Exterior Building Color & Material Samples (Photo)
Color Drawdowns
Drainage Reports
TIMA
Abbreveated Water & Sewer Need Report
Archaeological Resources
Airport Vicinity Development Checklist
Parking Study
Parking Master Plan
Water Study
Wastewater Study
Stormwater Waiver Application

Approved

KNG

7/12/16

17-ZN-2016
6/17/16

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PRELIMINARY DRAINAGE REPORT
FOR
DESERT MOUNTAIN PARCEL 19

June 16, 2016
WP# 164434

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1.0 INTRODUCTION

1.1 Project Description

Desert Mountain Parcel 19 (DM 19), herein referred to as the "Site," is an approximate 92-acre parcel of land located in north Scottsdale and is proposed to be rezoned to R4 zoning and OS (Open Space). The Site is located in Section 31, Township 6 North, Range 5 East, of the Gila and Salt River Base and Meridian. The Site is currently an undeveloped parcel, bound to the west by Pima Road and the Carefree Fore More Development (located within the Town of Carefree), to the east by the Desert Mountain Club Golf Course, to the north by the Gambel Quail Preserve 2 Development (both located in the City of Scottsdale), and to the south and southeast by the Velvet Shadows 3 Development and two churches (Christ the Lord Lutheran Church and Our Lady of Joy Roman Catholic Church; all within the Town of Carefree). The Site was originally part of the Desert Mountain Master Development Plan. Exhibit 1 – *Vicinity Map* shows the general location of the project and surrounding areas.

1.2 Type of Report

This Report is being prepared as a Preliminary Drainage Report for the DM 19 rezoning submittal to the City of Scottsdale. At this time, only preliminary grading, roadways and a general land use plan has been completed for the Site.

1.3 Purpose

The Preliminary Drainage Report for DM 19 has been prepared to meet the drainage design requirements outlined in Chapter 4 of the *City of Scottsdale Design Standards and Policies Manual* (*DS&PM*), the *Flood Control District of Maricopa County* (FCDMC), *Drainage Design Manual for Maricopa County, Arizona: Volume I – Hydrology*, and the *Flood Control District of Maricopa County*, *Drainage Design Manual for Maricopa County, Arizona: Volume II – Hydraulics*. This report presents the results of the hydrological and hydraulic modeling of the Site's proposed preliminary drainage systems.

The main purpose of this Report is to illustrate the following:

- Compliance with the City of Scottsdale's Floodplain Ordinance stormwater storage requirements for the property subject to the Environmentally Sensitive Land Ordinance (ESLO). The Site will provide the first flush stormwater storage for the first 0.5-inch of runoff and/or first flush treatment for the property's improved areas. A Request for a Stormwater Storage Waiver is anticipated to be submitted to the City of Scottsdale.

- Reduction of post-development flows to at or below the pre-development flows for 2-year, 10-year, and 100-year, 6-hour storm events using the *U.S. Army Corps of Engineers, HEC-1, Flood Hydrograph Package*. Hence, it is anticipated that the downstream properties shall be provided with similar or potentially better flood protection than the pre-development conditions.

- Maintaining the two main water courses traversing through the Site in their natural locations (the Galloway Wash and Wash A).

- Delineation of the 100-year water surface inundation extents, along with determination of the 100-year water surface elevations for the two main drainage courses using the *U.S. Army Corps of Engineers, HEC-RAS* (Version 4.1.0).

- Delineation of the 100-year water surface inundation extents for all washes determined to have peak flows equal to or greater than 50 cfs using hydraulic analysis software such as AutoCad Civil 3D *Hydroflow* (Version 10.5).

- Hydraulic analyses of preliminary drainage structures and wash conveyance corridors.

2.0 EXISTING ON-SITE DRAINAGE CONDITIONS AND CHARACTERISTICS

2.1 On-Site Drainage

The Site lies in the northern planning section of the City of Scottsdale. The elevations range from 2,612 in the middle of the Site, to 2,650 feet in the east and 2,587 feet in the west. Based on the existing topography, the Site drains primarily from east to west with an approximate average slope of 2%. There are two primary outflow concentration points, one located at the northwest corner and one at the center of the western property boundary. There are several additional minor outflow concentration points along the southern and western property boundary.

Vegetation is typical Sonoran Desert type with creosote bush, jumping cholla, saguaro cacti, palo verde, ironwood, and mesquite trees. The Site lies within the areas identified as Environmentally Sensitive Lands (ESL) by the City of Scottsdale. The Site is further classified as 'Upper Desert' within the ESL areas as shown on Exhibit 2 – *ESL Classification Map.*

The USDA Natural Resources Conservation Service (NRCS), formerly known as the Soil Conservation Service (SCS), provides soils data for all of Maricopa County. This data is reproduced on Exhibit 4 – *Soils Classification Map*. Soils data is the basis of the rainfall loss parameters, as discussed in Section 5.2.3.

There is one wash, the Galloway Wash, that traverses the Site and is categorized as a 'Vista Corridor' or 'Major Wash', as the calculated 100-year, 6-hour flow is greater than 750 cfs. There is also one other significant watercourse traversing the Site that has a 100-year, 6-hour flow greater than 400 cfs and is referred to as "Wash A". The Galloway Wash and Wash A are identified on Exhibit 9 – *Existing Conditions Hydraulics Map.* Wash A was determined to have a 100-year flow of approximately 470 cfs. Both washes will be maintained in their natural locations and will not be re-aligned.

2.2 Existing On-Site Drainage Network

Existing on-site drainage sub-basin boundaries were identified using aerial mapped 1-foot contours; refer to Exhibit 7 – *Existing Conditions Sub-Basin HEC-1 Map.*

The on-site watersheds primarily drain east to west or southwest with only one wash exiting the property along the southern boundary with a 100-year peak flow greater than 50 cfs. This wash appears to enter the Velvet Shadows 3 Development and continues west combining with some additional runoff from the Site before flowing through the Our Lady of Joy Roman Catholic Parish Carefree church parking lot and ultimately over Pima Road by an at-grade drainage crossing. The flow exiting the Site has an estimated existing 100-year peak flow of 65 cfs.

Based on the results of the wash hydraulic analysis, a delineation of this wash's existing condition 100-year, 6-hour floodplain limits has been illustrated on Exhibit 9 – *Existing Conditions Hydraulic Map.* Pre-development sub-critical flow water surface elevations for each cross-section are included on Exhibit 9. The hydrologic and hydraulic analysis procedures are discussed in Section 5.0. It is anticipated that this wash will be modified and an Application for Wash Modification will be submitted to the City of Scottsdale.

2.3 Off-Site Watersheds

The off-site drainage areas impacting the Site lay to the east and are in the northern planning section of the City of Scottsdale. The off-site watersheds contain primarily large rural lot single family residential subdivisions and are part of the Desert Mountain Master Development Plan community. These drainage areas are identified on Exhibit 7. The off-site areas are also classified as 'Upper Desert' ESL landform areas by the City of Scottsdale.

2.4 Existing Off-Site Drainage Network

The *Floodplain Delineation Study of Andora Hills & Galloway Washes Technical Data Notebook* (TDN), the *Master Drainage Report for Desert Mountain Parcel C* Offsite Drainage Map, the *Master Drainage Report for Desert Mountain Development* Master Development Plan exhibit and the City of Scottsdale 2-foot contour interval topographic Quarter Section Maps were used to identify and confirm the off-site drainage areas impacting the Site. Refer to Exhibit 7 for the limits of the drainage areas and concentration points.

Off-site flows from the east enter the Site's eastern property boundary at five locations. Four of the concentration points are washes with 100-year peak discharges greater than

50 cfs and one location has a discharge of only 3 cfs. Starting at the northeast property boundary and continuing south, the washes' approximate 100-year peak flows were determined to be: Wash A's flow is 468 cfs, two unnamed washes' flows are 72 cfs and 111 cfs, and the Galloway Wash is 1,111 cfs.

Based on the results of the HEC-RAS and hydraulic wash analyses, a delineation of the existing condition 100-year, 6-hour floodplain limits for the Galloway Wash, Wash A and the two unnamed washes have been illustrated on Exhibit 9 – *Exist Condition Hydraulics Map.* Pre-development subcritical flow water surface elevations for each cross-section are included on Exhibit 9. The hydrologic and hydraulic analysis procedures are discussed in Section 5.0.

2.5 Existing Drainage Relative to Adjacent Projects

Existing washes exit the Site as concentrated flows at various locations along the western and southern property boundary. As Wash A exits the Site it immediately combines with additional flow from the north and is conveyed over Pima Road by an at-grade drainage crossing. The Galloway Wash also is conveyed over Pima Road by an at-grade drainage crossing and the preliminary hydraulic results determined that the depth of flow over Pima Road is greater than one foot. As detailed within the *Floodplain Delineation Study of Andora Hills & Galloway Washes* TDN, when the flow leaves Pima Road it splits around the existing single-family residence before recombining downstream and continuing to the west.

There are an additional six concentrated flow exit locations along the western property boundary and three concentrated flow exit locations along the southern property boundary. These 100-year peak flows vary from a maximum discharge of 67 cfs to only 4 cfs. Refer to Exhibit 7 for the exiting concentration point locations.

There is also a small piece of the Site that is not within the City of Scottsdale and is located at the southeast corner of the property. This portion of the Site is located within the Town of Carefree and also has two existing concentration points that exit the Site to the west.

2.6 FEMA Regulated Flood Zones

The Site is located within the Flood Insurance Rate Map (FIRM) for Maricopa County, Arizona and Incorporated Areas, Panel Number 04013C0884L, effective date October 16, 2013. The FIRM, published by the Federal Emergency Management Agency (FEMA), indicates that the Site is located within Special Flood Hazard Areas (SFHAs) Zone AE, Other Flood Areas Zone "X" (Shaded) and Other Areas Zone "X".

Zone "X" is defined by FEMA as follows:

> *"Areas determined to be outside 500-year floodplain."*

Zone "X (Shaded)" is defined by FEMA as follows:

> *"Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance floods."*

Special Flood Hazard Areas (SFHAs) Subject To Inundation By the 1% Annual Chance Flood is defined as follows:

> *"The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Aras is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.*

Zone "AE" is defined as: *"Base Flood Elevations determined"*.

The approximate location of the Site relative to the FEMA FIRM panel is illustrated on Exhibit 3- *Flood Insurance Rate Map (FIRM)*.

The proposed Site's development will not alter the effective FEMA SFHA floodplain and/or floodway and will not change the effective FEMA SFHA base flood elevations. This will be documented in more detail as the Site progresses into the pre-plat phase of development.

3.0 PROPOSED DRAINAGE PLAN

3.1 General Description of Proposed Drainage System

The Site is being rezoned to approximately 44-acres of R4 zoning and approximately 48-acres of Open Space zoning. Preliminary site grading is shown on Exhibit 11 – *Preliminary Grading Plan*. The proposed drainage system is being designed to allow existing drainage patterns to be maintained in their natural location and condition where possible. Where the proposed development will disturb existing washes with 100-year peak discharges equal to or greater than 50 cfs, the washes will be modified to re-direct flow around and/or through the development to maintain historical flow patterns.

