149.37	2	1182	2152.46	2158.79		2159.38	0.009086	6.14	192.58	39.76	0.49
WillowSprings4	Tributary6.4	200.32	1	1182	2152.46	2158.75		2158.98	0.00654	4.1	325.36	94.38	0.35
WillowSprings4	Tributary6.4	200.32	2	1182	2152.46	2159.54		2159.82	0.007208	4.26	277.63	54.97	0.33
WillowSprings4	Tributary6.4	254	1	1182	2152.91	2159.01		2159.76	0.025045	7.15	179.47	60.02	0.66
WillowSprings4	Tributary6.4	254	2	1182	2152.91	2159.89		2160.5	0.018461	6.27	188.47	41.63	0.52
WillowSprings4	Tributary6.4	301.79	1	1182	2153.19	2160.11		2160.68	0.014899	6.25	205.18	59.75	0.54
WillowSprings4	Tributary6.4	301.79	2	1182	2153.19	2160.74		2161.27	0.013824	5.85	202.03	41.84	0.47
WillowSprings4	Tributary6.4	348.8	1	1182	2153.57	2160.81		2161.29	0.011377	5.74	223.81	61.46	0.47
WillowSprings4	Tributary6.4	348.8	2	1182	2153.57	2161.4		2161.86	0.011081	5.45	217.06	41.6	0.42
WillowSprings4	Tributary6.4	382.34	1	1182	2154.3	2161.17		2161.73	0.013299	6.14	209.87	58.14	0.5

Table 5.9.2.3
HEC-RAS OUTPUT
FLOODWAY AND FLOODPLAIN

River	Reach	River Sta	Profile #	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
WillowSprings4	Tributary6.4	382.34	2	1182	2154.3	2161.73		2162.26	0.011787	5.89	201.93	39.04	0.46
WillowSprings4	Tributary6.4	428.32	1	1182	2154.66	2161.88		2162.23	0.008754	5.01	263.52	71.35	0.41
WillowSprings4	Tributary6.4	428.32	2	1182	2154.66	2162.37		2162.79	0.010579	5.17	228.79	43.62	0.4
WillowSprings4	Tributary6.4	451.96	1	1182	2154.66	2162.18		2162.39	0.004155	3.94	347.75	79.89	0.29
WillowSprings4	Tributary6.4	451.96	2	1182	2154.66	2162.69		2163	0.006814	4.47	264.52	42.29	0.31
WillowSprings4	Tributary6.4	504.71	1	1182	2155.56	2162.36		2162.64	0.005017	4.66	309.61	81.42	0.37
WillowSprings4	Tributary6.4	504.71	2	1182	2155.56	2162.96		2163.3	0.004726	4.82	273.13	51.44	0.36
WillowSprings4	Tributary6.4	550.4	1	1182	2156.1	2162.64		2162.9	0.006587	4.48	316.61	91.45	0.35
WillowSprings4	Tributary6.4	550.4	2	1182	2156.1	2163.23		2163.54	0.006245	4.7	276.27	54.42	0.35
WillowSprings4	Tributary6.4	600.77	1	1182	2156.7	2162.91		2163.48	0.015373	6.42	212.05	65.86	0.54
WillowSprings4	Tributary6.4	600.77	2	1182	2156.7	2163.46		2164.07	0.012874	6.36	198.16	41.99	0.5
WillowSprings4	Tributary6.4	650.05	1	1182	2157.58	2163.72		2164.24	0.01564	6.16	216.41	65.34	0.53
WillowSprings4	Tributary6.4	650.05	2	1182	2157.58	2164.15		2164.73	0.014206	6.27	200.66	44.52	0.51
WillowSprings4	Tributary6.4	700.84	1	1182	2157.81	2164.14		2164.58	0.00371	5.56	245.83	68.09	0.46
WillowSprings4	Tributary6.4	700.84	2	1182	2157.81	2164.57		2165.06	0.003551	5.6	211.82	42.84	0.44
WillowSprings4	Tributary6.4	715.78	1	1182	2157.61	2163.99		2164.77	0.00842	7.27	173.55	57.82	0.65
WillowSprings4	Tributary6.4	715.78	2	1182	2157.61	2164.43		2165.23	0.008467	7.21	163.97	37.4	0.61
WillowSprings4	Tributary6.4	746.48	1	1182	2160.24	2165.06	2165.06	2166.18	0.008632	8.88	146.43	65.82	0.9
WillowSprings4	Tributary6.4	746.48	2	1182	2160.24	2165.08	2165.08	2166.6	0.012061	9.91	119.22	39.46	1.01
WillowSprings4	Tributary6.4	800.56	1	1182	2161.68	2166.49	2166.49	2167.64	0.006569	9.45	152.64	63.71	0.83
WillowSprings4	Tributary6.4	800.56	2	1182	2161.68	2166.55	2166.55	2168.45	0.010919	11.33	109.34	29.19	0.99
WillowSprings4	Tributary6.4	851.84	1	1182	2161.58	2167.93	2167.93	2169.19	0.008965	9.5	137.52	54.53	0.9
WillowSprings4	Tributary6.4	851.84	2	1182	2161.58	2167.99	2167.99	2169.74	0.012156	10.72	112.69	32.54	1.01
WillowSprings4	Tributary6.4	901.24	1	1182	2163.99	2168.5	2168.5	2169.68	0.009981	8.98	139.47	60.54	0.96
WillowSprings4	Tributary6.4	901.24	2	1182	2163.99	2169.34		2170.23	0.005874	7.58	155.96	43.62	0.71
WillowSprings4	Tributary6.4	951.78	1	1182	2166.02	2169.79	2169.79	2171.01	0.010119	9.51	141.63	62.16	0.98
WillowSprings4	Tributary6.4	951.78	2	1182	2166.02	2170.22	2170.22	2171.9	0.012499	10.39	113.75	34.01	1
WillowSprings4	Tributary6.4	994.62	1	1182	2166.25	2170.4	2170.4	2171.7	0.008829	9.82	146.22	59.98	0.94
WillowSprings4	Tributary6.4	994.62	2	1182	2166.25	2170.67	2170.67	2172.52	0.012515	10.93	108.18	29.51	1.01
WillowSprings4	Tributary6.4	1048.17	1	1182	2166.66	2171.18	2170.93	2172.15	0.007014	8.45	158.5	64.48	0.83
WillowSprings4	Tributary6.4	1048.17	2	1182	2166.66	2171.89	2171.27	2173.09	0.007469	8.8	134.33	34.1	0.78
WillowSprings4	Tributary6.4	1099.31	1	1182	2168.21	2171.8	2171.8	2173.09	0.009676	9.58	136.16	55.99	0.97
WillowSprings4	Tributary6.4	1099.31	2	1182	2168.21	2172.09	2172.02	2173.68	0.011582	10.11	116.89	34.96	0.97
WillowSprings4	Tributary6.4	1151.14	1	1182	2168.5	2172.37	2172.37	2173.67	0.008762	9.59	135.99	54.62	0.93
WillowSprings4	Tributary6.4	1151.14	2	1182	2168.5	2172.66	2172.52	2174.27	0.01095	10.17	116.17	32.4	0.95
WillowSprings4	Tributary6.4	1200.11	1	1182	2168.5	2173.51		2174.04	0.004537	6.33	217.2	83.9	0.56
WillowSprings4	Tributary6.4	1200.11	2	1182	2168.5	2173.95		2174.75	0.006335	7.19	164.43	37.88	0.61
WillowSprings4	Tributary6.4	1249.72	1	1182	2169.76	2173.7		2174.35	0.006604	6.67	197.78	77.81	0.64
WillowSprings4	Tributary6.4	1249.72	2	1182	2169.76	2174.52		2175.04	0.004323	5.78	204.49	49.16	0.5
WillowSprings5	Tributary6C	57.06	1	77	2171.57	2174.8		2174.82	0.000256	1.14	73.66	30.76	0.12
WillowSprings5	Tributary6C	57.06	2	77	2171.57	2175.37		2175.4	0.000352	1.32	58.25	16.44	0.12
WillowSprings5	Tributary6C	99.91	1	77	2172.13	2174.81		2174.84	0.000518	1.57	58.44	36.49	0.18
WillowSprings5	Tributary6C	99.91	2	77	2172.13	2175.38		2175.43	0.000711	1.72	44.65	14.71	0.17
WillowSprings5	Tributary6C	157.74	1	77	2173.21	2174.71		2174.99	0.009532	4.48	19.06	17.93	0.69
WillowSprings5	Tributary6C	157.74	2	77	2173.21	2175.36		2175.57	0.005699	3.66	21.06	10.72	0.46
WillowSprings5	Tributary6C	181.57	1	77	2173.65	2174.96	2174.96	2175.42	0.019728	5.82	14.69	16.36	0.96
WillowSprings5	Tributary6C	181.57	2	77	2173.65	2175.42		2175.84	0.015025	5.23	14.73	9.23	0.73
WillowSprings5	Tributary6C	215	1	77	2174.38	2175.72	2175.72	2176.17	0.020351	5.53	14.98	17.72	0.96
WillowSprings5	Tributary6C	215	2	77	2174.38	2175.98		2176.33	0.013872	4.78	16.12	12.55	0.74
WillowSprings5	Tributary6C	249.98	1	77	2174.82	2176.41	2176.39	2176.85	0.017672	5.55	15.68	18.09	0.91
WillowSprings5	Tributary6C	249.98	2	77	2174.82	2176.46	2176.43	2177.02	0.024233	6.04	12.74	10.57	0.97
WillowSprings5	Tributary6C	300.54	1	77	2175.79	2177.32		2177.67	0.01393	5.05	17.11	19.2	0.81

Table 5.9.2.3
HEC-RAS OUTPUT
FLOODWAY AND FLOODPLAIN

River	Reach	River Sta	Profile #	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
WillowSprings5	Tributary6C	300.54	2	77	2175.79	2177.59	2177.47	2178.18	0.021393	6.12	12.58	8.51	0.89
WillowSprings5	Tributary6C	349.49	1	77	2176.63	2178.2	2178.2	2178.66	0.01994	5.87	15.66	18.1	0.96
WillowSprings5	Tributary6C	349.49	2	77	2176.63	2178.61		2179.03	0.013911	5.19	14.84	9.45	0.73
WillowSprings5	Tributary6C	400.97	1	77	2177.3	2179.08		2179.44	0.012478	5.28	17.09	18.81	0.78
WillowSprings5	Tributary6C	400.97	2	77	2177.3	2179.33		2179.85	0.017347	5.79	13.3	7.99	0.79
WillowSprings5	Tributary6C	448.03	1	77	2177.76	2179.64		2179.99	0.011017	5.13	18.73	19.23	0.74
WillowSprings5	Tributary6C	448.03	2	77	2177.76	2180.12		2180.45	0.009185	4.61	16.72	8.51	0.58
WillowSprings5	Tributary6C	500.13	1	77	2179.08	2180.57	2180.57	2180.97	0.022209	5.32	16.26	21.4	0.91
WillowSprings5	Tributary6C	500.13	2	77	2179.08	2180.75		2181.13	0.018665	4.97	15.5	12.4	0.78
WillowSprings5	Tributary6C	552.89	1	77	2180.29	2181.63		2181.94	0.015061	5.15	21.25	35.27	0.84
WillowSprings5	Tributary6C	552.89	2	77	2180.29	2181.79	2181.79	2182.46	0.027762	6.57	11.73	8.89	1.01
WillowSprings5	Tributary6C	606.15	1	77	2181.17	2182.76	2182.76	2183.22	0.01868	5.64	15.58	18.83	0.93
WillowSprings5	Tributary6C	606.15	2	77	2181.17	2183.05		2183.43	0.012217	4.95	15.56	10.83	0.73
WillowSprings5	Tributary6C	648.37	1	77	2182.23	2183.68		2183.89	0.013355	3.14	21.57	24.61	0.58
WillowSprings5	Tributary6C	648.37	2	77	2182.23	2183.82	2183.79	2184.32	0.039521	5.69	13.53	12.83	0.98
WillowSprings5	Tributary6C	677.13	1	77	2183.86	2185.16	2185.16	2185.56	0.012589	5.37	15.81	20.12	0.92
WillowSprings5	Tributary6C	677.13	2	77	2183.86	2185.26	2185.26	2185.84	0.017726	6.14	12.54	10.85	1.01
WillowSprings5	Tributary6C	693.52	Int Struct										
WillowSprings5	Tributary6C	707.15	1	77	2184.78	2186.3	2185.92	2186.4	0.003664	2.57	30.01	35.7	0.49
WillowSprings5	Tributary6C	707.15	2	77	2184.78	2186.3	2185.93	2186.4	0.003664	2.57	30.01	35.7	0.49
WillowSprings5	Tributary6C	713.03	1	77	2184.67	2186.28		2186.44	0.004726	3.28	23.91	26.62	0.57
WillowSprings5	Tributary6C	713.03	2	77	2184.67	2186.28		2186.45	0.004774	3.29	23.45	23.22	0.58
WillowSprings5	Tributary6C	750.74	1	77	2184.81	2186.42		2186.71	0.007899	4.35	18.8	19.79	0.71
WillowSprings5	Tributary6C	750.74	2	77	2184.81	2186.43		2186.73	0.00939	4.4	17.48	14.97	0.72
WillowSprings5	Tributary6C	800.16	1	77	2185.36	2187.09	2187.09	2187.62	0.022593	6.16	14.79	15.97	0.93
WillowSprings5	Tributary6C	800.16	2	77	2185.36	2187.16	2187.16	2187.87	0.034221	6.74	11.42	7.97	0.99
WillowSprings5	Tributary6C	850.52	1	77	2186.78	2188.55	2188.55	2189.07	0.021759	6.15	15.88	17.51	0.92
WillowSprings5	Tributary6C	850.52	2	77	2186.78	2188.78	2188.62	2189.38	0.02622	6.2	12.42	7.63	0.86
WillowSprings5	Tributary6C	900.27	1	77	2187.34	2189.56	2189.55	2190.19	0.022798	6.68	13.78	12.38	0.92
WillowSprings5	Tributary6C	900.27	2	77	2187.34	2190.08		2190.57	0.021824	5.66	13.6	6.28	0.68
WillowSprings5	Tributary6C	951.53	1	77	2189.31	2190.96	2190.83	2191.22	0.017551	4.44	22.34	32.73	0.71
WillowSprings5	Tributary6C	951.53	2	77	2189.31	2191.25		2191.53	0.015307	4.25	18.11	12.06	0.61
WillowSprings5	Tributary6C	1000.85	1	77	2189.87	2191.98	2191.93	2192.48	0.036901	5.74	14.13	13.23	0.91
WillowSprings5	Tributary6C	1000.85	2	77	2189.87	2192.18	2191.91	2192.59	0.030001	5.19	14.83	10.3	0.76
WillowSprings5	Tributary6C	1039.68	1	77	2191.13	2193.21	2193.02	2193.61	0.022898	5.14	16.62	40.18	0.77
WillowSprings5	Tributary6C	1039.68	2	77	2191.13	2193.27	2193.03	2193.69	0.02653	5.18	14.87	10.21	0.76
WillowSprings5	Tributary6C	1082.25	1	77	2192.15	2194.2	2194.1	2194.64	0.024684	5.53	15.86	15.74	0.82
WillowSprings5	Tributary6C	1082.25	2	77	2192.15	2194.41	2194.11	2194.85	0.027468	5.29	14.56	8.85	0.73
WillowSprings5	Tributary6C	1101.05	1	77	2192.69	2194.68	2194.62	2195.17	0.029812	5.67	14.27	14.53	0.9
WillowSprings5	Tributary6C	1101.05	2	77	2192.69	2194.94	2194.61	2195.29	0.019946	4.78	16.11	10.79	0.69
WillowSprings5	Tributary6C	1113.82	1	77	2192.69	2195.12		2195.41	0.011138	4.41	20.99	34.54	0.6
WillowSprings5	Tributary6C	1113.82	2	77	2192.69	2195.2		2195.51	0.013685	4.42	17.44	10.03	0.59
WillowSprings5	Tributary6C	1159.65	1	77	2194.21	2195.71	2195.66	2196.11	0.019994	5.08	15.58	39.43	0.93
WillowSprings5	Tributary6C	1159.65	2	77	2194.21	2195.85	2195.66	2196.16	0.014689	4.47	17.23	16.41	0.77
WillowSprings5	Tributary6C	1201.09	1	77	2194.76	2196.78	2196.78	2197.2	0.012955	5.2	14.81	62.21	1
WillowSprings5	Tributary6C	1201.09	2	77	2194.76	2196.78	2196.78	2197.2	0.012941	5.2	14.81	17.48	1
WillowSprings5	Tributary6C	1208.3	1	77	2194.9	2197.1	2196.78	2197.29	0.006468	3.46	22.24	106.54	0.68
WillowSprings5	Tributary6C	1208.3	2	77	2194.9	2197.1	2196.78	2197.29	0.006468	3.46	22.24	32.02	0.68
WillowSprings5	Tributary6C	1228.74	1	77	2195.31	2197.24	2196.81	2197.41	0.005163	3.3	24.72	28.35	0.52
WillowSprings5	Tributary6C	1228.74	2	77	2195.31	2197.23	2196.8	2197.41	0.005457	3.35	22.98	18.72	0.53
WillowSprings5	Tributary6C	1257.15	1	77	2195.5	2197.44		2197.49	0.001825	2.17	52.11	56.01	0.31
WillowSprings5	Tributary6C	1257.15	2	77	2195.5	2197.44		2197.51	0.002585	2.41	40.03	34.57	0.35

Table 5.9.2.3
HEC-RAS OUTPUT
FLOODWAY AND FLOODPLAIN

River	Reach	River Sta	Profile #	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
WillowSprings5	Tributary6C	1300.25	1	77	2196.81	2198.26	2198.26	2198.62	0.016733	5.31	19.53	30.3	0.87
WillowSprings5	Tributary6C	1300.25	2	77	2196.81	2198.37	2198.37	2199	0.027467	6.4	12.03	9.5	1
WillowSprings5	Tributary6C	1349.43	1	77	2197.33	2199.11	2199.11	2199.7	0.013921	6.43	14.82	16.55	0.98
WillowSprings5	Tributary6C	1349.43	2	77	2197.33	2199.46	2199.17	2199.95	0.013789	5.6	13.75	8.17	0.76
WillowSprings5	Tributary6C	1399.34	1	77	2198.31	2200.16	2200.16	2200.76	0.018109	6.61	15.04	17.85	0.97
WillowSprings5	Tributary6C	1399.34	2	77	2198.31	2200.27	2200.27	2201.06	0.031579	7.14	10.79	6.91	1.01
WillowSprings5	Tributary6C	1454.68	1	77	2199.72	2201.2		2201.57	0.011496	5.11	18.48	20.48	0.79
WillowSprings5	Tributary6C	1454.68	2	77	2199.72	2201.64		2201.93	0.00852	4.28	17.99	10.28	0.57
WillowSprings6	Tributary6B	51.85	1	50	2187.86	2192.07		2192.08	0.000184	0.65	85.69	38.87	0.06
WillowSprings6	Tributary6B	51.85	2	50	2187.86	2192.79		2192.8	0.000136	0.58	86.2	21.6	0.05
WillowSprings6	Tributary6B	83.75	1	50	2188.41	2192.08		2192.08	0.000142	0.62	98.53	57.09	0.07
WillowSprings6	Tributary6B	83.75	2	50	2188.41	2192.79		2192.8	0.000099	0.57	87.1	28.39	0.06
WillowSprings6	Tributary6B	112.94	1	50	2189.25	2192.08		2192.09	0.000467	0.88	70.57	56.16	0.11
WillowSprings6	Tributary6B	112.94	2	50	2189.25	2192.8		2192.81	0.000331	0.8	62.48	23.3	0.09
WillowSprings6	Tributary6B	149.93	1	50	2189.53	2192.09		2192.12	0.000821	1.29	47.84	41.56	0.16
WillowSprings6	Tributary6B	149.93	2	50	2189.53	2192.8		2192.82	0.000424	1.05	47.63	18.27	0.11
WillowSprings6	Tributary6B	179.23	1	50	2190.17	2192.1		2192.19	0.008291	2.47	21.13	26.56	0.44
WillowSprings6	Tributary6B	179.23	2	50	2190.17	2192.82		2192.85	0.001619	1.46	34.35	20.19	0.2
WillowSprings6	Tributary6B	214.31	1	50	2190.79	2192.37		2192.45	0.006392	2.2	22.73	21.97	0.38
WillowSprings6	Tributary6B	214.31	2	50	2190.79	2192.88		2192.91	0.001853	1.48	33.74	22.02	0.21
WillowSprings6	Tributary6B	250.28	1	50	2191.22	2192.68		2192.84	0.019682	3.44	17.63	31.07	0.68
WillowSprings6	Tributary6B	250.28	2	50	2191.22	2192.93		2193.09	0.013455	3.21	15.6	14.95	0.55
WillowSprings6	Tributary6B	300.13	1	50	2192.29	2193.96	2193.93	2194.14	0.037261	3.45	16.02	39.82	0.8
WillowSprings6	Tributary6B	300.13	2	50	2192.29	2193.97		2194.17	0.03987	3.59	13.93	23.79	0.83
WillowSprings6	Tributary6B	349.74	1	50	2193.06	2194.94		2195.08	0.011376	2.94	17.47	21.21	0.51
WillowSprings6	Tributary6B	349.74	2	50	2193.06	2194.97		2195.1	0.010792	2.87	17.41	16.42	0.49
WillowSprings6	Tributary6B	399.65	1	50	2193.74	2195.58	2195.17	2195.71	0.013985	2.86	17.48	19.14	0.53
WillowSprings6	Tributary6B	399.65	2	50	2193.74	2195.58	2195.17	2195.71	0.013784	2.84	17.59	19.22	0.52
WillowSprings6	Tributary6B	448.82	1	50	2194.27	2196.36		2196.49	0.018157	2.83	17.68	24.56	0.59
WillowSprings6	Tributary6B	448.82	2	50	2194.27	2196.36		2196.49	0.018165	2.83	17.68	24.55	0.59
WillowSprings6	Tributary6B	499.9	1	50	2195.44	2197.18		2197.34	0.014888	3.18	15.75	18.13	0.59
WillowSprings6	Tributary6B	499.9	2	50	2195.44	2197.18		2197.34	0.014888	3.18	15.75	18.13	0.59
WillowSprings6	Tributary6B	548.45	1	50	2195.95	2197.94		2198.17	0.018907	3.9	12.83	13.11	0.69
WillowSprings6	Tributary6B	548.45	2	50	2195.95	2197.94		2198.17	0.018718	3.88	12.88	13.14	0.69
WillowSprings6	Tributary6B	599.99	1	50	2197.31	2198.73		2198.96	0.01267	3.78	13.22	18.36	0.79
WillowSprings6	Tributary6B	599.99	2	50	2197.31	2198.73		2198.96	0.012707	3.79	13.21	18.35	0.79
WillowSprings6	Tributary6B	649.8	1	50	2197.9	2199.51		2199.63	0.014084	2.72	18.38	20.71	0.51
WillowSprings6	Tributary6B	649.8	2	50	2197.9	2199.51		2199.63	0.014094	2.72	18.37	20.71	0.51
WillowSprings6	Tributary6B	698.61	1	50	2199.08	2200.51	2200.51	2200.87	0.048741	4.83	10.36	14.68	1.01
WillowSprings6	Tributary6B	698.61	2	50	2199.08	2200.51	2200.51	2200.87	0.049043	4.84	10.33	14.67	1.02
WillowSprings6	Tributary6B	739.34	1	50	2199.38	2201.49		2201.59	0.008711	2.51	19.95	18.88	0.43
WillowSprings6	Tributary6B	739.34	2	50	2199.38	2201.49		2201.59	0.008698	2.5	19.96	18.88	0.43
WillowSprings6	Tributary6B	764.68	1	50	2199.97	2201.72		2201.77	0.005584	1.77	28.27	31.13	0.33
WillowSprings6	Tributary6B	764.68	2	50	2199.97	2201.72		2201.77	0.00558	1.77	28.28	31.13	0.33
WillowSprings6	Tributary6B	800.62	1	50	2200.4	2201.93	2201.93	2202.13	0.014241	3.58	13.95	40.49	1.08
WillowSprings6	Tributary6B	800.62	2	50	2200.4	2201.94	2201.94	2202.13	0.013376	3.45	14.5	40.97	1.02
WillowSprings6	Tributary6B	822.64	1	50	2201.2	2202.48	2202.48	2202.78	0.053057	4.43	11.28	18.82	1.01
WillowSprings6	Tributary6B	822.64	2	50	2201.2	2202.48	2202.48	2202.78	0.053057	4.43	11.28	18.82	1.01
WillowSprings6	Tributary6B	845.79	1	50	2201.7	2203.17		2203.32	0.012261	3.05	16.39	17.33	0.55
WillowSprings6	Tributary6B	845.79	2	50	2201.7	2203.17		2203.32	0.012253	3.05	16.39	17.33	0.55
WillowSprings6	Tributary6B	869.58	Culvert										

Table 5.9.2.3
HEC-RAS OUTPUT
FLOODWAY AND FLOODPLAIN

River	Reach	River Sta	Profile #	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
WillowSprings6	Tributary6B	879.37	1	50	2201.9	2207.78	2203.13	2207.79	0.000068	0.58	104.5	72.51	0.05
VillowSprings6	Tributary6B	879.37	2	50	2201.9	2207.9	2203.13	2207.91	0.000095	0.6	82.98	20.01	0.05
WillowSprings6	Tributary6B	900.04	1	50	2203.41	2207.78		2207.79	0.000026	0.43	158.8	68.08	0.04
WillowSprings6	Tributary6B	900.04	2	50	2203.41	2207.9		2207.91	0.000042	0.52	96.8	24.43	0.05
WillowSprings6	Tributary6B	926.02	1	50	2203.86	2207.79		2207.79	0.000032	0.4	169.08	78.56	0.04
WillowSprings6	Tributary6B	926.02	2	50	2203.86	2207.91		2207.91	0.000061	0.52	95.58	27.28	0.05
WillowSprings6	Tributary6B	948.18	1	50	2204.4	2207.79		2207.79	0.000054	0.51	133.93	78.89	0.05
WillowSprings6	Tributary6B	948.18	2	50	2204.4	2207.91		2207.91	0.000082	0.61	82.09	26.85	0.06
WillowSprings6	Tributary6B	973.61	1	50	2204.4	2207.79		2207.79	0.000115	0.56	111.99	68.82	0.06
WillowSprings6	Tributary6B	973.61	2	50	2204.4	2207.91		2207.92	0.000198	0.67	74.08	27.26	0.07
WillowSprings6	Tributary6B	999.73	1	50	2204.7	2207.79		2207.8	0.000333	0.81	78.5	65.5	0.1
WillowSprings6	Tributary6B	999.73	2	50	2204.7	2207.91		2207.92	0.000499	0.93	53.65	22.94	0.11
WillowSprings6	Tributary6B	1031.02	1	50	2205.28	2207.8		2207.82	0.00136	1.19	41.98	30.05	0.18
WillowSprings6	Tributary6B	1031.02	2	50	2205.28	2207.93		2207.95	0.00106	1.09	46.03	31.13	0.16
WillowSprings6	Tributary6B	1067.5	1	50	2205.97	2207.87		2207.91	0.005307	1.7	29.39	33.99	0.32
WillowSprings6	Tributary6B	1067.5	2	50	2205.97	2207.98		2208.02	0.003627	1.5	33.32	34.77	0.27
WillowSprings6	Tributary6B	1103.6	1	50	2207.04	2208.06		2208.25	0.014321	3.51	14.26	23.61	0.8
WillowSprings6	Tributary6B	1103.6	2	50	2207.04	2208.11		2208.27	0.011807	3.25	15.39	24.4	0.72
WillowSprings6	Tributary6B	1150.07	1	50	2207.65	2209.17	2209.17	2209.56	0.038107	5.02	9.95	13.07	1.01
WillowSprings6	Tributary6B	1150.07	2	50	2207.65	2209.17	2209.17	2209.56	0.037996	5.02	9.96	13.07	1.01
WillowSprings6	Tributary6B	1199.55	1	50	2208.94	2210.71	2210.49	2210.91	0.020107	3.63	13.77	17.02	0.71
WillowSprings6	Tributary6B	1199.55	2	50	2208.94	2210.71	2210.49	2210.91	0.020028	3.62	13.79	17.03	0.71
WillowSprings6	Tributary6B	1250.7	1	50	2210.02	2211.78		2212.04	0.023761	4.04	12.37	13.6	0.75
WillowSprings6	Tributary6B	1250.7	2	50	2210.02	2211.78		2212.04	0.023952	4.06	12.33	13.58	0.75
WillowSprings6	Tributary6B	1300.37	1	50	2211.06	2212.84		2212.97	0.0148	2.86	17.5	21.35	0.56
WillowSprings6	Tributary6B	1300.37	2	50	2211.06	2212.84		2212.97	0.014763	2.86	17.51	21.36	0.56
VillowSprings6	Tributary6B	1349.93	1	50	2212.67	2213.93	2213.93	2214.26	0.019205	4.63	10.8	16.53	1.01
VillowSprings6	Tributary6B	1349.93	2	50	2212.67	2213.93	2213.93	2214.26	0.019205	4.63	10.8	16.53	1.01
WillowSprings6	Tributary6B	1399.87	1	50	2213.95	2215.4	2215.4	2215.77	0.04598	4.89	10.24	14.16	1.01
WillowSprings6	Tributary6B	1399.87	2	50	2213.95	2215.4	2215.4	2215.77	0.04572	4.87	10.26	14.18	1.01
WillowSprings6	Tributary6B	1449.8	1	50	2215.04	2216.84		2217.04	0.015958	3.61	13.86	15.07	0.66
WillowSprings6	Tributary6B	1449.8	2	50	2215.04	2216.84		2217.04	0.015997	3.61	13.84	15.06	0.66
WillowSprings6	Tributary6B	1499.93	1	50	2216.22	2217.8	2217.65	2218.05	0.024781	3.97	12.61	15.68	0.78
WillowSprings6	Tributary6B	1499.93	2	50	2216.22	2217.8		2218.05	0.024961	3.98	12.57	15.66	0.78
WillowSprings7	Tributary6A	16.67	1	60	2194.66	2197.48		2197.49	0.000282	0.86	94.2	75.66	0.11
WillowSprings7	Tributary6A	16.67	2	60	2194.66	2198.08		2198.09	0.000227	0.87	69.2	28.83	0.1
WillowSprings7	Tributary6A	41.4	1	60	2194.91	2197.48		2197.51	0.001209	1.44	52.6	48.29	0.21
WillowSprings7	Tributary6A	41.4	2	60	2194.91	2198.08		2198.1	0.000675	1.25	48.15	23.13	0.15
WillowSprings7	Tributary6A	76	1	60	2194.78	2197.51		2197.54	0.000837	1.42	51.63	46.69	0.19
WillowSprings7	Tributary6A	76	2	60	2194.78	2198.1		2198.12	0.000403	1.15	52.23	23.25	0.14
WillowSprings7	Tributary6A	102.08	1	60	2195.07	2197.54		2197.57	0.001543	1.56	49.51	52.53	0.22
WillowSprings7	Tributary6A	102.08	2	60	2195.07	2198.11		2198.14	0.000979	1.37	43.89	21.18	0.17
WillowSprings7	Tributary6A	135.24	1	60	2196.17	2197.62		2197.69	0.015273	2.19	30.69	60.54	0.48
WillowSprings7	Tributary6A	135.24	2	60	2196.17	2198.16		2198.19	0.002844	1.38	43.6	36.62	0.22
WillowSprings7	Tributary6A	161.57	1	60	2196.55	2197.93		2198.11	0.014257	3.42	20.53	47.26	0.74
WillowSprings7	Tributary6A	161.57	2	60	2196.55	2198.22		2198.31	0.005563	2.5	23.99	26.1	0.46
WillowSprings7	Tributary6A	199.4	1	60	2196.81	2198.3		2198.35	0.003488	1.76	41.07	78.98	0.33
WillowSprings7	Tributary6A	199.4	2	60	2196.81	2198.42		2198.46	0.002746	1.67	35.95	36.5	0.3
WillowSprings7	Tributary6A	249.44	1	60	2198.32	2199.11	2199.11	2199.26	0.047204	3.6	21.91	67.44	0.91
WillowSprings7	Tributary6A	249.44	2	60	2198.32	2199.2	2199.2	2199.49	0.056933	4.34	13.82	24.08	1.01
WillowSprings7	Tributary6A	300.54	1	60	2198.91	2200.41	2200.36	2200.69	0.016733	4.32	16.28	26.99	0.83
VillowSprings7	Tributary6A	300.54	2	60	2198.91	2200.51	2200.34	2200.78	0.013932	4.13	14.69	15.73	0.75

Table 5.9.2.3
HEC-RAS OUTPUT
FLOODWAY AND FLOODPLAIN

River	Reach	River Sta	Profile #	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
WillowSprings7	Tributary6A	350.24	1	60	2199.63	2201.2	2200.95	2201.37	0.011341	3.23	18.58	23.57	0.64
VillowSprings7	Tributary6A	350.24	2	60	2199.63	2201.23	2200.95	2201.38	0.010412	3.12	19.22	24.03	0.62
WillowSprings7	Tributary6A	399.69	1	60	2200.48	2201.87	2201.87	2202.23	0.021158	4.84	12.39	17.41	1.01
WillowSprings7	Tributary6A	399.69	2	60	2200.48	2201.87	2201.87	2202.23	0.021216	4.85	12.38	17.4	1.01
WillowSprings7	Tributary6A	450.17	1	60	2201.93	2203	2202.9	2203.18	0.014848	3.79	19.35	35.15	0.8
WillowSprings7	Tributary6A	450.17	2	60	2201.93	2203.03	2203.03	2203.4	0.024364	4.87	12.31	17	1.01
WillowSprings7	Tributary6A	488.74	1	60	2202.46	2203.8	2203.8	2204.14	0.033288	4.68	12.82	19.14	1.01
WillowSprings7	Tributary6A	488.74	2	60	2202.46	2203.98		2204.18	0.016514	3.66	16.37	20.19	0.72
WillowSprings7	Tributary6A	512.65	1	60	2203.24	2204.56	2204.56	2204.88	0.024881	4.55	13.19	21.02	1.01
WillowSprings7	Tributary6A	512.65	2	60	2203.24	2204.56	2204.56	2204.88	0.024833	4.55	13.2	21.03	1.01
WillowSprings7	Tributary6A	530.05	1	60	2203.64	2205		2205.24	0.01649	3.91	15.35	22.57	0.84
WillowSprings7	Tributary6A	530.05	2	60	2203.64	2205		2205.24	0.016505	3.91	15.34	22.57	0.84
WillowSprings7	Tributary6A	550.27	1	60	2204.23	2205.56	2205.56	2205.89	0.024399	4.63	12.97	20.09	1.01
WillowSprings7	Tributary6A	550.27	2	60	2204.23	2205.56	2205.56	2205.89	0.024399	4.63	12.97	20.09	1.01
WillowSprings7	Tributary6A	560.39	1	60	2205.12	2206.54	2206.54	2206.79	0.01607	3.98	15.09	31.93	1.02
WillowSprings7	Tributary6A	560.39	2	60	2205.12	2206.54	2206.54	2206.79	0.01607	3.98	15.09	31.93	1.02
WillowSprings7	Tributary6A	570.53	Inl Struct										
WillowSprings7	Tributary6A	580.2	1	60	2204.94	2207.69	2206.45	2207.7	0.000402	0.87	68.62	63.96	0.15
WillowSprings7	Tributary6A	580.2	2	60	2204.94	2207.69	2206.45	2207.7	0.000402	0.87	68.62	63.96	0.15
WillowSprings7	Tributary6A	599.6	1	60	2205.45	2207.69		2207.72	0.000732	1.39	48.95	49.17	0.21
WillowSprings7	Tributary6A	599.6	2	60	2205.45	2207.69		2207.72	0.00081	1.45	41.33	31.14	0.22
WillowSprings7	Tributary6A	649.54	1	60	2206.46	2207.73	2207.73	2208.05	0.018666	4.55	13.18	20.76	1.01
WillowSprings7	Tributary6A	649.54	2	60	2206.46	2207.73	2207.73	2208.05	0.018707	4.56	13.17	20.75	1.01
WillowSprings7	Tributary6A	699.17	1	60	2207.77	2209.13	2209.13	2209.47	0.046411	4.68	12.82	19.18	1.01
WillowSprings7	Tributary6A	699.17	2	60	2207.77	2209.13	2209.13	2209.47	0.046488	4.68	12.81	19.17	1.01
WillowSprings7	Tributary6A	751.32	1	60	2208.66	2210.18	2210.01	2210.39	0.009014	3.74	16.04	21.18	0.76
illowSprings7	Tributary6A	751.32	2	60	2208.66	2210.18	2210.02	2210.39	0.009014	3.74	16.04	21.18	0.76
WillowSprings7	Tributary6A	799.07	1	60	2209.76	2211.16	2211.16	2211.53	0.045216	4.89	12.27	16.79	1.01
WillowSprings7	Tributary6A	799.07	2	60	2209.76	2211.16	2211.16	2211.53	0.045109	4.88	12.29	16.79	1.01
WillowSprings7	Tributary6A	840.59	1	60	2210.73	2212.46		2212.57	0.015381	2.74	21.87	25.3	0.52
WillowSprings7	Tributary6A	840.59	2	60	2210.73	2212.46		2212.57	0.015392	2.74	21.87	25.3	0.52
WillowSprings7	Tributary6A	877.35	1	60	2211.62	2213.15		2213.37	0.029514	3.81	15.77	20.53	0.77
WillowSprings7	Tributary6A	877.35	2	60	2211.62	2213.15		2213.37	0.029581	3.81	15.75	20.52	0.77
WillowSprings7	Tributary6A	949.67	1	60	2214.06	2215.28	2215.28	2215.55	0.020583	4.18	14.34	26.99	1.01
WillowSprings7	Tributary6A	949.67	2	60	2214.06	2215.28	2215.28	2215.55	0.020536	4.18	14.35	27	1.01
WillowSprings7	Tributary6A	999.82	1	60	2216.16	2217.3	2217.3	2217.59	0.020714	4.33	13.87	24.24	1.01
WillowSprings7	Tributary6A	999.82	2	60	2216.16	2217.3	2217.3	2217.59	0.020642	4.32	13.89	24.25	1.01
WillowSprings7	Tributary6A	1049	1	60	2217.4	2218.69	2218.69	2219	0.014553	4.47	13.43	21.96	1.01
WillowSprings7	Tributary6A	1049	2	60	2217.4	2218.69	2218.69	2219	0.014477	4.46	13.46	21.98	1
WillowSprings7	Tributary6A	1099.83	1	60	2219.52	2220.77	2220.77	2221.1	0.028179	4.59	13.07	20.2	1.01
WillowSprings7	Tributary6A	1099.83	2	60	2219.52	2220.77	2220.77	2221.1	0.028124	4.59	13.08	20.21	1
WillowSprings7	Tributary6A	1148.99	1	60	2221.66	2222.83	2222.83	2223.12	0.03161	4.34	13.83	24.37	1.01
WillowSprings7	Tributary6A	1148.99	2	60	2221.66	2222.83	2222.83	2223.12	0.03161	4.34	13.83	24.37	1.01
WillowSprings7	Tributary6A	1202.61	1	60	2224.32	2225.49	2225.49	2225.82	0.03175	4.61	13.03	20.26	1.01
WillowSprings7	Tributary6A	1202.61	2	60	2224.32	2225.49	2225.49	2225.82	0.031652	4.6	13.04	20.27	1.01
WillowSprings7	Tributary6A	1251.56	1	60	2227.8	2229.01	2229.01	2229.31	0.032505	4.39	13.68	23.09	1
WillowSprings7	Tributary6A	1251.56	2	60	2227.8	2229.01	2229.01	2229.31	0.032372	4.38	13.7	23.11	1
WillowSprings7	Tributary6A	1298.93	1	60	2231.65	2232.67	2232.67	2232.93	0.034071	4.07	14.75	29.09	1.01
WillowSprings7	Tributary6A	1298.93	2	60	2231.65	2232.67	2232.67	2232.93	0.033821	4.06	14.79	29.14	1