The off-site flow of the Galloway Wash will be conveyed through the Site with as little disturbance to the natural wash corridor as possible. The Galloway Wash will have two proposed 3-barrel, 10-foot wide by 4-foot high box culvert roadway drainage crossings to pass the 100-year discharge under the streets. One crossing is located near the eastern property boundary and one crossing is located within the middle of the Site. There is no anticipated disturbance to the Galloway Wash natural wash bottom between these proposed drainage crossings. Downstream of the middle box culvert roadway crossing to approximately 200-feet upstream of the western property boundary, the Galloway Wash will have a relatively small pilot channel (20-foot wide by 1-foot deep) to offset some potential open space encroachment grading proposed within the existing FEMA SHFA. Any grading proposed within the existing FEMA 100-year floodplain will require an FCDMC floodplain use permit.

The off-site flow of Wash A will be conveyed through the Site. The post-development design is not anticipated to disturb the existing natural wash corridor. In addition, any post-development adjacent to the wash is being designed to drain away from Wash A. Therefore, there is no foreseen modification to the wash and/or change to the existing 100-year peak flow of Wash A due to development.

3.2 Future Conditions

Currently, the upstream off-site watersheds located within Desert Mountain have been fully developed. The Desert Mountain development land uses were obtained from the

Floodplain Delineation Study of Andora Hills & Galloway Washes TDN and were duplicated in the HEC-1 hydrologic models.

The drainage plan for the Site proposes to maintain the 2-year, 10-year, and 100-year, 6-hour storm event post-development peak discharges at or below the pre-development flows. In addition, the two significant drainage courses, Wash A and the Galloway Wash, will be maintained in their historic locations at the property boundary. No adverse impact is anticipated on the adjacent properties downstream of the project Site for the 2-year, 10-year, and 100-year, 6-hour storm events.

3.3 Stormwater Storage Requirements

According to the City of Scottsdale's Floodplain Ordinance for property located within the ESL, all runoff generated from the developed portion of the Site must be managed, and the peak discharges from the Site reduced to at least pre-development values during the 100-year, 10-year and 2-year storm frequencies. Proposed retention and/or detention basins will be strategically located along several exiting flow locations and along the Galloway Wash which will attenuate the post-development peak discharges to at or below the pre-development values. Stormwater storage basins will also be designed to intercept flow from upstream proposed developed areas to retain the post-development required first flush retention volume and/or flow will be treated prior to exiting into the adjacent washes. 18-inch bleed-off pipes with removable 6-inch orifice plates are proposed for the dissipation of the retained storm water.

Table 3.3 below summarizes the required first flush stormwater storage for the Site and Exhibit 8 and Exhibit 11 detail the on-site drainage areas and preliminary first flush basin locations, respectively.

Table 3.3
Required First Flush Stormwater Storage

Drainage Area	Area (SF)	Area (ac)	Weighted Runoff Coefficient	First Flush Volume (ac-ft)	Required Pre vs Post Volume (ac-ft)
B5	165024	3.79	1.00	0.16	0.42
B6	239591	5.50	1.00	0.23	N/A
B8	300366	6.90	1.00	0.29	N/A
B9	217378	4.99	1.00	0.21	N/A
B10	335363	7.70	1.00	0.32	N/A
B11	269364	6.18	1.00	0.26	N/A
B13	80916	1.86	1.00	0.08	N/A
B14	1072718	24.63	1.00	1.03	N/A
B14A	115650	2.65	1.00	0.11	N/A
C1	636403	14.61	1.00	0.61	N/A

3.4 Pre- and Post-Runoff Characteristics

The U.S. Army Corps of Engineers' HEC-1 computer analysis program was used for hydrologic modeling, including routing of flow through storage basins and combining hydrographs. The HEC-1 model was also used to compare the pre- and post-development runoff at concentration points exiting the property. Runoff for each drainage sub-basin was computed and if required, hydrographs were then combined. Drainage basins were further divided into sub-basins to simulate the developed conditions. The parameters were selected per the guidelines provided in the *DS&PM*. The parameters selected and the inputs for the HEC-1 models are discussed in Section 5.1.

The HEC-1 input data and output files for the existing conditions are included in Appendix A. The developed conditions data is included in Appendix B. The data analysis procedures are discussed in Section 5.0.

Table 3.4-1 below provides the comparative peak flows for the pre- vs. post-developed conditions for 100-year, 10-year, and 2-year, 6-hour events at concentration point where flow leaves the property. For the location of these concentration points and corresponding 100-year, 6-hour flow values, refer to Exhibit 7 and Exhibit 8.

Table 3.4-1
Pre – vs. Post-Peak Flow Analysis

HEC-1 ID PRE/POST	100-yr, 6-hr Existing Condition Peak Flow (cfs)	100-yr, 6-hr Post-Dev. Condition Peak Flow (cfs)	100-yr, 6-hr Difference in Peak Flow (cfs)	10-yr, 6-hr Existing Condition Peak Flow (cfs)	10-yr, 6-hr Post-Dev. Condition Peak Flow (cfs)	10-yr, 6-hr Difference in Peak Flow (cfs)	2-yr, 6-hr Existing Condition Peak Flow (cfs)	2-yr, 6-hr Post-Dev. Condition Peak Flow (cfs)	2-yr, 6-hr Difference in Peak Flow (cfs)
CP-A2/CP-A2	469	467	2	261	260	1	128	128	0
B1/DVB11	35	30	5	19	15	4	8	0	8
C1/DTC11	26	5	21	14	5	9	6	5	1
CP-E5/CPGAL	1124	1025	99	549	527	22	230	222	8
F1/DTGF	4	3	1	2	1	1	1	1	0
G1/DTC-H	23	15	8	13	8	5	6	0	6
H1/DV-B5	17	17	0	10	0	10	5	0	5
I1	20			11			5		
J1	10			6			3		
K1	65			36	29		17		
I1,J1,K1/DTC-K	95	50	45	53	18	35	25	1	24
L1	10	10	0	6	6	0	3	3	0
M1	3	3	0	2	2	0	1	1	0

3.5 Proposed Drainage Structures

3.5.1 On-site First Flush Storage Basins

On-site first flush storage basins will be used to capture the first 0.5-inch of runoff from the post-development disturbed areas. The design of the basins will be at a maximum depth of 3-feet and have 4:1 side slopes. 18-inch bleed-off pipes with 6-inch orifice plates will be used to drain the stormwater storage within a 36-hour period. Outlet weirs will be incorporated into the basin design for overflow conveyance. When the capacity of the basin is reached, the runoff will overtop the weir and be released at historic flow locations. Erosion protection will be incorporated within the design of the outlets.

3.5.2 Off-Site & On-Site Galloway Wash Detention Basins

As detailed on Exhibit 8, there are two off-site off-line detention basins (Basin 3 and Basin 4) and one on-site off-line detention basin (Basin 1) proposed along the Galloway Wash. The two off-site off-line detention basins will require improved wash channel sections and erosion protected weir inlets to remove a portion of the 100-year peak flow from the wash. The runoff will enter the detention basin and pond a maximum depth of 4-feet during the 100-year event and have a minimum of an 18-inch outflow pipe that will drain the basin within a few hours. The proposed detention basins will have storage volume capacities of approximately 2.0 acre-feet (Basin 3) and 1.4 acre-feet (Basin 4). Contractual agreements are being prepared with the upstream land owners to allow for the construction and maintenance of these off-line detention basins.

One on-site off-line detention basin will be located downstream of the Galloway Wash middle box culvert crossing and will receive flow from an 18-inch pipe located upstream of the roadway crossing. This detention basin will collect some of the low-flow stormwater runoff to reduce the 2-year and 10-year peak flow of the Galloway Wash. There will be a weir outlet from the detention basin that will drain excess flow back into the Galloway Wash. The proposed detention basin will have approximately 1.1 acre-feet of storage volume at a maximum ponding depth of 4-feet during the 100-year runoff event. The bottom 1-foot will be used for on-site first flush storage. The basin will have an 18-inch outflow pipe with a 6-inch orifice plate that will also drain back into the Galloway Wash. It is anticipated that the basin will drain within a few hours.

The three off-line detention basins were included in the post-development HEC-1 model. The hydrology results can be found within Appendix B.

In several critical locations along the wash, bank protection is necessary to protect proposed off-line detention basins. The bank protection is planned to be aesthetically pleasing and may be either integrally colored soil cement and/or reinforced gunnite/concrete, seated grouted rock riprap and/or gabion baskets/mattresses. Bank protection will be designed to extend to a maximum calculated scour depth of 4-5 feet below the wash bottom. Refer to Exhibit 10 for bank protection locations and Appendix E for scour depth calculations.

3.5.3 Roadway Crossing Structures

There are currently two proposed on-site roadway drainage crossing structures that have been designed to convey the anticipated post-development 100-year flow of the Galloway Wash. The flows were calculated at the box culvert locations using the results of the post-development HEC-1 model analysis. Refer to Appendix B for the flow calculations.

Both crossing locations will be designed with a 3-barrel, 10-foot wide by 4-foot high box culvert roadway drainage crossing. The roadway crossings were analyzed within the wash's hydraulic analysis using the U.S. Army Corps of Engineers *HEC-RAS (Version 4.1.0),* such that the estimated upstream 100-year peak flow is contained within the wash and no overtopping of the roadway is anticipated. The box culverts will be designed with drop inlets and a longitudinal slope such that sediment deposition is not anticipated within the culverts.

Riprap and/or erosion protection will be designed at the inlets and outlets of the box culverts to control velocities and prevent erosion. In several critical locations along the wash, bank protection is necessary to protect the proposed roadway improvements. The bank protection shall extend to a maximum calculated scour depth of 4-5 feet below the wash bottom. Refer to Exhibit 10 for bank protection locations and Appendix E for scour depth calculations.

Although the land use is still in a preliminary stage, there are additional locations within the Site that are anticipated to require culverts to pass the flow under roadways and/or to convey flow from the eastern property boundary to the Galloway Wash. These culverts will be designed using AutoCad Civil 3D *Hydroflow* (Version 10.5), Bentley's *CulvertMaster*® *v3.1*, Copyright© 1995-2007, and/or the Federal Highway Administration HY-8 v7.3, 2013 program to determine the pipe sizes, headwater elevations and pipe velocities.

3.5.4 On-site Roadway Drainage Structures

3.5.4.1 Street Flow

The Rational Method will be used to calculate the storm water runoff generated from the roadways and any on-site adjacent developments that drain into the residential roadways. The 100-year and 10-year flow will be calculated for the street flow based on the FCDMC Rational Method, as discussed in Section 5.1.3.

3.5.4.2 Street Capacity Hydraulics

There are no anticipated arterial, major and/or minor collector roadways proposed within the development. For all local interior streets, the street conveyance capacity will be calculated using Manning's Equation. The streets will be designed such that the 10-year peak flow is contained within the street curbs and the 100-year peak flow does not exceed a maximum depth of 8-inches. A Manning's "n" value of 0.015 will be used for the standard street cross-section. Roadway capacities will be calculated based on 4-inch and/or 6-inch roll curb (where necessary). The drainage for local residential roadways will be designed consistent with the City of Scottsdale Ordinance 37-42(4) for the allowable depth of water on the street when the street is being utilized as a water carrier. The methodology developed by the Federal Highway Administration will be used to calculate, in spreadsheet format, the allowable street cross-section capacities.

3.5.4.3 Curb Openings

Catch basins, scuppers and/or depressed curb openings will be designed to convey runoff from the streets such that street flow depths do not exceed 8-inches for the 100-year flow, and the 10-year flow is contained within the curbs. On-site storm water runoff generated by the residential roadways is planned to exit the street via on-grade and/or low point sump curb openings. Flow will then be directed within storm drain, roadside drainage swales and/or along natural grade to the closest receiving wash, retention basin, and/or culvert inlet. All scupper and catch basin curb openings will be designed to include a 0.80 reduction factor.

4.0 SPECIAL CONDITIONS

4.1 Section 404 Washes

To the best of our knowledge, the US Army Corps of Engineers (Corps) Section 404 of the Clean Water Act (CWA) Jurisdictional Waters of the United States has not yet been determined within the Site. Potential CWA Section 404 Jurisdictional Washes are under investigation and an approved jurisdictional determination submittal inclusive of a significant nexus analysis is being prepared for the Site by Del Sol Group to identify if any of the washes may be deemed jurisdictional. It is understood that an approved jurisdictional delineation of the Waters of the United States is required for the Site.

5.2 Parameter Estimation

The physical parameters of the sub-basins modeled by HEC-1 were estimated by the procedures in the *FCDMC Hydrology Manual*. The information and procedures used to estimate the aforementioned parameters are contained in the following sections. Parameter values are summarized for each sub-basin within the *FCDMC Drainage Design Management System for Windows* (DDMSW) software output located in Appendices A and Appendix B, for the existing and proposed conditions, respectively.

5.2.1 Drainage Area

For the existing conditions, the sub-basin drainage areas were determined for use in the HEC-1 model and are shown on Exhibit 7. For the proposed condition, the sub-basin drainage areas were determined for use in the HEC-1 model and are shown on Exhibit 8.

5.2.2 Precipitation

Due to the approximate one square mile size of the largest contributing watershed of the Galloway Wash, the 100-year, 6-hour storm frequency was used for the hydrology analysis. Rainfall distributions based on watershed area are furnished by the FCDMC. The contributing watershed area and corresponding precipitation pattern were determined and input into the HEC-1 model using the JD and PC record option.

Point precipitation values used in this study were derived from the isopluvial maps in the *FCDMC Hydrology Manual* which, in turn, were derived from the *NOAA Atlas XIV, Volume III.* The 100-year, 6-hour point rainfall depth used for the Site is 3.31 inches.

5.2.3 Soil Data

A description of the soils in the watershed is contained within the *NRCS Soil Survey of Aguila-Carefree Area, Parts of Maricopa and Pinal Counties, Arizona.* Based on the NRCS surveys, the Site's watersheds lie mainly within several soil map units: Unit 93, 96, 34 and for the Galloway Wash Unit 6, with the upstream watersheds consisting of primarily Unit 33. According to the soil survey, the soil

5.0 DATA ANALYSIS METHODS

5.1 Hydrologic Method Description

This section documents the engineering procedures and methodologies used to generate the existing and developed condition hydrologic models for the Site. The results of the hydrologic models were used in the conceptual design of drainage facilities and to assure compliance with current drainage design standards.

Precipitation was input by use of the FCDMC 6-hour local storm. Key rainfall statistics were obtained from the *NOAA Atlas 14*, Arizona. The FCDMC DDMSW program was used to develop the necessary point rainfall depth-duration-frequency statistics. Table 5.1 below provides a summary of the point rainfall depth-duration-frequency data. Rainfall losses were calculated by use of the Green and Ampt infiltration equation with an allowance for surface retention loss. Synthetic unit hydrographs for each sub-basin were developed using the Phoenix Desert/Rangeland unit hydrograph as was used within the approved *Floodplain Delineation Study of Andora Hills & Galloway Washes* TDN. Existing and proposed discharges for the 100-year, 10-year and 2-year, 6-hour storm events were modeled using HEC-1 at various concentration points as shown on Exhibit 7 and Exhibit 8, respectively. The HEC-1 results are provided within Appendix A and Appendix B for the existing and proposed condition watersheds, respectively.

Table 5.1
Point Rainfall Depth-Duration-Frequency Data

Frequency→	2-year	5-year	10-year	25-year	50-year	100-year
Duration↓	**Rainfall (in)**					
5 min	0.33	0.44	0.53	0.64	0.73	0.82
10 min	0.50	0.67	0.80	0.98	1.11	1.24
15 min	0.62	0.83	1.00	1.21	1.37	1.54
30 min	0.83	1.12	1.34	1.63	1.85	2.07
1 hour	1.03	1.39	1.66	2.02	2.29	2.56
2 hour	1.19	1.57	1.87	2.27	2.58	2.90
3 hour	1.26	1.64	1.94	2.36	2.70	3.04
6 hour	1.48	1.87	2.18	2.62	2.96	3.31
12 hour	1.78	2.23	2.59	3.08	3.45	3.84
24 hour	2.08	2.73	3.27	4.02	4.65	5.32

surface is primarily gravely clay and sandy loam. Exhibit 4 – *Soils Classification Map* depicts the contributing watersheds and soil designations.

5.2.4 Rainfall Losses

Rainfall losses were estimated using the Green and Ampt infiltration equation. The procedures used are described in the following paragraphs and were utilized for both existing and proposed condition HEC-1 modeling.

The composite (unadjusted) XKSAT parameter was calculated in the *FCDMC DDMSW* program using the log-average method for each sub-basin. This was accomplished by multiplying the total area of each soil map unit in the sub-basin by the common logarithm of the associated XKSAT value. The resultant products were then totaled and the sum was divided by the total area of the sub-basin. The result is the composite log-average bare ground XKSAT parameter. The log-average XKSAT parameter was then adjusted for the effects of vegetation cover using data from Figure 4.4 of the *FCDMC Hydrology Manual.* The volumetric soil moisture deficit at the start of rainfall (DTHETA) and wetting front capillary suction (PSIF) parameters are directly related to the composite bare ground hydraulic conductivity (XKSAT) by Figure 4.3 in the *FCDMC Hydrology Manual*.

The DTHETA parameters were read from lookup tables within the DDMSW program using the unadjusted XKSAT value calculated as described above. Two (2) DTHETA conditions are possible, dry and normal. The "dry" condition was used for all areas in the existing condition model for undeveloped desert areas. The "normal" condition was used for all other land uses occurring within the project watershed for the proposed condition model. DTHETA values were read from the lookup tables corresponding to the unadjusted XKSAT value, and were averaged by land use area-weighting within the DDMSW program. The value of PSIF was also read from lookup tables based on the unadjusted XKSAT value.

Initial abstraction (IA) and percent impervious (RTIMP) values correlate to soil types and land use. The following section further discusses the hydrologic significance of the IA and RTIMP parameters.

5.2.5 Land Use Characteristics

Land use characteristics upstream of the study area were obtained from the *Floodplain Delineation Study of Andora Hills & Galloway Washes* TDN and were verified from aerial photographs. Surface characteristics affecting the hydrology include terrain (land use classification), the proportion of impervious surfaces, and vegetative cover density. *DDMSW* values for initial abstraction (IA), percent impervious (RTIMP) were obtained from the FCDMC Hydrology Manual. The *Floodplain Delineation Study of Andora Hills & Galloway Washes* TDN was used to estimate the hydraulic efficiency (Kn) for the *Rural Density Residential* land use parameters. Assigned values for all parameters are shown in Appendices A and Appendix B for existing and proposed land use conditions, respectively.

5.2.6 Unit Hydrographs

To be consistent with the approved *Floodplain Delineation Study of Andora Hills & Galloway Washes* TDN, the *FCDMC Hydrology Manual* Phoenix Desert/ Rangeland unit hydrograph was used for watersheds upstream of the project Site and for the undeveloped on-site areas. The Phoenix Valley S-graph unit hydrograph was used for the post-development on-site conditions. Separate unit hydrographs are generated for each sub-basin by the use of the DDMSW program. This program calculates the basin lag time. Assigned values for all parameters are shown within the printouts of the FCDMC DDMSW located within Appendix A and Appendix B for the existing and proposed conditions, respectively.

5.2.7 Computation Time Interval

The computation time interval (NMIN) used in the HEC-1 models was based on guidelines in the *FCDMC Hydrology Manual,* which recommends an NMIN value of 0.15 *Tc. Due to the small post-development on-site watershed areas, a minimum NMIN value of 1 minute was used and a 15-minute hydrograph time interval was used for the entire study area. For comparison purposes, a 1-minute NMIN value and a 15-minute hydrograph time interval was also used for the existing condition model.

5.2.8 Routing Parameters

Routing of sub-basin hydrographs in the study area will be performed utilizing the normal depth/storage channel routing option of HEC-1.

5.2 Rational Method

The Rational Method will be used to compute peak discharges to size on-site culverts with watersheds less than or equal to 160 acres. Parameters necessary for this procedure are the measurement of drainage sub-basin areas, runoff coefficient ("C" values), and calculation of rainfall intensity. Runoff coefficients will be calculated using the values based on Figure 4-5 "Runoff Coefficients for Use with Rational Method" in the *DS&PM*.

5.3 Storm Water Storage

Based on the City of Scottsdale's Drainage Ordinance stormwater storage requirements, on-site first flush storm water storage is proposed to be provided for the first 0.5-inch of runoff. The Rational Method is used to estimate the first flush stormwater storage volumes. The required volume is based on the areas of the proposed disturbances within the development. The equations used to calculate the required and provided retention volumes are presented below.

5.3.1 Required Retention Volume

Retention volume required for the 100-year, 2-hour event is:

$$V_{REQUIRED} = C * \left(\frac{P}{12}\right) * A$$

Where:

- V is the required retention volume in acre-feet.
- C is the weighted "C" coefficient.
- P is the precipitation in inches for the 100-year, 2-hour rainfall; 2.70- inches for the proposed developed areas.
- A is the drainage area in acres.

5.3.2 Provided Retention Volume

Retention volume provided for the 100-year, 2-hour event is:

$$V_{PROVIDED} = \left[\left(\frac{A_1 + A_2}{2}\right) * (ELEV_2 - ELEV_1)\right]$$

Where:

- V is the provided retention volume in acre-feet.
- A is the contour area in acres.
- ELEV is the contour elevation.

Section 3.3 of this Report describes the preliminary storm water storage proposed basin locations. Assumptions that were made when determining provided volume were maximum side slopes of 4:1. Refer to stormwater storage basin volume calculations in Appendix C.

5.4 Hydraulic Procedures

5.4.1 Hydraulic Analysis of Open Channels

Due to the fact that the Galloway Wash and Wash A have significant 100-year peak flows, the U.S. Army Corps of Engineers' HEC-RAS computer program was used for the hydraulic analysis of both washes. Washes that were determined to be less than a 100-year peak flow of 150 cfs will use hydraulic analysis software such as AutoCad Civil 3D *Hydroflow* (Version 10.5) to determine their existing wash hydraulic conditions.