Table 5.9.2.4
HEC-RAS OUTPUT
Structures

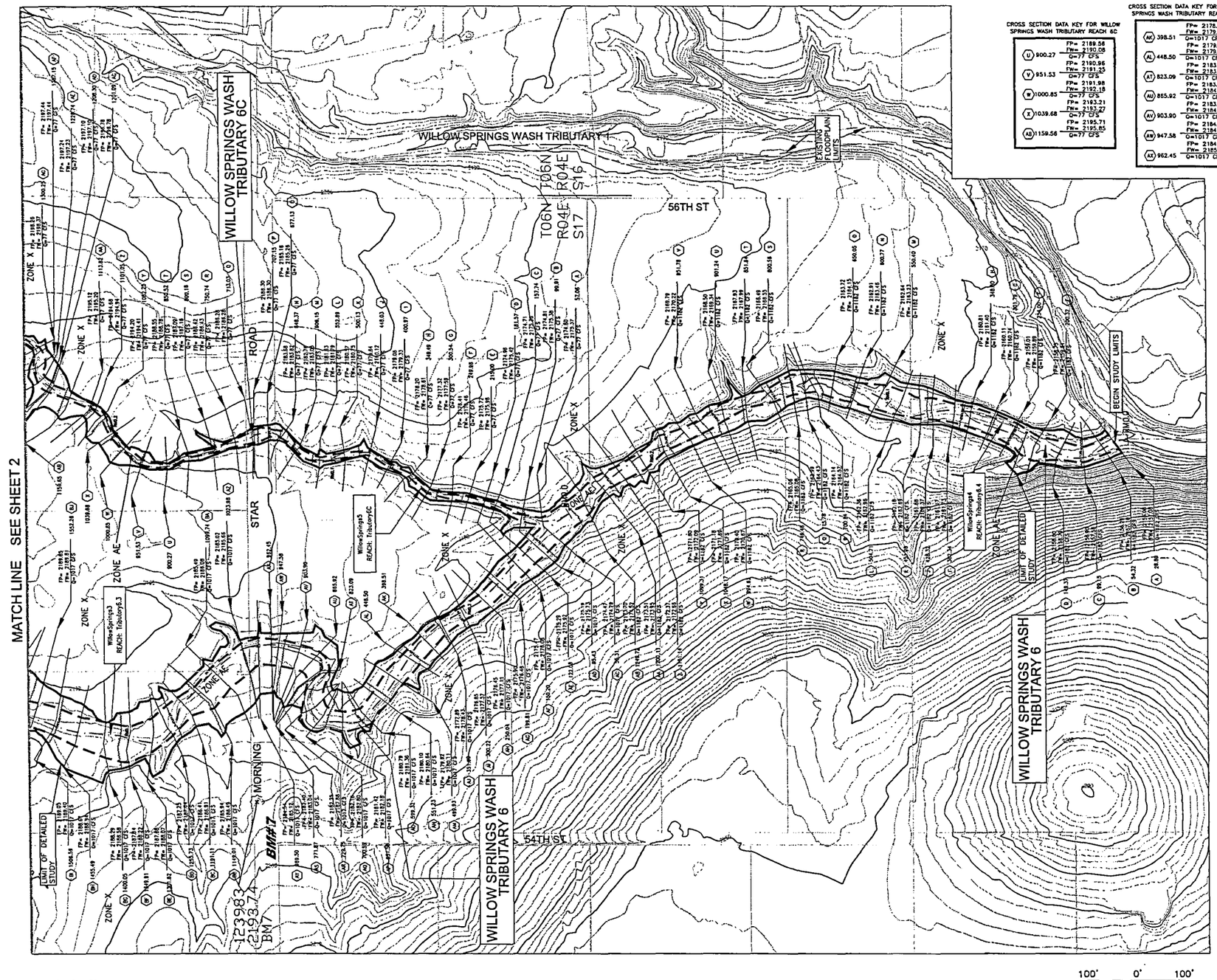
WSTribFPD.prj
HEC-RAS Plan: M4
PF 1 = Floodplain
PF 2 = Floodway

CULVERTS

River	Reach	River Sta	Profile	E.G. US.	W.S. US.	E.G.	E.G.	Min El	Q Culv	Q Weir	Delta	Culv Vel	Culv Vel
			#	(ft)	(ft)	IC (ft)	OC (ft)	Weir Flow (ft)	Group (cfs)	(cfs)	WS (ft)	US (ft/s)	DS (ft/s)
WillowSprings1	Tributary6.1	748.12 Culvert #1	1	2210.34	2210.20	2210.24	2210.34	2208.19	62.08	485.92	1.59	6.59	6.59
WillowSprings1	Tributary6.1	748.12 Culvert #1	2	2210.46	2210.32	2210.31	2210.46	2208.19	58.67	489.33	1.41	6.23	6.23
WillowSprings6	Tributary6B	869.58 Culvert #1	1	2207.79	2207.78	2203.63	2207.79	2207.48	19.38	13.77	4.61	3.08	4.15
WillowSprings6	Tributary6B	869.58 Culvert #2	2	2207.79	2207.78	2204.10	2207.78	2207.48	16.85	13.77	4.61	3.43	5.89
WillowSprings6	Tributary6B	869.58 Culvert #1	1	2207.91	2207.90	2203.64	2207.91	2207.64	19.64	13.29	4.73	3.13	4.21
WillowSprings6	Tributary6B	869.58 Culvert #2	2	2207.91	2207.90	2204.11	2207.90	2207.64	17.07	13.29	4.73	3.48	5.97

INLINE STRUCTURES

River	Reach	River Sta	Profile	E.G. Elev	W.S. Elev	Q Total	Q Weir
			#	(ft)	(ft)	(cfs)	(cfs)
WillowSprings3	Tributary6.3	976.01	1	2184.95	2184.54	1017	1017
WillowSprings3	Tributary6.3	976.01	2	2185.64	2185.12	1017	1017
WillowSprings5	Tributary6C	693.52	1	2186.40	2186.30	77	77
WillowSprings5	Tributary6C	693.52	2	2186.40	2186.30	77	77
WillowSprings7	Tributary6A	570.53	1	2207.70	2207.69	60	60
WillowSprings7	Tributary6A	570.53	2	2207.70	2207.69	60	60



CROSS SECTION DATA KEY FOR WILLOW SPRINGS WASH TRIBUTARY REACH 6C

U	900.27	FP= 2189.56 FW= 2190.06 Q=77 CFS
V	951.53	FP= 2190.95 FW= 2191.25 Q=77 CFS
W	1000.85	FP= 2191.98 FW= 2192.18 Q=77 CFS
X	1039.68	FP= 2193.21 FW= 2193.27 Q=77 CFS
AB	1159.58	FP= 2195.71 FW= 2195.85 Q=77 CFS

CROSS SECTION DATA KEY FOR WILLOW SPRINGS WASH TRIBUTARY REACH 6.3

AK	398.51	FP= 2178.69 FW= 2179.29 Q=1017 CFS
AL	448.50	FP= 2179.11 FW= 2179.72 Q=1017 CFS
AT	823.09	FP= 2183.11 FW= 2183.89 Q=1017 CFS
AU	865.92	FP= 2183.37 FW= 2184.16 Q=1017 CFS
AV	903.90	FP= 2183.53 FW= 2184.26 Q=1017 CFS
AW	947.58	FP= 2184.19 FW= 2184.87 Q=1017 CFS
AX	962.45	FP= 2184.45 FW= 2185.03 Q=1017 CFS

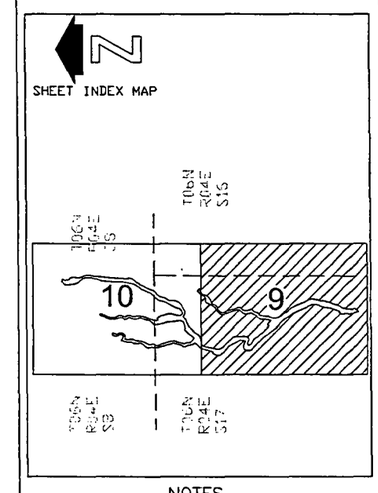
LEGEND

100-YR FLOODPLAIN BOUNDARY	
100-YR FLOODWAY BOUNDARY	
RIVER MILE	RM2.0 RM3 RM3.0
CROSS SECTION	A 144.44 — CROSS SECTION STATION (FEET); FP= 2250.55 FLOODPLAIN WATER SURFACE ELEVATION; FW= 2250.55 FLOODWAY WATER SURFACE ELEVATION; Q =4630 CFS 100 YEAR DISCHARGE; PROPOSED FEMA CROSS SECTION DESIGNATION
BASE FLOOD ELEVATION	2265.00
ELEVATION REFERENCE MARK	ERM 2400
ZONE DESIGNATION	ZONE AE
ZONE DESIGNATION	ZONE X
BENCHMARK DESIGNATION	BM#10

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88). CONVERSION FACTOR TO THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29) IS = -2.06 FOOT.

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
BM # 7	2193.74	THE INTERSECTION OF MORNING STAR ROAD AND 54TH STREET (NE CORNER)



NOTES

1- THIS MODEL HAS BEEN PREPARED TO TIE INTO THE EXISTING WILLOW SPRINGS TRIBUTARY-1 FLOOD PROFILE AT RIVER MILE 0.91, LOCATED BETWEEN THE EXISTING CROSS SECTIONS OF "D" AND "E". REFER TO PROFILE PANEL 581P, AND REFER TO FIRM PANEL # 04013C0802H, DATED SEPTEMBER 30, 2005.

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072
WILLOW SPRINGS WASH TRIBUTARY
FLOODPLAIN DELINEATION,
CAVE CREEK, AZ

BENCHMARK INFORMATION

BENCHMARK 7 QUALITY: BRASS CAP IN CONCRETE
MONUMENT TYPE: 30 NGS
DIAMETER HOLE: 10"
HOLE DEPTH: 38"
ROD FOOTAGE: 4' 0"
ROD TYPE: 9/16" STEEL

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1"= 100' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

COOPER AERIAL SURVEYS COMPANY
CONTRACT NUMBER: FCD2003C048, Assignment #4
FCD2005C030

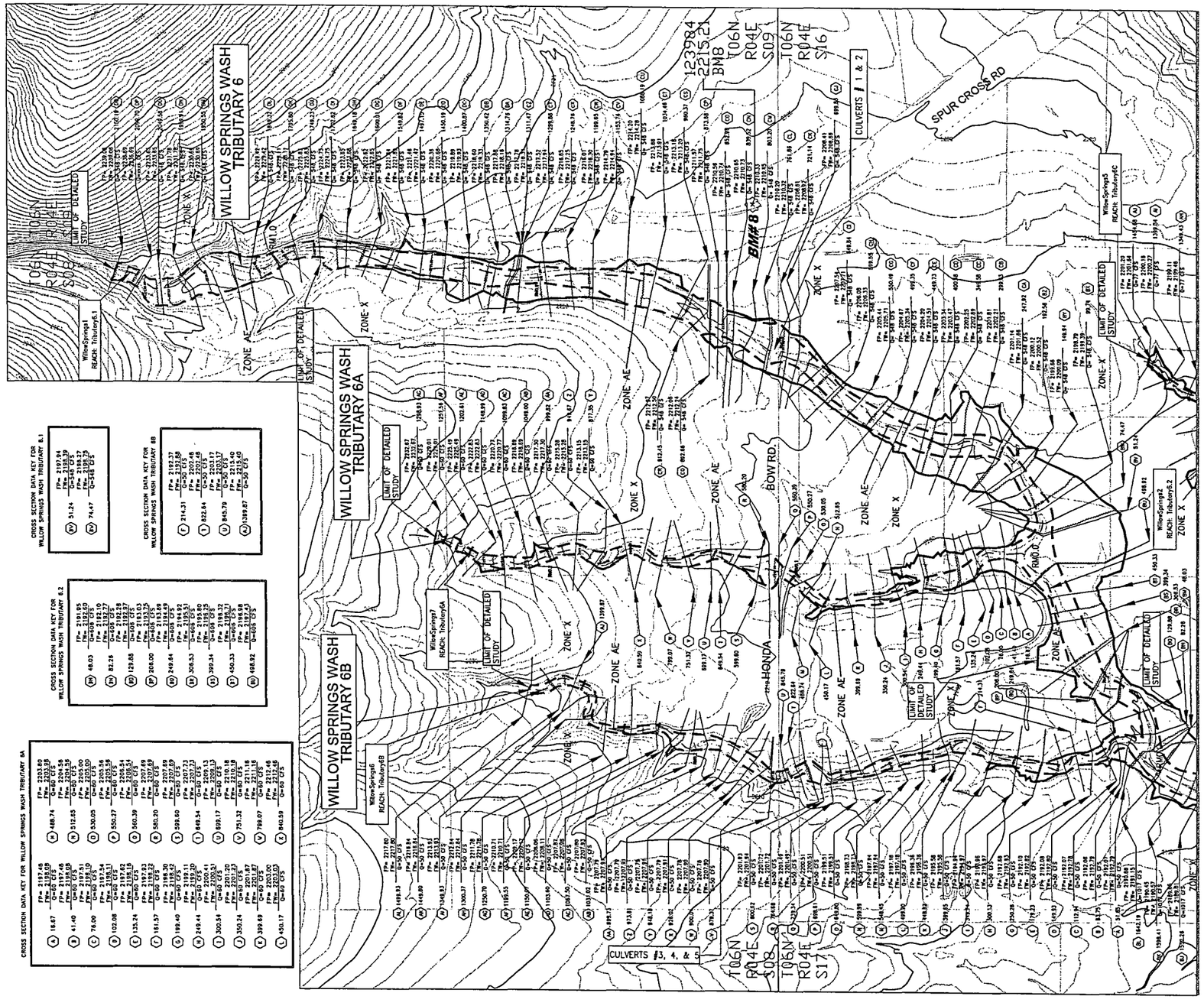
100' 0' 100' 200'
SCALE: 1" = 100'
CONTOUR INTERVAL = 2'
FLIGHT DATES: November 2003 through December 2005

GROUND CONTROL SURVEY DATA PROVIDED BY COOPER AERIAL SURVEYS COMPANY

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

Registered Professional Engineer (Civil) CERTIFICATE NO. 35571 LINDA A. POTTER ARIZONA, U.S.A.

	BY	DATE
DESIGN	M. FOUNTAIN	12-21-07
DESIGN CHK.	L. POTTER	12-21-07
PLANS	MC/MF	12-21-07
PLANS CHK.	L. POTTER	12-21-07



CROSS SECTION DATA KEY FOR WILLOW SPRINGS WASH TRIBUTARY 6.1

(W) 51.24	FP= 2197.94 FW= 2198.39 Q=4630 CFS FP= 2199.27 FW= 2199.79 Q=48 CFS
(W) 74.47	

CROSS SECTION DATA KEY FOR WILLOW SPRINGS WASH TRIBUTARY 6B

(E) 214.31	FP= 2192.37 FW= 2192.88 Q=50 CFS
(D) 822.84	FP= 2202.46 FW= 2202.97 Q=50 CFS
(T) 845.79	FP= 2203.17 FW= 2203.68 Q=50 CFS
(S) 1399.87	FP= 2215.19 FW= 2215.40 Q=50 CFS

CROSS SECTION DATA KEY FOR WILLOW SPRINGS WASH TRIBUTARY 6.2

(W) 49.03	FP= 2191.95 FW= 2192.50 Q=605 CFS FP= 2192.10 FW= 2192.67 Q=605 CFS
(W) 82.26	FP= 2192.29 FW= 2192.87 Q=605 CFS
(W) 129.88	FP= 2193.03 FW= 2193.62 Q=605 CFS
(W) 206.00	FP= 2193.75 FW= 2194.37 Q=605 CFS
(W) 249.61	FP= 2194.09 FW= 2194.69 Q=605 CFS
(W) 305.53	FP= 2194.33 FW= 2195.51 Q=605 CFS
(W) 399.34	FP= 2195.60 FW= 2196.25 Q=605 CFS
(V) 450.33	FP= 2196.11 FW= 2196.73 Q=605 CFS
(W) 498.92	FP= 2196.93 FW= 2197.43 Q=605 CFS

CROSS SECTION DATA KEY FOR WILLOW SPRINGS WASH TRIBUTARY 6A

(A) 18.67	FP= 2197.16 FW= 2199.09 Q=60 CFS
(B) 41.40	FP= 2197.46 FW= 2198.68 Q=60 CFS
(C) 78.00	FP= 2197.91 FW= 2198.10 Q=60 CFS
(D) 102.08	FP= 2197.54 FW= 2198.11 Q=60 CFS
(E) 135.24	FP= 2197.62 FW= 2198.16 Q=60 CFS
(F) 161.57	FP= 2197.93 FW= 2198.22 Q=60 CFS
(G) 189.40	FP= 2198.30 FW= 2198.52 Q=60 CFS
(H) 249.44	FP= 2199.11 FW= 2199.20 Q=60 CFS
(I) 300.54	FP= 2200.41 FW= 2200.53 Q=60 CFS
(J) 350.24	FP= 2201.20 FW= 2201.31 Q=60 CFS
(K) 399.69	FP= 2201.87 FW= 2201.98 Q=60 CFS
(L) 450.17	FP= 2203.00 FW= 2203.13 Q=60 CFS
(M) 488.74	FP= 2203.89 FW= 2204.04 Q=60 CFS
(N) 512.85	FP= 2204.46 FW= 2204.59 Q=60 CFS
(O) 530.05	FP= 2204.78 FW= 2205.00 Q=60 CFS
(P) 550.27	FP= 2205.36 FW= 2205.59 Q=60 CFS
(Q) 560.39	FP= 2206.54 FW= 2206.76 Q=60 CFS
(R) 580.20	FP= 2207.69 FW= 2207.89 Q=60 CFS
(S) 599.80	FP= 2207.89 FW= 2207.99 Q=60 CFS
(T) 649.54	FP= 2207.73 FW= 2207.93 Q=60 CFS
(U) 699.17	FP= 2209.13 FW= 2209.33 Q=60 CFS
(V) 751.32	FP= 2210.18 FW= 2210.39 Q=60 CFS
(W) 799.07	FP= 2211.18 FW= 2211.38 Q=60 CFS
(X) 840.59	FP= 2212.46 FW= 2212.66 Q=60 CFS

BENCHMARK INFORMATION

BENCHMARK 8 DUALITY: BRASS CAP IN CONCRETE
MONUMENT TYPE: 30 NGS
DIAMETER HOLE: 10"
HOLE DEPTH: 36"
ROD FOOTAGE: 3' 8"
ROD TYPE: 8/16" STEEL

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1"= 100' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

COOPER AERIAL SURVEYS COMPANY
CONTRACT NUMBER: FCD2003C048, Assignment #4
FCD2003C030

100' 0' 100' 200'

SCALE: 1" = 100'
CONTOUR INTERVAL = 2'
FLIGHT DATES: November 2003 through December 2005

GROUND CONTROL SURVEY DATA PROVIDED BY COOPER AERIAL SURVEYS COMPANY

LEGEND

100-YR FLOODPLAIN BOUNDARY

100-YR FLOODWAY BOUNDARY

RIVER MILE — RM2.0 RM2.5 RM3.0

CROSS SECTION — (A) 144.44 — CROSS SECTION STATION (FEET); FP= 2250.55 FLOODPLAIN WATER SURFACE ELEVATION; FW= 2250.55 FLOODWAY WATER SURFACE ELEVATION; Q =4630 CFS 100 YEAR DISCHARGE; PROPOSED FEMA CROSS SECTION DESIGNATION

BASE FLOOD ELEVATION — 2245.00

ELEVATION REFERENCE MARK — ERM 2400

ZONE DESIGNATION — ZONE AE

ZONE DESIGNATION — ZONE X

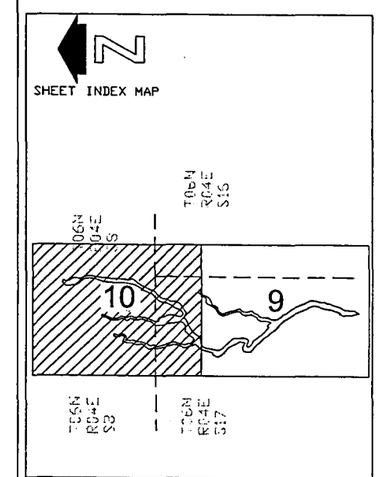
BENCHMARK DESIGNATION — BM#10

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88). CONVERSION FACTOR TO THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29) IS = -2.06 FOOT.

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
BM # 8	2215.21	THE INTERSECTION OF SPUR CROSS ROAD AND HONDA BOW ROAD (NE CORNER)

SHEET INDEX MAP



NOTES

1- THIS MODEL HAS BEEN PREPARED TO TIE INTO THE EXISTING WILLOW SPRINGS TRIBUTARY-1 FLOOD PROFILE AT RIVER MILE 0.91, LOCATED BETWEEN THE EXISTING CROSS SECTIONS OF "D" AND "E". REFER TO PROFILE PANEL 5619, AND REFER TO FIRM PANEL # 04013C0802H, DATED SEPTEMBER 30, 2005.

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072
WILLOW SPRINGS WASH TRIBUTARY
FLOODPLAIN DELINEATION,
CAVE CREEK, AZ

Registered Professional Engineer (Civil) CERTIFICATE NO. 35571 LINDA A. POTTER DATE SIGNED 12-21-07 ARIZONA, U.S.A.

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

	BY	DATE
DESIGN	M. FOUNTAIN	12-21-07
DESIGN CHK.	L. POTTER	12-21-07
PLANS	MC/MF	12-21-07
PLANS CHK.	L. POTTER	12-21-07

SHEET 10 OF 10

CAVE CREEK TRIBUTARIES

Table 5.9.2.5
HEC-RAS OUTPUT
FLOODWAY AND FLOODPLAIN

CCTribFPD.prj
HEC-RAS Plan: M4
PF 1 = Floodplain
PF 2 = Floodway

River	Reach	River Sta	Profile #	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude #
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	Chl
CaveCreek1	Tributary	19.38	1	543	2264.67	2268.4		2268.55	0.004531	3.14	173.02	79.3	0.37
CaveCreek1	Tributary	19.38	2	543	2264.67	2268.41		2268.56	0.004481	3.12	173.8	79.48	0.37
CaveCreek1	Tributary	69.51	1	543	2265.8	2268.67		2268.9	0.009583	3.93	143.75	84.33	0.52
CaveCreek1	Tributary	69.51	2	543	2265.8	2268.69		2268.97	0.011637	4.26	127.35	71.07	0.56
CaveCreek1	Tributary	119.55	1	543	2266.58	2269.23		2269.48	0.015518	4.18	133.2	89.18	0.61
CaveCreek1	Tributary	119.55	2	543	2266.58	2269.37		2269.73	0.019011	4.9	112.14	68.08	0.68
CaveCreek1	Tributary	170.85	1	543	2266.97	2269.95		2270.21	0.018066	4.36	133.41	98.24	0.65
CaveCreek1	Tributary	170.85	2	543	2266.97	2270.35		2270.82	0.022076	5.5	98.7	56.25	0.73
CaveCreek1	Tributary	220.21	1	543	2267.71	2270.85	2270.81	2271.46	0.027121	6.71	94.96	73.28	0.92
CaveCreek1	Tributary	220.21	2	543	2267.71	2271.31		2271.94	0.020103	6.39	84.95	41.9	0.79
CaveCreek1	Tributary	269.26	1	543	2268.97	2271.81		2272.14	0.007398	5.17	141.61	110.14	0.65
CaveCreek1	Tributary	269.26	2	543	2268.97	2272.03		2272.68	0.011536	6.48	83.84	38.71	0.78
CaveCreek1	Tributary	319.29	1	543	2269.84	2273.03	2273.03	2273.66	0.012586	7.06	113.12	112.29	0.91
CaveCreek1	Tributary	319.29	2	543	2269.84	2273.21	2273.21	2274.23	0.015917	8.11	66.94	32.81	1
CaveCreek1	Tributary	367.43	1	543	2271.12	2274.24	2274.24	2274.94	0.011269	7.27	106.7	92.45	0.86
CaveCreek1	Tributary	367.43	2	543	2271.12	2274.26	2274.26	2275.41	0.016233	8.6	63.16	28.08	1.01
CaveCreek1	Tributary	419.46	1	543	2272.43	2275.57	2275.57	2276.2	0.020784	7.22	107.16	91.95	0.88
CaveCreek1	Tributary	419.46	2	543	2272.43	2275.8	2275.8	2276.98	0.030999	8.72	62.29	26.83	1.01
CaveCreek1	Tributary	468.21	1	543	2273.68	2276.7		2277.26	0.022972	6.67	114.76	120.54	0.86
CaveCreek1	Tributary	468.21	2	543	2273.68	2277.57		2278.09	0.012427	5.78	93.97	34.08	0.61
CaveCreek1	Tributary	519.61	1	543	2275.61	2277.92		2278.49	0.024557	6.75	105.85	86.14	0.85
CaveCreek1	Tributary	519.61	2	543	2275.61	2278.29		2279.14	0.025897	7.41	73.28	31.29	0.85
CaveCreek1	Tributary	560.25	1	543	2276.17	2278.85	2278.75	2279.42	0.020569	6.36	102.96	90.96	0.83
CaveCreek1	Tributary	560.25	2	543	2276.17	2279.49		2279.93	0.011055	5.32	101.98	41.29	0.6
CaveCreek1	Tributary	596.99	1	543	2276.65	2279.64		2280.08	0.017036	5.78	119.7	101.98	0.74
CaveCreek1	Tributary	596.99	2	543	2276.65	2279.92		2280.48	0.016895	6.02	90.22	41.36	0.72
CaveCreek1	Tributary	635.6	1	543	2277.84	2280.29	2280.28	2280.79	0.032392	6.88	111.42	106.32	0.98
CaveCreek1	Tributary	635.6	2	543	2277.84	2280.96	2280.96	2282.07	0.038502	8.44	64.3	29.07	1
CaveCreek1	Tributary	670.23	1	543	2278.5	2281.54	2281.54	2282.25	0.025725	7.67	93.75	68.3	0.95
CaveCreek1	Tributary	670.23	2	543	2278.5	2282.06	2281.96	2283.19	0.026941	8.52	63.7	25.14	0.94
CaveCreek1	Tributary	719.91	1	543	2279.41	2282.62		2283.21	0.015329	6.52	99.77	61.57	0.74
CaveCreek1	Tributary	719.91	2	543	2279.41	2283.61		2284.03	0.007304	5.2	104.37	30.51	0.5
CaveCreek1	Tributary	770.28	1	543	2280.85	2283.5	2283.42	2284.22	0.022847	7.08	89.24	59.91	0.87
CaveCreek1	Tributary	770.28	2	543	2280.85	2284.02		2284.63	0.01507	6.28	86.44	33.79	0.69
CaveCreek1	Tributary	820.01	1	543	2282.12	2285.53	2285.53	2286.4	0.022331	7.66	75.98	44.12	0.95
CaveCreek1	Tributary	820.01	2	543	2282.12	2285.53	2285.53	2286.55	0.027067	8.12	66.88	33.41	1.01
CaveCreek1	Tributary	869.49	1	543	2283.42	2286.83		2287.47	0.018812	6.87	97.43	67.45	0.79
CaveCreek1	Tributary	869.49	2	543	2283.42	2286.96		2287.86	0.024387	7.63	72.44	29.68	0.85
CaveCreek1	Tributary	919.85	1	543	2284.79	2287.88		2288.2	0.009776	5	141.25	103.04	0.57
CaveCreek1	Tributary	919.85	2	543	2284.79	2288.31		2288.74	0.009934	5.28	102.78	36.78	0.56
CaveCreek1	Tributary	967.24	1	543	2286.03	2288.96	2288.96	2289.66	0.029168	7.09	88.9	64.47	0.94
CaveCreek1	Tributary	967.24	2	543	2286.03	2289.05	2289.05	2289.99	0.036174	7.78	69.78	37.87	1.01
CaveCreek1	Tributary	1020.1	1	543	2287.61	2290.16		2290.65	0.014467	5.99	107.9	65.37	0.73
CaveCreek1	Tributary	1020.1	2	543	2287.61	2290.61		2291.16	0.012438	5.94	91.44	35.73	0.65
CaveCreek1	Tributary	1068.23	1	543	2288.84	2291.28	2291.28	2292.07	0.029304	7.34	79.65	51.45	0.99
CaveCreek1	Tributary	1068.23	2	543	2288.84	2291.34	2291.34	2292.24	0.031928	7.61	71.36	40.35	1.01
CaveCreek1	Tributary	1120.03	1	543	2289.56	2292.7	2292.7	2293.54	0.024675	7.59	79.52	52.15	0.93
CaveCreek1	Tributary	1120.03	2	543	2289.56	2292.82	2292.67	2293.73	0.025789	7.65	70.93	32.26	0.91
CaveCreek1	Tributary	1170.11	1	543	2290.74	2294.03		2294.62	0.016496	6.45	97.39	65.5	0.81

Table 5.9.2.5
HEC-RAS OUTPUT
FLOODWAY AND FLOODPLAIN

River	Reach	River Sta	Profile #	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude #
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	Chl
CaveCreek1	Tributary	1170.11	2	543	2290.74	2294.14		2294.84	0.017258	6.71	80.89	39.33	0.82
CaveCreek1	Tributary	1218.92	1	543	2291.36	2295.7	2295.7	2296.55	0.041519	7.41	73.3	43.63	1.01
CaveCreek1	Tributary	1218.92	2	543	2291.36	2295.7	2295.7	2296.55	0.041416	7.4	73.39	43.66	1.01
CaveCreek1	Tributary	1268.1	1	543	2293.75	2297.24	2297.06	2297.98	0.020844	6.98	84.45	52.49	0.82
CaveCreek1	Tributary	1268.1	2	543	2293.75	2297.27		2298.06	0.023271	7.13	76.16	33.67	0.84
CaveCreek1	Tributary	1320.16	1	543	2294.98	2298.46	2298.46	2299.33	0.021118	8.12	86.59	53.62	0.89
CaveCreek1	Tributary	1320.16	2	543	2294.98	2298.59	2298.59	2299.96	0.029345	9.39	57.82	21.37	1.01
CaveCreek1	Tributary	1369	1	543	2296.68	2299.7	2299.7	2300.56	0.026475	8.21	82.53	48.9	0.96
CaveCreek1	Tributary	1369	2	543	2296.68	2300.19	2300.06	2301.4	0.027821	8.85	61.38	22.33	0.94
CaveCreek1	Tributary	1418.59	1	543	2297.51	2300.97		2301.54	0.013771	6.47	97.24	46.77	0.72
CaveCreek1	Tributary	1418.59	2	543	2297.51	2301.82		2302.38	0.009985	5.98	90.79	28.66	0.59
CaveCreek1	Tributary	1442.17	1	543	2297.83	2301.47	2301.47	2302.34	0.032207	8.19	79.87	47.16	0.99
CaveCreek1	Tributary	1442.17	2	543	2297.83	2301.88	2301.86	2303.09	0.031869	8.87	62.69	25.52	1
CaveCreek1	Tributary	1469.82	1	543	2298.43	2302.45		2302.96	0.016269	6.27	103.8	53.64	0.71
CaveCreek1	Tributary	1469.82	2	543	2298.43	2303.24		2303.77	0.010996	5.94	95.3	31.07	0.6
CaveCreek1	Tributary	1519.91	1	543	2299.97	2303.86	2303.86	2304.78	0.029558	8.56	79.37	44.28	0.96
CaveCreek1	Tributary	1519.91	2	543	2299.97	2304.34	2304.34	2305.74	0.038859	9.47	57.31	20.59	1
CaveCreek1	Tributary	1560.12	1	543	2301.27	2305.2	2305.2	2306.04	0.02629	8.45	84.8	48.5	0.97
CaveCreek1	Tributary	1560.12	2	543	2301.27	2305.89	2305.68	2307.03	0.024176	8.82	66.34	23.82	0.93
CaveCreek2	Tributary	49.14	1	1118	2266.35	2269.32	2269.32	2270.14	0.05017	7.3	156.7	103.8	0.98
CaveCreek2	Tributary	49.14	2	1118	2266.35	2269.32	2269.32	2270.16	0.051013	7.36	152.03	87.86	0.98
CaveCreek2	Tributary	81.7	1	1118	2267.27	2270.71	2270.4	2271.36	0.026806	6.47	178.53	97.93	0.78
CaveCreek2	Tributary	81.7	2	1118	2267.27	2270.74	2270.4	2271.38	0.026165	6.43	175.68	83.68	0.77
CaveCreek2	Tributary	128.96	1	1118	2269.74	2272.46	2272.46	2273.29	0.041821	7.56	163.36	108.61	0.95
CaveCreek2	Tributary	128.96	2	1118	2269.74	2272.48	2272.48	2273.47	0.04668	8.02	140.67	72.15	1.01
CaveCreek2	Tributary	200.96	1	1118	2271.4	2275.08	2275.07	2276.01	0.032908	7.84	152.35	90.23	0.94
CaveCreek2	Tributary	200.96	2	1118	2271.4	2275.23	2275.02	2276.11	0.028904	7.55	148.15	64.61	0.88
CaveCreek2	Tributary	249.82	1	1118	2272.24	2276.77		2277.33	0.019158	6.1	195	93.23	0.64
CaveCreek2	Tributary	249.82	2	1118	2272.24	2276.77		2277.38	0.020644	6.26	178.53	62.87	0.65
CaveCreek2	Tributary	301.02	1	1118	2273.22	2277.83		2278.47	0.024331	6.5	186.36	105.82	0.69
CaveCreek2	Tributary	301.02	2	1118	2273.22	2277.89		2278.56	0.024736	6.56	170.5	61.48	0.69
CaveCreek2	Tributary	351.72	1	1118	2275.41	2279.23	2279.23	2280.28	0.041843	8.29	141.73	75.18	0.94
CaveCreek2	Tributary	351.72	2	1118	2275.41	2279.3	2279.15	2280.35	0.041359	8.25	135.58	54.31	0.92
CaveCreek2	Tributary	400.22	1	1118	2276.69	2281.15	2280.99	2281.98	0.027893	7.4	165.01	106.43	0.82
CaveCreek2	Tributary	400.22	2	1118	2276.69	2281.21	2280.89	2282.07	0.028747	7.45	150.03	58.27	0.82
CaveCreek2	Tributary	450.61	1	1118	2278.46	2282.42		2283.2	0.020502	7.09	161.25	70.21	0.76
CaveCreek2	Tributary	450.61	2	1118	2278.46	2282.53		2283.26	0.018601	6.85	163.26	58.68	0.72
CaveCreek2	Tributary	498.23	1	1118	2278.91	2283.71		2284.2	0.017871	5.63	202.53	77.25	0.58
CaveCreek2	Tributary	498.23	2	1118	2278.91	2283.72		2284.22	0.018926	5.68	197	67.44	0.59
CaveCreek2	Tributary	551.16	1	1118	2280.24	2284.53		2284.96	0.011414	5.28	220.54	78.28	0.52
CaveCreek2	Tributary	551.16	2	1118	2280.24	2284.6		2285.05	0.012578	5.34	209.28	64.1	0.52
CaveCreek2	Tributary	600.05	1	1118	2281.56	2285.14	2284.94	2286.03	0.028468	7.71	156.62	80.65	0.85
CaveCreek2	Tributary	600.05	2	1118	2281.56	2285.25		2286.16	0.027908	7.66	145.89	55.28	0.83
CaveCreek2	Tributary	649.73	1	1118	2282.43	2286.67	2286.11	2287.28	0.019118	6.48	187.98	77.7	0.69
CaveCreek2	Tributary	649.73	2	1118	2282.43	2286.67	2286.21	2287.48	0.024069	7.22	156.34	56.73	0.76
CaveCreek2	Tributary	700.49	1	1118	2282.8	2288.08	2288.08	2289.03	0.044383	8.17	154.79	81.61	0.9
CaveCreek2	Tributary	700.49	2	1118	2282.8	2288.18	2288.12	2289.39	0.050035	8.85	127.9	50.42	0.96
CaveCreek2	Tributary	749.66	1	1118	2284.03	2289.8		2290.1	0.010824	4.61	263.18	103.24	0.47
CaveCreek2	Tributary	749.66	2	1118	2284.03	2290.22		2290.53	0.009105	4.51	247.86	73.94	0.43
CaveCreek2	Tributary	800.2	1	1118	2285.74	2290.39		2290.75	0.015465	4.95	246.65	121.07	0.56
CaveCreek2	Tributary	800.2	2	1118	2285.74	2290.73		2291.09	0.012674	4.82	232.1	84.22	0.51