5.4.2 HEC-RAS Errors, Warnings, and Notes

The HEC-RAS cross sections were placed such that significant variations in the channel cross-sectional geometry are adequately represented. Due to the relatively steep slopes on the Site, it was not feasible to put enough cross-sections such that the difference in energy grade elevations is less than 1-foot between cross sections. The HEC-RAS computer program gives a warning message for a difference in energy grade elevation of greater than 1-foot between cross sections. Hence, a wash was analyzed at an elevation difference of 1-foot to demonstrate the impact of additional cross sections on the HEC-RAS analysis. It was found that increasing the number of cross-sections did not impact the flow depths, as long as adequate cross-sections representative of the geometry of the channel are included.

HEC-RAS gives multiple warning messages when the energy equation could not be balanced, resulting in the program using the critical depth for the water surface elevation. This is due to the fact that a sub-critical flow regime was selected for the steady flow computations on a site that is relatively steep. The on-site washes are flowing super-critical, but a sub-critical flow regime was chosen because it results in the highest water surface elevations.

Since the proposed culverts generally follow the same slope as the washes, the flow in the culverts is also flowing super-critical, as noted by HEC-RAS with a note for each culvert within the model. These warnings and notes are expected when running sub-critical flow regimes for a steady flow analysis on steep sites.

HEC-RAS gives a warning message when the upstream conveyance ratio divided by the downstream conveyance ratio is less than 0.7 or greater than 1.4. Again, this is a result of the steep slopes on the Site, and it was not feasible to put enough cross-sections such that the difference in the conveyance ratio is less than 0.7 or greater than 1.4.

There are a number of warning messages generated by the HEC-RAS computer program for the hydraulic analysis of the project. These warnings do not affect the accuracy of the results and are intended to alert the user of any conditions outside of the expected norm. These warning messages, and notes for both the Developed Conditions and the Existing Conditions models were ignored, and the model was determined to be acceptable.

5.4.3 Hydraulic Analysis of Culverts

For analysis of anticipated additional culvert roadway crossings, the computer programs AutoCad Civil 3D *Hydroflow* (Version 10.5), CulvertMaster and/or HY-8 will be used for final design. Site characteristics and flow are entered into the program and the resulting pipe sizes, flow regime, headwater and tailwater values are calculated.

6.0 DRAINAGE PLAN REQUIREMENTS

6.1 Drainage System Requirements

The Site is being rezoned to approximately 44-acres of R4 zoning and approximately 48-acres of Open Space (OS) zoning. There are specific drainage system requirements in order for the proposed drainage design to be approved for the Site by the City of Scottsdale and are as follows:

1. According to the City of Scottsdale's Floodplain Ordinance for property located within the ESL, storm water storage may be waived under certain conditions and peak discharges from the Site reduced to at least pre-development values during the 100-year, 10-year and 2-year storm frequencies. The development must obtain a Stormwater Storage Waiver from the City of Scottsdale. In addition to the Stormwater Storage Waiver, the Site must either provide first-flush treatment and/or first-flush stormwater storage for the first 0.5-inch of runoff from the property's developed areas.

2. The proposed drainage system is being designed to allow existing drainage patterns to be maintained in their natural condition and location where possible. When the proposed development will disturb existing washes with peak 100-year discharges of 50 cfs or more, the washes will be modified to re-direct flow around and/or through the development to maintain historical flow patterns. The development must obtain a Wash Modification approval from the City of Scottsdale.

3. Any proposed development encroachment into the FEMA FIRM SFHAs must obtain an FCDMC Floodplain Use Permit.

4. The determination of the CWA Section 404 Jurisdictional Washes for the Site must be approved by the U.S. Army Corps.

5. Before any construction activities that will disturb one or more acres begin, these activities must be authorized by ADEQ under the Arizona Pollutant Discharge Elimination System (AZPDES) Construction General Permit. The City of Scottsdale also requires evidence of compliance before issuing development permits.

6.2 Easement Requirements

Where flows from the 100-year storm event are greater than 50 cfs, drainage easements will be required around the limits of the 100-year floodplain inundation. In addition, drainage easements will also be dedicated around the limits of the 100-year ponding for the retention and detention basins.

6.3 Roadway Crossing Requirements

In all cases, the depth of flow over streets will be in accordance with the City of Scottsdale Floodplain Ordinance and Design Standards & Policies Manual (2010).

6.4 Lowest Floor Elevations

Lowest floor (LF) elevations are to be a minimum of 12-inches above the highest adjacent 100-year water surface elevation and 14-inches above the low-site outfall. Lowest floor elevations on the grading and drainage plans for residential units reflect slab on grade conditions and cannot be lowered without agency approval in locations where 'Special Flood Hazard Areas' exist. In non-flood hazard locations, to ensure that adequate residential lot drainage can be achieved, a professional engineer should be consulted if the lowest floor elevation for the slab is proposed to be lowered, or if a basement is to be constructed.

6.5 Maintenance

Ongoing maintenance of the designed or recommended drainage systems is required to preserve the design integrity and purpose of the drainage system. Failure to provide maintenance can prevent the drainage system from performing to its intended design purpose and can result in reduced performance. Maintenance within the public right-of-way is the responsibility of the governing municipality. However, it is the responsibility of private developers, homeowner associations, etc. for facilities on private property within drainage easements and includes private streets. A regular maintenance program is required so that drainage systems perform to the level of protection or service as presented in this report and the project's plans and specifications.

Regular maintenance must be performed on detention/retention basins that are designed with sediment pools and/or are susceptible to wash sediment loads. Observation is required annually and after major storm events to monitor basin sediment load. Basins should be maintained and cleaned out in order for the drainage system to function properly.

6.6 Bank Protection

Scour protection shall be provided at all locations where the wash banks are being modified, where development is encroaching within the wash's erosion hazard setback limits and where it is necessary to protect proposed retention/detention basins. The bank protection considered may be one of a variety of choices: integrally colored soil cement and/or reinforced shotcrete/concrete, seated grouted rock riprap and/or gabion baskets. Bank protection will be designed to extend to a maximum calculated scour depth of 4-5 feet below the wash bottom. Refer to Exhibit 10 – *Developed Condition Hydraulics Map* for bank protection locations, and Appendix E for scour depth calculations.

6.7 Erosion Protection

Culverts that convey flow beneath roadways are to incorporate erosion protection at both the inlet and the outlet of the structures to dissipate energy and provide flow line scour protection. Detention and/or retention basins that utilize weir inlet and/or outlet structures will require erosion protection to prevent scour when flows overtops the weir. Bleed-off pipes will also incorporate riprap protection at pipe outlets.

7.0 CONCLUSIONS

1. The Site is located within the Flood Insurance Rate Map (FIRM) for Maricopa County, Arizona and Incorporated Areas, Panel Number 04013C0884L, effective date October 16, 2013 and is located within Special Flood Hazard Areas (SFHAs) Zone AE, Other Flood Areas Zone "X" (Shaded) and Other Areas Zone "X".
2. The proposed Site development will not alter the effective FEMA SFHA floodplain and/or floodway and will not change the effective FEMA SFHA base flood elevations. This will be documented in more detail as the Site progresses into the pre-plat phase of development.
3. The Galloway Wash and Wash 'A' will be maintained in their natural location and condition where possible and will not be re-aligned.
4. According to the City of Scottsdale's Floodplain Ordinance the Site is located within the ESL and will apply for a stormwater storage waiver
5. Peak discharges from the Site will be reduced to at least pre-development values during the 100-year, 10-year and 2-year storm frequencies.
6. The Site will must provide either first flush stormwater storage for the first 0.5-inch of runoff and/or first flush treatment for the property's developed areas.
7. The proposed drainage system is being designed to allow existing drainage patterns to be maintained in their natural location and condition where possible. Where the proposed development will disturb existing washes with peak 100-year discharges of 50 cfs or more, the washes will be modified to re-direct flow around and/or through the development to maintain historical flow patterns. The development will obtain a Wash Modification approval from the City of Scottsdale.
8. Any proposed development encroachment into the FEMA FIRM SFHAs must obtain an FCDMC Floodplain Use Permit.
9. The determination of the CWA Section 404 Jurisdictional Washes for the Site must be approved by the U.S. Army Corps.
10. Before any construction activities that will disturb one or more acres begin, these activities must be authorized by ADEQ under the Arizona Pollutant Discharge Elimination System (AZPDES) Construction General Permit. The City of Scottsdale also requires evidence of compliance before issuing development permits.

11. The design of hydraulic structures is based on generally accepted engineering practices and in accordance with City of Scottsdale's requirements.

12. The drainage for the local residential roadways will be designed consistent with City of Scottsdale Ordinance 37-42(4) for the allowable depth of water on the street when the street is being utilized as a water carrier.

13. Ongoing maintenance is required for all drainage systems in order to assure design performance. Regular maintenance must be performed on detention/retention basins that are designed with sediment pools and/or are susceptible to wash sediment loads. Observation is required annually and after major storm events to monitor basin sediment load. Basins should be maintained and cleaned out in order for the drainage system to function properly.

8.0 WARNING & DISCLAIMER OF LIABILITY

Per the requirements outlined in Chapter 4 of the *City of Scottsdale Design Standards and Policies Manual* (*DS&PM*), each drainage report must include a completed 'Warning and Disclaimer of Liability' as provided within the *DS&PM* Appendix 4-1C. As such, below is a City of Scottsdale 'Warning and Disclaimer of Liability' that will be completed as the Site progress into the pre-plat phase of development.

CITY OF SCOTTSDALE

Appendix 4-1C

WARNING & DISCLAIMER OF LIABILITY

The Drainage and Floodplain Regulations and Ordinances of the City of Scottsdale are intended to "minimize the occurrence of losses, hazards and conditions adversely affecting the public health, safety and general welfare which might result from flooding caused by the surface runoff of rainfall" (Scottsdale Revised Code §37-16).

As defined in S.R.C. §37-17, a flood plain or "*Special flood hazard* area means an area having flood and/or flood related erosion hazards as shown on a FHBM or FIRM as zone A, AO, A1-30, AE, A99, AH, or E, and those areas identified as such by the floodplain administrator, delineated in accordance with subsection 37-18(b) and adopted by the floodplain board." It is possible that a property could be inundated by greater frequency flood events or by a flood greater in magnitude than a 100-year flood. Additionally, much of the Scottsdale area is a dynamic flood area; that is, the floodplains may shift from one location to another, over time, due to natural processes.

WARNING AND DISCLAIMER OF LIABILITY PURSUANT TO S.R.C §37-22
"The degree of flood protection provided by the requirements in this article is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. Floods larger than the base flood can and will occur on rare occasions. Floodwater heights may be increased by man-made or natural causes. This article (Chapter 37, Article II) shall not create liability on the part of the city, any officer or employee thereof, or the federal government for any flood damages that result from reliance on this article or any administrative decision lawfully made thereunder."

Compliance with Drainage and Floodplain Regulations and Ordinances does not insure complete protection from flooding. The Floodplain Regulations and Ordinances meet established local and federal standards for floodplain management, but neither this review nor the Regulations and Ordinances take into account such flood related problems as natural erosion, streambed meander or man-made obstructions and diversions, all of which may have an adverse affect in the event of a flood. You are advised to consult your own engineer or other expert regarding these considerations.

I have read and understand the above. If I am an agent for an owner I have made the owner aware of and explained this disclaimer.