Table 5.9.2.5
HEC-RAS OUTPUT
FLOODWAY AND FLOODPLAIN

River	Reach	River Sta	Profile #	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude #
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	Chl
aveCreek2	Tributary	850.35	1	1118	2287.38	2291.55	2291.55	2292.33	0.053436	7.65	167.09	109.15	1
aveCreek2	Tributary	850.35	2	1118	2287.38	2291.89	2291.89	2292.96	0.052907	8.33	134.24	62.45	1
CaveCreek2	Tributary	900.01	1	1118	2289.59	2293.91	2293.91	2295.22	0.039657	9.24	125.73	53.11	0.97
CaveCreek2	Tributary	900.01	2	1118	2289.59	2294.03	2293.87	2295.29	0.038844	9	124.18	42.62	0.93
CaveCreek2	Tributary	950.92	1	1118	2292.04	2296.08	2295.59	2296.78	0.019459	6.7	166.76	67.3	0.75
CaveCreek2	Tributary	950.92	2	1118	2292.04	2296.11	2295.59	2296.8	0.018791	6.62	168.85	67.5	0.74
CaveCreek2	Tributary	1000.81	1	1118	2293.38	2297.9	2297.9	2298.74	0.060819	7.61	158.55	97.1	0.94
CaveCreek2	Tributary	1000.81	2	1118	2293.38	2297.92	2297.92	2298.96	0.069765	8.17	136.79	66.63	1.01
CaveCreek2	Tributary	1049.9	1	1118	2295.57	2301.22	2301.22	2302.15	0.062719	7.84	148.79	83.54	0.96
CaveCreek2	Tributary	1049.9	2	1118	2295.57	2301.27	2301.2	2302.25	0.063819	7.95	140.55	66.63	0.97
CaveCreek2	Tributary	1100.44	1	1118	2299.03	2303.18		2303.68	0.015896	5.72	199.81	80.41	0.62
CaveCreek2	Tributary	1100.44	2	1118	2299.03	2303.28		2303.77	0.014893	5.58	200.41	72.64	0.59
CaveCreek3	Tributary	55.46	1	1691	2219.52	2225.5		2225.94	0.005339	6.15	406.23	158.43	0.51
CaveCreek3	Tributary	55.46	2	1691	2219.52	2226.17		2227.03	0.009034	7.42	227.78	44.25	0.58
CaveCreek3	Tributary	126.15	1	1691	2220.21	2225.76		2226.47	0.006213	7.36	339.79	182.41	0.64
CaveCreek3	Tributary	126.15	2	1691	2220.21	2226.7		2227.5	0.00483	7.18	235.44	46.92	0.57
CaveCreek3	Tributary	175.97	1	1691	2221.34	2226.48	2226.48	2227.41	0.016929	8.32	266.84	163.63	0.8
CaveCreek3	Tributary	175.97	2	1691	2221.34	2226.93		2228.09	0.01712	8.62	196.14	51.82	0.78
CaveCreek3	Tributary	226.29	1	1691	2221.86	2227.54		2228.17	0.010737	6.77	309.65	147.9	0.59
CaveCreek3	Tributary	226.29	2	1691	2221.86	2228.17		2228.87	0.009959	6.72	251.63	54	0.55
CaveCreek3	Tributary	276.7	1	1691	2222	2228.02		2228.59	0.006076	6.77	367.55	166.58	0.56
CaveCreek3	Tributary	276.7	2	1691	2222	2228.54		2229.49	0.009832	7.84	215.65	42.27	0.61
CaveCreek3	Tributary	327.03	1	1691	2222.14	2228.28		2229.03	0.006857	7.49	311.08	138.82	0.63
CaveCreek3	Tributary	327.03	2	1691	2222.14	2228.97		2229.91	0.006737	7.75	218.24	42.96	0.61
CaveCreek3	Tributary	377.26	1	1691	2222.58	2228.91		2229.48	0.008719	6.64	324.87	132.55	0.56
CaveCreek3	Tributary	377.26	2	1691	2222.58	2229.49		2230.36	0.01142	7.47	226.25	45.85	0.59
aveCreek3	Tributary	426.19	1	1691	2223.32	2229.26		2230.03	0.010865	7.53	286.85	139.94	0.63
CaveCreek3	Tributary	426.19	2	1691	2223.32	2230.04		2230.92	0.011163	7.54	224.31	43.07	0.58
CaveCreek3	Tributary	476.86	1	1691	2224.85	2230.17		2230.66	0.010497	6.15	345.04	155.09	0.56
CaveCreek3	Tributary	476.86	2	1691	2224.85	2230.88		2231.53	0.010373	6.49	260.73	58.24	0.54
CaveCreek3	Tributary	527.08	1	1691	2225.06	2230.75		2231.15	0.009018	5.5	374.92	165.41	0.52
CaveCreek3	Tributary	527.08	2	1691	2225.06	2231.57		2232.01	0.006536	5.33	322.76	75.83	0.45
CaveCreek3	Tributary	579.37	1	1691	2225.9	2231.21		2231.54	0.006035	4.95	420.3	167.39	0.43
CaveCreek3	Tributary	579.37	2	1691	2225.9	2231.95		2232.34	0.005591	4.98	339.36	73.03	0.41
CaveCreek3	Tributary	626.69	1	1691	2226.11	2231.42	2230.97	2232.38	0.020684	7.95	229.48	107.71	0.78
CaveCreek3	Tributary	626.69	2	1691	2226.11	2232.18		2232.86	0.012098	6.61	255.63	63.67	0.58
CaveCreek3	Tributary	676.99	1	1691	2225.72	2232.55		2233.15	0.009592	6.57	310.28	119.05	0.57
CaveCreek3	Tributary	676.99	2	1691	2225.72	2232.72		2233.57	0.012801	7.37	229.53	52.73	0.62
CaveCreek3	Tributary	726.51	1	1691	2226.38	2232.98		2233.61	0.009109	6.79	297.39	98.7	0.58
CaveCreek3	Tributary	726.51	2	1691	2226.38	2233.31		2234.16	0.011239	7.39	228.71	50.68	0.61
CaveCreek3	Tributary	777.1	1	1691	2227.22	2233.49		2233.94	0.003692	5.7	380.32	141.13	0.46
CaveCreek3	Tributary	777.1	2	1691	2227.22	2234.06		2234.57	0.003699	5.69	297.03	56.11	0.44
CaveCreek3	Tributary	827.18	1	1691	2227.71	2233.5	2233.42	2234.67	0.020966	9.12	221.95	99.34	0.84
CaveCreek3	Tributary	827.18	2	1691	2227.71	2234.08		2235.27	0.018853	8.75	193.18	47.31	0.76
CaveCreek3	Tributary	876.05	1	1691	2229.02	2234.97		2235.46	0.007542	6.04	374.29	181.8	0.52
CaveCreek3	Tributary	876.05	2	1691	2229.02	2235.38		2236.05	0.009323	6.58	256.89	56.67	0.54
CaveCreek3	Tributary	926.59	1	1691	2229.56	2235.38		2235.91	0.009335	6.21	331.61	135.97	0.54
CaveCreek3	Tributary	926.59	2	1691	2229.56	2235.93		2236.54	0.00937	6.3	268.43	58.64	0.52
CaveCreek3	Tributary	977.03	1	1691	2229.73	2235.85		2236.36	0.009405	6.27	346.85	147.52	0.54
CaveCreek3	Tributary	977.03	2	1691	2229.73	2236.38		2237.11	0.011014	6.87	246.2	52.76	0.56
veCreek3	Tributary	1025.89	1	1691	2229.99	2236.36		2236.77	0.007896	5.69	376.17	149.18	0.5
eCreek3	Tributary	1025.89	2	1691	2229.99	2237.04		2237.63	0.008698	6.16	274.57	59.38	0.5

Table 5.9.2.5
HEC-RAS OUTPUT
FLOODWAY AND FLOODPLAIN

River	Reach	River Sta	Profile #	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude #
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	Chl
aveCreek3	Tributary	1076.84	1	1691	2231	2236.74		2237.29	0.010754	6.67	330.58	145.8	0.63
CaveCreek3	Tributary	1076.84	2	1691	2231	2237.47		2238.15	0.009809	6.74	262.08	67.56	0.6
CaveCreek3	Tributary	1126.52	1	1691	2231.23	2237.03		2237.88	0.008073	7.78	271.5	111.39	0.69
CaveCreek3	Tributary	1126.52	2	1691	2231.23	2237.78		2238.6	0.006231	7.27	232.67	49.85	0.59
CaveCreek3	Tributary	1176.55	1	1691	2232.11	2237.4	2237.4	2238.8	0.012857	9.91	211.87	91.24	0.89
CaveCreek3	Tributary	1176.55	2	1691	2232.11	2237.88		2239.32	0.011357	9.65	175.28	40.66	0.82
CaveCreek3	Tributary	1227.05	1	1691	2233.1	2238.44		2239.45	0.009089	8.54	254.44	102.99	0.75
CaveCreek3	Tributary	1227.05	2	1691	2233.1	2238.53		2239.91	0.011357	9.44	179.06	42.99	0.82
CaveCreek3	Tributary	1276.26	1	1691	2234.24	2238.84	2238.79	2240.18	0.016455	9.79	205.16	83.73	0.94
CaveCreek3	Tributary	1276.26	2	1691	2234.24	2239.07	2238.99	2240.77	0.018358	10.45	161.79	45.19	0.97
CaveCreek3	Tributary	1326.19	1	1691	2234.82	2240.18		2240.81	0.004846	6.66	293.29	106.64	0.57
CaveCreek3	Tributary	1326.19	2	1691	2234.82	2240.81		2241.49	0.004639	6.58	256.95	52.37	0.52
CaveCreek3	Tributary	1376.88	1	1691	2236.3	2240.33	2240.33	2241.59	0.019092	8.99	195.12	89.91	0.93
CaveCreek3	Tributary	1376.88	2	1691	2236.3	2240.84	2240.68	2242.33	0.021161	9.79	172.69	50.41	0.93
CaveCreek3	Tributary	1426.68	1	1691	2236.68	2241.64	2240.84	2242.36	0.008107	6.84	262.89	100.07	0.64
CaveCreek3	Tributary	1426.68	2	1691	2236.68	2242.31	2241.23	2243.19	0.009364	7.51	225.24	53.18	0.64
CaveCreek3	Tributary	1476.67	1	1691	2237.02	2242.03		2242.84	0.008348	7.51	250.38	91.48	0.68
CaveCreek3	Tributary	1476.67	2	1691	2237.02	2242.75		2243.66	0.008795	7.64	221.37	49.15	0.63
CaveCreek3	Tributary	1526.67	1	1691	2238.33	2242.42	2242.42	2243.83	0.013941	9.9	204.42	83.88	0.94
CaveCreek3	Tributary	1526.67	2	1691	2238.33	2243.05		2244.33	0.010704	9.08	186.14	46	0.8
CaveCreek3	Tributary	1576.2	1	1691	2238.28	2243.86		2244.48	0.005486	6.66	304.03	91.23	0.57
CaveCreek3	Tributary	1576.2	2	1691	2238.28	2244.05		2244.88	0.006766	7.31	231.48	51.83	0.61
CaveCreek3	Tributary	1626.37	1	1691	2238.23	2244.11		2244.74	0.005522	6.9	309.45	92.72	0.58
CaveCreek3	Tributary	1626.37	2	1691	2238.23	2244.33		2245.33	0.007765	8	211.36	45.57	0.65
CaveCreek3	Tributary	1676.33	1	1691	2238.37	2244.5		2245.08	0.007255	6.56	317.78	91.67	0.51
veCreek3	Tributary	1676.33	2	1691	2238.37	2245.01		2245.81	0.00959	7.2	234.9	41.61	0.53
CaveCreek3	Tributary	1727.16	1	1691	2238.61	2244.86		2245.57	0.00952	7.32	286.43	85.73	0.58
CaveCreek3	Tributary	1727.16	2	1691	2238.61	2245.47		2246.43	0.011827	7.88	214.53	38.38	0.59
CaveCreek3	Tributary	1775.85	1	1691	2239.8	2245.39		2246.02	0.008696	6.79	298.17	88.81	0.55
CaveCreek3	Tributary	1775.85	2	1691	2239.8	2246.33		2247	0.008295	6.58	256.92	45.17	0.49
CaveCreek3	Tributary	1826.28	1	1691	2240.18	2246.06		2246.46	0.006287	5.39	377.4	120.71	0.44
CaveCreek3	Tributary	1826.28	2	1691	2240.18	2247		2247.42	0.005913	5.25	321.85	56.64	0.39
CaveCreek3	Tributary	1875.82	1	1691	2240.26	2246.27		2247.13	0.013559	7.83	255.93	91.39	0.66
CaveCreek3	Tributary	1875.82	2	1691	2240.26	2247.2		2248	0.01082	7.18	235.5	44.75	0.55
CaveCreek3	Tributary	1926.02	1	1691	2241.19	2247.23		2247.77	0.008953	6.18	324.65	112.65	0.51
CaveCreek3	Tributary	1926.02	2	1691	2241.19	2247.99		2248.55	0.008495	6.02	281.04	53.67	0.46
CaveCreek3	Tributary	1975.87	1	1691	2241.47	2247.61		2248.35	0.011051	7.26	271.53	86.59	0.61
CaveCreek3	Tributary	1975.87	2	1691	2241.47	2248.33		2249.1	0.009419	7.05	239.74	47.56	0.55
CaveCreek3	Tributary	2026.23	1	1691	2241.71	2248.15		2248.97	0.012488	7.61	254.14	74.7	0.62
CaveCreek3	Tributary	2026.23	2	1691	2241.71	2248.82		2249.67	0.01205	7.4	228.36	44.39	0.58
CaveCreek3	Tributary	2076.05	1	1691	2243.1	2248.79		2249.53	0.009268	7.06	263.24	75.98	0.58
CaveCreek3	Tributary	2076.05	2	1691	2243.1	2249.57		2250.19	0.007043	6.33	267.17	49.85	0.48
CaveCreek3	Tributary	2126.56	1	1691	2243.9	2249.33		2250.23	0.016865	7.69	226.89	67.83	0.68
CaveCreek3	Tributary	2126.56	2	1691	2243.9	2249.99		2250.68	0.011728	6.67	253.5	54.9	0.55
CaveCreek3	Tributary	2176.55	1	1691	2244.52	2250.21		2251.24	0.021385	8.18	208.68	61.94	0.75
CaveCreek3	Tributary	2176.55	2	1691	2244.52	2250.6		2251.45	0.016476	7.42	228	55.89	0.65
CaveCreek3	Tributary	2226.36	1	1691	2244.94	2251.45	2250.28	2252.28	0.017845	7.32	230.96	59.25	0.65
CaveCreek3	Tributary	2226.36	2	1691	2244.94	2251.49	2250.28	2252.31	0.017293	7.23	233.78	59.58	0.64
CaveCreek3	Tributary	2275.58	1	1691	2245.57	2252.43	2250.86	2253.11	0.014618	6.64	254.77	62.21	0.58
CaveCreek3	Tributary	2275.58	2	1691	2245.57	2252.44	2250.86	2253.12	0.01449	6.61	255.63	62.32	0.58
veCreek3	Tributary	2307.26	1	1691	2245.78	2253.16		2253.52	0.007097	4.85	353.69	94.16	0.4

Table 5.9.2.5
HEC-RAS OUTPUT
FLOODWAY AND FLOODPLAIN

River	Reach	River Sta	Profile #	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude #
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	Chl
CaveCreek3	Tributary	2307.26	2	1691	2245.78	2253.17		2253.53	0.00724	4.85	348.5	77.28	0.4
CaveCreek3	Tributary	2392.89	1	1691	2246.05	2253.86		2254.07	0.005034	3.71	476.1	149.16	0.32
CaveCreek3	Tributary	2392.89	2	1691	2246.05	2253.88		2254.1	0.00527	3.77	448.76	109.88	0.33
CaveCreek3	Tributary	2448.51	1	1691	2247.18	2254.16		2254.61	0.013048	5.42	328.99	139.19	0.52
CaveCreek3	Tributary	2448.51	2	1691	2247.18	2254.2		2254.67	0.013381	5.47	309.2	91.09	0.52
CaveCreek3	Tributary	2484.05	1	1691	2248.46	2254.58	2253.49	2255.25	0.016864	6.54	262.51	86.33	0.6
CaveCreek3	Tributary	2484.05	2	1691	2248.46	2254.64	2253.49	2255.29	0.016601	6.47	261.55	71.04	0.59
CaveCreek3	Tributary	2527.13	1	1691	2249.77	2255.07	2255.02	2256.7	0.031888	10.3	169.98	54.87	0.94
CaveCreek3	Tributary	2527.13	2	1691	2249.77	2255.14	2254.95	2256.78	0.034472	10.28	164.5	43.14	0.93
CaveCreek3	Tributary	2577.17	1	1691	2251.53	2256.57		2257.53	0.006609	7.95	238.17	108.43	0.77
CaveCreek3	Tributary	2577.17	2	1691	2251.53	2256.63		2257.62	0.006677	8	211.38	62.36	0.77
CaveCreek3	Tributary	2626.98	1	1691	2252.31	2256.88	2256.54	2257.95	0.00824	8.41	218.27	86.51	0.81
CaveCreek3	Tributary	2626.98	2	1691	2252.31	2256.94		2258.06	0.008445	8.49	199.22	58.81	0.81
CaveCreek3	Tributary	2677.04	1	1691	2253.22	2257.92	2257.92	2259.48	0.010858	10.21	181.7	66.92	0.99
CaveCreek3	Tributary	2677.04	2	1691	2253.22	2258	2258	2259.7	0.012986	10.48	161.39	48.2	1.01
CaveCreek3	Tributary	2726.6	1	1691	2254.29	2259.13		2260.07	0.006528	7.89	232.16	86.53	0.74
CaveCreek3	Tributary	2726.6	2	1691	2254.29	2259.52		2260.35	0.005062	7.28	232.24	59.69	0.65
CaveCreek3	Tributary	2776.16	1	1691	2254.74	2259.58		2260.4	0.004973	7.53	268.95	107.08	0.71
CaveCreek3	Tributary	2776.16	2	1691	2254.74	2259.72		2260.66	0.005303	7.81	216.59	59.11	0.72
CaveCreek3	Tributary	2825.71	1	1691	2254.81	2260.42	2260.42	2261.65	0.006978	9.43	221.87	97.61	0.9
CaveCreek3	Tributary	2825.71	2	1691	2254.81	2260.47	2260.47	2262.2	0.00984	10.55	160.27	46.73	1
CaveCreek3	Tributary	2874.41	1	1691	2255.95	2261.43		2262.27	0.016336	7.56	242.91	103.43	0.78
CaveCreek3	Tributary	2874.41	2	1691	2255.95	2262.39		2262.97	0.007901	6.1	277.08	71.26	0.55
CaveCreek3	Tributary	2926.5	1	1691	2255.83	2262.39	2261.08	2262.85	0.006017	5.59	323.96	97.25	0.51
CaveCreek3	Tributary	2926.5	2	1691	2255.83	2262.89	2261.03	2263.34	0.005083	5.35	315.88	73.44	0.45
CaveCreek3	Tributary	2976.89	1	1691	2256.83	2262.66		2263.1	0.004116	5.54	357.8	143.19	0.51
CaveCreek3	Tributary	2976.89	2	1691	2256.83	2263.11		2263.55	0.003568	5.35	316.23	79.39	0.47
CaveCreek3	Tributary	3026.25	1	1691	2256.85	2262.84	2261.87	2263.54	0.011752	6.7	254.56	85.21	0.65
CaveCreek3	Tributary	3026.25	2	1691	2256.85	2263.31	2261.87	2263.85	0.007946	5.88	287.44	76.53	0.53
CaveCreek3	Tributary	3076.09	1	1691	2258.19	2263.66		2264.38	0.024976	6.79	249.13	80.33	0.67
CaveCreek3	Tributary	3076.09	2	1691	2258.19	2263.87		2264.5	0.020501	6.36	266.46	84.9	0.61
CaveCreek3	Tributary	3126.26	1	1691	2258.96	2264.89		2265.56	0.021903	6.6	258.88	85.44	0.65
CaveCreek3	Tributary	3126.26	2	1691	2258.96	2264.91		2265.58	0.022049	6.57	257.42	78.86	0.64
CaveCreek3	Tributary	3176.64	1	1691	2259.52	2265.96		2266.53	0.016116	6.12	282.51	85.79	0.57
CaveCreek3	Tributary	3176.64	2	1691	2259.52	2265.98		2266.55	0.01587	6.09	281.44	79.97	0.56
CaveCreek3	Tributary	3225.5	1	1691	2259.8	2266.77		2267.19	0.010014	5.2	329.82	89.34	0.45
CaveCreek3	Tributary	3225.5	2	1691	2259.8	2266.78		2267.2	0.009957	5.2	327.92	82.83	0.45
CaveCreek3	Tributary	3276.91	1	1691	2262.58	2267.46		2268.11	0.027772	6.48	263.88	105.7	0.7
CaveCreek3	Tributary	3276.91	2	1691	2262.58	2267.47		2268.12	0.027724	6.49	262.07	100.64	0.7
CaveCreek4	Tributary	63.09	1	294	2220.31	2225.76		2225.83	0.000588	2.13	171.24	77.76	0.19
CaveCreek4	Tributary	63.09	2	294	2220.31	2226.54		2226.59	0.000404	1.93	152.69	31.91	0.16
CaveCreek4	Tributary	199.2	1	294	2223.81	2226.09	2226.09	2226.45	0.02214	5.28	76.08	108.32	0.84
CaveCreek4	Tributary	199.2	2	294	2223.81	2226.55		2226.91	0.013628	4.83	60.91	36.26	0.66
CaveCreek4	Tributary	250.01	1	294	2225.16	2227.24		2227.64	0.02291	6.12	74.44	98.7	0.87
CaveCreek4	Tributary	250.01	2	294	2225.16	2227.6	2227.6	2228.58	0.03485	7.94	37.05	19.32	1.01
CaveCreek4	Tributary	300.24	1	294	2225.99	2228.32	2228.32	2228.79	0.020774	6.48	67.5	79.83	0.85
CaveCreek4	Tributary	300.24	2	294	2225.99	2229.2	2228.64	2229.88	0.017716	6.63	44.31	16.43	0.71
CaveCreek4	Tributary	349.34	1	294	2226.54	2229.23		2229.67	0.015789	6	66.55	60.92	0.75
CaveCreek4	Tributary	349.34	2	294	2226.54	2230.14		2230.62	0.010837	5.53	53.16	18.28	0.57
CaveCreek4	Tributary	398.78	1	294	2227.18	2230.05		2230.57	0.018414	6.2	61.48	56.19	0.8
CaveCreek4	Tributary	398.78	2	294	2227.18	2230.69		2231.15	0.01057	5.43	54.17	21.46	0.6

Table 5.9.2.5
HEC-RAS OUTPUT
FLOODWAY AND FLOODPLAIN

River	Reach	River Sta	Profile #	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude #
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	Chl
aveCreek4	Tributary	449.12	1	294	2228.28	2231.04		2231.4	0.013434	4.96	67.63	63.16	0.66
aveCreek4	Tributary	449.12	2	294	2228.28	2231.39		2231.68	0.008716	4.33	67.88	31.9	0.52
CaveCreek4	Tributary	499.9	1	294	2229.4	2231.83		2232.17	0.017826	5	75.05	84.77	0.72
CaveCreek4	Tributary	499.9	2	294	2229.4	2231.95		2232.38	0.018908	5.34	56.33	35.33	0.74
CaveCreek4	Tributary	550.21	1	294	2230.32	2232.62		2233	0.014666	5.08	67.79	68.1	0.7
CaveCreek4	Tributary	550.21	2	294	2230.32	2232.79		2233.17	0.012524	4.9	60.01	33.34	0.64
CaveCreek4	Tributary	591.49	1	294	2230.58	2233.25		2233.47	0.007516	4.15	90.65	75.2	0.52
CaveCreek4	Tributary	591.49	2	294	2230.58	2233.31		2233.8	0.015412	5.61	52.37	25.61	0.69
CaveCreek4	Tributary	649.6	1	294	2231.2	2233.76		2234.06	0.016636	5.24	84.9	96.99	0.73
CaveCreek4	Tributary	649.6	2	294	2231.2	2234.24		2234.8	0.018029	6.02	48.81	23.7	0.74
CaveCreek4	Tributary	702.29	1	294	2231.57	2234.49	2234.42	2234.94	0.020978	6.1	70.02	82.97	0.81
CaveCreek4	Tributary	702.29	2	294	2231.57	2235.14		2235.72	0.016587	6.07	48.42	19.99	0.69
CaveCreek4	Tributary	750.06	1	294	2232.67	2235.36		2235.65	0.013646	4.89	85.92	94.43	0.68
CaveCreek4	Tributary	750.06	2	294	2232.67	2235.99		2236.33	0.008418	4.68	62.8	28.05	0.55
CaveCreek4	Tributary	799.92	1	294	2234.28	2236.11		2236.45	0.022232	5.38	78	100.53	0.81
CaveCreek4	Tributary	799.92	2	294	2234.28	2236.51		2237.05	0.020075	5.88	49.97	27.88	0.77
CaveCreek4	Tributary	850.83	1	294	2235.77	2237.23		2237.48	0.028017	4.53	76.23	81.85	0.78
CaveCreek4	Tributary	850.83	2	294	2235.77	2237.75		2238.26	0.028268	5.76	51.67	33.1	0.81
CaveCreek4	Tributary	899.79	1	294	2235.05	2237.72		2237.82	0.004915	3.21	133.02	97.34	0.4
CaveCreek4	Tributary	899.79	2	294	2235.05	2238.63		2238.91	0.006524	4.25	69.19	24.12	0.44
CaveCreek4	Tributary	950.75	1	294	2235.89	2238.03		2238.44	0.022238	5.97	73.08	87.31	0.84
CaveCreek4	Tributary	950.75	2	294	2235.89	2238.98		2239.42	0.011046	5.3	55.46	21.89	0.59
CaveCreek4	Tributary	999.76	1	294	2236.16	2238.96	2238.92	2239.49	0.017921	6.1	62.14	70.98	0.79
CaveCreek4	Tributary	999.76	2	294	2236.16	2239.53		2239.94	0.010319	5.18	56.71	23.55	0.59
CaveCreek4	Tributary	1050.89	1	294	2237.2	2240.1	2240.03	2240.54	0.022584	5.44	62.14	80.85	0.77
CaveCreek4	Tributary	1050.89	2	294	2237.2	2240.23		2240.65	0.019486	5.23	56.22	33.14	0.71
aveCreek4	Tributary	1099.46	1	294	2238.04	2241.02		2241.2	0.00782	3.71	96.94	65.28	0.48
CaveCreek4	Tributary	1099.46	2	294	2238.04	2241.1		2241.47	0.014146	4.88	60.21	30.95	0.62
CaveCreek4	Tributary	1150.26	1	294	2238.27	2241.34		2241.51	0.006143	3.88	108.26	82.22	0.46
CaveCreek4	Tributary	1150.26	2	294	2238.27	2241.65		2242.02	0.008629	4.88	60.24	24.23	0.55
CaveCreek4	Tributary	1200.58	1	294	2239.09	2241.69	2241.69	2242.29	0.024131	6.52	54.23	52.22	0.88
CaveCreek4	Tributary	1200.58	2	294	2239.09	2242.15		2242.67	0.015835	5.78	50.84	23.61	0.69
CaveCreek4	Tributary	1250.9	1	294	2240.44	2243.04		2243.32	0.01553	4.76	80.6	77.95	0.65
CaveCreek4	Tributary	1250.9	2	294	2240.44	2243.11		2243.64	0.023485	5.86	50.21	29.29	0.79
CaveCreek4	Tributary	1299.45	1	294	2241.43	2243.73		2244.09	0.016613	5.64	72.06	60.88	0.74
CaveCreek4	Tributary	1299.45	2	294	2241.43	2244.13		2244.89	0.023082	6.99	42.05	19.02	0.83
CaveCreek4	Tributary	1349.34	1	294	2241.96	2244.46		2244.98	0.021699	6.4	62.11	65.32	0.86
CaveCreek4	Tributary	1349.34	2	294	2241.96	2245.3		2245.75	0.010972	5.37	54.77	21.19	0.59
CaveCreek4	Tributary	1400.14	1	294	2243.42	2245.63		2245.93	0.014696	5.23	80.13	69.91	0.71
CaveCreek4	Tributary	1400.14	2	294	2243.42	2245.95	2245.83	2246.8	0.0285	7.41	39.67	19.66	0.92
CaveCreek4	Tributary	1449.78	1	294	2243.92	2246.43		2246.96	0.030182	6.48	57.66	53.56	0.91
CaveCreek4	Tributary	1449.78	2	294	2243.92	2247.38		2247.82	0.012283	5.27	55.74	22.12	0.59
CaveCreek4	Tributary	1499.9	1	294	2244.18	2247.35		2247.66	0.00796	4.77	75.14	48.96	0.54
CaveCreek4	Tributary	1499.9	2	294	2244.18	2247.98		2248.26	0.005471	4.25	69.22	22.85	0.43
CaveCreek4	Tributary	1550.11	1	294	2245.47	2247.88		2248.16	0.011548	4.68	80.16	57.54	0.58
CaveCreek4	Tributary	1550.11	2	294	2245.47	2248.32		2248.73	0.013405	5.18	56.72	23.04	0.58
CaveCreek4	Tributary	1600.12	1	294	2246.84	2248.87	2248.87	2249.48	0.02984	6.89	53.29	46.01	0.96
CaveCreek4	Tributary	1600.12	2	294	2246.84	2249.09	2249.09	2250.01	0.035318	7.7	38.16	20.81	1
CaveCreek4	Tributary	1650.15	1	294	2247.91	2250.11		2250.38	0.009909	4.29	77.63	53.92	0.54
CaveCreek4	Tributary	1650.15	2	294	2247.91	2250.61		2250.83	0.005988	3.71	79.26	32.12	0.42
veCreek4	Tributary	1698.95	1	294	2249.14	2250.76		2251.03	0.020065	4.65	76.56	83.03	0.7
eCreek4	Tributary	1698.95	2	294	2249.14	2251.01		2251.45	0.023029	5.3	55.44	34.19	0.73

Table 5.9.2.5
HEC-RAS OUTPUT
FLOODWAY AND FLOODPLAIN

River	Reach	River Sta	Profile #	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
aveCreek4	Tributary	1750.07	1	294	2249.58	2251.96	2251.96	2252.62	0.027856	6.64	49.06	42.46	0.94
CaveCreek4	Tributary	1750.07	2	294	2249.58	2252.12	2251.94	2252.76	0.024138	6.39	46.04	26.71	0.86
CaveCreek4	Tributary	1798.07	1	294	2249.94	2253.06		2253.26	0.005805	3.83	90.02	57.79	0.44
CaveCreek4	Tributary	1798.07	2	294	2249.94	2253.18		2253.45	0.007242	4.14	70.94	28.9	0.47
CaveCreek4	Tributary	1849.57	1	294	2250.3	2253.35		2253.56	0.006128	4.02	86.45	60.88	0.48
CaveCreek4	Tributary	1849.57	2	294	2250.3	2253.55		2253.89	0.008658	4.68	62.78	25.95	0.53
CaveCreek4	Tributary	1899.5	1	294	2251.23	2253.68		2253.86	0.006411	3.61	92.53	66.75	0.47
CaveCreek4	Tributary	1899.5	2	294	2251.23	2254.07		2254.27	0.005297	3.52	83.54	37.73	0.42
CaveCreek4	Tributary	1949.68	1	294	2252.61	2254.34	2254.34	2254.94	0.031355	6.27	48.68	43.26	0.98
CaveCreek4	Tributary	1949.68	2	294	2252.61	2254.41	2254.33	2254.97	0.028413	6.05	48.62	36.8	0.93
CaveCreek4	Tributary	1999.48	1	294	2253.75	2255.9	2255.78	2256.22	0.017661	4.89	73.8	85.91	0.72
CaveCreek4	Tributary	1999.48	2	294	2253.75	2255.92	2255.85	2256.56	0.034253	6.44	45.62	31.6	0.95
CaveCreek4	Tributary	2050.03	1	294	2254.96	2256.86		2257.16	0.018922	4.67	72.45	70.42	0.69
CaveCreek4	Tributary	2050.03	2	294	2254.96	2257.31		2257.56	0.010496	4.03	73.03	38.91	0.52
CaveCreek4	Tributary	2100.35	1	294	2255.26	2257.54		2257.73	0.006945	3.92	89.54	62.68	0.5
CaveCreek4	Tributary	2100.35	2	294	2255.26	2257.78		2258.15	0.0106	4.88	60.3	27.62	0.58
CaveCreek4	Tributary	2149.47	1	294	2256.64	2258.05	2258.05	2258.5	0.02742	6.09	59.31	69.04	0.93
CaveCreek4	Tributary	2149.47	2	294	2256.64	2258.41	2258.34	2259.17	0.030475	7.01	41.95	24.72	0.95
CaveCreek4	Tributary	2199.7	1	294	2257.4	2259.38	2259.38	2259.75	0.025219	5.93	73.55	106.43	0.89
CaveCreek4	Tributary	2199.7	2	294	2257.4	2259.88	2259.79	2260.71	0.029568	7.32	40.14	21.43	0.94
CaveCreek4	Tributary	2247.07	1	294	2258.52	2260.6	2260.6	2261.07	0.021908	6.19	61.58	64.46	0.86
CaveCreek4	Tributary	2247.07	2	294	2258.52	2261.24		2261.86	0.01839	6.35	46.28	20.49	0.74
CaveCreek4	Tributary	2299.81	1	294	2259.55	2261.64		2261.99	0.015262	5.11	71.68	73.38	0.71
CaveCreek4	Tributary	2299.81	2	294	2259.55	2262.26		2262.56	0.007634	4.37	67.3	30.28	0.52
CaveCreek4	Tributary	2350.46	1	294	2260.51	2262.91	2262.91	2263.55	0.023551	6.91	51.34	42.5	0.9
veCreek4	Tributary	2350.46	2	294	2260.51	2263.01	2263.01	2263.98	0.034504	7.94	37.02	19.28	1.01
CaveCreek5	Tributary	28.32	1	1985	2217.86	2224.98		2225.11	0.001925	3.11	818.33	312.4	0.27
CaveCreek5	Tributary	28.32	2	1985	2217.86	2225.47		2225.67	0.002417	3.61	550.03	120.44	0.3
CaveCreek5	Tributary	56.87	1	1985	2217.93	2225.03		2225.21	0.004342	3.89	661.27	275.13	0.34
CaveCreek5	Tributary	56.87	2	1985	2217.93	2225.5		2225.85	0.006288	4.76	416.6	93.48	0.4
CaveCreek6	Tributary	59.11	1	650	2221	2225.15		2225.26	0.00142	2.87	281.22	110.01	0.28
CaveCreek6	Tributary	59.11	2	650	2221	2225.71		2225.91	0.002114	3.55	183.22	48.44	0.32
CaveCreek6	Tributary	86.23	1	650	2221.55	2225.18		2225.33	0.002925	3.26	222.11	109.37	0.38
CaveCreek6	Tributary	86.23	2	650	2221.55	2225.85		2225.98	0.00187	2.92	222.79	74.52	0.3
CaveCreek6	Tributary	140.24	1	650	2222.1	2225.33		2225.75	0.013038	5.84	145.74	123.46	0.78
CaveCreek6	Tributary	140.24	2	650	2222.1	2225.82		2226.41	0.011321	6.14	105.83	47.01	0.72
CaveCreek6	Tributary	181.19	1	650	2222.39	2225.76		2226.21	0.010356	6.15	149.79	125.43	0.76
CaveCreek6	Tributary	181.19	2	650	2222.39	2226.19		2226.96	0.011077	7.03	92.47	37.44	0.79
CaveCreek6	Tributary	228.67	1	650	2223.4	2226.35		2226.77	0.014885	6.11	148.49	135.1	0.8
CaveCreek6	Tributary	228.67	2	650	2223.4	2226.85		2227.57	0.014861	6.98	96.92	43.69	0.82
CaveCreek6	Tributary	281.03	1	650	2223.71	2226.99		2227.26	0.00829	4.79	182.14	152.38	0.61
CaveCreek6	Tributary	281.03	2	650	2223.71	2227.77		2228.14	0.006089	4.96	134.94	50.35	0.53
CaveCreek6	Tributary	333.36	1	650	2223.94	2227.38		2227.89	0.016462	6.62	146.7	149.27	0.82
CaveCreek6	Tributary	333.36	2	650	2223.94	2228.05		2228.81	0.015286	7.01	92.73	34.62	0.75
CaveCreek6	Tributary	381.15	1	650	2224.69	2228.15		2228.59	0.013286	6.21	150.92	141.04	0.77
CaveCreek6	Tributary	381.15	2	650	2224.69	2228.8		2229.47	0.011887	6.74	101.97	40.39	0.72
CaveCreek6	Tributary	431.58	1	650	2225.07	2228.8	2228.8	2229.44	0.014241	6.95	122.37	111.89	0.8
CaveCreek6	Tributary	431.58	2	650	2225.07	2229.36		2230.07	0.011135	6.77	96.02	32.71	0.7
CaveCreek6	Tributary	481.63	1	650	2225.04	2229.71	2229.71	2230.59	0.013437	7.94	104.5	71.42	0.81
CaveCreek6	Tributary	481.63	2	650	2225.04	2229.84	2229.52	2230.99	0.017968	8.58	75.78	24.04	0.85
veCreek6	Tributary	531.04	1	650	2226.22	2230.68		2231.02	0.003105	5.08	171.66	97.89	0.51

Table 5.9.2.5
HEC-RAS OUTPUT
FLOODWAY AND FLOODPLAIN

River	Reach	River Sta	Profile #	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude #
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	Chl
CaveCreek6	Tributary	531.04	2	650	2226.22	2231.06		2231.54	0.003795	5.54	117.24	34.03	0.53
CaveCreek6	Tributary	579.05	1	650	2226.99	2231.01	2231.01	2231.86	0.014925	8.08	104.88	76.9	0.92
CaveCreek6	Tributary	579.05	2	650	2226.99	2231.25	2231.25	2232.58	0.020654	9.25	70.26	26.63	1
CaveCreek6	Tributary	608.01	1	650	2227.36	2231.76		2232.19	0.003878	5.6	159.46	86.9	0.57
CaveCreek6	Tributary	608.01	2	650	2227.36	2232.61		2233.02	0.002494	5.11	127.31	33.06	0.46
CaveCreek6	Tributary	654.88	1	650	2227.67	2232.25		2232.38	0.001578	3.16	266.51	132.87	0.33
CaveCreek6	Tributary	654.88	2	650	2227.67	2233.02		2233.18	0.001352	3.23	204.26	55.96	0.3
CaveCreek6	Tributary	681.58	1	650	2228.68	2232.24		2232.5	0.003094	4.69	210.85	140.6	0.5
CaveCreek6	Tributary	681.58	2	650	2228.68	2232.96		2233.33	0.002673	4.89	135.86	39.19	0.46
CaveCreek6	Tributary	712.75	1	650	2229.26	2232.44	2232.44	2233.07	0.015359	6.85	121.55	116.48	0.82
CaveCreek6	Tributary	712.75	2	650	2229.26	2232.98		2233.61	0.011275	6.38	101.81	37.62	0.68
CaveCreek6	Tributary	781.52	1	650	2230	2233.58		2233.74	0.005295	3.58	214.62	143.45	0.44
CaveCreek6	Tributary	781.52	2	650	2230	2234		2234.28	0.006046	4.19	155.06	62.5	0.47
CaveCreek6	Tributary	830.89	1	650	2230.92	2233.86		2234.19	0.016258	5.28	151.41	129.5	0.76
CaveCreek6	Tributary	830.89	2	650	2230.92	2234.31		2234.93	0.018265	6.32	102.91	53.94	0.81
CaveCreek6	Tributary	880.63	1	650	2231.22	2234.56	2234.4	2234.99	0.014934	5.97	145.74	115.94	0.73
CaveCreek6	Tributary	880.63	2	650	2231.22	2235.09		2235.78	0.014877	6.71	98.64	38.26	0.73
CaveCreek6	Tributary	930.87	1	650	2231.42	2235.28		2235.87	0.017316	6.94	128.65	110.68	0.79
CaveCreek6	Tributary	930.87	2	650	2231.42	2235.81		2236.71	0.017945	7.6	85.57	29.39	0.78
CaveCreek6	Tributary	980.8	1	650	2232.6	2236.11	2236.11	2236.8	0.017648	7.45	118.73	93.86	0.82
CaveCreek6	Tributary	980.8	2	650	2232.6	2236.68		2237.67	0.01886	7.96	81.64	26.16	0.79
CaveCreek6	Tributary	1031.9	1	650	2231.52	2237.03		2237.49	0.009433	6.07	141.98	84.96	0.61
CaveCreek6	Tributary	1031.9	2	650	2231.52	2237.85		2238.41	0.008326	6.1	111.15	29.25	0.54
CaveCreek6	Tributary	1081.94	1	650	2233.4	2237.65		2237.95	0.007394	4.86	169.94	101.89	0.53
CaveCreek6	Tributary	1081.94	2	650	2233.4	2238.45		2238.82	0.006099	4.86	133.83	39.04	0.46
CaveCreek6	Tributary	1130.69	1	650	2234.38	2238.06		2238.28	0.005413	4.02	190.3	101.96	0.43
CaveCreek6	Tributary	1130.69	2	650	2234.38	2238.86		2239.11	0.004453	4	162.5	45.77	0.37
CaveCreek6	Tributary	1181.67	1	650	2235.6	2238.92	2238.92	2239.63	0.020879	7.38	110.21	81.31	0.86
CaveCreek6	Tributary	1181.67	2	650	2235.6	2239.03	2239.03	2240.27	0.032285	8.91	72.98	30.2	1.01
CaveCreek6	Tributary	1231.01	1	650	2236.7	2239.89		2240.38	0.011589	6.1	124.49	71.46	0.66
CaveCreek6	Tributary	1231.01	2	650	2236.7	2240.72		2241.25	0.009324	5.87	110.76	31.46	0.55
CaveCreek6	Tributary	1281.34	1	650	2237.08	2240.65		2240.89	0.007209	4.37	182.13	112.62	0.51
CaveCreek6	Tributary	1281.34	2	650	2237.08	2241.38		2241.69	0.006017	4.5	144.29	47.58	0.46
CaveCreek6	Tributary	1331.71	1	650	2237.72	2241.02		2241.27	0.009067	4.33	170.45	119.59	0.59
CaveCreek6	Tributary	1331.71	2	650	2237.72	2241.72		2242.02	0.007088	4.42	146.99	61.5	0.5
CaveCreek6	Tributary	1381.36	1	650	2238.83	2241.47		2241.79	0.013352	3.7	154.61	128.43	0.61
CaveCreek6	Tributary	1381.36	2	650	2238.83	2242.16		2242.44	0.009442	4.22	154.49	83.89	0.55
CaveCreek6	Tributary	1422.32	1	650	2239.45	2242.1		2242.3	0.00989	3.47	184.9	162.07	0.57
CaveCreek6	Tributary	1422.32	2	650	2239.45	2242.56		2242.85	0.010612	4.34	150.87	92.98	0.6
CaveCreek6	Tributary	1481.05	1	650	2240.59	2242.67		2242.94	0.015868	3.59	160.28	168.24	0.68
CaveCreek6	Tributary	1481.05	2	650	2240.59	2243.25		2243.56	0.01357	4.5	145.23	100.62	0.66
CaveCreek6	Tributary	1530.78	1	650	2241.7	2243.9	2243.9	2244.34	0.02415	4.42	126.26	133.78	0.86
CaveCreek6	Tributary	1530.78	2	650	2241.7	2244.29	2244.29	2244.89	0.031537	6.24	104.76	88.28	1.01
CaveCreek6	Tributary	1556.15	1	650	2241.92	2244.73	2244.48	2245.08	0.015457	4.06	141.32	114	0.69
CaveCreek6	Tributary	1556.15	2	650	2241.92	2245.12	2244.88	2245.56	0.018965	5.29	122.95	85.64	0.78
CaveCreek6	Tributary	1581.06	1	650	2242.36	2245.24	2245.22	2245.77	0.025797	5.87	112.48	102.48	0.97
CaveCreek6	Tributary	1581.06	2	650	2242.36	2245.58		2246.05	0.019398	5.5	118.17	79.98	0.8
CaveCreek6	Tributary	1604.3	1	650	2243.1	2245.96		2246.17	0.007365	3.7	181.59	118.52	0.5
CaveCreek6	Tributary	1604.3	2	650	2243.1	2246.02		2246.46	0.015273	5.34	121.81	69.54	0.71
CaveCreek6	Tributary	1630.77	1	650	2243.31	2246.14		2246.5	0.011994	5.15	142.28	97.81	0.65
CaveCreek6	Tributary	1630.77	2	650	2243.31	2246.34		2247.05	0.019908	6.75	96.25	45.42	0.82