______________ ______________________________ ______________

Plan Check No. Owner or Agent Date

Design Standards & Policies Manual
City of Scottsdale - January 2010

Page 1 of 1

9.0 REFERENCES

1. *Design Standards and Policies Manual Chapter 4 Drainage*, City of Scottsdale, January 2010.
2. *Drainage Design Manual for Maricopa County, Arizona: Volume I – Hydrology,* Flood Control District of Maricopa County, revised August 15, 2013.
3. *Drainage Design Manual for Maricopa County, Arizona: Volume II – Hydraulics*, Flood Control District of Maricopa County, revised August 15, 2013.
4. *HEC-1, Flood Hydrograph Package*, U.S. Army Corps of Engineers, June 1998.
5. *HEC-RAS, Version 4.1.0*, U.S. Army Corps of Engineers, January 2010.
6. *Drainage Design Management System for Windows-Version 4.624d,* Flood Control District of Maricopa County, revised September 17, 2013, by KVL Consultants, Inc.

APPENDIX A

Existing Condition Hydrologic Calculations

DDMSW Output Data

2-year HEC-1 Model

10-year HEC-1 Model

100-year HEC-1 Model

DDMSW Output Data

Area ID	Book Number	Map Unit	Soil ID	Area (sq mi)	Area (%)	XKSAT	Rock Percent (%)	Effective Rock (%)	Comments

Major Basin ID: 01

Area ID	Book Number	Map Unit	Soil ID	Area (sq mi)	Area (%)	XKSAT	Rock Percent (%)	Effective Rock (%)	Comments
A1	645	33	64533	0.085	43.00	0.230	-	100	
	645	40	64540	0.083	42.20	0.170	-	100	
	645	93	64593	0.023	11.50	0.330	-	100	
	645	96	64596	0.007	3.30	0.070	-	100	
A2	645	93	64593	0.010	69.20	0.330	-	100	
	645	96	64596	0.005	30.80	0.070	-	100	
B1	645	33	64533	0.000	0.90	0.230	-	100	
	645	93	64593	0.011	99.10	0.330	-	100	
C1	645	93	64593	0.008	100.00	0.330	-	100	
D1	645	93	64593	0.002	100.00	0.330	-	100	
E1	645	33	64533	0.022	100.00	0.230	-	100	
E2	645	33	64533	0.001	100.00	0.230	-	100	
E3	645	33	64533	0.038	100.00	0.230	-	100	
E4	645	6	6456	0.043	4.60	0.620	-	100	
	645	33	64533	0.712	77.30	0.230	-	100	
	645	34	64534	0.004	0.50	0.230	-	100	
	645	40	64540	0.014	1.50	0.170	-	100	
	645	63	64563	0.079	8.60	0.140	25.00	100	
	645	96	64596	0.069	7.50	0.070	-	100	
E5	645	6	6456	0.019	29.70	0.620	-	100	
	645	33	64533	0.013	21.40	0.230	-	100	
	645	93	64593	0.010	16.10	0.330	-	100	
	645	96	64596	0.021	32.70	0.070	-	100	
F1	645	96	64596	0.001	100.00	0.070	-	100	
G1	645	34	64534	0.007	94.40	0.230	-	100	
	645	96	64596	0.000	5.60	0.070	-	100	
H1	645	34	64534	0.005	100.00	0.230	-	100	
I1	645	34	64534	0.006	100.00	0.230	-	100	
J1	645	34	64534	0.003	94.30	0.230	-	100	
	645	96	64596	0.000	5.70	0.070	-	100	
K1	645	33	64533	0.004	17.50	0.230	-	100	
	645	34	64534	0.015	75.00	0.230	-	100	
	645	96	64596	0.002	7.50	0.070	-	100	
L1	645	33	64533	0.003	100.00	0.230	-	100	
M1	645	33	64533	0.002	100.00	0.230	-	100	

Sub Basin	Land Use Code	Area (sq mi)	Area (%)	Initial Loss (IA)	Percent Impervious (RTIMP)	Vegetation Cover (%)	DTHETA	Kn	Description
Major Basin ID: 01									
A1	901	0.0181	9.2	0.20	0	75.0	NORMAL	0.030	Recreational Open Space
	902	0.1792	90.8	0.30	5	30.0	NORMAL	0.040	Rural (1 dwelling unit per acre or less)
		0.1973	**100.0**						
A2	900	0.0146	100.0	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)
		0.0146	**100.0**						
B1	900	0.0115	100.0	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)
		0.0115	**100.0**						
C1	900	0.0084	100.0	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)
		0.0084	**100.0**						
D1	900	0.0024	100.0	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)
		0.0024	**100.0**						
E1	900	0.0018	8.3	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)
	901	0.0045	20.7	0.20	0	75.0	NORMAL	0.030	Recreational Open Space
	902	0.0154	71.0	0.30	5	30.0	NORMAL	0.040	Rural (1 dwelling unit per acre or less)
		0.0217	**100.0**						
E2	900	0.0012	100.0	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)
		0.0012	**100.0**						
E3	900	0.0038	10.0	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)
	901	0.0057	15.0	0.20	0	75.0	NORMAL	0.030	Recreational Open Space
	902	0.0285	75.0	0.30	5	30.0	NORMAL	0.040	Rural (1 dwelling unit per acre or less)
		0.0380	**100.0**						

Sub Basin	Land Use Code	Area (sq mi)	Area (%)	Initial Loss (IA)	Percent Impervious (RTIMP)	Vegetation Cover (%)	DTHETA	Kn	Description
Major Basin ID: 01									
E4	130	0.0074	0.8	0.18	15	35.0	NORMAL	0.040	Large Lot Residential - Single Family (1 du per acre to 2 du
	150	0.0250	2.7	0.15	25	30.0	NORMAL	0.040	Small Lot Residential - (2-5 dwelling units per acre)
	220	0.0067	0.7	0.07	80	10.0	NORMAL	0.020	Neighborhood Retail Center
	900	0.1237	13.5	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)
	901	0.2047	22.3	0.20	0	75.0	NORMAL	0.030	Recreational Open Space
	902	0.5446	59.3	0.30	5	30.0	NORMAL	0.040	Rural (1 dwelling unit per acre or less)
	903	0.0066	0.7	0.20	0	35.0	NORMAL	0.050	Dedicated Open Space
		0.9187	**100.0**						
E5	900	0.0626	100.0	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)
		0.0626	**100.0**						
F1	900	0.0012	100.0	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)
		0.0012	**100.0**						
G1	900	0.0071	100.0	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)
		0.0071	**100.0**						
H1	900	0.0051	100.0	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)
		0.0051	**100.0**						
I1	900	0.0064	100.0	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)
		0.0064	**100.0**						
J1	900	0.0035	100.0	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)
		0.0035	**100.0**						
K1	900	0.0200	100.0	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)

* Non default value

Sub Basin	Land Use Code	Area (sq mi)	Area (%)	Initial Loss (IA)	Percent Impervious (RTIMP)	Vegetation Cover (%)	DTHETA	Kn	Description

Major Basin ID: 01

Sub Basin	Land Use Code	Area (sq mi)	Area (%)	Initial Loss (IA)	Percent Impervious (RTIMP)	Vegetation Cover (%)	DTHETA	Kn	Description
		0.0200	**100.0**						
L1	900	0.0027	100.0	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)
		0.0027	**100.0**						
M1	900	0.0015	100.0	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)
		0.0015	**100.0**						

Area ID	Sub Basin Parameters: Area (sq mi)	Length (mi)	Slope (ft/mi)	S-Graph	Lca (mi)	Lag (min)	Velocity (f/s)	Kn	Rainfall Losses: IA (in)	DTHETA	PSIF (in)	XKSAT (in/hr)	RTIMP (%)
Major Basin ID: 01													
A1	0.197	0.95	134.1	DESERT/RANGE	0.51	16.80	4.96	0.039	0.29	0.25	5.34	0.258	5
A2	0.015	0.19	118.3	DESERT/RANGE	0.10	5.10	3.20	0.040	0.35	0.37	5.24	0.250	
B1	0.011	0.22	209.1	DESERT/RANGE	0.10	4.90	3.96	0.040	0.35	0.35	4.33	0.401	
C1	0.008	0.21	216.3	DESERT/RANGE	0.09	4.60	4.00	0.040	0.35	0.35	4.33	0.403	
D1	0.002	0.09	252.9	DESERT/RANGE	0.04	2.30	3.27	0.040	0.35	0.35	4.33	0.403	
E1	0.022	0.31	184.7	DESERT/RANGE	0.15	6.40	4.35	0.038	0.28	0.26	5.05	0.306	4
E2	0.001	0.05	297.9	DESERT/RANGE	0.02	1.40	3.00	0.040	0.35	0.36	5.05	0.281	
E3	0.038	0.57	146.3	DESERT/RANGE	0.25	10.40	4.85	0.039	0.29	0.26	5.05	0.299	4
E4	0.921	3.33	259.5	DESERT/RANGE	1.69	36.70	7.99	0.038	0.28	0.27	5.24	0.281	6
E5	0.063	0.39	123.7	DESERT/RANGE	0.23	9.20	3.71	0.040	0.35	0.36	5.14	0.272	
F1	0.001	0.05	215.7	DESERT/RANGE	0.02	1.50	2.96	0.040	0.35	0.30	7.94	0.085	
G1	0.007	0.24	167.4	DESERT/RANGE	0.09	5.10	4.15	0.040	0.35	0.36	5.14	0.264	
H1	0.005	0.17	189.3	DESERT/RANGE	0.07	3.90	3.77	0.040	0.35	0.36	5.05	0.281	
I1	0.006	0.23	191.1	DESERT/RANGE	0.11	5.20	3.80	0.040	0.35	0.36	5.05	0.281	
J1	0.003	0.16	206.5	DESERT/RANGE	0.07	3.80	3.64	0.040	0.35	0.36	5.14	0.262	
K1	0.020	0.23	171.7	DESERT/RANGE	0.15	6.10	3.38	0.040	0.35	0.37	5.24	0.257	
L1	0.003	0.12	243.7	DESERT/RANGE	0.05	2.90	3.62	0.040	0.35	0.36	5.05	0.281	
M1	0.001	0.10	204.1	DESERT/RANGE	0.04	2.60	3.38	0.040	0.35	0.36	5.05	0.281	