Table 5.9.2.5
HEC-RAS OUTPUT
FLOODWAY AND FLOODPLAIN

River	Reach	River Sta	Profile #	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude #
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	Chl
CaveCreek6	Tributary	1667.12	1	650	2244	2246.95	2246.95	2247.59	0.012372	7	110.66	86.63	0.89
CaveCreek6	Tributary	1667.12	2	650	2244	2247.17	2247.17	2248.24	0.016027	8.31	78.19	36.52	1
CaveCreek6	Tributary	1732.08	1	650	2244.78	2247.99	2247.99	2248.78	0.013675	7.89	113.02	80.87	0.9
CaveCreek6	Tributary	1732.08	2	650	2244.78	2248.19	2248.19	2249.51	0.019067	9.22	70.49	27.09	1.01
CaveCreek6	Tributary	1780.69	1	650	2245.38	2248.84	2248.84	2249.57	0.019207	7.74	116.6	94.65	0.91
CaveCreek6	Tributary	1780.69	2	650	2245.38	2249.51	2249.14	2250.51	0.018154	8.01	81.13	27.79	0.83
CaveCreek6	Tributary	1832.84	1	650	2246.2	2249.73	2249.73	2250.45	0.011817	7.38	119.18	89.78	0.84
CaveCreek6	Tributary	1832.84	2	650	2246.2	2250.48		2251.19	0.007931	6.77	96.05	30.56	0.67
CaveCreek6	Tributary	1881.6	1	650	2247.73	2251.14	2251.14	2251.95	0.012204	7.88	113.95	81.23	0.88
CaveCreek6	Tributary	1881.6	2	650	2247.73	2251.22	2251.22	2252.54	0.018291	9.2	70.68	27.36	1.01
CaveCreek7	Tributary	23.91	1	933	2218.72	2225.06		2225.1	0.000863	1.91	571.33	192.83	0.17
CaveCreek7	Tributary	23.91	2	933	2218.72	2225.59		2225.67	0.001082	2.23	418.6	92.26	0.18
CaveCreek7	Tributary	45.2	1	933	2219.02	2225.07		2225.14	0.001871	2.33	441.05	170.55	0.22
CaveCreek7	Tributary	45.2	2	933	2219.02	2225.6		2225.73	0.002648	2.9	321.49	81.5	0.26
CaveCreek8	Tributary	20.37	1	283	2220.03	2225.13		2225.18	0.000733	1.98	162.73	65.68	0.19
CaveCreek8	Tributary	20.37	2	283	2220.03	2225.72		2225.79	0.000856	2.11	133.9	35.23	0.19
CaveCreek8	Tributary	39.6	1	283	2220.61	2225.13		2225.21	0.001418	2.34	129.71	62.12	0.26
CaveCreek8	Tributary	39.6	2	283	2220.61	2225.74		2225.81	0.001099	2.14	132.09	42.17	0.21
CaveCreek8	Tributary	99.35	1	283	2222.26	2225.2		2225.51	0.010378	4.51	63.6	53.84	0.69
CaveCreek8	Tributary	99.35	2	283	2222.26	2225.81		2225.96	0.003552	3.11	91.1	47.32	0.39
CaveCreek8	Tributary	150.37	1	283	2223.46	2226.59	2226.59	2227.33	0.015858	7.26	43.55	33.36	0.92
CaveCreek8	Tributary	150.37	2	283	2223.46	2226.63	2226.63	2227.63	0.021299	8.06	35.11	17.85	1.01
CaveCreek8	Tributary	200.44	1	283	2224.34	2227.57		2227.92	0.00664	4.96	67.72	45.68	0.6
CaveCreek8	Tributary	200.44	2	283	2224.34	2227.96		2228.3	0.005237	4.68	60.5	24.5	0.52
CaveCreek8	Tributary	249.31	1	283	2227.7	2229.88	2229.88	2230.42	0.018444	6.25	51.34	47.49	0.95
CaveCreek8	Tributary	249.31	2	283	2227.7	2229.98	2229.98	2230.7	0.02125	6.81	41.53	29.28	1.01
CaveCreek8	Tributary	284.89	1	283	2228.42	2230.73	2230.73	2231.25	0.020403	6.21	51.41	48.69	0.98
CaveCreek8	Tributary	284.89	2	283	2228.42	2230.95	2230.95	2231.68	0.021981	6.85	41.29	29.22	1.02
CaveCreek8	Tributary	328.87	1	283	2230.78	2232.59	2232.59	2233.21	0.020694	6.31	44.8	36.72	1.05
CaveCreek8	Tributary	328.87	2	283	2230.78	2233.12	2233.12	2233.96	0.021009	7.35	38.48	23.55	1.01
CaveCreek8	Tributary	353.1	1	283	2231.03	2233.58	2233.58	2234.25	0.018369	6.99	46.23	35.41	1
CaveCreek8	Tributary	353.1	2	283	2231.03	2233.82	2233.82	2234.68	0.019622	7.47	37.88	22.26	1.01
CaveCreek8	Tributary	394.91	1	283	2231.36	2234.62	2234.62	2235.29	0.014331	7.11	48.05	38.3	0.87
CaveCreek8	Tributary	394.91	2	283	2231.36	2234.73	2234.73	2235.83	0.019525	8.42	33.63	15.57	1.01
CaveCreek8	Tributary	421.98	1	283	2232.23	2235.62	2235.62	2236.11	0.013751	6.05	61	64.05	0.8
CaveCreek8	Tributary	421.98	2	283	2232.23	2235.79	2235.55	2236.46	0.018066	6.58	43.02	22.34	0.84
CaveCreek8	Tributary	449.41	1	283	2232.75	2236.34	2236.34	2236.92	0.022732	6.28	51.37	57.67	0.82
CaveCreek8	Tributary	449.41	2	283	2232.75	2236.38	2236.24	2237.12	0.029852	6.93	40.85	22.05	0.9
CaveCreek8	Tributary	498.24	1	283	2234.07	2237.26	2237.26	2238.09	0.016851	7.47	40.29	25.37	0.95
CaveCreek8	Tributary	498.24	2	283	2234.07	2237.4	2237.27	2238.27	0.017253	7.48	37.86	18.35	0.92
CaveCreek8	Tributary	549.57	1	283	2235.15	2238.41	2238.41	2239.33	0.014604	8.03	39.77	24.39	0.92
CaveCreek8	Tributary	549.57	2	283	2235.15	2238.45	2238.45	2239.68	0.023111	8.89	31.82	13.14	1.01
CaveCreek8	Tributary	589.8	1	283	2237.07	2239.73	2239.73	2240.41	0.016583	7.02	45.74	38.93	0.96
CaveCreek8	Tributary	589.8	2	283	2237.07	2239.97	2239.97	2240.94	0.022408	7.94	35.66	18.61	1.01
CaveCreek8	Tributary	650.95	1	283	2239.24	2241.47	2241.47	2242.02	0.016543	6.2	51.18	53.2	0.94
CaveCreek8	Tributary	650.95	2	283	2239.24	2241.62	2241.55	2242.29	0.018918	6.58	42.99	28.41	0.94
CaveCreek8	Tributary	694.11	1	283	2241.19	2242.64	2242.64	2243.16	0.021098	6.15	49.42	49.57	1
CaveCreek8	Tributary	694.11	2	283	2241.19	2243.14	2243.14	2243.98	0.021488	7.38	38.32	22.86	1.01
CaveCreek8	Tributary	732.6	1	283	2241.49	2243.76	2243.76	2244.35	0.014958	6.36	50.86	51.81	0.88
CaveCreek8	Tributary	732.6	2	283	2241.49	2244.15		2244.62	0.009463	5.52	51.24	25.66	0.69
CaveCreek8	Tributary	764.86	1	283	2242.26	2244.97	2244.97	2245.47	0.01381	6.21	58.37	62.04	0.85
CaveCreek8	Tributary	764.86	2	283	2242.26	2245.06	2245.06	2245.95	0.021077	7.57	37.39	21.45	1.01

Table 5.9.2.5
HEC-RAS OUTPUT
FLOODWAY AND FLOODPLAIN

River	Reach	River Sta	Profile #	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
aveCreek8	Tributary	798.77	1	283	2242.91	2245.65	2245.65	2246.16	0.014847	6.37	58.31	56.02	0.88
CaveCreek8	Tributary	798.77	2	283	2242.91	2245.77	2245.77	2246.68	0.020971	7.63	37.07	20.96	1.01
CaveCreek8	Tributary	849.27	1	283	2244.58	2246.9	2246.9	2247.47	0.015824	6.43	54.21	55.17	0.89
CaveCreek8	Tributary	849.27	2	283	2244.58	2246.99	2246.9	2247.73	0.018653	6.9	41	23.97	0.93
CaveCreek8	Tributary	900.17	1	283	2246.82	2248.67	2248.67	2249.22	0.017701	6.28	53.03	50.99	0.94
CaveCreek8	Tributary	900.17	2	283	2246.82	2248.73	2248.73	2249.47	0.021895	6.88	41.11	28.43	1.01
CaveCreek8	Tributary	948.74	1	283	2247.57	2249.98	2249.98	2250.48	0.016495	6.41	58.22	57.17	0.91
CaveCreek8	Tributary	948.74	2	283	2247.57	2250.22	2250.22	2251.12	0.021728	7.63	37.1	20.9	1.01
CaveCreek8	Tributary	999.92	1	283	2249.31	2251.32	2251.32	2251.93	0.017307	6.46	49.5	46.92	0.94
CaveCreek8	Tributary	999.92	2	283	2249.31	2251.53		2252.12	0.014765	6.19	45.75	27.3	0.84
CaveCreek8	Tributary	1049.95	1	283	2250.4	2253.07	2253.07	2253.66	0.014749	6.56	51.11	48.63	0.88
CaveCreek8	Tributary	1049.95	2	283	2250.4	2253.09	2253.09	2253.98	0.021046	7.57	37.38	21.49	1.01
CaveCreek8	Tributary	1099.76	1	283	2252.38	2254.4	2254.4	2254.96	0.022399	6.23	52.01	51.14	0.92
CaveCreek8	Tributary	1099.76	2	283	2252.38	2254.51	2254.41	2255.15	0.023145	6.44	43.93	29.02	0.92
CaveCreek8	Tributary	1148.38	1	283	2253.5	2255.45		2255.85	0.014161	5.29	58.53	49.19	0.73
CaveCreek8	Tributary	1148.38	2	283	2253.5	2255.63		2256.09	0.014675	5.45	51.93	28.43	0.71
CaveCreek8	Tributary	1200.37	1	283	2254.11	2256.7	2256.7	2257.41	0.015177	7.1	48.37	39.9	0.91
CaveCreek8	Tributary	1200.37	2	283	2254.11	2256.74	2256.74	2257.71	0.020852	7.92	35.75	18.76	1.01
CaveCreek8	Tributary	1250.15	1	283	2256.13	2258.8	2258.8	2259.55	0.015996	7.23	44.52	34.37	0.93
CaveCreek8	Tributary	1250.15	2	283	2256.13	2258.84	2258.84	2259.81	0.021282	7.91	35.78	18.74	1.01
CaveCreek8	Tributary	1292.59	1	283	2257.6	2260.04	2260.04	2260.74	0.016984	6.82	44.3	33.58	0.98
CaveCreek8	Tributary	1292.59	2	283	2257.6	2260.05	2260.05	2260.82	0.018218	7.04	40.2	26.51	1.01
CaveCreek8	Tributary	1324.46	1	283	2258.34	2261.31	2261.31	2262.08	0.020629	7.01	40.39	27.08	1.01
CaveCreek8	Tributary	1324.46	2	283	2258.34	2261.31	2261.31	2262.08	0.020578	7	40.43	27.09	1.01
CaveCreek8	Tributary	1371.69	1	283	2260.15	2262.51		2262.88	0.010822	4.89	58.01	41.74	0.72
aveCreek8	Tributary	1371.69	2	283	2260.15	2262.51		2262.88	0.010925	4.88	57.97	40.52	0.72
CaveCreek8	Tributary	1406.24	1	283	2261.19	2263.63	2263.63	2264.1	0.017668	5.46	51.88	58.87	1.02
CaveCreek8	Tributary	1406.24	2	283	2261.19	2263.64	2263.64	2264.1	0.017541	5.44	52.06	59.05	1.02
CaveCreek8	Tributary	1450.16	1	283	2260.5	2264.47		2264.66	0.007329	3.45	82.12	54.76	0.5
CaveCreek8	Tributary	1450.16	2	283	2260.5	2264.47		2264.65	0.007351	3.45	82	54.7	0.5
CaveCreek8	Tributary	1500.84	1	283	2262.56	2264.87		2265.12	0.010086	4.03	70.28	71.38	0.72
CaveCreek8	Tributary	1500.84	2	283	2262.56	2264.87		2265.12	0.010113	4.03	70.19	71.3	0.72
CaveCreek8	Tributary	1550.15	1	283	2263.88	2265.84	2265.84	2266.34	0.018857	5.7	49.66	49.95	1.01
CaveCreek8	Tributary	1550.15	2	283	2263.88	2265.84	2265.84	2266.34	0.018857	5.7	49.66	49.95	1.01
CaveCreek8	Tributary	1593.76	1	283	2265.12	2267.14	2267.14	2267.68	0.019365	5.92	47.8	44.44	1.01
CaveCreek8	Tributary	1593.76	2	283	2265.12	2267.14	2267.14	2267.68	0.019365	5.92	47.8	44.44	1.01
CaveCreek8	Tributary	1624.07	1	283	2265.91	2267.98	2267.98	2268.6	0.01602	6.7	50.02	44.61	0.92
CaveCreek8	Tributary	1624.07	2	283	2265.91	2268.02	2268.02	2268.88	0.021814	7.44	38.03	22.54	1.01
CaveCreek8	Tributary	1650.94	1	283	2265.92	2268.91	2268.91	2269.58	0.013568	7	48.13	41.42	0.87
CaveCreek8	Tributary	1650.94	2	283	2265.92	2268.91	2268.91	2269.92	0.021144	8.09	34.99	17.23	1
CaveCreek8	Tributary	1700.46	1	283	2266.98	2270.37	2270.37	2271.43	0.019553	8.56	36	26.76	1.03
CaveCreek8	Tributary	1700.46	2	283	2266.98	2270.57	2270.57	2271.75	0.022791	8.72	32.47	13.92	1.01
CaveCreek8	Tributary	1749.39	1	283	2269.67	2272.06		2272.47	0.014352	6.05	62.7	57.78	0.85
CaveCreek8	Tributary	1749.39	2	283	2269.67	2272.47	2272.47	2273.47	0.02152	8.02	35.27	17.96	1.01
CaveCreek8	Tributary	1799.45	1	283	2271.31	2273.9	2273.9	2274.32	0.013346	6.14	65.94	74.18	0.83
CaveCreek8	Tributary	1799.45	2	283	2271.31	2274.18	2274.18	2275.18	0.021441	8.03	35.22	17.91	1.01
CaveCreek8	Tributary	1849.65	1	283	2272.91	2275.31	2275.31	2275.92	0.01417	6.65	51.96	47.97	0.88
CaveCreek8	Tributary	1849.65	2	283	2272.91	2275.37	2275.33	2276.26	0.02003	7.55	37.49	20.23	0.98
CaveCreek8	Tributary	1900.27	1	283	2273.37	2276.12	2276.11	2276.86	0.02264	6.93	41.95	30.44	0.96
CaveCreek8	Tributary	1900.27	2	283	2273.37	2276.66		2277.09	0.010144	5.3	53.38	24.76	0.64
veCreek8	Tributary	1951.5	1	283	2275.19	2277.9	2277.9	2278.59	0.025447	6.68	42.36	31.19	1.01

Table 5.9.2.5
HEC-RAS OUTPUT
FLOODWAY AND FLOODPLAIN

River	Reach	River Sta	Profile #	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
aveCreek8	Tributary	1951.5	2	283	2275.19	2277.91	2277.91	2278.59	0.025273	6.66	42.49	31.24	1.01
CaveCreek8	Tributary	2000.81	1	283	2277.16	2279.43	2279.43	2280.14	0.027738	6.74	41.99	30.22	1.01
CaveCreek8	Tributary	2000.81	2	283	2277.16	2279.43	2279.43	2280.14	0.027762	6.74	41.97	30.22	1.01
CaveCreek9	Tributary	39.15	1	3699	2110.86	2119.78	2119.5	2120.99	0.01891	9.12	474.44	196.06	0.8
CaveCreek9	Tributary	39.15	2	3699	2110.86	2120.78	2119.34	2121.74	0.012354	7.86	470.74	93.09	0.62
CaveCreek9	Tributary	72.13	1	3699	2111.16	2120.78		2121.71	0.019733	7.9	505.3	151.39	0.62
CaveCreek9	Tributary	72.13	2	3699	2111.16	2121.38		2122.24	0.016495	7.43	497.54	86.88	0.55
CaveCreek9	Tributary	110.68	1	3699	2111.16	2121.54		2122.35	0.012641	7.37	535.99	106.63	0.52
CaveCreek9	Tributary	110.68	2	3699	2111.16	2122.01		2122.81	0.01258	7.18	515.3	76.17	0.49
CaveCreek9	Tributary	165.99	1	3699	2112.05	2122.11		2123.05	0.010425	7.93	501.11	89.1	0.51
CaveCreek9	Tributary	165.99	2	3699	2112.05	2122.61		2123.53	0.011244	7.72	479.33	60.6	0.48
CaveCreek9	Tributary	200.99	1	3699	2112.71	2122.35		2123.61	0.012661	9.15	430.59	74.97	0.6
CaveCreek9	Tributary	200.99	2	3699	2112.71	2122.89		2124.09	0.013093	8.82	419.3	53.28	0.55
CaveCreek9	Tributary	259.9	1	3699	2114.39	2122.85	2122.74	2125.56	0.040737	13.22	279.89	48.99	0.97
CaveCreek9	Tributary	259.9	2	3699	2114.39	2123.52		2125.69	0.029628	11.8	313.46	50.88	0.83
CaveCreek9	Tributary	310.51	1	3699	2115.04	2124.57	2124.18	2127.2	0.026073	13.1	291.21	49.55	0.9
CaveCreek9	Tributary	310.51	2	3699	2115.04	2124.69	2124.18	2127.23	0.0245	12.85	297.27	49.94	0.87
CaveCreek9	Tributary	356.15	1	3699	2117.13	2125.83	2125.76	2128.53	0.030719	13.23	285.38	54.41	0.97
CaveCreek9	Tributary	356.15	2	3699	2117.13	2125.86	2125.76	2128.53	0.030088	13.15	287.31	54.5	0.96
CaveCreek9	Tributary	400.11	1	3699	2120.72	2132.79	2132.79	2136.1	0.048863	14.59	253.5	38.64	1
CaveCreek9	Tributary	400.11	2	3699	2120.72	2132.79	2132.79	2136.1	0.048863	14.59	253.5	38.64	1
CaveCreek9	Tributary	448.71	1	3699	2126.4	2136.33		2137.98	0.01864	10.32	358.44	49.45	0.68
CaveCreek9	Tributary	448.71	2	3699	2126.4	2136.33		2137.98	0.01864	10.32	358.44	49.45	0.68
CaveCreek9	Tributary	499.39	1	3699	2127	2137.49		2138.99	0.019276	9.84	376.06	56.07	0.67
CaveCreek9	Tributary	499.39	2	3699	2127	2137.49		2138.99	0.019276	9.84	376.06	56.07	0.67
aveCreek9	Tributary	549.03	1	3699	2127.66	2138.07	2137.61	2141.08	0.040093	13.91	265.92	37.2	0.92
aveCreek9	Tributary	549.03	2	3699	2127.66	2138.07	2137.61	2141.08	0.040093	13.91	265.92	37.2	0.92
CaveCreek9	Tributary	599.9	1	3699	2129.33	2141.58		2142.73	0.013516	8.61	429.85	56.29	0.55
CaveCreek9	Tributary	599.9	2	3699	2129.33	2141.58		2142.73	0.013516	8.61	429.85	56.29	0.55
CaveCreek9	Tributary	649.5	1	3699	2130.88	2142.14		2143.57	0.014558	9.57	386.4	52.49	0.62
CaveCreek9	Tributary	649.5	2	3699	2130.88	2142.14		2143.57	0.014558	9.57	386.4	52.49	0.62
CaveCreek9	Tributary	700.56	1	3699	2131.51	2142.91		2144.55	0.020596	10.26	360.68	56.9	0.72
CaveCreek9	Tributary	700.56	2	3699	2131.51	2142.91		2144.55	0.020596	10.26	360.68	56.9	0.72
CaveCreek9	Tributary	749.58	1	3699	2134.84	2144.34	2144.34	2147.04	0.036244	13.17	280.83	52.31	1
CaveCreek9	Tributary	749.58	2	3699	2134.84	2144.34	2144.34	2147.04	0.036244	13.17	280.83	52.31	1
CaveCreek9	Tributary	799.63	1	3699	2137.16	2146.99		2148.71	0.021621	10.52	351.56	58.83	0.76
CaveCreek9	Tributary	799.63	2	3699	2137.16	2146.99		2148.71	0.021621	10.52	351.56	58.83	0.76
CaveCreek9	Tributary	849.15	1	3699	2138.35	2148.03		2149.91	0.023589	10.98	336.98	54.44	0.78
CaveCreek9	Tributary	849.15	2	3699	2138.35	2148.03		2149.91	0.023589	10.98	336.98	54.44	0.78
CaveCreek9	Tributary	899.77	1	3699	2138.96	2149.25	2149.25	2152.48	0.044202	14.43	256.29	39.9	1
CaveCreek9	Tributary	899.77	2	3699	2138.96	2149.25	2149.25	2152.48	0.044202	14.43	256.29	39.9	1
CaveCreek9	Tributary	949.51	1	3699	2139.43	2151.94	2150.97	2154.47	0.029334	12.76	289.99	40.06	0.84
CaveCreek9	Tributary	949.51	2	3699	2139.43	2151.94	2150.97	2154.47	0.029334	12.76	289.99	40.06	0.84
CaveCreek9	Tributary	999.54	1	3699	2144.18	2153.98	2153.98	2156.74	0.043677	13.32	277.7	50.81	1
CaveCreek9	Tributary	999.54	2	3699	2144.18	2153.98	2153.98	2156.74	0.043677	13.32	277.7	50.81	1
CaveCreek9	Tributary	1048.85	1	3699	2145.57	2157.45		2158.44	0.014817	7.98	463.63	73.75	0.56
CaveCreek9	Tributary	1048.85	2	3699	2145.57	2157.45		2158.44	0.014817	7.98	463.63	73.75	0.56
CaveCreek9	Tributary	1099.52	1	3699	2147.48	2158.11		2159.34	0.016031	8.89	415.98	61.73	0.6
CaveCreek9	Tributary	1099.52	2	3699	2147.48	2158.11		2159.34	0.016031	8.89	415.98	61.73	0.6
CaveCreek9	Tributary	1149.76	1	3699	2148.81	2158.88		2160.76	0.031431	11	336.16	57.99	0.81
aveCreek9	Tributary	1149.76	2	3699	2148.81	2158.88		2160.76	0.031431	11	336.16	57.99	0.81

Table 5.9.2.5
HEC-RAS OUTPUT
FLOODWAY AND FLOODPLAIN

River	Reach	River Sta	Profile #	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude #
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	Chl
aveCreek9	Tributary	1198.87	1	3699	2149.11	2161.19		2161.85	0.008592	6.52	567.58	79.91	0.43
aveCreek9	Tributary	1198.87	2	3699	2149.11	2161.19		2161.85	0.008592	6.52	567.58	79.91	0.43
CaveCreek9	Tributary	1250.76	1	3699	2152.1	2161.56	2161.56	2163.95	0.045722	12.42	297.94	62.19	1
CaveCreek9	Tributary	1250.76	2	3699	2152.1	2161.56	2161.56	2163.95	0.045722	12.42	297.94	62.19	1
CaveCreek9	Tributary	1300.1	1	3699	2154.69	2164.5		2165.93	0.026494	9.58	385.98	73.58	0.74
CaveCreek9	Tributary	1300.1	2	3699	2154.69	2164.5		2165.93	0.026494	9.58	385.98	73.58	0.74
CaveCreek9	Tributary	1349.78	1	3699	2156.21	2165.84		2167.46	0.031644	10.2	362.82	72.58	0.8
CaveCreek9	Tributary	1349.78	2	3699	2156.21	2165.84		2167.46	0.031644	10.2	362.82	72.58	0.8
CaveCreek9	Tributary	1400.02	1	3699	2157.11	2167.8		2168.78	0.016995	7.96	464.45	82.14	0.59
CaveCreek9	Tributary	1400.02	2	3699	2157.11	2167.8		2168.78	0.016995	7.96	464.45	82.14	0.59
CaveCreek9	Tributary	1450.07	1	3699	2159.53	2168.74		2169.83	0.023295	8.37	441.84	91.74	0.67
CaveCreek9	Tributary	1450.07	2	3699	2159.53	2168.74		2169.83	0.023295	8.37	441.84	91.74	0.67
CaveCreek9	Tributary	1499.84	1	3699	2160.47	2169.74		2171.04	0.021017	9.27	434.56	120.65	0.68
CaveCreek9	Tributary	1499.84	2	3699	2160.47	2169.77		2171.17	0.024518	9.48	392.8	69.9	0.7
CaveCreek9	Tributary	1549.38	1	3699	2162.56	2170.62		2171.85	0.012661	9.05	449.56	122.79	0.67
CaveCreek9	Tributary	1549.38	2	3699	2162.56	2170.79		2172.07	0.013193	9.09	407.05	69.65	0.66
CaveCreek9	Tributary	1598.8	1	3699	2162.86	2171.88		2172.51	0.007448	6.57	652.19	157.17	0.46
CaveCreek9	Tributary	1598.8	2	3699	2162.86	2172.02		2172.79	0.01007	7.05	524.39	79.8	0.48
CaveCreek9	Tributary	1649.72	1	3699	2163.63	2172.3		2172.88	0.006819	6.29	672.19	158.67	0.43
CaveCreek9	Tributary	1649.72	2	3699	2163.63	2172.65		2173.29	0.008044	6.43	575.17	83.9	0.43
CaveCreek9	Tributary	1699.68	1	3699	2163.46	2172.82		2173.24	0.005763	5.35	779.48	168.98	0.37
CaveCreek9	Tributary	1699.68	2	3699	2163.46	2173.24		2173.69	0.00591	5.42	693.17	100.74	0.36
CaveCreek9	Tributary	1749.76	1	3699	2163.76	2173.13		2173.48	0.003826	4.93	835.42	164.91	0.34
CaveCreek9	Tributary	1749.76	2	3699	2163.76	2173.57		2173.95	0.00399	4.95	755.1	110.46	0.33
CaveCreek9	Tributary	1799.89	1	3699	2164.06	2173.33		2173.75	0.005942	5.38	744.26	157.26	0.4
aveCreek9	Tributary	1799.89	2	3699	2164.06	2173.77		2174.26	0.00684	5.59	661.54	108.23	0.4
veCreek9	Tributary	1849.84	1	3699	2165.32	2173.5		2174.01	0.003339	5.91	688.43	147.88	0.45
CaveCreek9	Tributary	1849.84	2	3699	2165.32	2173.98		2174.51	0.0032	5.82	635.11	107.18	0.42
CaveCreek9	Tributary	1899.4	1	3699	2166.21	2173.61		2174.24	0.003481	6.51	618.29	139.37	0.51
CaveCreek9	Tributary	1899.4	2	3699	2166.21	2174.1		2174.7	0.003181	6.24	592.88	106.27	0.47
CaveCreek9	Tributary	1949.95	1	3699	2166.45	2173.71		2174.51	0.003913	7.36	553.02	130.8	0.58
CaveCreek9	Tributary	1949.95	2	3699	2166.45	2174.18		2174.96	0.003656	7.09	521.57	94.41	0.53
CaveCreek9	Tributary	1999.3	1	3699	2166.75	2173.8		2174.85	0.004914	8.46	494.95	133.38	0.68
CaveCreek9	Tributary	1999.3	2	3699	2166.75	2174.26		2175.29	0.004581	8.14	454.21	87.15	0.63
CaveCreek9	Tributary	2049.17	1	3699	2166.45	2173.9		2175.34	0.00732	9.78	432.08	130.02	0.78
CaveCreek9	Tributary	2049.17	2	3699	2166.45	2174.38		2175.71	0.006532	9.27	399.1	75.23	0.71
CaveCreek9	Tributary	2099.27	1	3699	2166.75	2174.21		2175.78	0.007887	10.31	420.94	133.87	0.86
CaveCreek9	Tributary	2099.27	2	3699	2166.75	2174.63		2176.18	0.007892	9.97	371.08	75.73	0.79
CaveCreek9	Tributary	2149.54	1	3699	2167.34	2175.62		2176.26	0.002453	6.69	667.65	167.76	0.5
CaveCreek9	Tributary	2149.54	2	3699	2167.34	2175.79		2176.63	0.003289	7.36	502.9	88.11	0.54
CaveCreek9	Tributary	2199.8	1	3699	2167.5	2175.7		2176.45	0.002776	7.27	639.56	165.17	0.55
CaveCreek9	Tributary	2199.8	2	3699	2167.5	2175.91		2176.83	0.003029	7.69	480.81	84.61	0.57
CaveCreek9	Tributary	2250.59	1	3699	2167.64	2175.79		2176.82	0.008951	8.36	504.76	150.91	0.68
CaveCreek9	Tributary	2250.59	2	3699	2167.64	2176.07		2177.17	0.009543	8.4	440.13	88.01	0.66
CaveCreek9	Tributary	2299.67	1	3699	2168.42	2176.62		2177.31	0.007733	6.99	603.36	159.52	0.55
CaveCreek9	Tributary	2299.67	2	3699	2168.42	2176.83		2177.7	0.009441	7.51	492.73	92.77	0.57
CaveCreek9	Tributary	2350.05	1	3699	2168.49	2177.04		2177.86	0.012016	7.68	544.3	151.77	0.62
CaveCreek9	Tributary	2350.05	2	3699	2168.49	2177.31		2178.4	0.01469	8.39	440.95	86.41	0.65
CaveCreek9	Tributary	2399.34	1	3699	2169.14	2177.55		2178.39	0.009335	7.71	570.06	170.58	0.59
CaveCreek9	Tributary	2399.34	2	3699	2169.14	2178.03		2179.03	0.01029	8.01	462.05	79.68	0.59
aveCreek9	Tributary	2450.02	1	3699	2169.68	2177.99		2178.89	0.009193	8	540.57	149.04	0.61
veCreek9	Tributary	2450.02	2	3699	2169.68	2178.51		2179.59	0.010048	8.34	443.53	76.55	0.61

Table 5.9.2.5
HEC-RAS OUTPUT
FLOODWAY AND FLOODPLAIN

River	Reach	River Sta	Profile #	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude #
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	Chl
aveCreek9	Tributary	2500.04	1	3699	2171.15	2178.4		2179.53	0.01252	8.87	472.69	131.4	0.72
CaveCreek9	Tributary	2500.04	2	3699	2171.15	2179		2180.16	0.011277	8.61	429.5	81.23	0.66
CaveCreek9	Tributary	2549.7	1	3699	2171.85	2179.14		2180.13	0.010473	8.28	506.22	145.92	0.67
CaveCreek9	Tributary	2549.7	2	3699	2171.85	2179.72		2180.71	0.009373	7.99	463.15	86.75	0.61
CaveCreek9	Tributary	2599.14	1	2909	2172.42	2180.23		2180.62	0.003746	5.34	699.06	229.36	0.4
CaveCreek9	Tributary	2599.14	2	2909	2172.42	2180.67		2181.17	0.004206	5.72	519.04	88.67	0.41
CaveCreek9	Tributary	2699.13	1	2909	2173.92	2180.61		2181.19	0.006359	6.45	539.25	166.81	0.5
CaveCreek9	Tributary	2699.13	2	2909	2173.92	2181.1		2181.81	0.007015	6.79	428.73	75.13	0.5
CaveCreek9	Tributary	2749.27	1	2909	2174.22	2180.85		2181.59	0.005788	7.18	482.95	140.27	0.53
CaveCreek9	Tributary	2749.27	2	2909	2174.22	2181.37		2182.18	0.005873	7.21	403.6	65.21	0.51
CaveCreek9	Tributary	2800.15	1	2909	2174.52	2181.05		2182.09	0.008211	8.34	401.62	154.16	0.67
CaveCreek9	Tributary	2800.15	2	2909	2174.52	2181.63		2182.57	0.006884	7.77	374.5	69.67	0.59
CaveCreek9	Tributary	2848.09	1	2909	2175.73	2181.56		2182.52	0.009041	8.25	414.61	143.47	0.68
CaveCreek9	Tributary	2848.09	2	2909	2175.73	2181.92		2183.06	0.010033	8.58	338.99	68.66	0.68
CaveCreek9	Tributary	2900.65	1	2909	2176.61	2182.07		2182.96	0.007088	7.98	448.73	163.61	0.65
CaveCreek9	Tributary	2900.65	2	2909	2176.61	2182.53		2183.55	0.007512	8.14	357.51	68.86	0.63
CaveCreek9	Tributary	2950.09	1	2909	2176.91	2182.36		2183.45	0.009064	8.76	373.56	136.05	0.72
CaveCreek9	Tributary	2950.09	2	2909	2176.91	2182.84		2184.05	0.009024	8.82	329.86	65.62	0.69
CaveCreek9	Tributary	2999.47	1	2909	2177.21	2182.77		2183.94	0.009362	9.05	352.44	102.19	0.74
CaveCreek9	Tributary	2999.47	2	2909	2177.21	2183.24		2184.59	0.010021	9.32	312.15	61.02	0.73
CaveCreek9	Tributary	3049.55	1	2909	2177.5	2183.39		2184.42	0.007943	8.65	387.71	127.44	0.69
CaveCreek9	Tributary	3049.55	2	2909	2177.5	2183.7		2185.11	0.009513	9.56	306.47	58.77	0.74
CaveCreek9	Tributary	3099.01	1	2909	2178.07	2183.83		2184.74	0.004457	8.08	407.16	121.15	0.67
CaveCreek9	Tributary	3099.01	2	2909	2178.07	2184.51		2185.55	0.004582	8.17	355.87	67.86	0.63
CaveCreek9	Tributary	3149.34	1	2909	2178.81	2184.13		2184.98	0.004727	7.81	410.46	137.07	0.68
veCreek9	Tributary	3149.34	2	2909	2178.81	2184.79		2185.79	0.004854	8.04	361.95	76.28	0.65
CaveCreek9	Tributary	3199.53	1	2909	2179	2184.21	2184.21	2185.61	0.007812	9.85	327.58	122.91	0.89
CaveCreek9	Tributary	3199.53	2	2909	2179	2184.92		2186.23	0.006658	9.16	317.51	70.28	0.76
CaveCreek9	Tributary	3249.95	1	2909	2180.44	2184.62	2184.62	2186.11	0.007329	10.22	315.17	109.44	0.93
CaveCreek9	Tributary	3249.95	2	2909	2180.44	2185.12	2184.73	2186.73	0.007051	10.2	285.25	67.16	0.87
CaveCreek9	Tributary	3300.97	1	2909	2180.83	2185.58	2185.58	2187.45	0.009874	11.53	309.2	92.93	1
CaveCreek9	Tributary	3300.97	2	2909	2180.83	2185.86	2185.86	2188.1	0.010644	12.04	241.7	54.39	1.01
CaveCreek9	Tributary	3349.04	1	2909	2181.39	2186.22	2186.22	2188.05	0.013245	11.4	291.71	87.41	0.97
CaveCreek9	Tributary	3349.04	2	2909	2181.39	2186.98	2186.41	2188.75	0.010215	10.79	273.2	54.47	0.85
CaveCreek9	Tributary	3399.41	1	2909	2181.99	2187.11	2187.11	2188.98	0.012124	11.15	292.23	94.96	0.93
CaveCreek9	Tributary	3399.41	2	2909	2181.99	2187.61		2189.28	0.009837	10.38	280.36	56.56	0.82
CaveCreek9	Tributary	3449.16	1	2909	2181.99	2189.28	2187.48	2189.86	0.008349	6.38	538.39	174.13	0.49
CaveCreek9	Tributary	3449.16	2	2909	2181.99	2189.33		2190.08	0.011157	6.94	419.05	77.31	0.53
CaveCreek9	Tributary	3499.14	1	2909	2182.97	2189.6		2190.15	0.003929	6.2	552.8	140.91	0.46
CaveCreek9	Tributary	3499.14	2	2909	2182.97	2189.78		2190.45	0.004818	6.58	442.2	77.26	0.48
CaveCreek9	Tributary	3549.58	1	2909	2183.78	2189.8		2190.35	0.004448	6.4	568.23	148.6	0.49
CaveCreek9	Tributary	3549.58	2	2909	2183.78	2189.99		2190.83	0.007068	7.38	393.98	70.77	0.55
CaveCreek9	Tributary	3600.86	1	2909	2184.13	2190.21		2190.59	0.003369	5.47	643.59	183.68	0.42
CaveCreek9	Tributary	3600.86	2	2909	2184.13	2190.46		2191.2	0.005907	6.95	425.85	77.24	0.52
CaveCreek9	Tributary	3664.96	1	2909	2184.46	2190.24		2191.31	0.01158	8.74	387.48	106.78	0.7
CaveCreek9	Tributary	3664.96	2	2909	2184.46	2190.75		2191.99	0.013196	8.93	325.61	60.65	0.68
CaveCreek9	Tributary	3700.07	1	2909	2185.28	2190.69		2191.68	0.008676	8.4	408.37	106.3	0.67
CaveCreek9	Tributary	3700.07	2	2909	2185.28	2191.28		2192.4	0.008497	8.48	343.09	62.26	0.64
CaveCreek9	Tributary	3750.26	1	2909	2185.57	2191.11		2192.16	0.009118	8.72	408.94	115.54	0.68
CaveCreek9	Tributary	3750.26	2	2909	2185.57	2191.66		2192.94	0.009924	9.06	321.23	56.32	0.67
veCreek9	Tributary	3799.78	1	2909	2185.44	2191.55		2192.83	0.013714	9.18	337.27	89.29	0.74

Table 5.9.2.5
HEC-RAS OUTPUT
FLOODWAY AND FLOODPLAIN

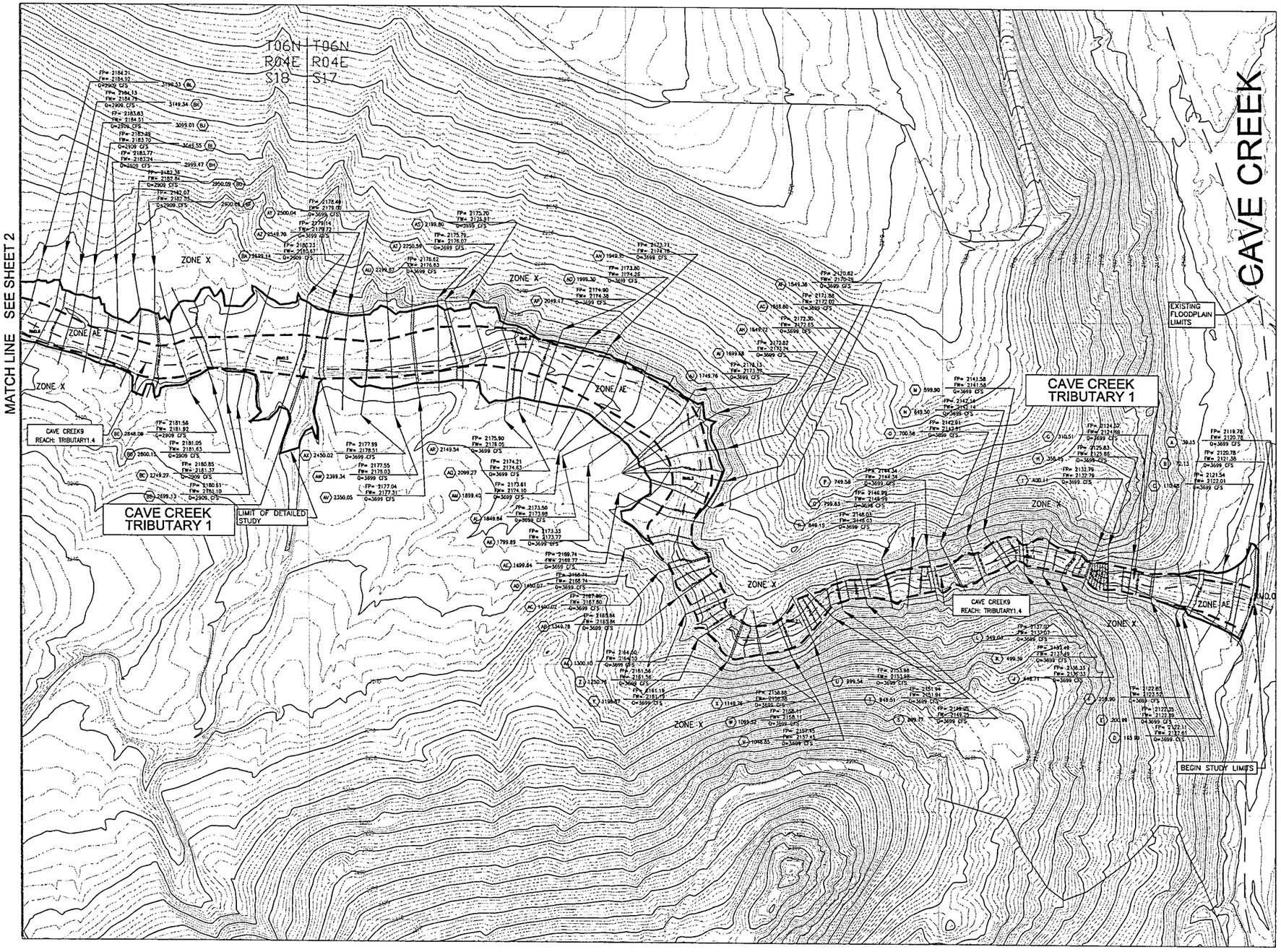
River	Reach	River Sta	Profile #	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude #
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	Chl
aveCreek9	Tributary	3799.78	2	2909	2185.44	2192.55		2193.5	0.008975	7.81	372.48	63.92	0.57
CaveCreek9	Tributary	3850.32	1	2909	2185.28	2192.72		2193.54	0.009978	7.65	466.09	156.23	0.59
CaveCreek9	Tributary	3850.32	2	2909	2185.28	2193.04		2194.05	0.01193	8.08	364.22	67.39	0.61
CaveCreek9	Tributary	3875.49	1	2909	2185.28	2193.4		2193.85	0.006049	5.71	621.4	167.55	0.4
CaveCreek9	Tributary	3875.49	2	2909	2185.28	2193.83		2194.42	0.007974	6.19	470.19	70.76	0.42
CaveCreek9	Tributary	3900.01	1	2909	2185.46	2193.46		2194.2	0.012924	7.15	474.97	154.46	0.56
CaveCreek9	Tributary	3900.01	2	2909	2185.46	2193.98		2194.77	0.0133	7.13	407.83	73.24	0.53
CaveCreek9	Tributary	3949.46	1	2909	2185.86	2194.17		2194.8	0.010834	6.8	511.5	166.04	0.53
CaveCreek9	Tributary	3949.46	2	2909	2185.86	2194.61		2195.5	0.014441	7.56	384.92	68.8	0.56
CaveCreek9	Tributary	3999.67	1	2909	2185.93	2194.74		2195.25	0.006333	6.2	582.68	173.12	0.44
CaveCreek9	Tributary	3999.67	2	2909	2185.93	2195.36		2196.08	0.008222	6.84	425.25	63.81	0.47
CaveCreek9	Tributary	4049.3	1	2909	2187.21	2195.03		2195.64	0.006883	6.79	555.17	159.34	0.49
CaveCreek9	Tributary	4049.3	2	2909	2187.21	2195.73		2196.56	0.009053	7.31	397.74	59.23	0.5
CaveCreek9	Tributary	4099.75	1	2909	2187.66	2195.4		2195.93	0.004191	6.44	635.59	175.74	0.45
CaveCreek9	Tributary	4099.75	2	2909	2187.66	2196.12		2196.93	0.005636	7.22	402.64	57.47	0.48
CaveCreek9	Tributary	4149.22	1	2909	2187.72	2195.56		2196.28	0.006035	7.26	520.33	148.4	0.53
CaveCreek9	Tributary	4149.22	2	2909	2187.72	2196.39		2197.24	0.006387	7.4	392.87	59.67	0.51
CaveCreek9	Tributary	4205.69	1	2909	2188.88	2195.9		2196.85	0.011434	8.16	428.12	131	0.62
CaveCreek9	Tributary	4205.69	2	2909	2188.88	2196.81		2197.73	0.010387	7.68	378.8	59.72	0.54
CaveCreek9	Tributary	4249.02	1	2909	2189.53	2196.33		2197.48	0.013085	8.9	378.47	104.73	0.67
CaveCreek9	Tributary	4249.02	2	2909	2189.53	2197.23		2198.28	0.012025	8.23	353.28	54.94	0.57
CaveCreek9	Tributary	4299.58	1	2909	2190.45	2197.25		2198.12	0.009671	7.76	441.4	121.01	0.58
CaveCreek9	Tributary	4299.58	2	2909	2190.45	2198.02		2198.88	0.009818	7.48	388.99	60.78	0.52
CaveCreek9	Tributary	4349.25	1	2909	2191.36	2197.76		2198.54	0.006513	7.5	482.69	124.31	0.55
CaveCreek9	Tributary	4349.25	2	2909	2191.36	2198.4		2199.32	0.007026	7.67	379.06	59.57	0.54
veCreek9	Tributary	4399.43	1	2909	2192.43	2198.07		2199.04	0.010093	8.16	419.27	122.78	0.64
aveCreek9	Tributary	4399.43	2	2909	2192.43	2198.81		2199.74	0.009681	7.73	376.2	64.36	0.56
CaveCreek9	Tributary	4449.14	1	2909	2192.73	2198.7		2199.51	0.007306	7.37	442.9	110.18	0.55
CaveCreek9	Tributary	4449.14	2	2909	2192.73	2199.48		2200.2	0.006745	6.81	427.04	67.06	0.48
CaveCreek9	Tributary	4499.39	1	2909	2192.9	2199.09		2199.86	0.006623	7.25	447.95	107.22	0.54
CaveCreek9	Tributary	4499.39	2	2909	2192.9	2199.81		2200.52	0.006072	6.77	429.58	67.43	0.47
CaveCreek9	Tributary	4549.73	1	2909	2193.02	2199.44		2200.25	0.008461	7.47	453.65	130.47	0.59
CaveCreek9	Tributary	4549.73	2	2909	2193.02	2200.11		2200.9	0.007567	7.12	408.58	71.97	0.53
CaveCreek9	Tributary	4600.58	1	2909	2194.15	2200.27		2200.66	0.003759	5.26	653.02	192.64	0.4
CaveCreek9	Tributary	4600.58	2	2909	2194.15	2200.65		2201.28	0.005924	6.41	453.68	80.27	0.48
CaveCreek9	Tributary	4649.75	1	2909	2194.37	2200.33		2201.16	0.008768	7.73	477.11	159.23	0.61
CaveCreek9	Tributary	4649.75	2	2909	2194.37	2200.85		2201.78	0.008819	7.8	383.16	71.14	0.59
CaveCreek9	Tributary	4699.86	1	2909	2194.53	2201.13		2201.71	0.011128	6.53	521.55	156.62	0.53
CaveCreek9	Tributary	4699.86	2	2909	2194.53	2201.62		2202.36	0.012021	6.87	423.53	80.09	0.53
CaveCreek9	Tributary	4750.23	1	2909	2195.09	2201.77		2202.21	0.007947	5.66	605.66	180.33	0.46
CaveCreek9	Tributary	4750.23	2	2909	2195.09	2202.38		2202.92	0.00857	5.9	492.91	91.43	0.45
CaveCreek9	Tributary	4798.38	1	2909	2195.08	2202		2202.76	0.007964	7.27	476.76	185.54	0.67
CaveCreek9	Tributary	4798.38	2	2909	2195.08	2202.66		2203.36	0.006633	6.71	433.66	101.22	0.57
CaveCreek9	Tributary	4866.43	1	2909	2194.68	2203.01	2200.49	2203.32	0.005462	4.73	694.64	166.74	0.35
CaveCreek9	Tributary	4866.43	2	2909	2194.68	2203.51	2200.43	2203.89	0.006092	4.93	590.01	96.17	0.35
CaveCreek9	Tributary	4900.48	1	2909	2194.94	2203.13		2203.56	0.005282	5.52	616.76	159.79	0.43
CaveCreek9	Tributary	4900.48	2	2909	2194.94	2203.66		2204.16	0.006193	5.68	512.2	88.81	0.42
CaveCreek9	Tributary	4948.9	1	2909	2195.22	2203.45		2203.93	0.010022	5.86	566.78	158.46	0.46
CaveCreek9	Tributary	4948.9	2	2909	2195.22	2204.02		2204.56	0.010158	5.93	490.78	85.96	0.44
CaveCreek9	Tributary	4999.6	1	2909	2196.02	2203.8		2204.56	0.009358	7.16	452.42	135.98	0.57
veCreek9	Tributary	4999.6	2	2909	2196.02	2204.39		2205.08	0.007675	6.67	436.2	78.76	0.5

Table 5.9.2.5
HEC-RAS OUTPUT
FLOODWAY AND FLOODPLAIN

River	Reach	River Sta	Profile #	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude #
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	Chl
CaveCreek9	Tributary	5049.33	1	2909	2197.61	2204.33		2205.04	0.008953	7.01	493.77	153.46	0.54
CaveCreek9	Tributary	5049.33	2	2909	2197.61	2204.75		2205.54	0.008935	7.1	409.51	71.52	0.52
CaveCreek9	Tributary	5086.65	1	2909	2197.82	2204.78		2205.38	0.007511	6.84	566.94	163.9	0.52
CaveCreek9	Tributary	5086.65	2	2909	2197.82	2204.99		2206.06	0.011607	8.33	349.18	61.67	0.62
CaveCreek9	Tributary	5150.5	1	2909	2197.54	2205.32		2206.12	0.013252	7.46	449.15	125.16	0.57
CaveCreek9	Tributary	5150.5	2	2909	2197.54	2206.1		2206.9	0.011927	7.17	405.68	65.6	0.51
CaveCreek9	Tributary	5199.1	1	2909	2198.97	2205.91	2205.33	2207.32	0.027506	9.61	321.06	105.31	0.79
CaveCreek9	Tributary	5199.1	2	2909	2198.97	2206.68		2207.78	0.019587	8.42	345.57	64.24	0.64
CaveCreek9	Tributary	5250.57	1	2909	2199.5	2207.54		2208.28	0.009149	7.08	444.94	88.59	0.5
CaveCreek9	Tributary	5250.57	2	2909	2199.5	2207.78		2208.61	0.011211	7.33	396.86	61.56	0.51
CaveCreek9	Tributary	5300.11	1	2909	2199.81	2207.99		2208.66	0.006127	6.85	458.17	99.08	0.51
CaveCreek9	Tributary	5300.11	2	2909	2199.81	2208.23		2209.07	0.007749	7.34	396.55	67.72	0.53
CaveCreek9	Tributary	5346.56	1	2909	2202.04	2208.23		2209.15	0.01063	8.07	393.81	106.8	0.66
CaveCreek9	Tributary	5346.56	2	2909	2202.04	2208.51		2209.73	0.013679	8.86	328.51	65.83	0.7
CaveCreek9	Tributary	5399.5	1	2909	2201.85	2208.73		2209.7	0.010066	8.36	395.76	110.35	0.69
CaveCreek9	Tributary	5399.5	2	2909	2201.85	2209.18		2210.41	0.011812	8.91	326.62	64.79	0.7
CaveCreek9	Tributary	5449.72	1	2909	2204.15	2209.31		2210.26	0.010744	8.21	403.27	118.77	0.7
CaveCreek9	Tributary	5449.72	2	2909	2204.15	2209.97		2211.02	0.010274	8.2	354.6	72.41	0.65
CaveCreek9	Tributary	5498.99	1	2909	2205.24	2209.81		2210.98	0.013713	9.1	354.01	116.37	0.79
CaveCreek9	Tributary	5498.99	2	2909	2205.24	2210.42		2211.74	0.013791	9.23	315.32	66.95	0.75
CaveCreek9	Tributary	5549.53	1	2909	2205.8	2210.49		2211.71	0.013769	9.33	358.98	119.99	0.8
CaveCreek9	Tributary	5549.53	2	2909	2205.8	2211.08		2212.49	0.014166	9.5	306.05	63.18	0.76
CaveCreek9	Tributary	5606.87	1	2909	2206.27	2211.24		2212.66	0.014529	10.1	334.6	99.28	0.83
CaveCreek9	Tributary	5606.87	2	2909	2206.27	2211.8		2213.49	0.016075	10.44	278.66	53.91	0.81
CaveCreek9	Tributary	5649.37	1	2909	2205.78	2211.68	2211.49	2213.54	0.016729	11.3	292.32	76.35	0.89
CaveCreek9	Tributary	5649.37	2	2909	2205.78	2212.42		2214.17	0.014152	10.61	274.1	47.48	0.78
CaveCreek9	Tributary	5694.94	1	2909	2205.84	2212.53	2212.53	2214.58	0.02602	11.65	273.31	80.61	0.89
CaveCreek9	Tributary	5694.94	2	2909	2205.84	2213.18		2214.96	0.021017	10.7	271.86	45.98	0.78
CaveCreek9	Tributary	5736.39	1	2909	2205.83	2214.83		2215.6	0.010522	7.33	460.31	119.23	0.53
CaveCreek9	Tributary	5736.39	2	2909	2205.83	2214.88		2215.88	0.013517	8.02	362.74	60.61	0.58
CaveCreek9	Tributary	5798.99	1	2909	2206.9	2215.45		2216.28	0.011601	7.53	437.9	112.92	0.55
CaveCreek9	Tributary	5798.99	2	2909	2206.9	2215.81		2216.72	0.012406	7.66	379.67	61.9	0.55
CaveCreek9	Tributary	5850.09	1	2909	2207.52	2215.92		2216.82	0.008385	7.89	425.03	94.46	0.53
CaveCreek9	Tributary	5850.09	2	2909	2207.52	2216.33		2217.33	0.00995	8.04	362.04	49.98	0.53
CaveCreek9	Tributary	5900.01	1	2909	2208.04	2216.18		2217.6	0.014237	10	342.46	78.27	0.68
CaveCreek9	Tributary	5900.01	2	2909	2208.04	2216.66		2218.31	0.018188	10.33	281.52	39.46	0.68
CaveCreek9	Tributary	5954.73	1	2909	2209.4	2217.29		2218.25	0.006755	8.19	416.63	87.77	0.56
CaveCreek9	Tributary	5954.73	2	2909	2209.4	2218.1		2219.09	0.006896	7.98	364.61	48.57	0.51
CaveCreek9	Tributary	6052.53	1	2909	2211.35	2218.19		2218.97	0.007001	7.37	464.46	114.74	0.53
CaveCreek9	Tributary	6052.53	2	2909	2211.35	2219.11		2219.86	0.007399	6.96	417.74	61.13	0.47
CaveCreek9	Tributary	6100	1	2909	2212.22	2218.5		2219.38	0.008368	7.79	436.97	112.43	0.57
CaveCreek9	Tributary	6100	2	2909	2212.22	2219.45		2220.27	0.008324	7.26	400.7	60.22	0.5
CaveCreek9	Tributary	6149.61	1	2909	2212.33	2219.12		2219.86	0.009546	7.39	484.89	133.28	0.55
CaveCreek9	Tributary	6149.61	2	2909	2212.33	2219.84		2220.71	0.008494	7.55	401.34	64.76	0.53
CaveCreek9	Tributary	6199.9	1	2909	2211.79	2219.91		2220.32	0.00563	5.44	628.7	155.89	0.39
CaveCreek9	Tributary	6199.9	2	2909	2211.79	2220.7		2221.16	0.005283	5.5	537.22	80	0.37
CaveCreek9	Tributary	6250.09	1	2909	2212.77	2220.15		2220.6	0.004832	5.61	608.8	164.32	0.43
CaveCreek9	Tributary	6250.09	2	2909	2212.77	2220.95		2221.4	0.00402	5.35	543.27	87.53	0.38
CaveCreek9	Tributary	6299.56	1	2909	2213.66	2220.39		2220.88	0.005741	6	579.97	158.93	0.48
CaveCreek9	Tributary	6299.56	2	2909	2213.66	2221.12		2221.69	0.005266	6.05	480.71	84.5	0.45
CaveCreek9	Tributary	6350.21	1	2909	2215.31	2220.69		2221.32	0.009253	6.83	513.51	147.98	0.55
CaveCreek9	Tributary	6350.21	2	2909	2215.31	2221.38		2222.15	0.010389	7.03	413.81	74.42	0.53

Table 5.9.2.5
HEC-RAS OUTPUT
FLOODWAY AND FLOODPLAIN

River	Reach	River Sta	Profile #	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude #
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	Chl
CaveCreek9	Tributary	6401.71	1	2909	2214.73	2221		2221.98	0.010011	8.3	412.04	116.12	0.65
CaveCreek9	Tributary	6401.71	2	2909	2214.73	2221.77		2222.75	0.008967	7.95	365.91	62.08	0.58
CaveCreek9	Tributary	6447.86	1	2909	2214.34	2221.9		2222.55	0.010391	6.84	510.04	155.23	0.53
CaveCreek9	Tributary	6447.86	2	2909	2214.34	2222.51		2223.28	0.011114	7.02	414.18	72.77	0.52
CaveCreek9	Tributary	6510.02	1	2909	2215.63	2222.61		2223.09	0.006285	5.99	611.83	204.93	0.49
CaveCreek9	Tributary	6510.02	2	2909	2215.63	2223.19		2223.87	0.007581	6.64	438.34	85.42	0.52
CaveCreek9	Tributary	6562.48	1	2909	2215.64	2222.9		2223.58	0.009158	6.95	507.78	186.56	0.59
CaveCreek9	Tributary	6562.48	2	2909	2215.64	2223.59		2224.3	0.008278	6.76	430.31	85.43	0.53
CaveCreek9	Tributary	6599.99	1	2909	2216.66	2223.18		2224.18	0.015053	8.29	404.98	178.17	0.74
CaveCreek9	Tributary	6599.99	2	2909	2216.66	2223.86		2224.74	0.010908	7.53	386.17	84.84	0.62
CaveCreek9	Tributary	6649.15	1	2909	2218.38	2224.48		2224.9	0.008846	5.64	638.24	232.67	0.46
CaveCreek9	Tributary	6649.15	2	2909	2218.38	2224.7		2225.37	0.012406	6.6	443.05	91.75	0.53



LEGEND

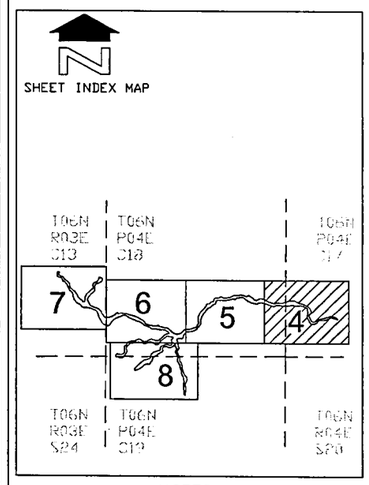
100-YR FLOODPLAIN BOUNDARY	
100-YR FLOODWAY BOUNDARY	
RIVER MILE	RM2.0 RM3.0
CROSS SECTION	A 144.44 — CROSS SECTION STATION (FEET); FP= 2250.55 — FLOODPLAIN WATER SURFACE ELEVATION; FW= 2250.55 — FLOODWAY WATER SURFACE ELEVATION; Q =4630 CFS — 100 YEAR DISCHARGE; PROPOSED FEMA CROSS SECTION DESIGNATION
BASE FLOOD ELEVATION	2265.00
ELEVATION REFERENCE MARK	ERM 2400
ZONE DESIGNATION	ZONE AE
ZONE DESIGNATION	ZONE X

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88). CONVERSION FACTOR TO THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29) IS = -2.06 FOOT.

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION

SHEET INDEX MAP



NOTES

1- THIS MODEL HAS BEEN PREPARED TO TIE INTO THE EXISTING CAVE CREEK WASH FLOOD PROFILE AT RIVER MILE 39.41, LOCATED BETWEEN THE EXISTING CROSS SECTIONS OF "TE" AND "FF". REFER TO PROFILE PANEL 1019P, AND REFER TO FIRM PANEL # 04013C0805H DATED SEPTEMBER 30, 2005.

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

CAVE CREEK TRIBUTARY FLOODPLAIN DELINEATION, CAVE CREEK, AZ

100' 0' 100' 200'

SCALE: 1" = 100'
CONTOUR INTERVAL = 2'
FLIGHT DATES: November 2003 through December 2005

GROUND CONTROL SURVEY DATA PROVIDED BY COOPER AERIAL SURVEYS COMPANY

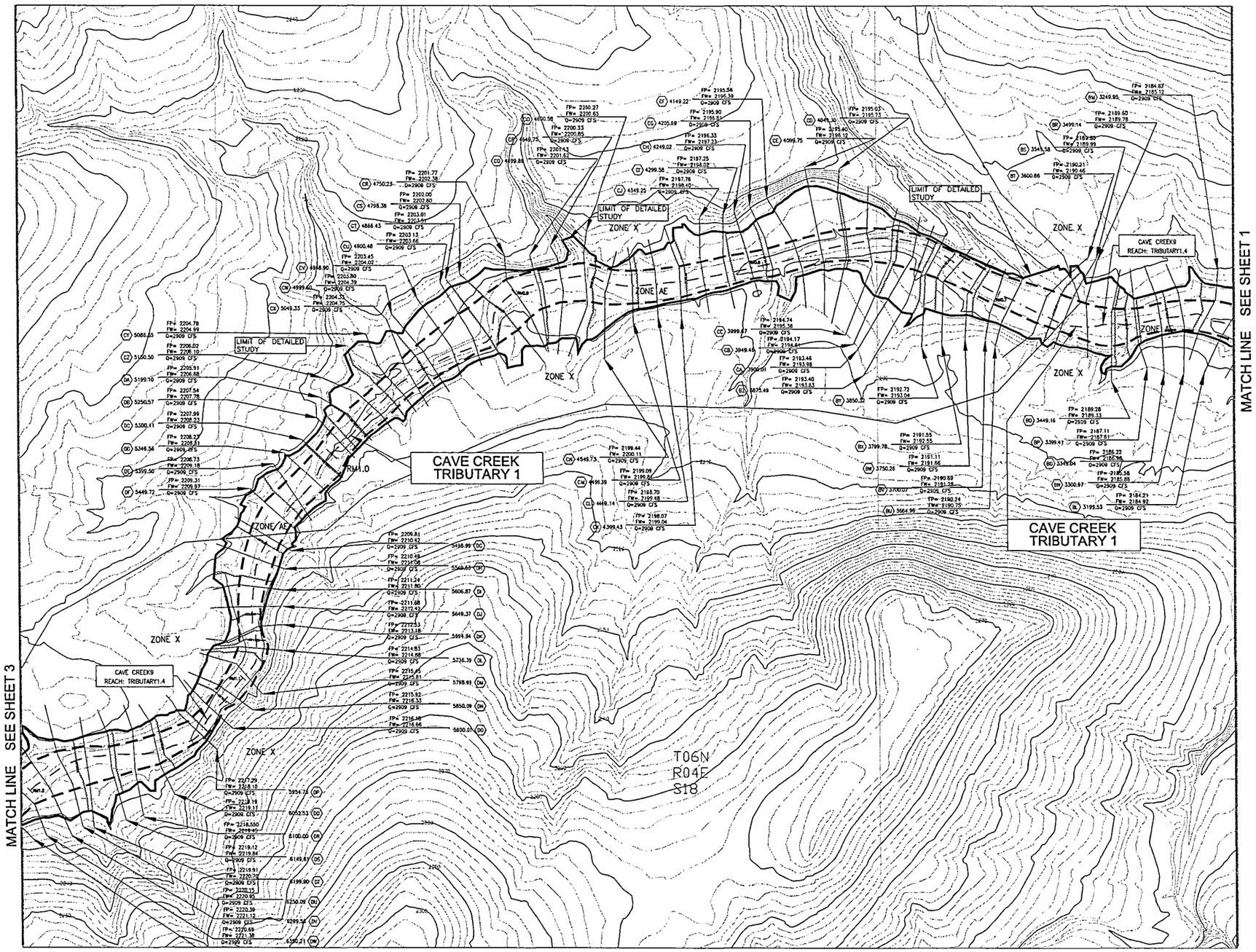
THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1"= 100' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

COOPER AERIAL SURVEYS COMPANY
CONTRACT NUMBER: FCD2003C048, Assignment #4
FCD2005C030

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

REGISTERED PROFESSIONAL ENGINEER (CIVIL) CERTIFICATE NO. 35571 LINDA A. POTTER Date Signed 12-21-07 ARIZONA, U.S.A.

	BY	DATE
DESIGN	M. FOUNTAIN	12-21-07
DESIGN CHK.	L. POTTER	12-21-07
PLANS	MC/MF	12-21-07
PLANS CHK.	L. POTTER	12-21-07



LEGEND

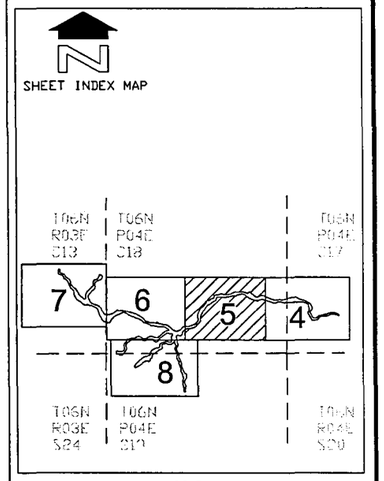
100-YR FLOODPLAIN BOUNDARY	
100-YR FLOODWAY BOUNDARY	
RIVER MILE	RM2.0 RM2.5 RM3.0
CROSS SECTION	(A) 144.44 — CROSS SECTION STATION (FEET); FP= 2250.55 — FLOODPLAIN WATER SURFACE ELEVATION; FW= 2250.55 — FLOODWAY WATER SURFACE ELEVATION; Q =4630 CFS — 100 YEAR DISCHARGE; PROPOSED FEMA CROSS SECTION DESIGNATION
BASE FLOOD ELEVATION	2265.00
ELEVATION REFERENCE MARK	ERM 2400
ZONE DESIGNATION	ZONE AE
ZONE DESIGNATION	ZONE X

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88). CONVERSION FACTOR TO THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29) IS = -2.06 FOOT.

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION

SHEET INDEX MAP



NOTES

1- THIS MODEL HAS BEEN PREPARED TO TIE INTO THE EXISTING CAVE CREEK WASH FLOOD PROFILE AT RIVER MILE 39.41, LOCATED BETWEEN THE EXISTING CROSS SECTIONS OF "FE" AND "FF". REFER TO PROFILE PANEL 1019P, AND REFER TO FIRM PANEL # 04013C0805H DATED SEPTEMBER 30, 2005.

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

CAVE CREEK TRIBUTARY FLOODPLAIN DELINEATION, CAVE CREEK, AZ

100' 0' 100' 200'

SCALE: 1" = 100'
CONTOUR INTERVAL = 2'
FLIGHT DATES: November 2003 through December 2005

GROUND CONTROL SURVEY DATA PROVIDED BY COOPER AERIAL SURVEYS COMPANY

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1"= 100' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

COOPER AERIAL SURVEYS COMPANY
CONTRACT NUMBER: FCD2003C048, Assignment #4
FCD2005C030

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

REGISTERED PROFESSIONAL ENGINEER (CIVIL) CERTIFICATE NO. 35571 LINDA A. POTTER ARIZONA, U.S.A.

	BY	DATE
DESIGN	M. FOUNTAIN	12-21-07
DESIGN CHK.	L. POTTER	12-21-07
PLANS	MC/MF	12-21-07
PLANS CHK.	L. POTTER	12-21-07

CROSS SECTION DATA KEY FOR CAVE CREEK TRIBUTARY WASH 1.2

GB 2484.05	FP= 2254.58 FW= 2254.64 Q=1691 CFS	
GC 2527.13	FP= 2255.07 FW= 2255.14 Q=1691 CFS	
GD 2577.17	FP= 2256.57 FW= 2256.63 Q=1691 CFS	
GE 2626.98	FP= 2256.88 FW= 2256.94 Q=1691 CFS	

CROSS SECTION DATA KEY FOR CAVE CREEK TRIBUTARY WASH 1B

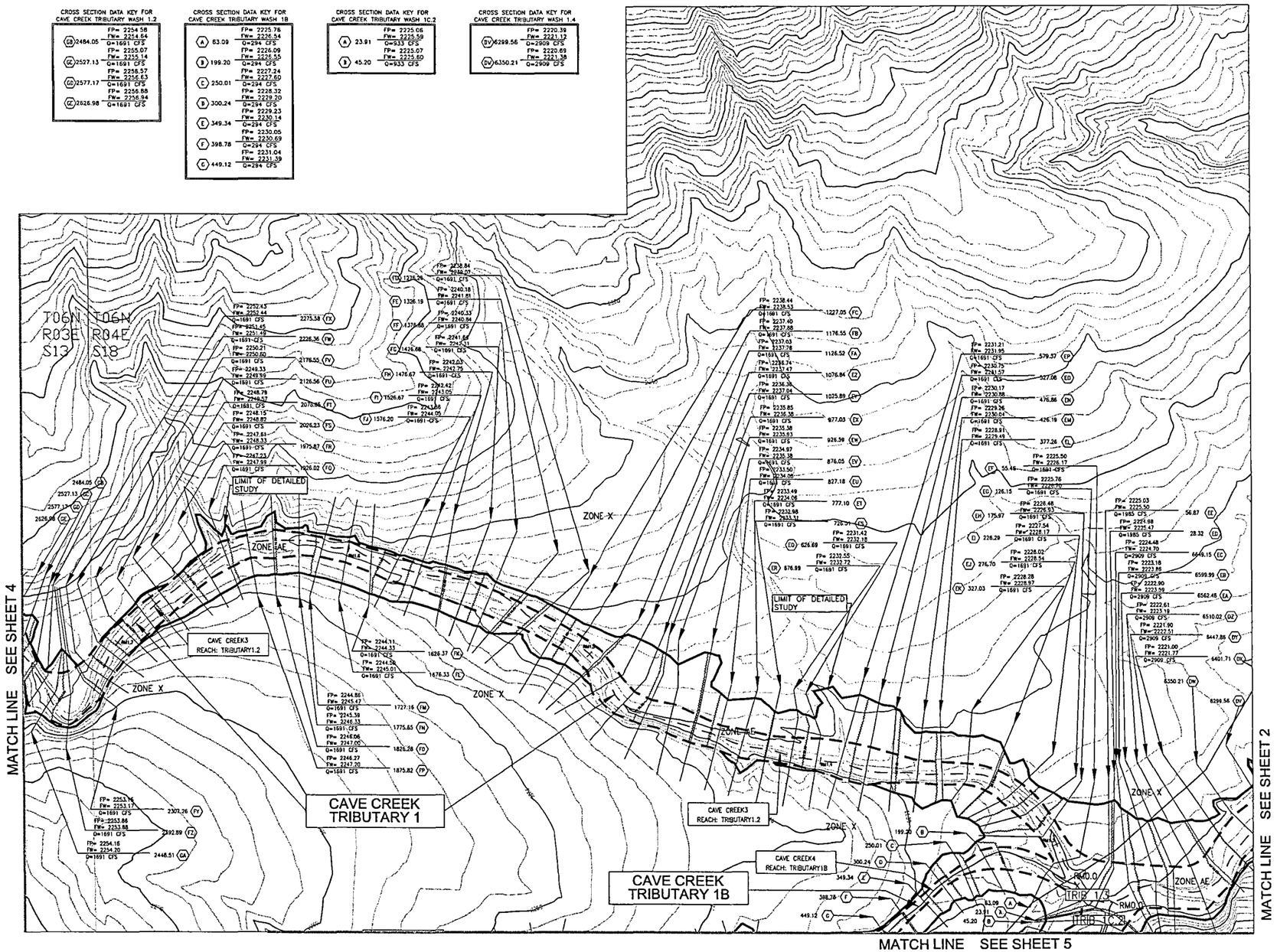
A 63.09	FP= 2225.78 FW= 2226.54 Q=294 CFS	
B 199.20	FP= 2226.09 FW= 2226.55 Q=294 CFS	
C 250.01	FP= 2227.24 FW= 2227.60 Q=294 CFS	
B 300.24	FP= 2228.32 FW= 2229.20 Q=294 CFS	
E 349.34	FP= 2229.23 FW= 2230.14 Q=294 CFS	
F 398.78	FP= 2230.05 FW= 2230.69 Q=294 CFS	
G 449.12	FP= 2231.04 FW= 2231.39 Q=294 CFS	

CROSS SECTION DATA KEY FOR CAVE CREEK TRIBUTARY WASH 1C.2

A 23.91	FP= 2225.06 FW= 2225.59 Q=933 CFS	
B 45.20	FP= 2225.07 FW= 2225.60 Q=933 CFS	

CROSS SECTION DATA KEY FOR CAVE CREEK TRIBUTARY WASH 1.4

BV 6299.56	FP= 2220.39 FW= 2221.12 Q=2909 CFS	
DV 6350.21	FP= 2220.69 FW= 2221.38 Q=2909 CFS	



LEGEND

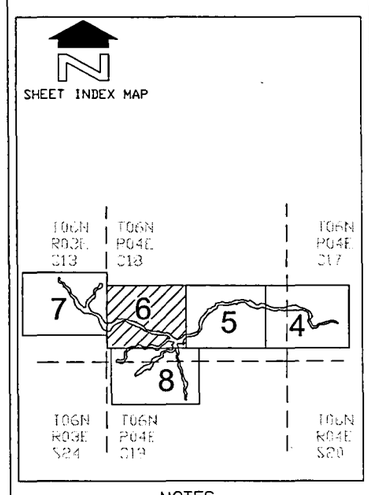
100-YR FLOODPLAIN BOUNDARY	
100-YR FLOODWAY BOUNDARY	
RIVER MILE	RM2.0 RM2.5 RM3.0
CROSS SECTION	A 144.44 FP= 2250.55 FW= 2250.55 Q =4630 CFS (CROSS SECTION STATION (FEET); FLOODPLAIN WATER SURFACE ELEVATION; FLOODWAY WATER SURFACE ELEVATION; 100 YEAR DISCHARGE; PROPOSED FEMA CROSS SECTION DESIGNATION)
BASE FLOOD ELEVATION	2265.00
ELEVATION REFERENCE MARK	ERM 2400
ZONE DESIGNATION	ZONE AE
ZONE DESIGNATION	ZONE X

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88). CONVERSION FACTOR TO THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29) IS = -2.06 FOOT.

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION

SHEET INDEX MAP



NOTES

1.- THIS MODEL HAS BEEN PREPARED TO TIE INTO THE EXISTING CAVE CREEK WASH FLOOD PROFILE AT RIVER MILE 39.41, LOCATED BETWEEN THE EXISTING CROSS SECTIONS OF "FE" AND "FF". REFER TO PROFILE PANEL 1019P, AND REFER TO FIRM PANEL # 04013C0805H DATED SEPTEMBER 30, 2005.

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

CAVE CREEK TRIBUTARY FLOODPLAIN DELINEATION, CAVE CREEK, AZ

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

Registered Professional Engineer (Civil) CERTIFICATE NO. 35571 LINDA A. POTTER Date Signed 12-21-07 ARIZONA, U.S.A.

	BY	DATE
DESIGN	M. FOUNTAIN	12-21-07
DESIGN CHK.	L. POTTER	12-21-07
PLANS	MC/MF	12-21-07
PLANS CHK.	L. POTTER	12-21-07

SHEET 6 OF 10

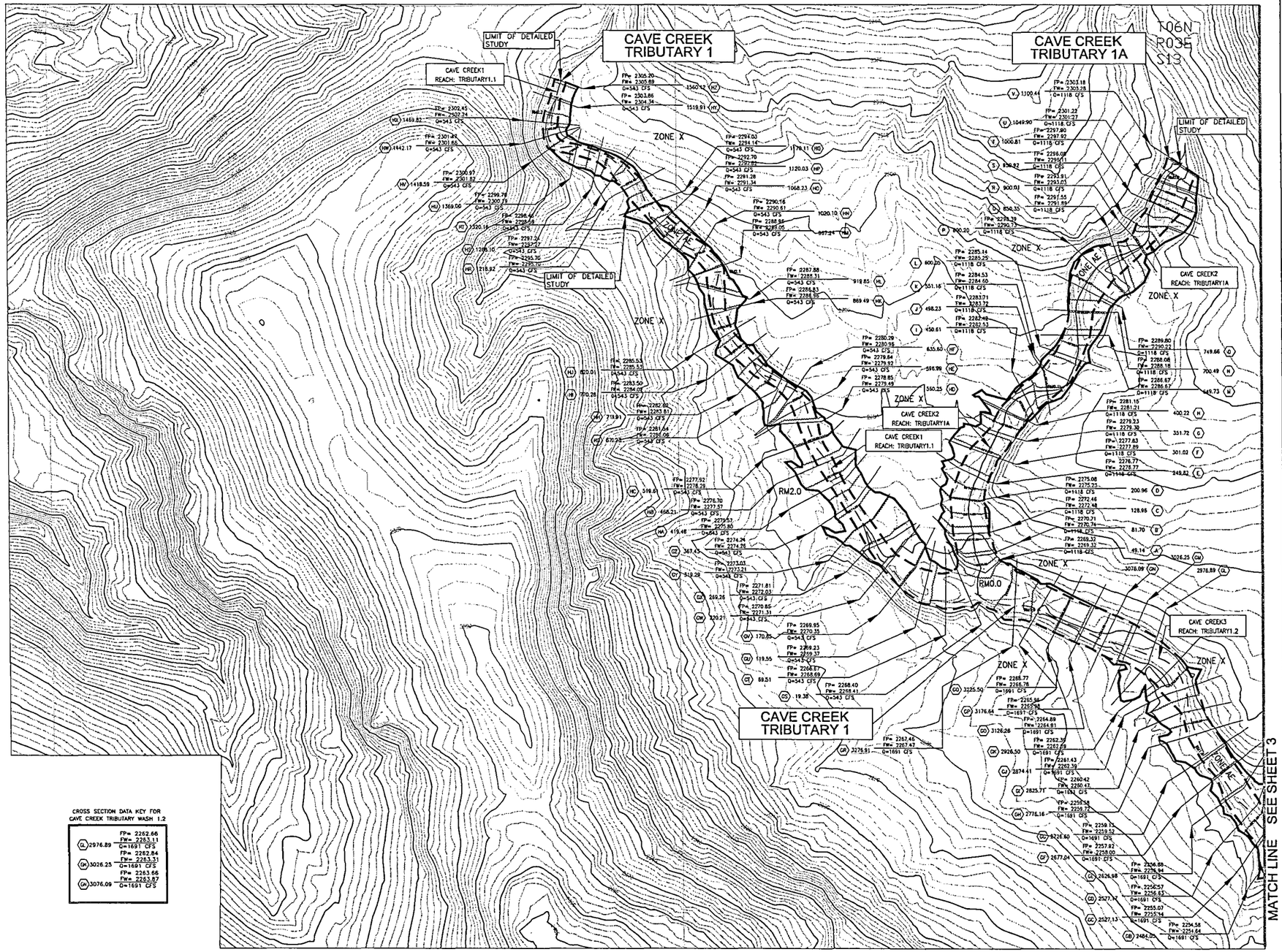
100' 0' 100' 200'

SCALE: 1" = 100'
CONTOUR INTERVAL = 2'
FLIGHT DATES: November 2003 through December 2005

GROUND CONTROL SURVEY DATA PROVIDED BY COOPER AERIAL SURVEYS COMPANY

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1"= 100' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

COOPER AERIAL SURVEYS COMPANY
CONTRACT NUMBER: FCD2003C048, Assignment #4
FCD2005C030



CROSS SECTION DATA KEY FOR CAVE CREEK TRIBUTARY WASH 1.2

GL	2976.89	FP= 2262.66 FW= 2263.11 Q=1691 CFS
GK	3026.25	FP= 2262.84 FW= 2263.31 Q=1691 CFS
GH	3076.09	FP= 2263.66 FW= 2263.87 Q=1691 CFS

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1"= 100' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

COOPER AERIAL SURVEYS COMPANY
CONTRACT NUMBER: FCD2003C048, Assignment #4
FCD2005C030

100' 0' 100' 200'

SCALE: 1" = 100'
CONTOUR INTERVAL = 2'
FLIGHT DATES: November 2003 through December 2005

GROUND CONTROL SURVEY DATA PROVIDED BY COOPER AERIAL SURVEYS COMPANY

LEGEND

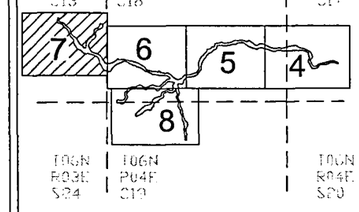
100-YR FLOODPLAIN BOUNDARY	
100-YR FLOODWAY BOUNDARY	
RIVER MILE	RM2.0 RM2.5 RM3.0
CROSS SECTION	A 144.44 — CROSS SECTION STATION (FEET); FP= 2250.55 — FLOODPLAIN WATER SURFACE ELEVATION; FW= 2250.55 — FLOODWAY WATER SURFACE ELEVATION; Q =4630 CFS — 100 YEAR DISCHARGE; PROPOSED FEMA CROSS SECTION DESIGNATION
BASE FLOOD ELEVATION	2265.00
ELEVATION REFERENCE MARK	ERM 2400
ZONE DESIGNATION	ZONE AE
ZONE DESIGNATION	ZONE X

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88). CONVERSION FACTOR TO THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29) IS = -2.05 FOOT.