2-year HEC-1 Model

```
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   15JUN16  TIME  20:29:19    *                                              *        (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        Flood Control District of Maricopa County
              2       ID        DM19 EX - Desert Mountain 19 Existing Condition
              3       ID        2 YEAR
              4       ID        6 Hour  Storm
              5       ID        Unit Hydrograph: S-Graph
              6       ID        Storm: Multiple
              7       ID        06/14/2016
              8       ID        WOOD/PATEL FILE NAME: DM19EX2.DAT
                      *DIAGRAM
              9       IT       1  1JAN99       0    2000
             10       IO       5
             11       IN      15
                      *
             12       JD  1.475 0.0001
             13       PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
             14       PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
             15       PC   0.962   0.972   0.983   0.991   1.000
             16       JD  1.466 0.5000
             17       PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
             18       PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
             19       PC   0.962   0.972   0.983   0.991   1.000
             20       JD  1.438 2.8
             21       PC   0.000   0.009   0.016   0.025   0.034   0.042   0.051   0.059   0.067   0.076
             22       PC   0.087   0.100   0.120   0.163   0.252   0.451   0.694   0.837   0.900   0.938
             23       PC   0.950   0.963   0.975   0.988   1.000
                      *

             24       KK      A1   BASIN
             25       BA   0.197
             26       LG    0.29    0.25    5.34    0.26       5
             27       UI       0      39      39      39      50     114     146     182     223     254
             28       UI     279     323     344     355     374     378     378     369     357     338
             29       UI     302     275     245     222     200     181     164     147     133     120
             30       UI     108      94      88      75      74      62      61      53      42      42
             31       UI      42      31      27      27      27      27      25      10      10      10
             32       UI      10      10      10      10      10      10      10      10      10      10
             33       UI      10      10       0       0       0       0       0       0       0       0
                      *

             34       KK    R-A1   ROUTE
             35       RS       4    FLOW
             36       RC   0.060   0.040   0.060     980  0.0224   19.00
             37       RX    0.00   42.00   73.00  106.00  196.00  225.00  251.00  295.00
             38       RY   20.00   15.00   10.00    7.00    6.00    5.00   13.00   19.00
                      *

             39       KK      A2   BASIN
             40       BA   0.015
             41       LG    0.35    0.37    5.24    0.25       0
             42       UI       0      10      31      61      85      95      85      63      45      32
             43       UI      22      16      11       8       6       2       2       2       2       0
             44       UI       0       0       0       0       0       0       0       0       0       0
             45       UI       0       0       0       0       0       0       0       0       0       0
             46       UI       0       0       0       0       0       0       0       0       0       0
                      *
1                                            HEC-1 INPUT                                              PAGE  2

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


             47       KK   CP-A2 COMBINE
             48       HC       2    .212
                      *

             49       KK      B1   BASIN
             50       BA   0.011
             51       LG    0.35    0.35    4.33    0.40       0
```

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 52          UI        0       8      25      49      67      72      62      44      31      21
 53          UI       15      10       7       5       3       2       2       2       2       0
 54          UI        0       0       0       0       0       0       0       0       0       0
 55          UI        0       0       0       0       0       0       0       0       0       0
 56          UI        0       0       0       0       0       0       0       0       0       0
             *

 57          KK       C1   BASIN
 58          BA    0.008
 59          LG     0.35    0.35    4.33    0.40       0
 60          UI        0       6      22      41      54      55      43      29      20      13
 61          UI       10       6       4       3       1       1       1       0       0       0
 62          UI        0       0       0       0       0       0       0       0       0       0
 63          UI        0       0       0       0       0       0       0       0       0       0
 64          UI        0       0       0       0       0       0       0       0       0       0
             *

 65          KK       D1   BASIN
 66          BA    0.002
 67          LG     0.35    0.35    4.33    0.40       0
 68          UI        0       7      24      24      12       6       3       1       1       0
 69          UI        0       0       0       0       0       0       0       0       0       0
 70          UI        0       0       0       0       0       0       0       0       0       0
 71          UI        0       0       0       0       0       0       0       0       0       0
 72          UI        0       0       0       0       0       0       0       0       0       0
             *

 73          KK    CLEAR COMBINE
 74          HC        3
             *
             *

 75          KK       E1   BASIN
 76          BA    0.022
 77          LG     0.28    0.26    5.05    0.31       4
 78          UI        0      12      23      55      81     101     111     106      88      66
 79          UI       51      39      29      23      17      12       9       8       5       3
 80          UI        3       3       3       3       0       0       0       0       0       0
 81          UI        0       0       0       0       0       0       0       0       0       0
 82          UI        0       0       0       0       0       0       0       0       0       0
             *
1                                       HEC-1 INPUT                                              PAGE  3

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

 83          KK       E2   BASIN
 84          BA    0.001
 85          LG     0.35    0.36    5.05    0.28       0
 86          UI        0      10      19       7       2       1       0       0       0       0
 87          UI        0       0       0       0       0       0       0       0       0       0
 88          UI        0       0       0       0       0       0       0       0       0       0
 89          UI        0       0       0       0       0       0       0       0       0       0
 90          UI        0       0       0       0       0       0       0       0       0       0
             *

 91          KK       E3   BASIN
 92          BA    0.038
 93          LG     0.29    0.26    5.05    0.30       4
 94          UI        0      12      12      26      47      66      83      99     110     117
 95          UI      118     113     105      88      74      63      54      45      38      32
 96          UI       27      23      19      17      13      13       8       8       8       5
 97          UI        3       3       3       3       3       3       3       3       3       0
 98          UI        0       0       0       0       0       0       0       0       0       0
             *

 99          KK       E4   BASIN
100          BA    0.921
101          LG     0.28    0.27    5.24    0.28       6
102          UI        0      84      84      84      84      84      84      84      84     173
103          UI      243     243     297     329     364     405     445     470     511     545
104          UI      580     602     598     694     695     721     747     752     771     764
105          UI      810     810     810     810     810     810     803     777     766     760
106          UI      748     720     694     650     614     589     589     531     511     494
107          UI      463     445     432     399     393     367     360     329     329     299
108          UI      299     274     259     259     235     231     231     198     189     189
109          UI      188     159     159     159     159     143     130     130     130     130
110          UI      128      90      90      90      90      90      90      90      87      58
111          UI       58      58      58      58      58      58      58      58      58      58
112          UI       58      30      21      21      21      21      21      21      21      21
113          UI       21      21      21      21      21      21      21      21      21      21
114          UI       21      21      21      21      21      21      21      21      21      21
115          UI       21      21      21      21      21       0       0       0       0       0
             *

116          KK    CP-E4 COMBINE
117          HC        4    .982
             *

118          KK   R-CPE4   ROUTE
119          RS        1    FLOW
120          RC    0.060   0.040   0.060    2050  0.0234 2635.00
121          RX     0.00   33.00   50.00  130.00  345.00  390.00  447.00  530.00
122          RY    34.00   25.00   18.00   19.00   18.00   20.00   26.00   32.00
             *
1                                       HEC-1 INPUT                                              PAGE  4

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

123          KK       E5   BASIN
124          BA    0.063
125          LG     0.35    0.36    5.14    0.27       0
126          UI        0      23      23      65     105     143     176     204     217     221
127          UI      209     184     152     126     105      86      71      58      48      41
```

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 128          UI     35     25     24     16     16     16      7      6      6      6
 129          UI      6      6      6      6      0      0      0      0      0      0
 130          UI      0      0      0      0      0      0      0      0      0      0
              *

 131          KK  CP-E5 COMBINE
 132          HC      2  1.044
              *

 133          KK     F1  BASIN
 134          BA  0.001
 135          LG   0.35   0.30   7.94   0.09      0
 136          UI      0      9     19      8      2      1      0      0      0      0
 137          UI      0      0      0      0      0      0      0      0      0      0
 138          UI      0      0      0      0      0      0      0      0      0      0
 139          UI      0      0      0      0      0      0      0      0      0      0
 140          UI      0      0      0      0      0      0      0      0      0      0
              *

 141          KK     G1  BASIN
 142          BA  0.007
 143          LG   0.35   0.36   5.14   0.26      0
 144          UI      0      5     14     28     40     44     40     29     21     15
 145          UI     10      8      5      4      3      1      1      1      1      0
 146          UI      0      0      0      0      0      0      0      0      0      0
 147          UI      0      0      0      0      0      0      0      0      0      0
 148          UI      0      0      0      0      0      0      0      0      0      0
              *

 149          KK     H1  BASIN
 150          BA  0.005
 151          LG   0.35   0.36   5.05   0.28      0
 152          UI      0      5     20     35     41     34     22     14      9      6
 153          UI      4      2      1      1      1      0      0      0      0      0
 154          UI      0      0      0      0      0      0      0      0      0      0
 155          UI      0      0      0      0      0      0      0      0      0      0
 156          UI      0      0      0      0      0      0      0      0      0      0
              *

 157          KK     I1  BASIN
 158          BA  0.006
 159          LG   0.35   0.36   5.05   0.28      0
 160          UI      0      4     12     24     33     37     34     26     18     13
 161          UI      9      7      5      3      3      1      1      1      1      1
 162          UI      0      0      0      0      0      0      0      0      0      0
 163          UI      0      0      0      0      0      0      0      0      0      0
 164          UI      0      0      0      0      0      0      0      0      0      0
              *
```



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

 165          KK   CLR2 COMBINE
 166          HC      4
              *
              *

 167          KK     J1  BASIN
 168          BA  0.003
 169          LG   0.35   0.36   5.14   0.26      0
 170          UI      0      3     13     22     25     20     13      8      5      3
 171          UI      2      1      1      1      0      0      0      0      0      0
 172          UI      0      0      0      0      0      0      0      0      0      0
 173          UI      0      0      0      0      0      0      0      0      0      0
 174          UI      0      0      0      0      0      0      0      0      0      0
              *

 175          KK     K1  BASIN
 176          BA  0.020
 177          LG   0.35   0.37   5.24   0.26      0
 178          UI      0     11     25     55     81    100    106     97     75     57
 179          UI     43     32     23     18     13     10      8      6      3      3
 180          UI      3      3      3      0      0      0      0      0      0      0
 181          UI      0      0      0      0      0      0      0      0      0      0
 182          UI      0      0      0      0      0      0      0      0      0      0
              *

 183          KK     L1  BASIN
 184          BA  0.003
 185          LG   0.35   0.36   5.05   0.28      0
 186          UI      0      6     23     33     25     14      7      4      2      1
 187          UI      1      0      0      0      0      0      0      0      0      0
 188          UI      0      0      0      0      0      0      0      0      0      0
 189          UI      0      0      0      0      0      0      0      0      0      0
 190          UI      0      0      0      0      0      0      0      0      0      0
              *