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION

SHEET INDEX MAP



NOTES

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NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

CAVE CREEK TRIBUTARY FLOODPLAIN DELINEATION, CAVE CREEK, AZ

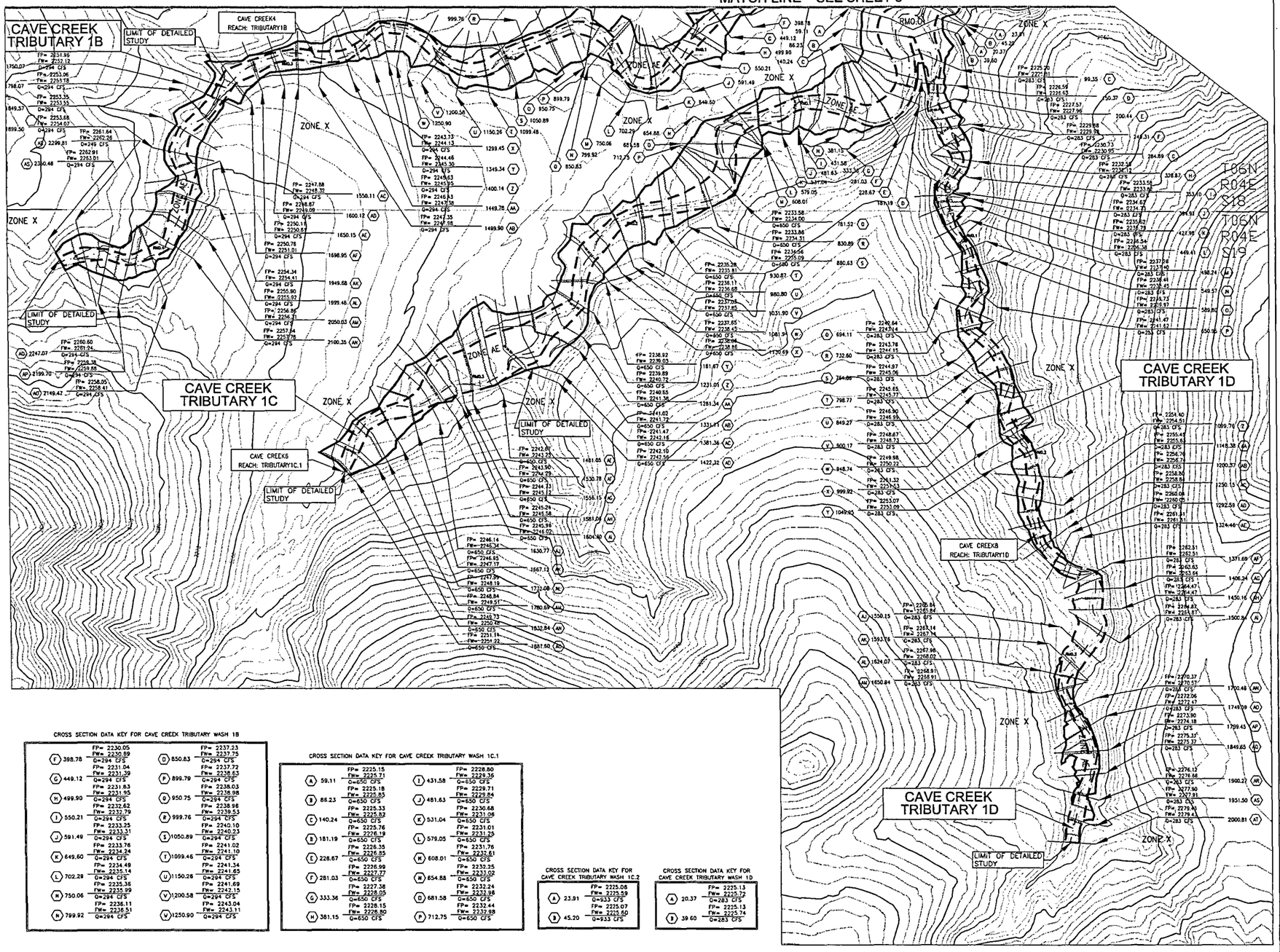
HDR ENGINEERING, INC.
3200 East Camelback Road, Suite 350
PHOENIX, ARIZONA 85018-2311
(602) 522-7700

Registered Professional Engineer (Civil) CERTIFICATE NO. 35571 LINDA A. POTTER Date Signed 12-21-07 ARIZONA, U.S.A.

	BY	DATE
DESIGN	M. FOUNTAIN	12-21-07
DESIGN CHK.	L. POTTER	12-21-07
PLANS	MC/MF	12-21-07
PLANS CHK.	L. POTTER	12-21-07

SHEET 7 OF 10

MATCH LINE SEE SHEET 3



CROSS SECTION DATA KEY FOR CAVE CREEK TRIBUTARY WASH 1B

F	398.78	FP= 2230.05 FW= 2230.69 Q=294 CFS	D	850.83	FP= 2237.23 FW= 2237.75 Q=294 CFS
G	449.12	FP= 2231.04 FW= 2231.39 Q=294 CFS	P	899.79	FP= 2237.72 FW= 2238.53 Q=294 CFS
H	499.90	FP= 2231.63 FW= 2231.95 Q=294 CFS	Q	950.75	FP= 2238.03 FW= 2238.98 Q=294 CFS
I	550.21	FP= 2232.62 FW= 2232.79 Q=294 CFS	R	999.76	FP= 2238.98 FW= 2239.53 Q=294 CFS
J	591.49	FP= 2233.25 FW= 2233.31 Q=294 CFS	S	1050.89	FP= 2240.10 FW= 2240.23 Q=294 CFS
K	649.60	FP= 2233.76 FW= 2234.24 Q=294 CFS	T	1099.46	FP= 2241.02 FW= 2241.10 Q=294 CFS
L	702.28	FP= 2234.49 FW= 2235.14 Q=294 CFS	U	1150.28	FP= 2241.34 FW= 2241.65 Q=294 CFS
M	750.06	FP= 2235.36 FW= 2235.99 Q=294 CFS	V	1200.58	FP= 2241.69 FW= 2242.15 Q=294 CFS
N	799.92	FP= 2236.11 FW= 2236.51 Q=294 CFS	W	1250.90	FP= 2243.04 FW= 2243.11 Q=294 CFS

CROSS SECTION DATA KEY FOR CAVE CREEK TRIBUTARY WASH 1C.1

A	59.11	FP= 2225.15 FW= 2225.71 Q=650 CFS	I	431.58	FP= 2228.80 FW= 2229.36 Q=650 CFS
B	88.23	FP= 2225.18 FW= 2225.85 Q=650 CFS	J	481.63	FP= 2229.71 FW= 2229.84 Q=650 CFS
C	140.24	FP= 2225.33 FW= 2225.82 Q=650 CFS	K	531.04	FP= 2230.68 FW= 2231.06 Q=650 CFS
D	181.19	FP= 2225.76 FW= 2226.19 Q=650 CFS	L	579.05	FP= 2231.01 FW= 2231.25 Q=650 CFS
E	228.67	FP= 2226.35 FW= 2226.85 Q=650 CFS	M	608.01	FP= 2231.76 FW= 2232.61 Q=650 CFS
F	281.03	FP= 2226.99 FW= 2227.77 Q=650 CFS	N	654.88	FP= 2232.25 FW= 2233.02 Q=650 CFS
G	333.36	FP= 2227.38 FW= 2228.05 Q=650 CFS	O	681.58	FP= 2232.24 FW= 2232.88 Q=650 CFS
H	381.15	FP= 2228.15 FW= 2228.80 Q=650 CFS	P	712.75	FP= 2232.44 FW= 2232.98 Q=650 CFS

CROSS SECTION DATA KEY FOR CAVE CREEK TRIBUTARY WASH 1C.2

A	23.91	FP= 2225.08 FW= 2225.59 Q=933 CFS
B	45.20	FP= 2225.07 FW= 2225.60 Q=933 CFS

CROSS SECTION DATA KEY FOR CAVE CREEK TRIBUTARY WASH 1D

A	20.37	FP= 2225.13 FW= 2225.72 Q=283 CFS
B	39.60	FP= 2225.13 FW= 2225.74 Q=283 CFS

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1"= 100' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

COOPER AERIAL SURVEYS COMPANY
CONTRACT NUMBER: FCD2003C048, Assignment #4
FCD2005C030

100' 0' 100' 200'

SCALE: 1" = 100'
CONTOUR INTERVAL = 2'
FLIGHT DATES: November 2003 through December 2005

GROUND CONTROL SURVEY DATA PROVIDED BY COOPER AERIAL SURVEYS COMPANY

LEGEND

100-YR FLOODPLAIN BOUNDARY

100-YR FLOODWAY BOUNDARY

RIVER MILE — RM2.0 — RM2.5 — RM3.0

CROSS SECTION — A 144.44 — CROSS SECTION STATION (FEET); FP= 2250.55 FLOODPLAIN WATER SURFACE ELEVATION; FW= 2250.55 FLOODWAY WATER SURFACE ELEVATION; Q =4630 CFS 100 YEAR DISCHARGE; PROPOSED FEMA CROSS SECTION DESIGNATION

BASE FLOOD ELEVATION — 2265.00

ELEVATION REFERENCE MARK — ERM 2400

ZONE DESIGNATION — ZONE AE

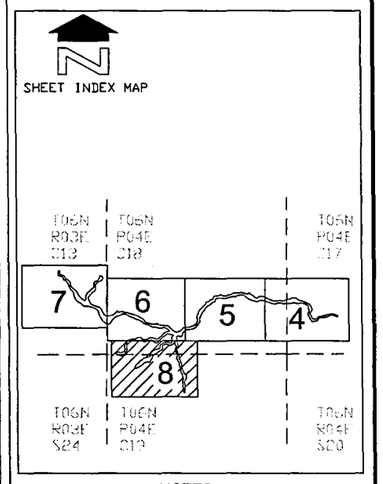
ZONE DESIGNATION — ZONE X

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88). CONVERSION FACTOR TO THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29) IS = -2.05 FOOT.

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION

SHEET INDEX MAP



NOTES

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NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

CAVE CREEK TRIBUTARY FLOODPLAIN DELINEATION, CAVE CREEK, AZ

Registered Professional Engineer (Civil) CERTIFICATE NO. 35571 LINDA A. POTTER Date Signed 12-21-07 ARIZONA, U.S.A.

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

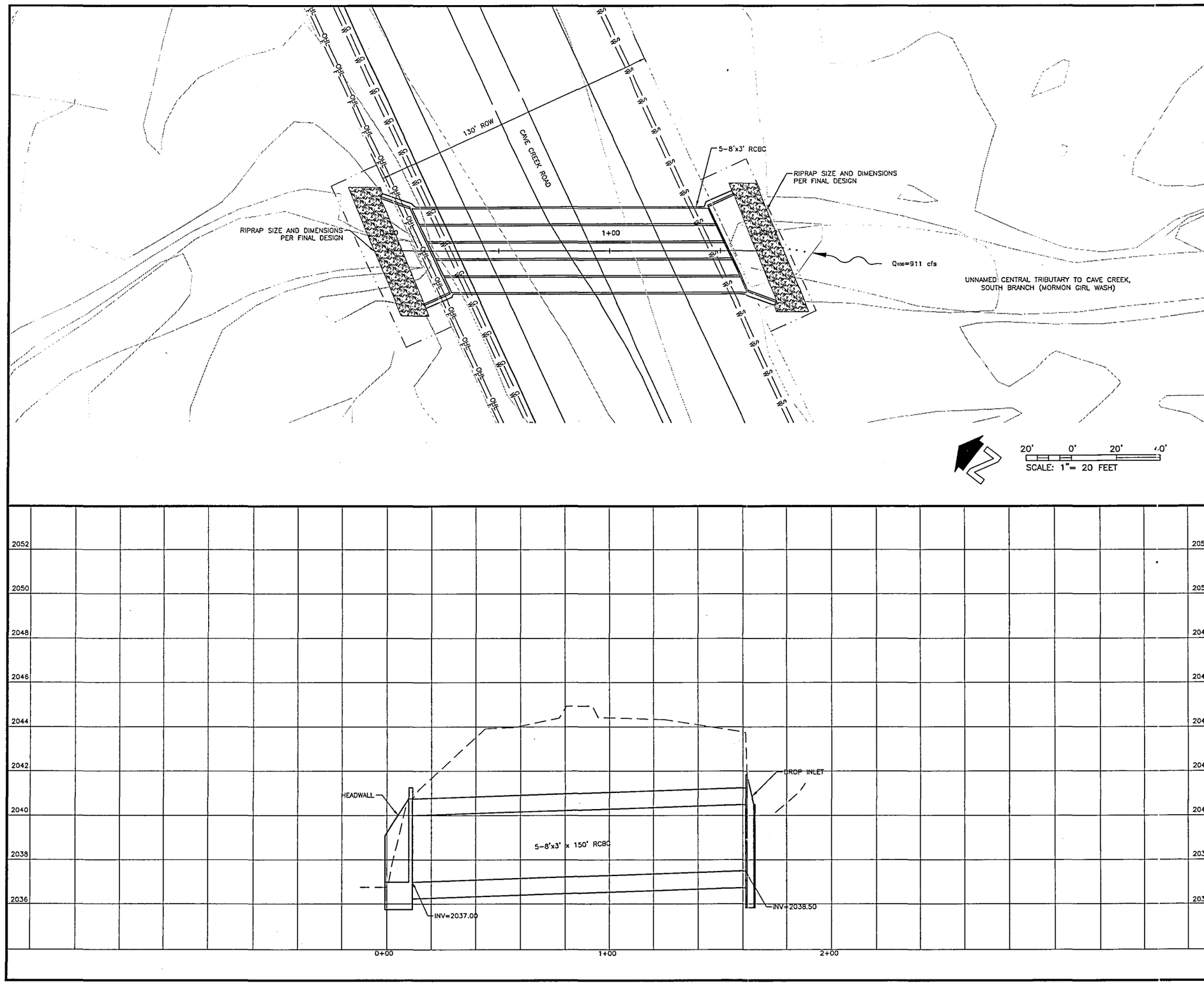
	BY	DATE
DESIGN	M. FOUNTAIN	12-21-07
DESIGN CHK.	L. POTTER	12-21-07
PLANS	MC/MF	12-21-07
PLANS CHK.	L. POTTER	12-21-07

SHEET 8 OF 10

APPENDIX F IMPROVEMENT PLANS AND COST ESTIMATES

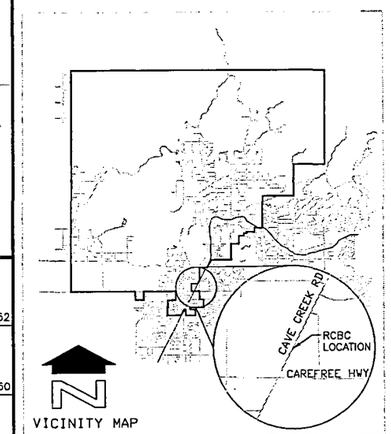
Improvement Plans

Cost Estimates (2008 Dollars)



LEGEND

	PARCEL/ROW LINE
	PROPOSED ROW
—OHL—OHL—	OVERHEAD APS LINE
—W—W—	BURIED WATER LINE
—G—G—	BURIED GAS LINE
—S—S—	BURIED SANITARY LINE
—F—F—	BURIED FIBER OPTIC



NOTES

1- BASIS OF ELEVATION NAVD88
2- 2' CI CONTOUR MAPPING
3- ALL UTILITY LOCATIONS ARE APPROXIMATE

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

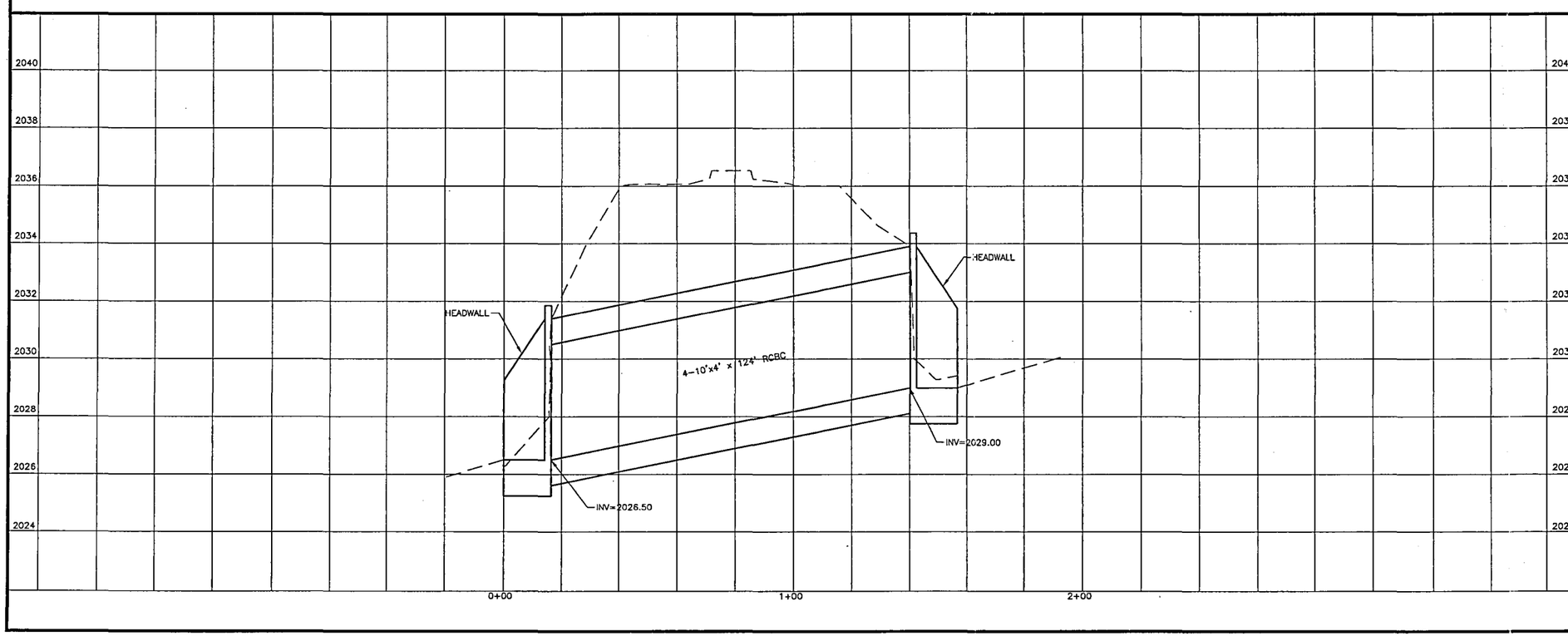
CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072
CAVE CREEK ROAD AT UNNAMED CENTRAL TRIBUTARY TO CAVE CREEK, SOUTH BRANCH (MORMON GIRL WASH)

PRELIMINARY NOT FOR CONSTRUCTION

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

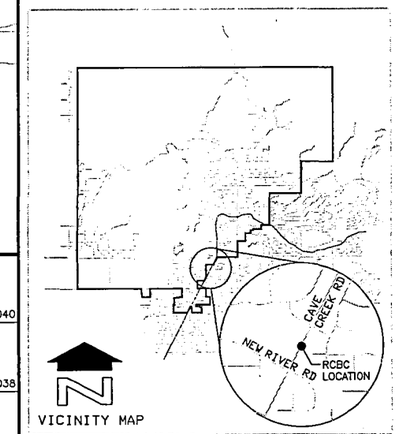
	BY	DATE
DESIGN	M. FOUNTAIN	01-2008
DESIGN CHK.	L. POTTER	01-2008
PLANS	MC/MF	01-2008
PLANS CHK.	–	01-2008

SHEET 1 OF 7



LEGEND

	PARCEL/ROW LINE
	PROPOSED ROW
—OHL——OHL—	OVERHEAD APS LINE
— W —— W —	BURIED WATER LINE
— G —— G —	BURIED GAS LINE
— S —— S —	BURIED SANITARY LINE
— F —— F —	BURIED FIBER OPTIC



NOTES

1- BASIS OF ELEVATION NAVD88
2- 2' CI CONTOUR MAPPING
3- ALL UTILITY LOCATIONS ARE APPROXIMATE

NO.	REVISION	BY	DATE
2			
1			

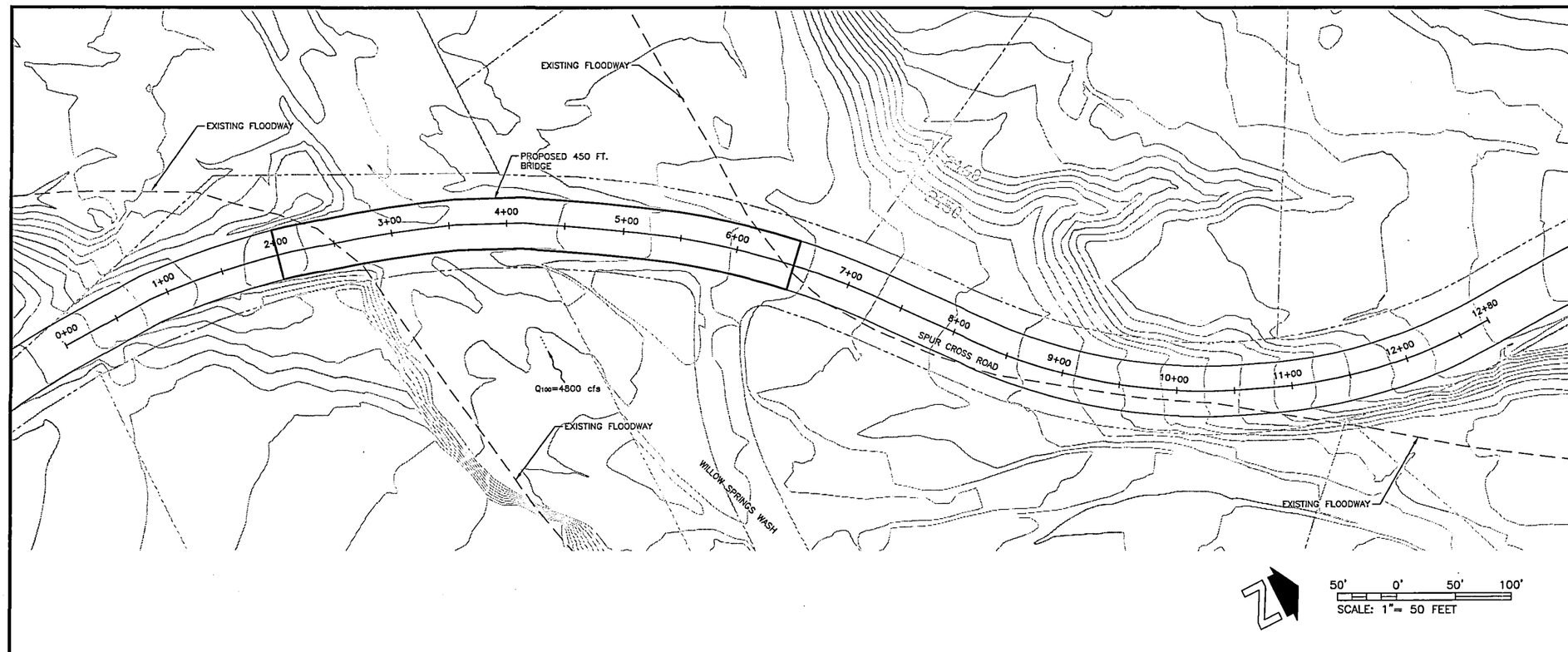
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

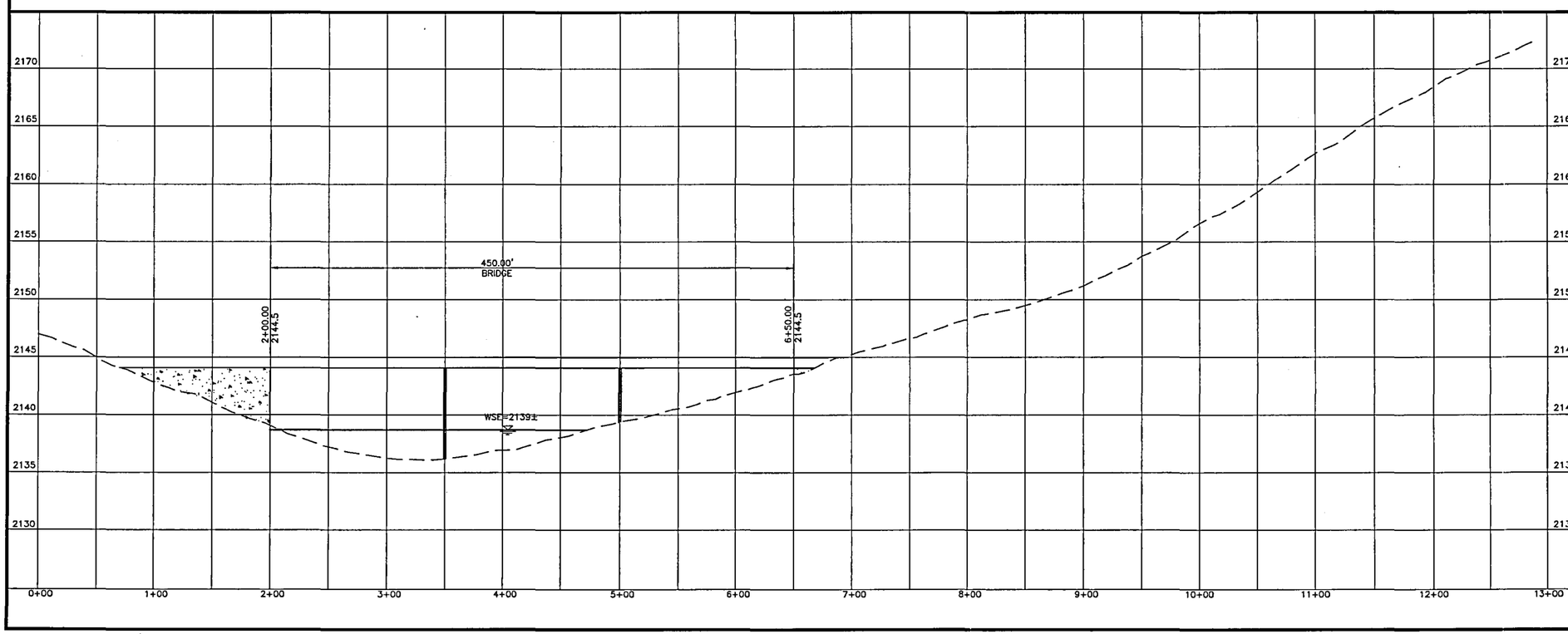
CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072
CAVE CREEK ROAD AT UNNAMED CENTRAL TRIBUTARY TO CAVE CREEK, NORTH BRANCH (MORMON GIRL WASH)

PRELIMINARY NOT FOR CONSTRUCTION

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

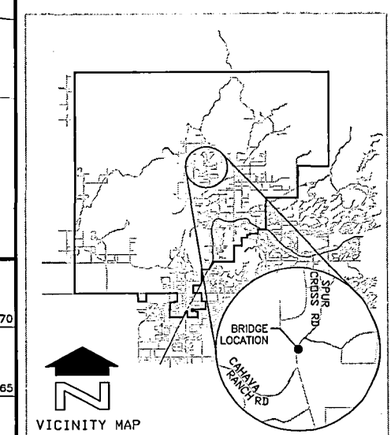
	BY	DATE
DESIGN	M. FOUNTAIN	01-2008
DESIGN CHK.	L. POTTER	01-2008
PLANS	MC/MF	01-2008
PLANS CHK.	-	01-2008





LEGEND

- PARCEL/ROW LINE
- PROPOSED ROW
- FLOODPLAIN
- FLOODWAY



VICINITY MAP

NOTES

1– BASIS OF ELEVATION NAVD88
2– 2' CI CONTOUR MAPPING

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

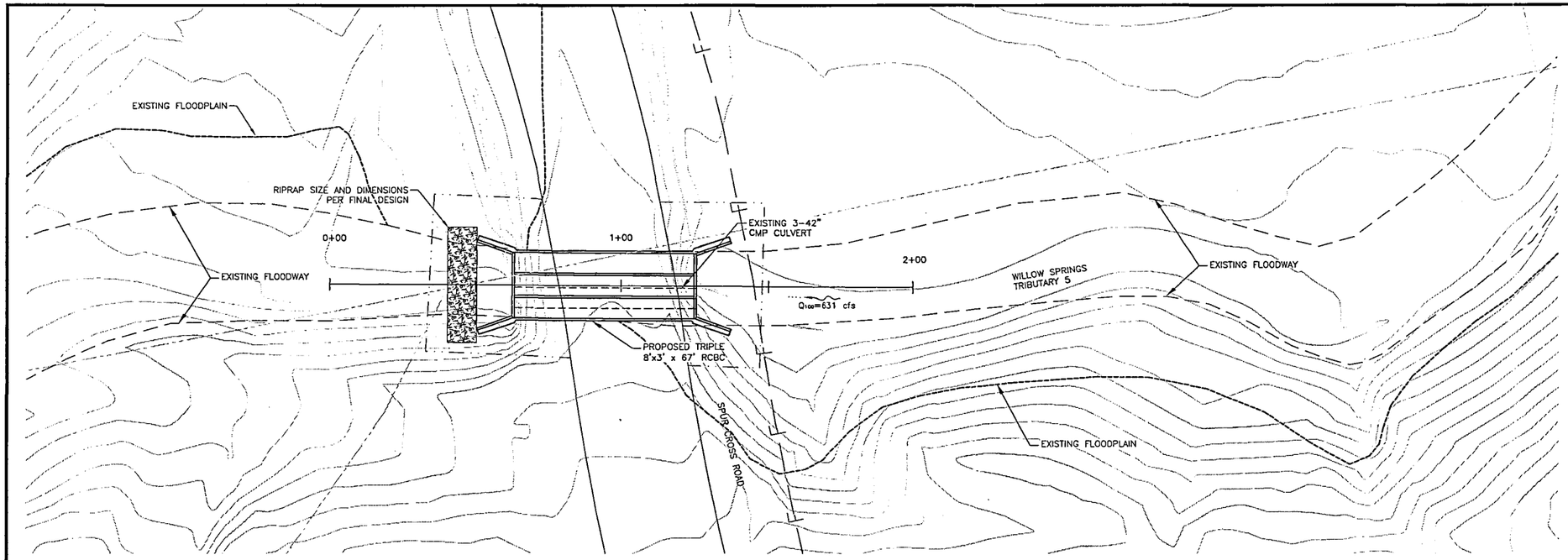
SPUR CROSS ROAD AT WILLOW SPRINGS WASH

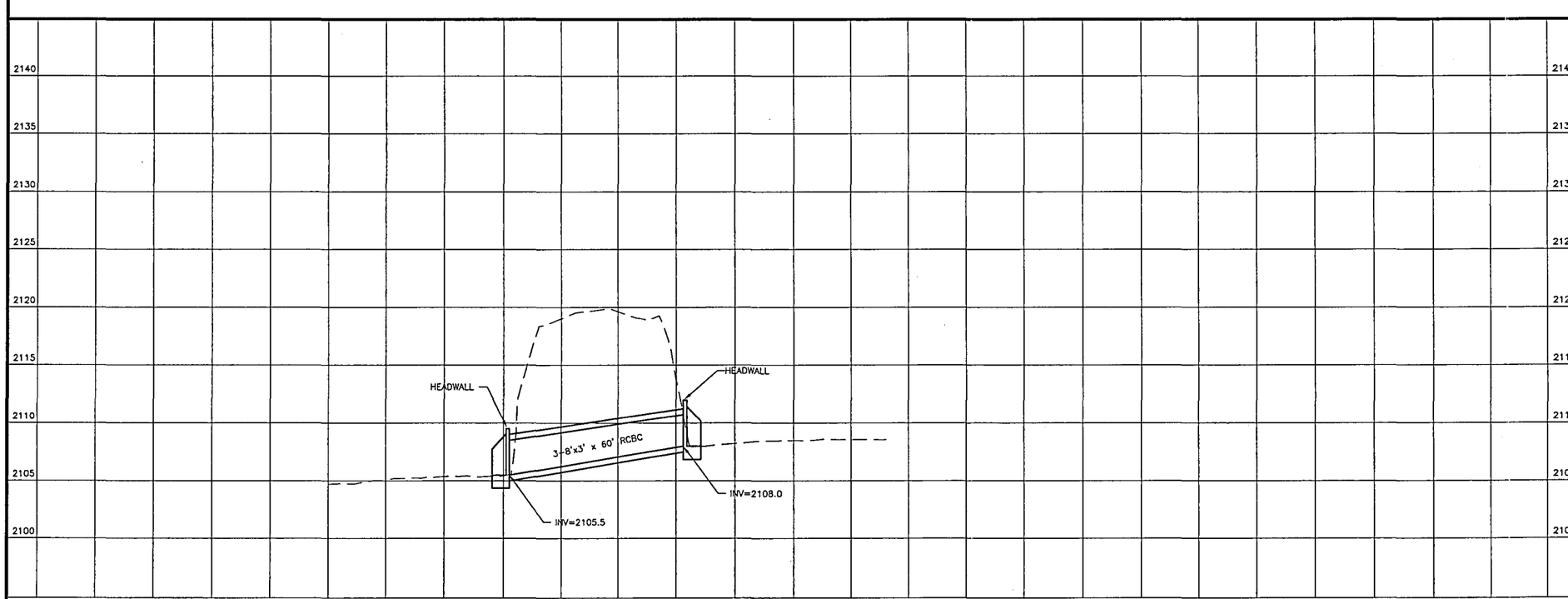
PRELIMINARY NOT FOR CONSTRUCTION

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

	BY	DATE
DESIGN	M. FOUNTAIN	01-2008
DESIGN CHK.	L. POTTER	01-2008
PLANS	MC/MF	01-2008
PLANS CHK.	–	01-2008

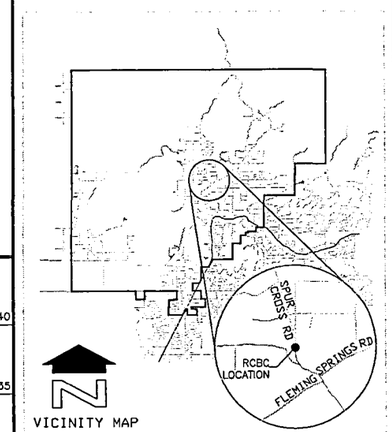
SHEET 3 OF 7





LEGEND

	PARCEL/ROW LINE
	PROPOSED ROW
	FLOODPLAIN
	FLOODWAY
—OHL—OHL—	OVERHEAD APS LINE
— W — W —	BURIED WATER LINE
— G — G —	BURIED GAS LINE
— S — S —	BURIED SANITARY LINE
— F — F —	BURIED FIBER OPTIC



NOTES

1- BASIS OF ELEVATION NAVD88
2- 2' CI CONTOUR MAPPING
3- ALL UTILITY LOCATIONS ARE APPROXIMATE

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

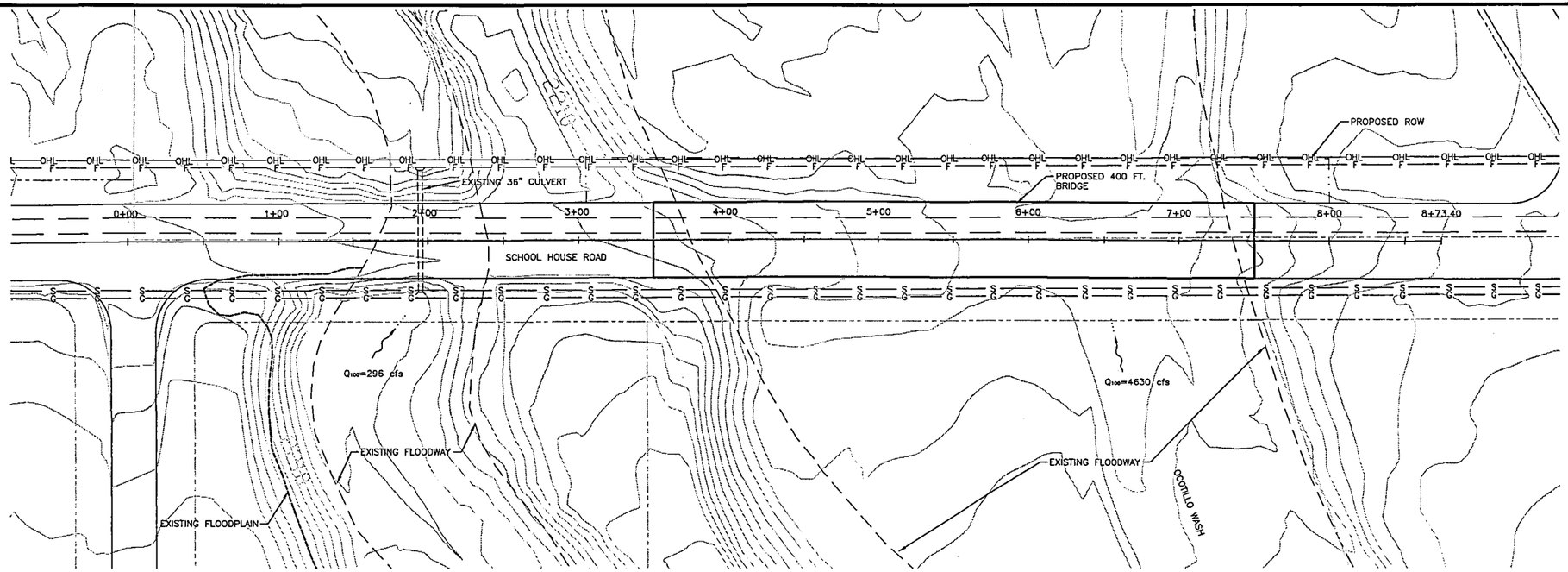
CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072
SPUR CROSS ROAD AT
WILLOW SPRINGS WASH
TRIBUTARY 5

PRELIMINARY NOT FOR CONSTRUCTION

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

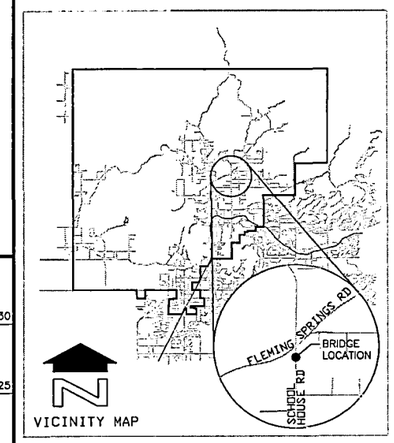
	BY	DATE
DESIGN	M. FOUNTAIN	01-2008
DESIGN CHK.	L. POTTER	01-2008
PLANS	MC/MF	01-2008
PLANS CHK.	–	01-2008

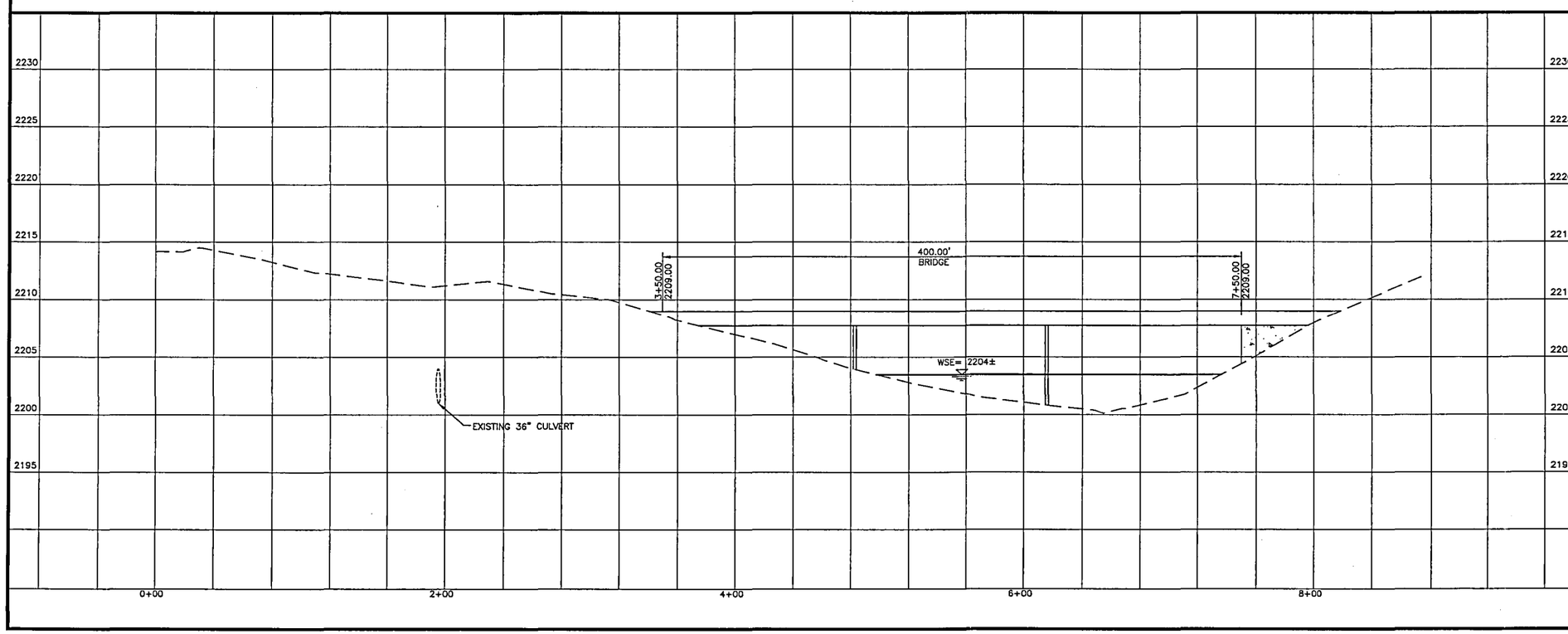
SHEET 4 OF 7



LEGEND

	PARCEL/ROW LINE
	PROPOSED ROW
	FLOODPLAIN
	FLOODWAY
—OHL—OHL—	OVERHEAD APS LINE
— W — W —	BURIED WATER LINE
— G — G —	BURIED GAS LINE
— S — S —	BURIED SANITARY LINE
— F — F —	BURIED FIBER OPTIC





NOTES

1- BASIS OF ELEVATION NAVD88
2- 2' CI CONTOUR MAPPING
3- ALL UTILITY LOCATIONS ARE APPROXIMATE

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

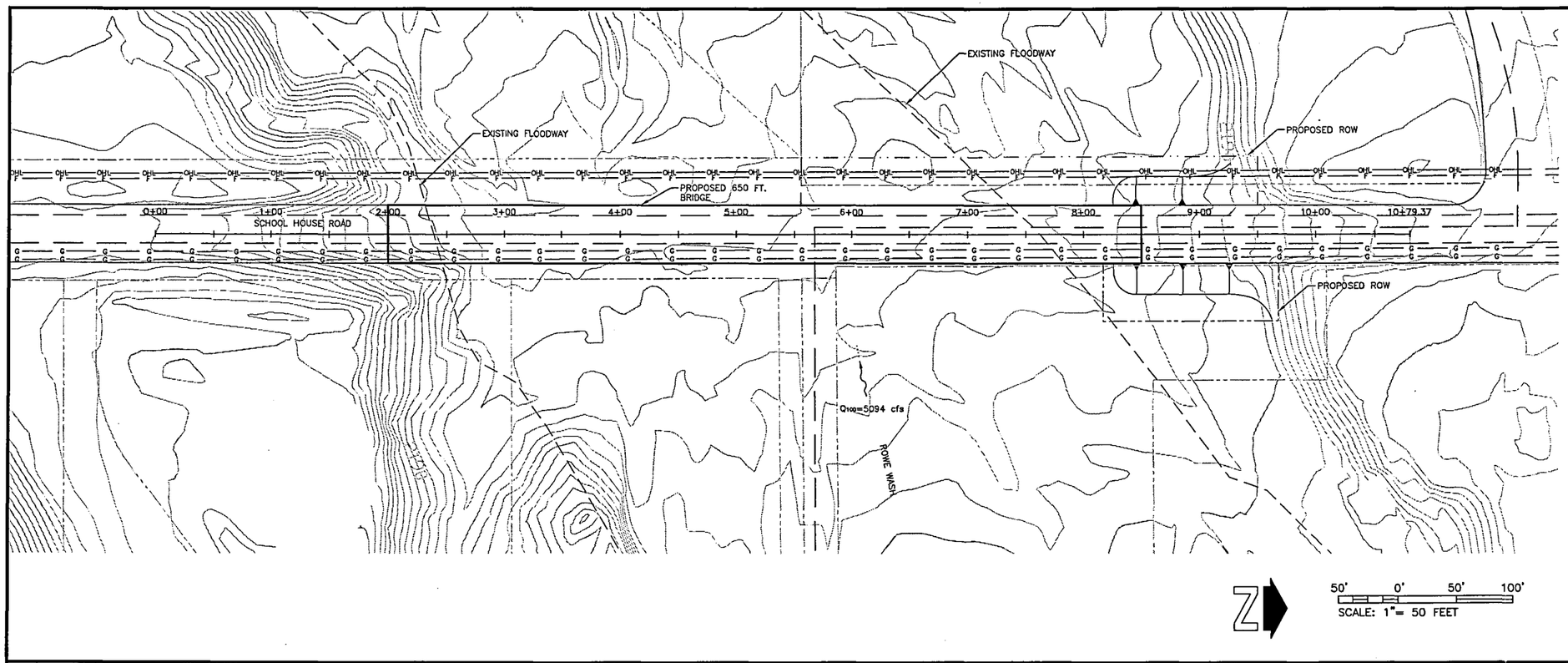
CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

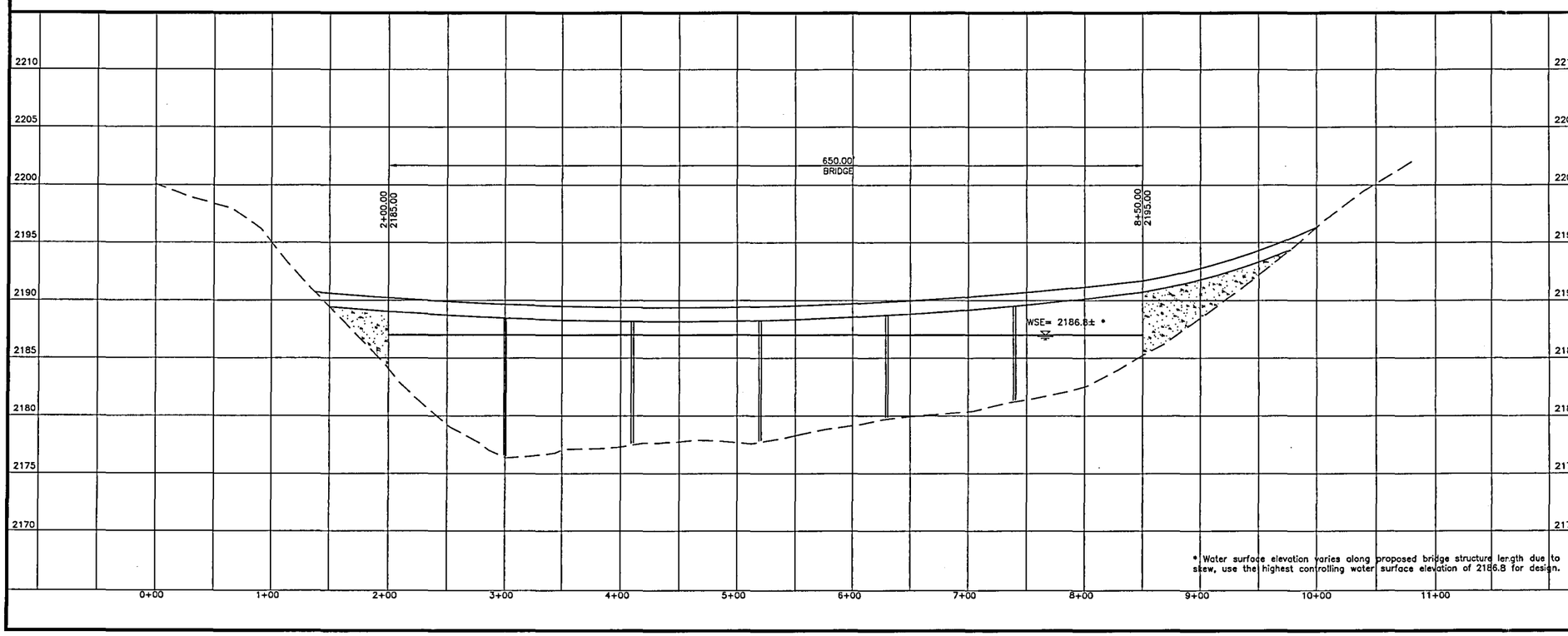
SCHOOL HOUSE ROAD AT OCOTILLO WASH

PRELIMINARY NOT FOR CONSTRUCTION

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

	BY	DATE
DESIGN	M. FOUNTAIN	01-2008
DESIGN CHK.	L. POTTER	01-2008
PLANS	MC/MF	01-2008
PLANS CHK.	–	01-2008

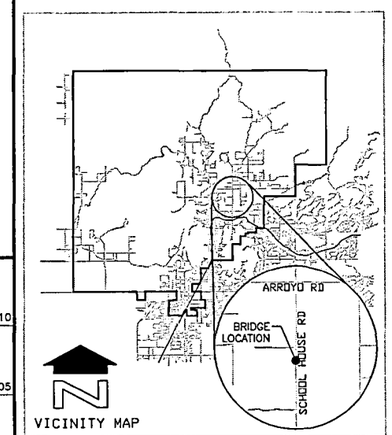




* Water surface elevation varies along proposed bridge structure length due to skew, use the highest controlling water surface elevation of 2186.8 for design.

LEGEND

	PARCEL/ROW LINE
	PROPOSED ROW
	FLOODPLAIN
	FLOODWAY
—OHL—OHL—	OVERHEAD APS LINE
— W — W —	BURIED WATER LINE
— G — G —	BURIED GAS LINE
— S — S —	BURIED SANITARY LINE
— F — F —	BURIED FIBER OPTIC



NOTES

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3- ALL UTILITY LOCATIONS ARE APPROXIMATE

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

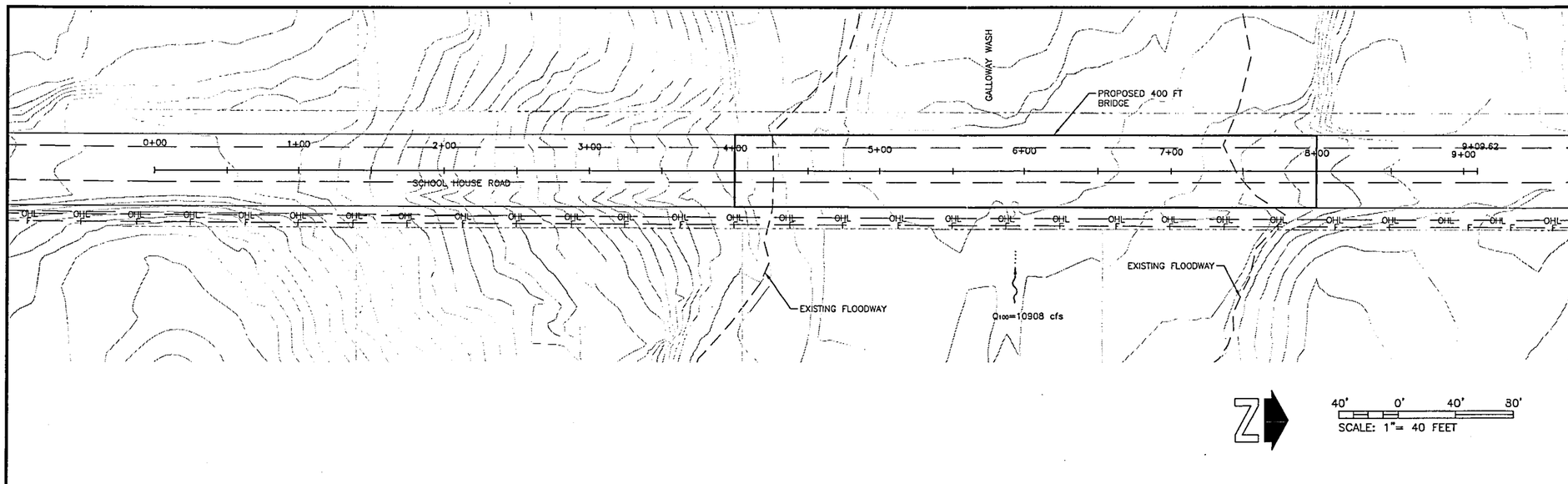
CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

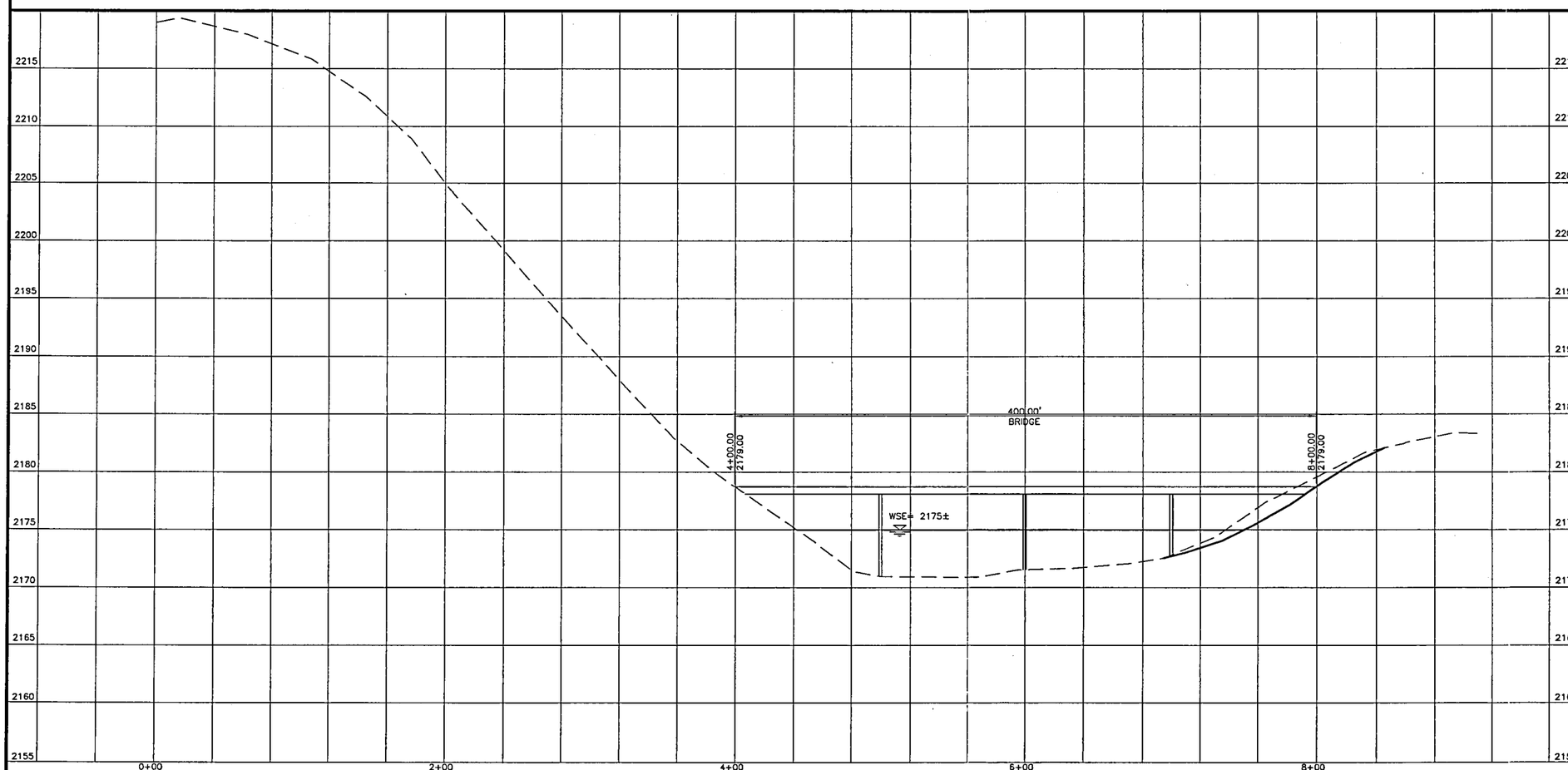
SCHOOL HOUSE ROAD AT ROWE WASH

PRELIMINARY NOT FOR CONSTRUCTION

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

	BY	DATE
DESIGN	M. FOUNTAIN	01-2008
DESIGN CHK.	L. POTTER	01-2008
PLANS	MC/MF	01-2008
PLANS CHK.	–	01-2008





LEGEND

	PARCEL/ROW LINE
	PROPOSED ROW
	FLOODPLAIN
	FLOODWAY
—OHL—OHL—	OVERHEAD APS LINE
— W — W —	BURIED WATER LINE
— G — G —	BURIED GAS LINE
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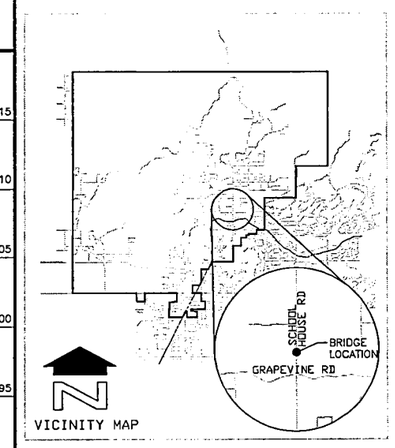

NOTES

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2- 2' CI CONTOUR MAPPING
3- ALL UTILITY LOCATIONS ARE APPROXIMATE

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

SCHOOL HOUSE ROAD AT GALLOWAY WASH

PRELIMINARY NOT FOR CONSTRUCTION

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

	BY	DATE
DESIGN	M. FOUNTAIN	01-2008
DESIGN CHK.	L. POTTER	01-2008
PLANS	MC/MF	01-2008
PLANS CHK.	–	01-2008

SHEET 7 OF 7

Job No.

Computation

HDR

Project: Cave Creek DMP	Computed: EC	Date
Subject: Cost Estimate	Checked: LP	Date
Task: Determine Cost Estimate for Proposed 5-8x3 RCBC	Sheet: 1 of 1	

COST ESTIMATE

Cave Creek Road at Unnamed Central Tributary to Cave Creek, South Branch (Mormon Girl Wash)

ITEM NO.	ITEM	UNIT	QUANTITY	UNIT PRICE*	AMOUNT
NA	Right-of-Way	ACRE	0.08	$321,000	$25,776
2010001	Clearing and Grubbing	L.SUM	1	$10,700	$10,700
2030301	Roadway Excavation	CU.YD.	500	$6.42	$3,210
2030401	Drainage Excavation	CU.YD.	1500	$5.35	$8,025
2030508	Structure Backfill	CU.YD.	1000	$42.80	$42,800
3030022	Aggregate Base, Class 2	CU.YD.	250	$29.96	$7,490
4060023	Asphaltic Concrete (3/4" mix)	TON	1000	$42.80	$42,800
6010003	Structural Concrete (Class S) (F'C=3,500)	CU.YD.	235	$642.00	$150,900
6016088	Headwall (Inlet Headwall 5-8x3 RCBC)	EACH	1	$8,774	$8,800
6016089	Headwall (Outlet Headwall w/Apron 5-8x3 RCBC)	EACH	1	$23,540	$23,500
6040001	Structural Steel	LB.	23993	$1.07	$25,700
6110201	Metal Handrail	L.FT.	60	$42.80	$2,600
7040070	Pavement Marking	L.FT.	500	$0.43	$200
	SUBTOTAL				**$353,000**
9250001	Construction Surveying and Layout (2%)		1	$7,060	$7,060
2070001	Furnish Water Supply & Dust Palliative (2%)		1	$7,060	$7,060
7010001	Maintenance and Protection of Traffic		1	$30,000	$30,000
9010001	Mobilization (12%)		1	$42,360	$42,360
9240170	Quality Control (2%)		1	$7,060	$7,060
2030857	Erosion Control (1%)		1	$3,530	$3,530
N/A	Utility Relocations (5%)		1	$17,650	$17,650
N/A	Design (12%)		1	$42,360	$42,360
N/A	Construction Engineering and Contingencies (30%)		1	$105,900	$105,900
					$616,000

* Based on 2008 projected pricing

Job No.

Computation

HDR

Project: Cave Creek DMP	Computed: EC	Date
Subject: Cost Estimate	Checked: LP	Date
Task: Determine Cost Estimate for Proposed 4-10x4 RCBC	Sheet: 1 or 1	

COST ESTIMATE

Cave Creek Road at Unnamed Central Tributary to Cave Creek, North Branch (Mormon Girl Wash)

ITEM NO.	ITEM	UNIT	QUANTITY	UNIT PRICE*	AMOUNT
NA	Right-of-Way	ACRE	0.08	$321,000.00	$26,515
2010001	Clearing and Grubbing	L.SUM	1	$10,700.00	$10,700
2030301	Roadway Excavation	CU.YD.	500	$6.42	$3,210
2030401	Drainage Excavation	CU.YD.	1500	$5.35	$8,025
2030508	Structure Backfill	CU.YD.	1000	$42.80	$42,800
3030022	Aggregate Base, Class 2	CU.YD.	250	$29.96	$7,490
4060023	Asphaltic Concrete (3/4" mix)	TON	750	$42.80	$32,100
6010003	Structural Concrete (Class S) (F'C=3,500)	CU.YD.	484	$642.00	$310,700
6016088	Headwall (Inlet Headwall 4-10x4 RCBC)	EACH	1	$8,560.00	$8,600
6016089	Headwall (Outlet Headwall w/Apron 4-10x4 RCBC)	EACH	1	$23,540.00	$23,500
6050001	Structural Steel	LB.	69626	$1.07	$74,500
6110201	Metal Handrail	L.FT.	60	$42.80	$2,600
7040070	Pavement Marking	L.FT.	500	$0.43	$200
	SUBTOTAL				**$551,000**
9250001	Construction Surveying and Layout (2%)		1	$11,020	$11,020
2070001	Furnish Water Supply & Dust Palliative (2%)		1	$11,020	$11,020
7010001	Maintenance and Protection of Traffic		1	$50,000	$50,000
9010001	Mobilization (12%)		1	$66,120	$66,120
9240170	Quality Control (2%)		1	$11,020	$11,020
2030857	Erosion Control (1%)		1	$5,510	$5,510
N/A	Utility Relocations (5%)		1	$27,550	$27,550
N/A	Design (12%)		1	$66,120	$66,120
N/A	Construction Engineering and Contingencies (30%)		1	$165,300	$165,300
					$965,000

* Based on 2008 projected pricing

Job No.

Computation

HDR

Project: Cave Creek DMP	Computed: EC	Date
Subject: Cost Estimate	Checked: LP	Date
Task: Determine Cost Estimate for Proposed Bridge at Willow Springs Wash/Spur Cross	Sheet: 1 or 1	

COST ESTIMATE
Spur Cross Road at Willow Springs Wash

ITEM NO.	ITEM	UNIT	QUANTITY	UNIT PRICE*	AMOUNT
NA	Right of Way	ACRE	0.00	$321,000	$0
2030501	Structural Excavation	CU.YD.	500	$6.42	$3,210
2030508	Structure Backfill	CU.YD.	1000	$42.80	$42,800
6011371	Approach Slab	SQ.FT.	9100	$24	$214,200
NA	Bridge superstructure	SQ.FT.	20475	$120	$2,453,700
	SUBTOTAL				**$2,714,000**
9250001	Construction Surveying and Layout (2%)		1	$54,280	$54,280
2070001	Furnish Water Supply & Dust Palliative (2%)		1	$54,280	$54,280
7010001	Maintenance and Protection of Traffic		1	$50,000	$50,000
9010001	Mobilization (12%)		1	$325,680	$325,680
9240170	Quality Control (2%)		1	$54,280	$54,280
2030857	Erosion Control (1%)		1	$27,140	$27,140
N/A	Design (12%)		1	$325,680	$325,680
N/A	Construction Engineering and Contingencies (30%)		1	$814,200	$814,200
					$4,420,000

* Based on 2008 projected pricing

Job No.

Computation

HDR

Project: Cave Creek DMP	Computed: EC	Date
Subject: Cost Estimate	Checked: LP	Date
Task: Determine Cost Estimate for Proposed 3-8x3 RCBC	Sheet: 1 or 1	

COST ESTIMATE
Spur Cross Road at Willow Springs Wash, Tributary 5

ITEM NO.	ITEM	UNIT	QUANTITY	UNIT PRICE*	AMOUNT
NA	Right-of-Way	ACRE	0.03	$321,000.00	$11,042
2010001	Clearing and Grubbing	L.SUM	1	$10,700.00	$10,700
2030301	Roadway Excavation	CU.YD.	500	$6.42	$3,210
2030401	Drainage Excavation	CU.YD.	1500	$5.35	$8,025
2030508	Structure Backfill	CU.YD.	1000	$42.80	$42,800
3030022	Aggregate Base, Class 2	CU.YD.	250	$29.96	$7,490
4060023	Asphaltic Concrete (3/4" mix)	TON	750	$42.80	$32,100
6010003	Structural Concrete (Class S) (F'C=3,500)	CU.YD.	143	$642.00	$91,800
6016088	Headwall (Inlet Headwall 3-8x3 RCBC)	EACH	1	$6,955	$7,000
6016089	Headwall (Outlet Headwall w/Apron 3-8x3 RCBC)	EACH	1	$16,050	$16,100
6040001	Structural Steel	LB.	23993	$1.07	$25,700
6110201	Metal Handrail	L.FT.	40	$42.80	$1,700
7040070	Pavement Marking	L.FT.	500	$0.43	$200
	SUBTOTAL				**$258,000**
9250001	Construction Surveying and Layout (2%)		1	$5,160	$5,160
2070001	Furnish Water Supply & Dust Palliative (2%)		1	$5,160	$5,160
7010001	Maintenance and Protection of Traffic		1	$30,000	$30,000
9010001	Mobilization (12%)		1	$30,960	$30,960
9240170	Quality Control (2%)		1	$5,160	$5,160
2030857	Erosion Control (1%)		1	$2,580	$2,580
N/A	Utility Relocations (5%)		1	$12,900	$12,900
N/A	Design (12%)		1	$30,960	$30,960
N/A	Construction Engineering and Contingencies (30%)		1	$77,400	$77,400
					$458,000

* Based on 2008 projected pricing

Job No.

Computation

HDR

Project: Cave Creek DMP	Computed: EC	Date
Subject: Cost Estimate	Checked: LP	Date
Task: Determine Cost Estimate for Proposed Bridge at Ocotillo Wash/School House	Sheet: 1 or 1	

COST ESTIMATE
School House Road at Ocotillo Wash

ITEM NO.	ITEM	UNIT	QUANTITY	UNIT PRICE*	AMOUNT
NA	Right of Way	ACRE	0.09	$321,000	$27,638
2030501	Structural Excavation	CU.YD.	500	$6.42	$3,210
2030508	Structure Backfill	CU.YD.	1000	$42.80	$42,800
6011371	Approach Slab	SQ.FT.	7725	$24	$181,800
NA	Bridge superstructure	SQ.FT.	20600	$120	$2,468,700
	SUBTOTAL				**$2,724,000**
9250001	Construction Surveying and Layout (2%)		1	$54,480	$54,480
2070001	Furnish Water Supply & Dust Palliative (2%)		1	$54,480	$54,480
7010001	Maintenance and Protection of Traffic		1	$50,000	$50,000
9010001	Mobilization (12%)		1	$326,880	$326,880
9240170	Quality Control (2%)		1	$54,480	$54,480
2030857	Erosion Control (1%)		1	$27,240	$27,240
N/A	Design (12%)		1	$326,880	$326,880
N/A	Construction Engineering and Contingencies (30%)		1	$817,200	$817,200
					$4,436,000

* Based on 2008 projected pricing

Job No.

Computation

HDR

Project: Cave Creek DMP	Computed: EC	Date
Subject: Cost Estimate	Checked: LP	Date
Task: Determine Cost Estimate for Proposed Bridge at Rowe Wash/School House	Sheet: 1 or 1	

COST ESTIMATE
School House Road at Rowe Wash

ITEM NO.	ITEM	UNIT	QUANTITY	UNIT PRICE*	AMOUNT
NA	Right of Way	ACRE	0.06	$321,000	$19,902
2030501	Structural Excavation	CU.YD.	500	$6.42	$3,210
2030508	Structure Backfill	CU.YD.	1000	$42.80	$42,800
6011371	Approach Slab	SQ.FT.	10300	$24	$242,500
NA	Bridge superstructure	SQ.FT.	33475	$120	$4,011,600
	SUBTOTAL				**$4,320,000**
9250001	Construction Surveying and Layout (2%)		1	$86,400	$86,400
2070001	Furnish Water Supply & Dust Palliative (2%)		1	$86,400	$86,400
7010001	Maintenance and Protection of Traffic		1	$50,000	$50,000
9010001	Mobilization (12%)		1	$518,400	$518,400
9240170	Quality Control (2%)		1	$86,400	$86,400
2030857	Erosion Control (1%)		1	$43,200	$43,200
N/A	Design (12%)		1	$518,400	$518,400
N/A	Construction Engineering and Contingencies (30%)		1	$1,296,000	$1,296,000
					$7,005,000

* Based on 2008 projected pricing

Job No.

Computation

HDR

Project: Cave Creek DMP	Computed: EC	Date
Subject: Cost Estimate	Checked: LP	Date
Task: Determine Cost Estimate for Proposed Bridge at Galloway Wash/School House	Sheet: 1 or 1	

COST ESTIMATE
School House Road at Galloway Wash

ITEM NO.	ITEM	UNIT	QUANTITY	UNIT PRICE*	AMOUNT
NA	Right of Way	ACRE	0.00	$321,000	$0
2030501	Structural Excavation	CU.YD.	500	$6.42	$3,210
2030508	Structure Backfill	CU.YD.	1000	$42.80	$42,800
6011371	Approach Slab	SQ.FT.	2575	$24	$60,600
NA	Bridge superstructure	SQ.FT.	20600	$120	$2,468,700
	SUBTOTAL				**$2,575,000**
9250001	Construction Surveying and Layout (2%)		1	$51,500	$51,500
2070001	Furnish Water Supply & Dust Palliative (2%)		1	$51,500	$51,500
7010001	Maintenance and Protection of Traffic		1	$50,000	$50,000
9010001	Mobilization (12%)		1	$309,000	$309,000
9240170	Quality Control (2%)		1	$51,500	$51,500
2030857	Erosion Control (1%)		1	$25,750	$25,750
N/A	Design (12%)		1	$309,000	$309,000
N/A	Construction Engineering and Contingencies (30%)		1	$772,500	$772,500
					$4,196,000

* Based on 2008 projected pricing

APPENDIX G DRAINAGE GUIDELINES

Drainage Guidelines

BEST MANAGEMENT PRACTICES

A Construction Guide for Development of Subdivisions and Individual Lots in the Town of Cave Creek

November 2007

CAVE CREEK
ARIZONA

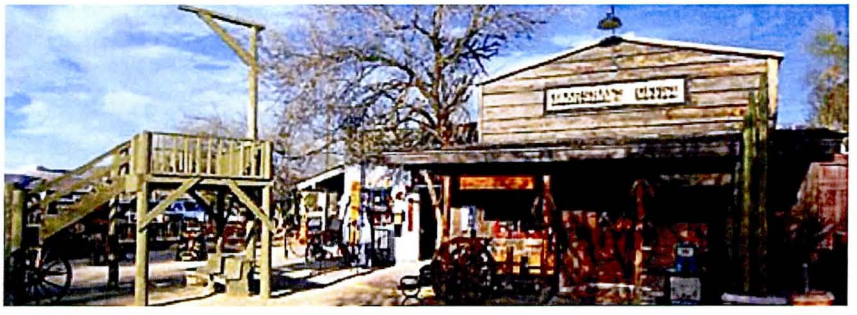
Settled 1870 - Incorporated 1986

Table of Contents

PART 1 - INTRODUCTION	1
PART 2 - DRAINAGE CROSSINGS	3
PART 3 - EVALUATING EROSION	11
PART 4 - FUTURE DEVELOPMENT	17
PART 5 - OTHER CONSIDERATIONS	27
GLOSSARY	29

INTRODUCTION

The rural feel and the natural elements in the Town of Cave Creek (Town) allow for a unique living experience. As the Town grows, the appearance of new developments will play an important role in the preservation of these characteristics. The information contained herein describes some of the important drainage considerations that should be made prior to construction. For additional information on drainage and grading issues, please consult the *Grading and Drainage Design Guidelines for the Town of Cave Creek.*



CURRENT REQUIREMENTS

Washes are a key element within the Town and lend to its character. However, to ensure the safety of people, structures, and to preserve the integrity of the washes, a number of rules and permitting requirements must be considered in the planning stages of a project. Design standards, in conjunction with governing specifications and ordinances at the federal, state, county and Town level, guide development to ensure safety and preserve aesthetic values. The following federal, state, county, and Town documents should be reviewed prior to developing any project.

Federal (U.S. Army Corps of Engineers and Federal Emergency Management Administration [FEMA])

- Clean Water Act (CWA) Section 404 permit and 401 certification is required if removing or adding fill material to a jurisdictional area
- Construction that modifies the floodplain within a Special Flood Hazard Area (SFHA) requires a Letter of Map revision or amendment from FEMA

State (Arizona Department of Environmental Quality)

- National Pollution Discharge Elimination System (NPDES) permit and Storm Water Pollution Prevention Plan (SWPPP) are required for disturbances of one or more acres of ground
- CWA Section 401 certification
- Drywell registration

County (Flood Control District of Maricopa County [FCDMC])

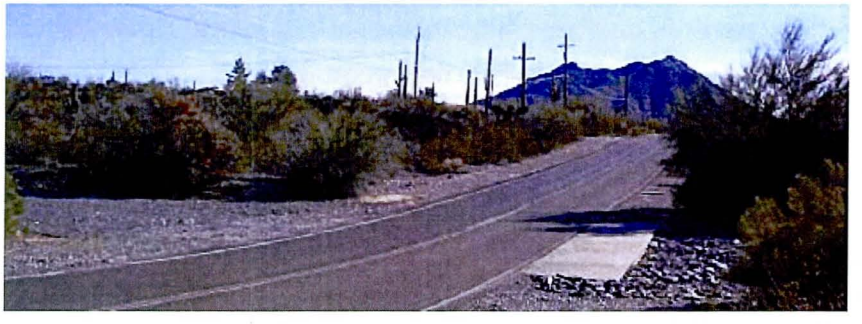
- Floodplain Use Permit for improvements within any FEMA delineated floodplain
- Drainage Design Manual for Maricopa County, Arizona, Volume I – Hydrology and Volume II – Hydraulics required for drainage design purposes

Town of Cave Creek

- Zoning and Subdivision Ordinances
- Town ordinances govern land including grading and drainage
- Grading and Drainage Design Guidelines for the Town of Cave Creek

AT-GRADE CROSSINGS

Most of the wash crossings in the Town are "at-grade" crossings. That is to say, they allow all water flowing in the wash to pass over the top of the roadway. This is true for both publicly owned and privately owned wash crossings. At-grade crossings may be either paved or unpaved. This method of crossing the numerous washes in the Town is effective in part from the low initial cost and it imposes the least visual impact upon the natural wash aesthetics. There are, however, several significant design components that need to be considered in the proper design of an at-grade crossing, including maintenance and access during flow events.



MAINTENANCE

Flood waters in natural desert washes carry significant amounts of sediment and debris. This is in part due to the particularly steep slopes and relatively high velocities of the washes found within the Town. The energy in the flowing water creates a natural process of eroding the stream channel bottom and sides, conveying the eroded material (also known as alluvium) downstream. At wash crossings, the flow velocity often slows down, depositing the loose material onto the roadway. This results in a layer of sand or gravel on the road that requires follow-up maintenance for removal.

Natural washes may degrade over time, and this process is hastened by large flow events. Degradation of a wash usually includes a lowering of the wash bottom. "Head-cutting" is the lowering of the wash bottom, as the degradation migrates upstream. When head-cutting reaches an at-grade crossing it may destroy the crossing, sometimes during a single event. The result is an impassable surface that may be covered in water or hidden by debris.

Access During Flow Events

At-grade crossings are effective in the Town due to the low initial expense and their ability to function during dry periods, which are most days of the year. On the infrequent occasions that washes are flowing, they should not be crossed due to the inherent hazards of becoming stranded or swept downstream.

Most vehicles lose grip with the road in less than 6 inches of flowing water, and most vehicles can become buoyant in 2 feet of water or less.

Nearly half of all flash flood fatalities are automobile related. Most occur when people drive into flooded roadways, particularly at night or when driving on unfamiliar roads.

Design Recommendations

At-grade crossings should be designed to reduce the need for routine maintenance while promoting a clear and structurally sound roadway surface. Elements of a properly engineered, at-grade crossing include:

- A concrete surface to keep the shape of the crossing and to provide a base elevation for sediment removal.
- A constant, one-way cross slope throughout the entire crossing of at least two percent and preferably four percent, to reduce the accumulation of sediment on the roadway.
- Upstream and downstream cut-off walls with aprons shall be provided to minimize the effects of headcutting and erosion.
- Concrete ribbon curb on the upstream edge of the crossing to prevent damage to the roadway surface.
- For public crossings, caution signs shall be added, where appropriate, to warn motorists not to cross when flooded.
- Public crossings should be designed such that adequate sight distance and design speeds accommodate the resulting at-grade roadway profile.