 191          KK     M1  BASIN
 192          BA  0.001
 193          LG   0.35   0.36   5.05   0.28      0
 194          UI      0      3      9     12      7      4      2      1      0      0
 195          UI      0      0      0      0      0      0      0      0      0      0
 196          UI      0      0      0      0      0      0      0      0      0      0
 197          UI      0      0      0      0      0      0      0      0      0      0
 198          UI      0      0      0      0      0      0      0      0      0      0
              *
 199          ZZ
```

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

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

   24          A1
                V
                V
   34        R-A1
                .
                .
   39           .          A2
                .           .
                .           .
   47       CP-A2............
                .
                .
   49           .          B1
                .           .
                .           .
   57           .           .          C1
                .           .           .
                .           .           .
   65           .           .           .          D1
                .           .           .           .
                .           .           .           .
   73           .       CLEAR........................
                .           .
                .           .
   75           .           .          E1
                .           .           .
                .           .           .
   83           .           .           .          E2
                .           .           .           .
                .           .           .           .
   91           .           .           .           .          E3
                .           .           .           .           .
                .           .           .           .           .
   99           .           .           .           .           .          E4
                .           .           .           .           .           .
                .           .           .           .           .           .
  116           .           .       CP-E4....................................
                .           .           V
                .           .           V
  118           .           .      R-CPE4
                .           .           .
                .           .           .
  123           .           .           .          E5
                .           .           .           .
                .           .           .           .
  131           .           .       CP-E5............
                .           .           .
                .           .           .
  133           .           .           .          F1
                .           .           .           .
                .           .           .           .
  141           .           .           .           .          G1
                .           .           .           .           .
                .           .           .           .           .
  149           .           .           .           .           .          H1
                .           .           .           .           .           .
                .           .           .           .           .           .
  157           .           .           .           .           .           .          I1
                .           .           .           .           .           .           .
                .           .           .           .           .           .           .
  165           .           .           .        CLR2....................................
                .           .           .           .
                .           .           .           .
  167           .           .           .           .          J1
                .           .           .           .           .
                .           .           .           .           .
  175           .           .           .           .           .          K1
                .           .           .           .           .           .
                .           .           .           .           .           .
  183           .           .           .           .           .           .          L1
                .           .           .           .           .           .           .
                .           .           .           .           .           .           .
  191           .           .           .           .           .           .           .          M1

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION
```

```
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   15JUN16  TIME  20:29:19   *                                    *          (916) 756-1104               *
 *                                       *                                    *                                       *
*****************************************                                    *****************************************



                         Flood Control District of Maricopa County
                         DM19 EX - Desert Mountain 19 Existing Condition
                         2 YEAR
                         6 Hour  Storm
                         Unit Hydrograph: S-Graph
                         Storm: Multiple
                         06/14/2016
                         WOOD/PATEL FILE NAME: DM19EX2.DAT

  10 IO         OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE

    IT          HYDROGRAPH TIME DATA
                       NMIN          1  MINUTES IN COMPUTATION INTERVAL
                      IDATE     1JAN99  STARTING DATE
                      ITIME       0000  STARTING TIME
                         NQ       2000  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE     2JAN99  ENDING DATE
                     NDTIME       0919  ENDING TIME
                      ICENT         19  CENTURY MARK

                 COMPUTATION INTERVAL     .02 HOURS
                      TOTAL TIME BASE   33.32 HOURS

        ENGLISH UNITS
             DRAINAGE AREA          SQUARE MILES
             PRECIPITATION DEPTH    INCHES
             LENGTH, ELEVATION      FEET
             FLOW                   CUBIC FEET PER SECOND
             STORAGE VOLUME         ACRE-FEET
             SURFACE AREA           ACRES
             TEMPERATURE            DEGREES FAHRENHEIT

  12 JD         INDEX STORM NO. 1
                      STRM        1.48  PRECIPITATION DEPTH
                      TRDA         .00  TRANSPOSITION DRAINAGE AREA

  13 PI          PRECIPITATION PATTERN
                      .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                      .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                      .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                      .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                      .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                      .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                      .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                      .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                      .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                      .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                      .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                      .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
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                      .01       .01       .01       .01       .01       .01       .01       .01       .01       .01
                      .01       .01       .01       .01       .01       .01       .01       .01       .01       .01
                      .01       .01       .01       .01       .01       .03       .03       .03       .03       .03
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  16 JD         INDEX STORM NO. 2
                      STRM        1.47  PRECIPITATION DEPTH
                      TRDA         .50  TRANSPOSITION DRAINAGE AREA

  17 PI          PRECIPITATION PATTERN
                      .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                      .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
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20 JD INDEX STORM NO. 3
STRM 1.44 PRECIPITATION DEPTH
TRDA 2.80 TRANSPOSITION DRAINAGE AREA

21 PI PRECIPITATION PATTERN

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.01	.01	.01	.01	.01	.02	.02	.02	.02	.02
.02	.02	.02	.02	.02	.02	.02	.02	.02	.02
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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			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+					6-HOUR	24-HOUR	72-HOUR			
+	HYDROGRAPH AT	A1	131.	4.15	9.	2.	2.	.20		
+	ROUTED TO	R-A1	128.	4.22	9.	2.	2.	.20		
+	HYDROGRAPH AT	A2	13.	4.03	0.	0.	0.	.01		
+	2 COMBINED AT	CP-A2	128.	4.22	10.	2.	2.	.21		
+	HYDROGRAPH AT	B1	8.	4.03	0.	0.	0.	.01		
+	HYDROGRAPH AT	C1	6.	4.03	0.	0.	0.	.01		
+	HYDROGRAPH AT	D1	2.	4.02	0.	0.	0.	.00		
+	3 COMBINED AT	CLEAR	16.	4.03	0.	0.	0.	.02		
+	HYDROGRAPH AT	E1	21.	4.03	1.	0.	0.	.02		
+	HYDROGRAPH AT	E2	1.	4.02	0.	0.	0.	.00		
+	HYDROGRAPH AT	E3	31.	4.08	2.	0.	0.	.04		
+	HYDROGRAPH AT	E4	236.	4.43	33.	8.	6.	.92		
+	4 COMBINED AT	CP-E4	230.	4.43	34.	9.	6.	.98		
+	ROUTED TO	R-CPE4	230.	4.43	34.	9.	6.	.98		
+	HYDROGRAPH AT	E5	44.	4.07	2.	0.	0.	.06		
+	2 COMBINED AT	CP-E5	230.	4.43	35.	9.	6.	1.04		
+	HYDROGRAPH AT	F1	1.	4.02	0.	0.	0.	.00		
+	HYDROGRAPH AT	G1	6.	4.03	0.	0.	0.	.01		
+	HYDROGRAPH AT	H1	5.	4.03	0.	0.	0.	.00		
+	HYDROGRAPH AT	I1	5.	4.03	0.	0.	0.	.01		
+	4 COMBINED AT	CLR2	17.	4.02	1.	0.	0.	.02		
+	HYDROGRAPH AT	J1	3.	4.02	0.	0.	0.	.00		
+	HYDROGRAPH AT	K1	17.	4.05	1.	0.	0.	.02		
+	HYDROGRAPH AT	L1	3.	4.02	0.	0.	0.	.00		
+	HYDROGRAPH AT	M1	1.	4.02	0.	0.	0.	.00		

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

10-year HEC-1 Model

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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   15JUN16  TIME  20:29:28    *                                     *         (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        Flood Control District of Maricopa County
            2          ID        DM19 EX - Desert Mountain 19 Existing Condition
            3          ID        10 YEAR
            4          ID        6 Hour  Storm
            5          ID        Unit Hydrograph: S-Graph
            6          ID        Storm: Multiple
            7          ID        06/14/2016
            8          ID        WOOD/PATEL FILE NAME: DM19EX10.DAT
                       *DIAGRAM
            9          IT       1  1JAN99       0    2000
           10          IO       5
           11          IN      15
                       *
           12          JD  2.182 0.0001
           13          PC  0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
           14          PC  0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
           15          PC  0.962   0.972   0.983   0.991   1.000
           16          JD  2.169 0.5000
           17          PC  0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
           18          PC  0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
           19          PC  0.962   0.972   0.983   0.991   1.000
           20          JD  2.127 2.8
           21          PC  0.000   0.009   0.016   0.025   0.034   0.042   0.051   0.059   0.067   0.076
           22          PC  0.087   0.100   0.120   0.163   0.252   0.451   0.694   0.837   0.900   0.938
           23          PC  0.950   0.963   0.975   0.988   1.000
                       *

           24          KK     A1   BASIN
           25          BA  0.197
           26          LG   0.29    0.25    5.34    0.26       5
           27          UI      0      39      39      39      50     114     146     182     223     254
           28          UI    279     323     344     355     374     378     378     369     357     338
           29          UI    302     275     245     222     200     181     164     147     133     120
           30          UI    108      94      88      75      74      62      61      53      42      42
           31          UI     42      31      27      27      27      27      25      10      10      10
           32          UI     10      10      10      10      10      10      10      10      10      10
           33          UI     10      10       0       0       0       0       0       0       0       0
                       *

           34          KK   R-A1   ROUTE
           35          RS      3    FLOW
           36          RC  0.060   0.040   0.060     980  0.0224   19.00
           37          RX   0.00   42.00   73.00  106.00  196.00  225.00  251.00  295.00
           38          RY  20.00   15.00   10.00    7.00    6.00    5.00   13.00   19.00
                       *

           39          KK     A2   BASIN
           40          BA  0.015
           41          LG   0.35    0.37    5.24    0.25       0
           42          UI      0      10      31      61      85      95      85      63      45      32
           43          UI     22      16      11       8       6       2       2       2       2       0
           44          UI      0       0       0       0       0       0       0       0       0       0
           45          UI      0       0       0       0       0       0       0       0       0       0
           46          UI      0       0       0       0       0       0       0       0       0       0
                       *
1                                           HEC-1 INPUT                                               PAGE  2

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


           47          KK  CP-A2 COMBINE
           48          HC      2    .212
                       *

           49          KK     B1   BASIN
           50          BA  0.011
           51          LG   0.35    0.35    4.33    0.40       0
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  52      UI      0      8     25     49     67     72     62     44     31     21
  53      UI     15     10      7      5      3      2      2      2      2      0
  54      UI      0      0      0      0      0      0      0      0      0      0
  55      UI      0      0      0      0      0      0      0      0      0      0
  56      UI      0      0      0      0      0      0      0      0      0      0
          *

  57      KK     C1  BASIN
  58      BA  0.008
  59      LG   0.35   0.35   4.33   0.40      0
  60      UI      0      6     22     41     54     55     43     29     20     13
  61      UI     10      6      4      3      1      1      1      0      0      0
  62      UI      0      0      0      0      0      0      0      0      0      0
  63      UI      0      0      0      0      0      0      0      0      0      0
  64      UI      0      0      0      0      0      0      0      0      0      0
          *

  65      KK     D1  BASIN
  66      BA  0.002
  67      LG   0.35   0.35   4.33   0.40      0
  68      UI      0      7     24     24     12      6      3      1      1      0
  69      UI      0      0      0      0      0      0      0      0      0      0
  70      UI      0      0      0      0      0      0      0      0      0      0
  71      UI      0      0      0      0      0      0      0      0      0      0
  72      UI      0      0      0      0      0      0      0      0      0      0
          *

  73      KK  CLEAR COMBINE
  74      HC      3
          *
          *

  75      KK     E1  BASIN
  76      BA  0.022
  77      LG   0.28   0.26   5.05   0.31      4
  78      UI      0     12     23     55     81    101    111    106     88     66