CULVERTS

Wash locations with naturally occurring steep banks, limited right-of-way, or large peak discharges, will require a pipe culvert crossing, rather than an at-grade crossing. Culverts for Major Washes (a water course with an officially delineated Flood Hazard Zone or any wash having a drainage basin of ten acres or larger) shall pass stormwater under the road without overtopping during the 100-year storm event. Specific requirements for the design of culverts, i.e. size, length, slope, and material are defined in the *Maricopa County Hydraulics Manual*, and in

the *Grading and Drainage Design Guidelines for the Town of Cave Creek*. Within the Town, the minimum allowable culvert size is 24 inches in diameter.

All culverts are to be installed with end treatments on both the upstream and downstream ends. End treatments may consist of either manufactured end sections or headwall sections. End treatments appropriate for the Town include riprap erosion protection constructed from local rock surrounding the manufactured section (*Figure 1*), or concrete headwalls faced with either natural stone or painted to blend with the natural desert (*Figure 2*). All end sections are to be constructed in accordance with

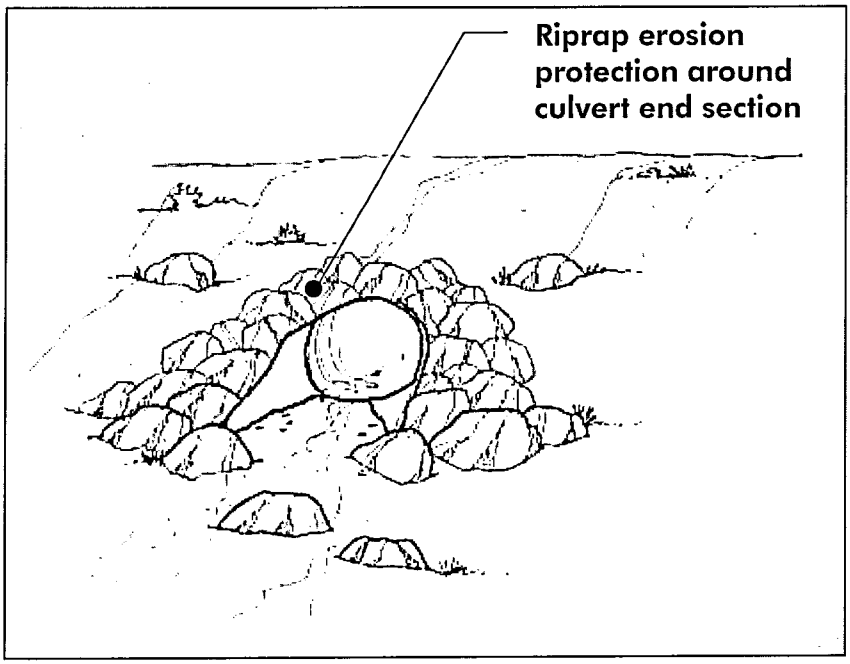


Figure 1: Manufactured End Section

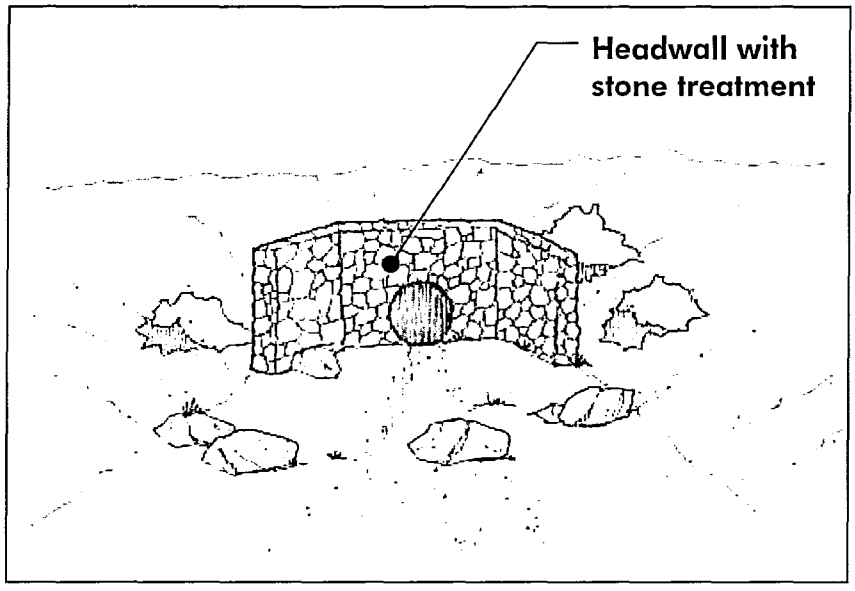


Figure 2: Headwall

Maricopa Association of Governments Standard Details. In addition, hand rail treatments shall be painted in a desert complementary color.

Culvert designs shall be prepared under the direction of, and sealed by, an Arizona registered Civil Engineer for approval by the Town Engineer. Culverts are not only designed to pass flows from the wash, but must also be designed to accommodate the sediment that is conveyed in the water for all storm events up to and including the 10-year storm event. Culverts must also be structurally designed to accommodate traffic loading.

UTILITY CROSSINGS

In addition to roadway crossings, it is sometimes necessary for utilities to either cross or be located along the length of a wash. Publicly owned utilities are contained within public right-of-way or utility easements and are designed

and constructed by the company or agency providing the utility service. These may include:

Water supply pipelines	Cable television
Sewer lines	Telephone
Buried electric lines	Gas lines

Private utilities such as on-lot water, electric, irrigation, etc. should be buried below the anticipated scour depth. Cover may be removed from the utility by weathering over time.

DRIVEWAYS

Driveways may extend from the public right-of-way to serve one landowner, or in some cases, extend across private property to serve more than one landowner. Driveways may or may not be paved. It is important that the design of the driveway takes into account all the minor washes and minor flowpaths that may exist on the property. A minor wash is defined as any water course having a drainage basin of less than 10 acres. These are sometimes not readily observable, but become clearly evident when storm runoff occurs. If not accounted for, the driveway may inadvertently intercept stormwater and direct it towards a house or garage.

The elevation of the finished floor for a structure not located in a FEMA Special Flood Hazard Area should be at least 14 inches above the highest adjacent grade on the lot. Ignoring driveway grading may cause flooding in the structure for an otherwise safe building, as shown in *Figure 3.1.* Suggested alternatives include the elevation of the elevation of the Finish Floor, sloped driveways, and adequate drainage capacity as shown in *Figure 3.2* to reduce the risk of structure flooding.

Driveway crossings of washes may be at-grade or contain structures to convey the flow. If a culvert is provided, the design shall allow for storm flows in excess of the culvert capacity to flow over the driveway and return to the wash, without being diverted.

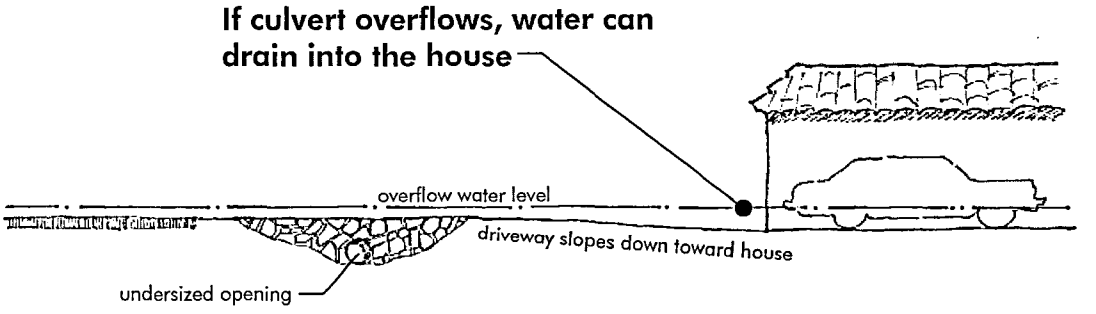


Figure 3.1: What Not To Do

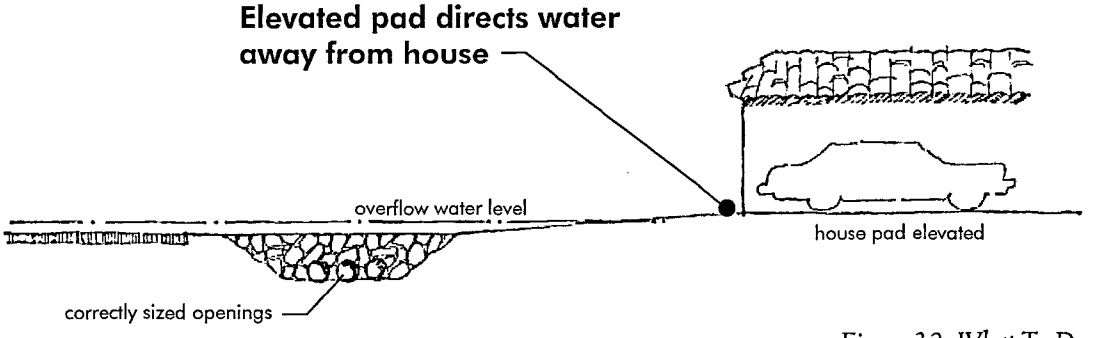


Figure 3.2: What To Do

EROSION HAZARD SETBACK LIMITS

Erosion hazard setback limits (EHSL) are areas adjacent to or within major washes where the placement of structures is not allowed without engineered erosion protection (*Figure 4* and *Example Photo next page*). These limits are established to protect structures from erosion-related damages. Early in the planning stages of a project, review of the EHSL shall be conducted to determine the necessary level of effort for protecting the proposed development. The design of a property shall avoid placing habitable structures, retaining walls, pools, driveways or other permanent types of improvements within the EHSL. All encroachments of the determined EHSL will require some form of structural erosion control measure. Examples of structural erosion control measures include loose or grouted riprap, retaining walls, gravity walls, roller compacted concrete, etc. General design guidelines for erosion control structures are found in the *Grading and Drainage Design Guidelines for the Town of Cave Creek.*

Refer to the *Geomorphic and Sedimentation Engineering Report* prepared by JE Fuller for Equilibrium Slope Analysis and Erosion Hazard Zones prepared for Cave Creek and its tributaries in the eastern and western portions of the study area.

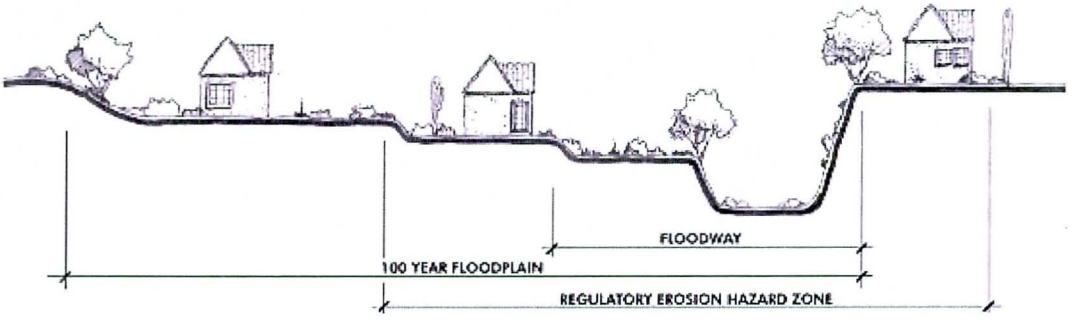
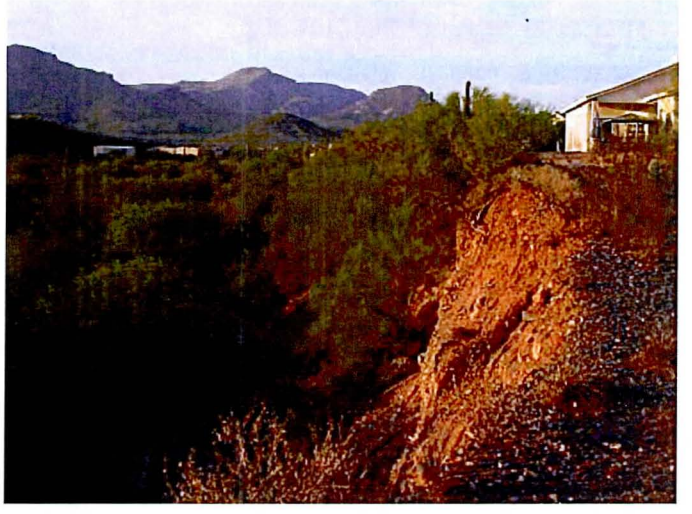


Figure 4: Erosion Hazard Setback Limits



Example: Existing Wash Bank Near Structure

SEDIMENTATION AND SCOUR

The Town of Cave Creek sits on a landform in the foothills region of the Sonoran high elevation desert that is characterized by steep slopes, rock outcroppings, and significant vegetation. The soil and rock stability is not well established and is subject to movement during small to moderate storm events. The loose soil and rock material can become a potential maintenance problem if not accounted for in the design of drainage facilities.

Areas other than washes that are disturbed can become susceptible to sedimentation and scour problems as a result of grading or construction activities if not properly restored. Therefore, stabilizing soils in disturbed areas is required to prevent erosion of the soil. Some common

methods of managing sedimentation and soil stability include:

SEDIMENT CONTROL	EROSION CONTROL
Organic filter barrier	Erosion control mats
Sand bag barrier	Dust control
Check dams	Diversion dikes (see photo below)
Silt fence	Drainage swales
Temporary sediment basins	Outlet protection
	Flexible bank protection

Example: Diversion Dike

To minimize sedimentation and scouring during construction, the following measures shall be followed:

- All applicable erosion and sediment control practices shall be in place prior to any grading operation and/or installation of proposed structures or utilities.
- All applicable erosion and sediment control practices shall be left in place until construction is completed and /or the area is stabilized.
- The site shall, at all times, be graded and maintained such that all stormwater runoff is diverted to sediment control facilities, preventing soil erosion.

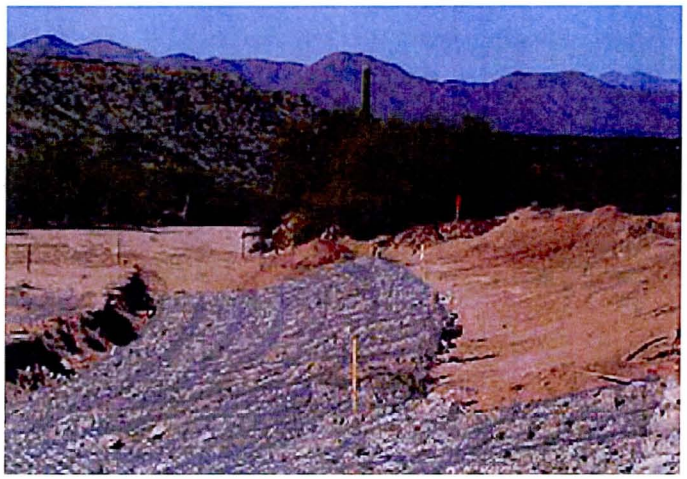
- Off-site sediment disturbance may require additional control measures to be determined by the Town Engineer, prior to any construction operations.
- Maximum cut and fill slopes of an exposed surface shall not be constructed steeper than 3:1 and 4:1 respectively, unless surface stabilization measures are taken. Stabilization methods should be approved by the Town Engineer, prior to any construction operations.

EROSION CONTROL

The Town of Cave Creek is subject to high levels of erosion due to steep slopes and mild to no vegetation in certain locations. Soil at embankments, roadway crossings, and within the washes may be eroded creating a potential hazard. Suggested erosion control elements include the following:

- Flexible bank protection (e.g. rock riprap)(see example photo and *Figure 5* next page)
- Geosynthetic erosion control mattresses
- Gabion baskets (see example photo next page)
- Articulated concrete block mattresses
- Concrete
- Cement stabilized alluvium
- Mechanically stabilized earth (MSE) walls

Prior to installation of any erosion control protection, an Erosion Control measure analysis shall be conducted by an Arizona registered Civil Engineer for approval by the Town Engineer.



Example: Flexible Bank Protection

Example: Gabion Baskets

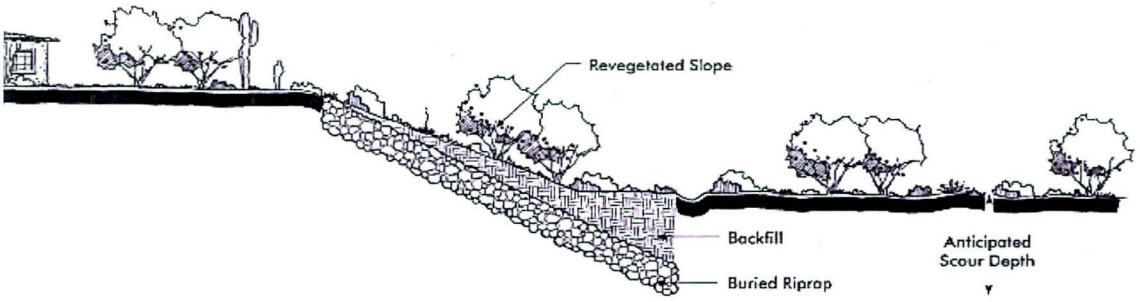


Figure 5: Buried Riprap

ON-LOT DEVELOPMENT AND DOWNSTREAM IMPACTS

Water flow within a lot should be considered when planning on-lot development. Finished floors of structures need to be elevated in comparison to adjacent grades. For structures within mapped floodplains, finished floor elevations must be elevated at least 24 inches above the 100-year water surface elevation. For structures that are not within mapped floodplains, the landscape surrounding the structure must accommodate drainage from the 100-year storm while maintaining 100-year water surface levels at least 6 inches below the finished flood elevation. In addition, the grade surrounding a structure must drain away from the base of the structure, dropping a minimum of 6 inches in the first 10 feet.

The method in which water leaves a lot that has been altered by grading can adversely affect downstream properties. Therefore, when grading alters the natural drainage of a property, historical drainage must be maintained at the on-lot property boundary. This includes drainage location, volume, velocity, sediment yield, and the direction of flow from the property.

No property wall shall be constructed as to prevent the discharge from the 100-year storm event through any parcel within the Town. Any property walls constructed within or across a wash shall utilize a system to accommodate the conveyance of water. All wall designs shall be approved by the Town Engineer prior to construction.

STREAM BANK VEGETATION

While disturbance of stream banks should be avoided, vegetation is an effective tool for stabilizing soil. Indigenous materials should be used, either salvaged from

other areas of construction disturbance or brought in from an off-site nursery. Chapter 12 of the Town Zoning Ordinance provides a listing of approved materials. Spacing and variety of species used should reflect adjacent areas and blend with the natural environment.

FENCES AND WALLS

The Town of Cave Creek recognizes the increased construction of fences and walls for property owners and large developments. To prevent flooding damage and the diversion of flow upon adjacent property owners, the following design criteria must be met.

- Walls and fences shall comply with the use, size, and type as summarized in the Town Zoning Ordinances.
- Perimeter or landscape walls must not block natural drainage paths unless provisions have been made for conveying the drainage with sufficient scour protection.
- Walls must be capable of allowing sheet flow, rill flow, and otherwise uncontained flooding that may impact the wall to pass through.
- Walls crossing a Major Wash require a detailed hydraulic and scour analysis report prepared by an Arizona registered Civil Engineer for approval by the Town Engineer.

For additional information, refer to the Town of Cave Creek General Plan 2005, Section 8, Subsection B, Policies 1 and 2.

Below in *Figures 6.1a* and *6.1b* are examples of what not to do. In these examples a wall has been constructed that either prevents flow from continuing the natural drainage path or the capacity of the opening is inadequate for the flow received and is ultimately redirected around the property.

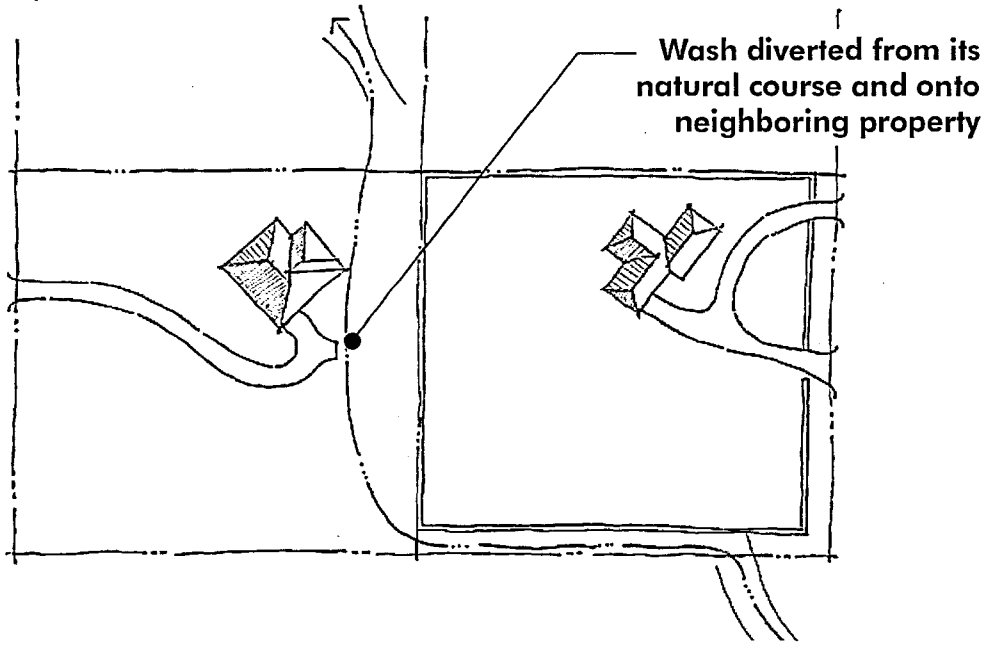


Figure 6.1a: Water is diverted onto a neighboring property after walls are built across wash without having properly sized openings.

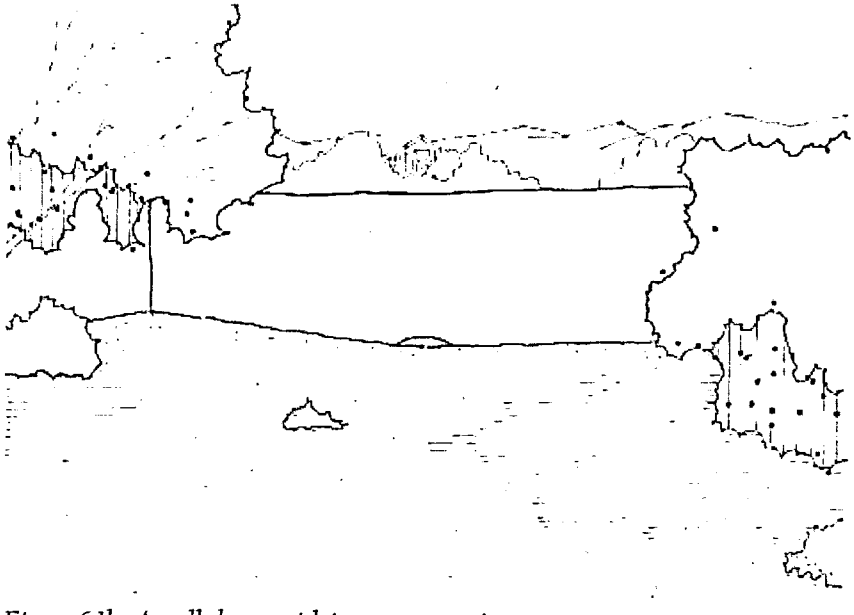


Figure 6.1b: A wall shown with improper openings.

Below in *Figures 6.1c* and *6.1d* is are examples of what to do. In these examples, a wall has been constructed with sufficient capacity to convey the flow along the natural drainage path or walls are not constructed across a wash.

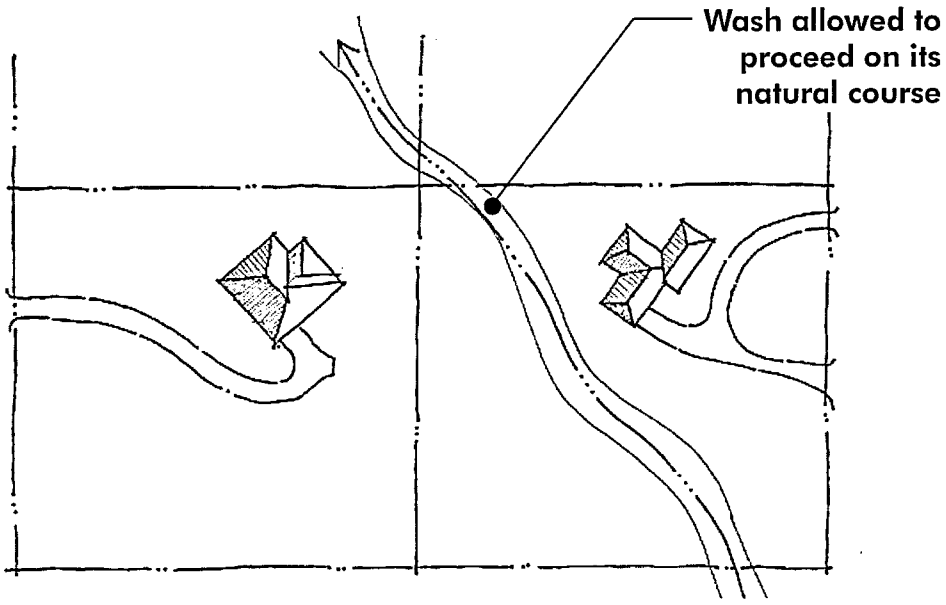


Figure 6.1c.: Water is allowed to proceed along its natural course if there are no obstructions or walls have adequately sized openings.

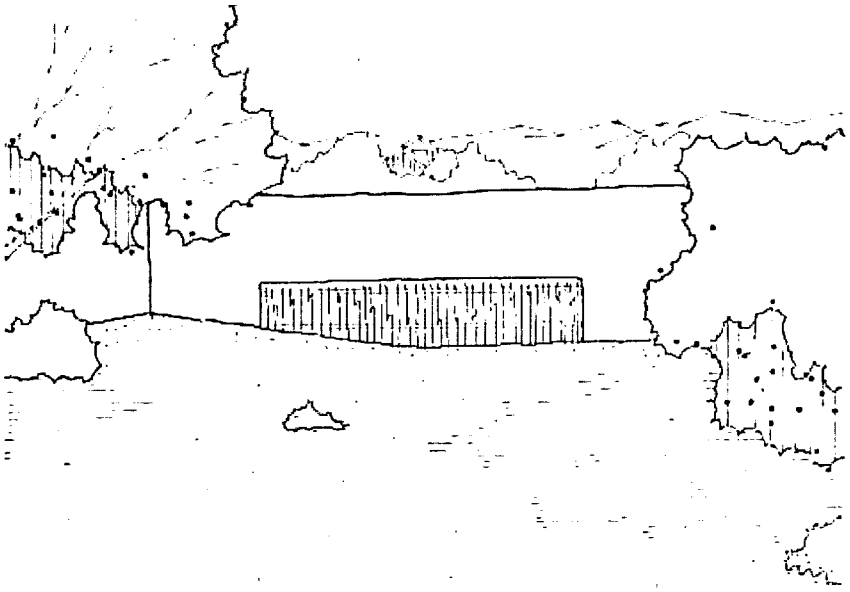


Figure 6.1d: A wall shown with proper openings. Openings shall be sized for proper capacity by an Arizona registered Civil Engineer and approved by the Town Engineer.

CHANNEL RESTORATION

Construction-related disturbances can make it necessary to stabilize and restore channels. Riprap is a common treatment which can be improved both functionally and aesthetically when coupled with vegetation. *Figure 5* on page 15 depicts a wash bank with a revegetated slope over buried riprap. Channel restoration efforts should reflect the undisturbed surrounding area in material and composition. If landscaping materials or channel linings are used, they should be inlaid below the design bottom of the channel so that the finished elevation of the treatment is equal to the design finished grade elevations of the channel.

CONSTRUCTION REQUIREMENTS

Any number of permits or approvals from federal, state, county or local authorities may be necessary depending on the scope and potential impacts associated with an improvement. Prior to the commencement of grading, grubbing or permanent improvement work, all engineering plans are required to have been approved by the Town Engineer. Building permits are required prior to construction of any temporary or permanent structure. All floodplain and erosion setback analyses shall be prepared under the direction of, and sealed by, an Arizona registered Civil Engineer.

FINISHED FLOOR ELEVATIONS

To reduce the risk of structures flooding, minimum finished floor elevations have been established. While the limitations vary, structures occurring both within and outside the Special Flood Hazard Area (SFHA) are subject to these restrictions. Outside of the SFHA, all finished floors must be a minimum of 14 inches above the highest adjacent grade and/or the adjacent ultimate lot outfall. Within the SFHA, the risk of structures being exposed to flood flows is higher and it is required that all finished floor elevations be set at a minimum of 24 inches above the Base Flood Elevation (BFE) identified on the FEMA FIRM panel that covers the project site.

RETENTION FOR SUBDIVISIONS

In order to help keep pollutants out of watercourses and to account for the increased amount of runoff occurring from site development, it is required that all new subdivision developments provide stormwater storage for runoff generated by the 100-year, 2-hour storm event. For subdivisions with lots less than one acre in area, storage shall be located in common tracts of land which may be dedicated to and maintained by the Home Owners Association. Multiple storage basins may be necessary to capture flows from the site. All basins must utilize a maximum ponding water depth of three feet within the storage basin(s).

Once the storm has passed, water must be able to leave the retention/detention area within 36 hours. This is required to minimize nuisances such as odors and insects. Acceptable methods of disposing of water include gravity outfalls through the use of culverts or pipes, natural percolation, drywells and pumps. The method used shall 1) be prepared according to the *Grading*

and Drainage Design Guidelines for the Town of Cave Creek, and 2) be reviewed and approved by the Town Engineer.

Stormwater storage areas shall be attractive in appearance, and replicate the natural desert landscape as closely as possible. This can best be accomplished by contouring sides and bottoms of the basins to enhance appearance through varied and naturally appearing slopes. The use of native materials in the construction of all basins is also encouraged.

SETBACKS FROM MAJOR WASHES

The flow of water through a desert wash can be very swift, strong, and dangerous. In order to protect the health, safety and welfare of the people living within the Town of Cave Creek numerous stormwater management strategies have been developed. Setting structures and improvements away from washes is one component of the Town's comprehensive stormwater management program. Prior to construction along a major wash, the 100-year floodplain should be determined through a SFHA, if not already delineated by either FEMA, FCDMC, or the Town. The Town keeps records of major wash delineations.

If an erosion hazard setback has not already been delineated, then an erosion setback analysis compliant with the Erosion Hazard Setback Guidelines for the Town of Cave Creek shall be performed and delineated by an Arizona registered Civil Engineer for Major Washes subject to disturbance.

In addition to conveying water, washes provide corridors for wildlife movement. For minor washes, development shall be set back a minimum of 20 feet from the top of the

wash bank to allow the animal travel corridors to remain uninterrupted.

FILL IN WASHES

In general, placing fill within a wash is not allowed (see Arizona Revised Statute below). Washes shall not be used to store construction waste, landscaping waste, manure, machinery, etc. In certain instances, fill may be allowed. Fill may be acceptable for the installation of culverts, minor wash crossings, utility installations and embankment restoration for repair of scour and/or erosion damages. However, this is subject to approval and the associated requirements for the Town, the District, U.S. Army Corps of Engineers, and FEMA. Such activities may require a study to be completed for the applicable agencies. In order to determine what may be required for a particular location, contact the Town Engineer.

A.R.S. 48-3615. Violation; classification; civil penalties; strict liability

A. It is unlawful for a person to engage in any development or to divert, retard or obstruct the flow of waters in a watercourse if it creates a hazard to life or property without securing the written authorization required by section 48-3613. Where the watercourse is a delineated floodplain it is unlawful to engage in any development affecting the flow of waters without securing written authorization required by section 48-3613.

AESTHETIC GUIDELINES

Drainage and stormwater storage facilities should present an aesthetically pleasing appearance that replicates the natural desert landscape as closely as possible. This can be accomplished by contouring the bottoms and sides of basins to enhance appearance through varied and naturally appearing slopes. The use of native plants and boulders is also encouraged to achieve a restored natural environment. Boulders used for hillside restoration can be treated with a surface stain for aesthetic color matching if approved by the Town Engineer. When re-establishing disturbed areas, plant densities and varieties should mirror the surrounding, undisturbed areas. Where long stretches of a wash along several properties require stabilization, treatments should be uniform.

MAINTENANCE

All public and private drainage control, flood control, stormwater storage, and erosion control facilities shall be maintained to ensure they function properly to reduce the potential for damage of upstream or downstream facilities. Drainage control features shall be maintained according to the general standards presented in the *Grading and Drainage Design Guidelines for the Town of Cave Creek.*

100-Year (or Base) Flood. A flood event that statistically has a 1 out of 100 (or one percent) chance of being equaled or exceeded on a specific watercourse in any given year. A flood event of this magnitude is often used to determine if flood insurance is either advisable or required on a property.

Acre-foot. The volume of water necessary to cover an acre of land to a depth of one foot. It equals 43,560 cubic feet or 325,851 gallons.

Base Flood Elevation. A base flood elevation (BFE) is the height of the base flood, usually in feet, in relation to the National Geodetic Vertical Datum of 1929, the North American Vertical Datum of 1988, or other datum referenced in the Flood Insurance Study report, or the depth of the base flood, usually in feet, above the ground surface.

CFS. The measuring unit of cubic feet per second (cfs), which is used to quantify the amount of flow in a wash. A cubic foot is equivalent to 7.5 gallons of water. Thus, 1 cfs is 7.5 gallons of water passing by you every second.

Channel. An open conveyance of surface stormwater having a bottom and sides in a linear configuration. Channels can be natural or man-made. Channels may have levees or dikes along their sides to build up their depth. Constructed channels can be plain earth, landscaped, or lined with concrete, stone, or any other hard surface to resist erosion and scour.

Culvert. A hydraulically short conduit which conveys surface water runoff through a roadway embankment or through some other type of flow obstruction.

Delineation. Defining the physical boundaries of a stream, floodplain, jurisdictional wash, etc.

Deposit. Something dropped or left behind by moving water, as sand or mud.

Detention Basin. A basin or reservoir where water is stored for regulating a flood. It has outlets for releasing the flows during the floods

Development. A man-made change to property, such as buildings or other structures, mining, dredging, filling, grading, paving, excavation, or drilling operations.

Discharge. The amount of water that passes a specific point on a watercourse over a given period of time. Rates of discharge are usually measured in cubic feet per second (cfs).

Dry Well. A deep hole, covered and designed to hold drainage water until it seeps into the ground.

Elevation. A water-level expressed in terms of mean sea level. It differs from stage, which is a water-level in terms of some local datum.

Elevation Certificate. The Elevation Certificate is an important administrative tool of the National Flood Insurance Program (NFIP). It is to be used to provide elevation information necessary to ensure compliance with community floodplain management ordinances, to determine the proper insurance premium rate, and to support a request for a Letter of Map Amendment or Revision (LOMA or LOMR-F). Go to www.fema.gov/business/nfip/elvinst.shtm to download the Elevation Certificate Instruction or from FEMA.

Encroachment. The result of placing a building, fence, berm or other structure in a floodplain in a manner that obstructs or increases the depth (or velocity) of flow on a watercourse.

Erosion. The wearing away of land by the flow of water.

FCDMC. Acronym for Flood Control District of Maricopa County.

FEMA (Federal Emergency Management Agency). An independent federal agency established to respond to major emergencies that state and local agencies don't have the resources to handle. FEMA seeks to reduce the loss of life and protect property against all types of hazards through a comprehensive, risk-based emergency management program. Visit the FEMA web site at www.fema.gov.

FIRM. Acronym for Flood Insurance Rate Map.

Flood Insurance Rate Map (FIRM). Issued by FEMA, these maps show special hazard areas, including the 100-year floodplain. They also show flood insurance risk zones and other flood-related information applicable to a community.

Flood Insurance Study (FIS). Hydrologic and Hydraulic studies that identify a flood hazard area, flood insurance risk zones and other flood data such as flood depths and velocities.

Flood/Flooding. A temporary condition caused by the accumulation of runoff from any source, which exceeds the capacity of a natural or man-made drainage system and results in inundation of normally dry land areas.

Floodplain. The area adjoining a watercourse that may be covered by floodwater during a flood.

Grading. Disturbance of existing land contours.

Hydraulics. A field of study dealing with the flow pattern and rate of water movement based on the principles of fluid mechanics.

Hydrology. A field of study concerned with the distribution and circulation of surface water, as well as water dynamics below the ground and in the atmosphere.

LOMA (Letter of Map Amendment). An official amendment of a current Flood Insurance Rate Map (FIRM) accepted by FEMA for a property or a structure. The LOMA verifies that the structure or portions of the property have been removed from a designated floodplain area.

LOMR (Letter of Map Revision). An official revision of a current Flood Insurance Rate Map (FIRM) accepted by FEMA, which reflects changes in mapped areas for flood zones, floodplain areas, floodways and flood elevations.

Major Wash. Any watercourse with an officially delineated Flood Hazard Zone or any wash having a drainage basin of ten (10) acres or larger.

Minor Wash. Any watercourse having a drainage basin of less than ten (10) acres.

National Flood Insurance Program (NFIP). A federal program that allows property owners to purchase insurance protection against losses due to flooding. In order to participate in this program, local communities must agree to implement and enforce measures that reduce future flood risks in special flood hazard areas. Go to www.fema.gov/nfip for additional information.

Precipitation. All forms of water that fall to the earth's surface - including rain, snow, sleet and hail.

Regulatory. Subject to the control of or required to follow rules set forth by a governmental agency. With respect to washes or streams it refers to those areas where the federal government restricts the use or development of areas it has deemed to be "Waters of the U.S." These regulations are part of the Clean Water Act.

Regulatory Flood Elevation. The elevation which is one foot above the base flood elevation for a watercourse. Where a floodway has been delineated, the base flood

elevation is the higher of either the natural or encroached water surface elevation of the 100-year flow.

Regulatory Floodplain. A portion of the geologic floodplain that may be inundated by the base flood where the peak discharge is 100 cubic feet per second (cfs) or greater. Regulatory floodplains also include areas which are subject to sheet flooding, or areas on existing recorded subdivision plats mapped as being floodprone.

Retention Basin. A basin or reservoir where water is stored for regulating a flood. Unlike a detention basin, it does not have outlets for releasing the flows, the water must be disposed by draining into the soil, evaporation, or pumping systems.

Runoff. The portion of precipitation on land that ultimately reaches streams, especially water from rain or melted snow that flows over ground surface.

Sediment. Soil particles, sand, and minerals washed from the land into aquatic systems as a result of natural and human activities.

Sedimentation. A large-scale process where sediment is transported by water and deposited downstream.

Setback. The minimum distance required between a man-made structure and a watercourse. This distance is measured from the top edge of the highest channel bank or the edge of the 100-year flood water surface elevation.

Soil Erosion. The processes by which soil is removed from one place by forces such as wind, water, waves, glaciers, and construction activity and eventually deposited at some new place.

Special Flood Hazard Areas (SFHA). FEMA designates certain types of zones as Special Flood Hazard Areas (SFHA). These are the zones that start with an "A" and, roughly speaking, correspond to the limits of the 100-year

flood for that area. Although the 100-year boundary was chosen as the SFHA limit, property located just outside this boundary is almost equally at risk as one just inside it.

Spillway. An outlet pipe or channel serving to discharge water from a dam, ditch, gutter, or basin.

Storage. The volume of water stored in a basin or behind a dam – usually expressed in acre-feet. It differs from capacity, which is the volume of water stored at the emergency spillway elevation.

Stormwater. Precipitation from rain or snow that accumulates in a natural or man-made watercourse or conveyance system.

Surface Water. Water that flows in streams, rivers, natural lakes, wetlands, and man-made reservoirs.

Watercourse. Any minor or major lake, river, creek, stream, wash, arroyo, channel or other topographic feature on or over which waters flow at least periodically. Watercourse includes specifically designated areas in which substantial flood damage may occur.

Waters of the U.S. All waters which are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce.

Watershed. An area from which water drains into a lake, stream or other body of water. A watershed is also often referred to as a basin, with the basin boundary defined by a high ridge or divide, and with a wash, river or lake located at a lower point.

CONTACT

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