  79      UI     51     39     29     23     17     12      9      8      5      3
  80      UI      3      3      3      3      0      0      0      0      0      0
  81      UI      0      0      0      0      0      0      0      0      0      0
  82      UI      0      0      0      0      0      0      0      0      0      0
          *
1                                 HEC-1 INPUT                                      PAGE  3

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


  83      KK     E2  BASIN
  84      BA  0.001
  85      LG   0.35   0.36   5.05   0.28      0
  86      UI      0     10     19      7      2      1      0      0      0      0
  87      UI      0      0      0      0      0      0      0      0      0      0
  88      UI      0      0      0      0      0      0      0      0      0      0
  89      UI      0      0      0      0      0      0      0      0      0      0
  90      UI      0      0      0      0      0      0      0      0      0      0
          *

  91      KK     E3  BASIN
  92      BA  0.038
  93      LG   0.29   0.26   5.05   0.30      4
  94      UI      0     12     12     26     47     66     83     99    110    117
  95      UI    118    113    105     88     74     63     54     45     38     32
  96      UI     27     23     19     17     13     13      8      8      8      5
  97      UI      3      3      3      3      3      3      3      3      3      0
  98      UI      0      0      0      0      0      0      0      0      0      0
          *

  99      KK     E4  BASIN
 100      BA  0.921
 101      LG   0.28   0.27   5.24   0.28      6
 102      UI      0     84     84     84     84     84     84     84     84    173
 103      UI    243    243    297    329    364    405    445    470    511    545
 104      UI    580    602    598    694    695    721    747    752    771    764
 105      UI    810    810    810    810    810    810    803    777    766    760
 106      UI    748    720    694    650    614    589    589    531    511    494
 107      UI    463    445    432    399    393    367    360    329    329    299
 108      UI    299    274    259    259    235    231    231    198    189    189
 109      UI    188    159    159    159    159    143    130    130    130    130
 110      UI    128     90     90     90     90     90     90     90     87     58
 111      UI     58     58     58     58     58     58     58     58     58     58
 112      UI     58     30     21     21     21     21     21     21     21     21
 113      UI     21     21     21     21     21     21     21     21     21     21
 114      UI     21     21     21     21     21     21     21     21     21     21
 115      UI     21     21     21     21     21      0      0      0      0      0
          *

 116      KK  CP-E4 COMBINE
 117      HC      4   .982
          *

 118      KK R-CPE4  ROUTE
 119      RS      1   FLOW
 120      RC  0.060  0.040  0.060   2050 0.0234 2635.00
 121      RX   0.00  33.00  50.00 130.00 345.00 390.00 447.00 530.00
 122      RY  34.00  25.00  18.00  19.00  18.00  20.00  26.00  32.00
          *
1                                 HEC-1 INPUT                                      PAGE  4

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


 123      KK     E5  BASIN
 124      BA  0.063
 125      LG   0.35   0.36   5.14   0.27      0
 126      UI      0     23     23     65    105    143    176    204    217    221
 127      UI    209    184    152    126    105     86     71     58     48     41
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 128        UI      35      25      24      16      16      16       7       6       6       6
 129        UI       6       6       6       6       0       0       0       0       0       0
 130        UI       0       0       0       0       0       0       0       0       0       0
            *

 131        KK   CP-E5 COMBINE
 132        HC       2   1.044
            *

 133        KK      F1   BASIN
 134        BA   0.001
 135        LG    0.35    0.30    7.94    0.09       0
 136        UI       0       9      19       8       2       1       0       0       0       0
 137        UI       0       0       0       0       0       0       0       0       0       0
 138        UI       0       0       0       0       0       0       0       0       0       0
 139        UI       0       0       0       0       0       0       0       0       0       0
 140        UI       0       0       0       0       0       0       0       0       0       0
            *

 141        KK      G1   BASIN
 142        BA   0.007
 143        LG    0.35    0.36    5.14    0.26       0
 144        UI       0       5      14      28      40      44      40      29      21      15
 145        UI      10       8       5       4       3       1       1       1       1       0
 146        UI       0       0       0       0       0       0       0       0       0       0
 147        UI       0       0       0       0       0       0       0       0       0       0
 148        UI       0       0       0       0       0       0       0       0       0       0
            *

 149        KK      H1   BASIN
 150        BA   0.005
 151        LG    0.35    0.36    5.05    0.28       0
 152        UI       0       5      20      35      41      34      22      14       9       6
 153        UI       4       2       1       1       1       0       0       0       0       0
 154        UI       0       0       0       0       0       0       0       0       0       0
 155        UI       0       0       0       0       0       0       0       0       0       0
 156        UI       0       0       0       0       0       0       0       0       0       0
            *

 157        KK      I1   BASIN
 158        BA   0.006
 159        LG    0.35    0.36    5.05    0.28       0
 160        UI       0       4      12      24      33      37      34      26      18      13
 161        UI       9       7       5       3       3       1       1       1       1       1
 162        UI       0       0       0       0       0       0       0       0       0       0
 163        UI       0       0       0       0       0       0       0       0       0       0
 164        UI       0       0       0       0       0       0       0       0       0       0
            *
1                                            HEC-1 INPUT                                          PAGE  5

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


 165        KK    CLR2 COMBINE
 166        HC       4
            *
            *
            *

 167        KK      J1   BASIN
 168        BA   0.003
 169        LG    0.35    0.36    5.14    0.26       0
 170        UI       0       3      13      22      25      20      13       8       5       3
 171        UI       2       1       1       1       0       0       0       0       0       0
 172        UI       0       0       0       0       0       0       0       0       0       0
 173        UI       0       0       0       0       0       0       0       0       0       0
 174        UI       0       0       0       0       0       0       0       0       0       0
            *

 175        KK      K1   BASIN
 176        BA   0.020
 177        LG    0.35    0.37    5.24    0.26       0
 178        UI       0      11      25      55      81     100     106      97      75      57
 179        UI      43      32      23      18      13      10       8       6       3       3
 180        UI       3       3       3       0       0       0       0       0       0       0
 181        UI       0       0       0       0       0       0       0       0       0       0
 182        UI       0       0       0       0       0       0       0       0       0       0
            *

 183        KK      L1   BASIN
 184        BA   0.003
 185        LG    0.35    0.36    5.05    0.28       0
 186        UI       0       6      23      33      25      14       7       4       2       1
 187        UI       1       0       0       0       0       0       0       0       0       0
 188        UI       0       0       0       0       0       0       0       0       0       0
 189        UI       0       0       0       0       0       0       0       0       0       0
 190        UI       0       0       0       0       0       0       0       0       0       0
            *

 191        KK      M1   BASIN
 192        BA   0.001
 193        LG    0.35    0.36    5.05    0.28       0
 194        UI       0       3       9      12       7       4       2       1       0       0
 195        UI       0       0       0       0       0       0       0       0       0       0
 196        UI       0       0       0       0       0       0       0       0       0       0
 197        UI       0       0       0       0       0       0       0       0       0       0
 198        UI       0       0       0       0       0       0       0       0       0       0
            *
 199        ZZ
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1
                 SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

    24          A1
                 V
                 V
    34        R-A1
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    39           .          A2
                 .           .
                 .           .
    47       CP-A2............
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    49           .          B1
                 .           .
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    57           .           .          C1
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    65           .           .           .          D1
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    73           .       CLEAR........................
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    75           .           .          E1
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    83           .           .           .          E2
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    91           .           .           .           .          E3
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    99           .           .           .           .           .          E4
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   116           .           .       CP-E4....................................
                 .           .           V
                 .           .           V
   118           .           .      R-CPE4
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   123           .           .           .          E5
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   131           .           .       CP-E5............
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   133           .           .           .          F1
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   141           .           .           .           .          G1
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   149           .           .           .           .           .          H1
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   157           .           .           .           .           .           .          I1
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   165           .           .           .        CLR2....................................
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   167           .           .           .           .          J1
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   175           .           .           .           .           .          K1
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   183           .           .           .           .           .           .          L1
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   191           .           .           .           .           .           .           .          M1

 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
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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   15JUN16  TIME  20:29:28    *                                                        *         (916) 756-1104                *
 *                                       *                                                        *                                       *
 *****************************************                                                        *****************************************



                              Flood Control District of Maricopa County
                              DM19 EX - Desert Mountain 19 Existing Condition
                              10 YEAR
                              6 Hour  Storm
                              Unit Hydrograph: S-Graph
                              Storm: Multiple
                              06/14/2016
                              WOOD/PATEL FILE NAME: DM19EX10.DAT

  10 IO            OUTPUT CONTROL VARIABLES
                         IPRNT          5  PRINT CONTROL
                         IPLOT          0  PLOT CONTROL
                         QSCAL         0.  HYDROGRAPH PLOT SCALE

     IT            HYDROGRAPH TIME DATA
                          NMIN          1  MINUTES IN COMPUTATION INTERVAL
                         IDATE     1JAN99  STARTING DATE
                         ITIME       0000  STARTING TIME
                            NQ       2000  NUMBER OF HYDROGRAPH ORDINATES
                        NDDATE     2JAN99  ENDING DATE
                        NDTIME       0919  ENDING TIME
                         ICENT         19  CENTURY MARK

                    COMPUTATION INTERVAL     .02 HOURS
                         TOTAL TIME BASE   33.32 HOURS

          ENGLISH UNITS
                DRAINAGE AREA          SQUARE MILES
                PRECIPITATION DEPTH    INCHES
                LENGTH, ELEVATION      FEET
                FLOW                   CUBIC FEET PER SECOND
                STORAGE VOLUME         ACRE-FEET
                SURFACE AREA           ACRES
                TEMPERATURE            DEGREES FAHRENHEIT

  12 JD            INDEX STORM NO. 1
                          STRM       2.18  PRECIPITATION DEPTH
                          TRDA        .00  TRANSPOSITION DRAINAGE AREA

  13 PI              PRECIPITATION PATTERN
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  16 JD            INDEX STORM NO. 2
                          STRM       2.17  PRECIPITATION DEPTH
                          TRDA        .50  TRANSPOSITION DRAINAGE AREA

  17 PI              PRECIPITATION PATTERN
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20 JD INDEX STORM NO. 3
STRM 2.13 PRECIPITATION DEPTH
TRDA 2.80 TRANSPOSITION DRAINAGE AREA

21 PI PRECIPITATION PATTERN

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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	A1	262.	4.13	19.	5.	3.	.20		
+	ROUTED TO	R-A1	258.	4.18	19.	5.	3.	.20		
+	HYDROGRAPH AT	A2	28.	4.02	1.	0.	0.	.01		
+	2 COMBINED AT	CP-A2	261.	4.18	20.	5.	4.	.21		
+	HYDROGRAPH AT	B1	19.	4.02	1.	0.	0.	.01		
+	HYDROGRAPH AT	C1	14.	4.02	1.	0.	0.	.01		
+	HYDROGRAPH AT	D1	4.	4.02	0.	0.	0.	.00		
+	3 COMBINED AT	CLEAR	36.	4.02	1.	0.	0.	.02		
+	HYDROGRAPH AT	E1	42.	4.02	2.	0.	0.	.02		
+	HYDROGRAPH AT	E2	2.	4.02	0.	0.	0.	.00		
+	HYDROGRAPH AT	E3	63.	4.07	3.	1.	1.	.04		
+	HYDROGRAPH AT	E4	553.	4.43	78.	19.	14.	.92		
+	4 COMBINED AT	CP-E4	549.	4.42	82.	20.	15.	.98		
+	ROUTED TO	R-CPE4	549.	4.43	82.	20.	15.	.98		
+	HYDROGRAPH AT	E5	102.	4.05	5.	1.	1.	.06		
+	2 COMBINED AT	CP-E5	549.	4.42	85.	21.	15.	1.04		
+	HYDROGRAPH AT	F1	2.	4.02	0.	0.	0.	.00		
+	HYDROGRAPH AT	G1	13.	4.02	1.	0.	0.	.01		
+	HYDROGRAPH AT	H1	10.	4.02	0.	0.	0.	.00		
+	HYDROGRAPH AT	I1	11.	4.02	0.	0.	0.	.01		
+	4 COMBINED AT	CLR2	36.	4.02	2.	0.	0.	.02		
+	HYDROGRAPH AT	J1	6.	4.02	0.	0.	0.	.00		
+	HYDROGRAPH AT	K1	36.	4.03	2.	0.	0.	.02		
+	HYDROGRAPH AT	L1	6.	4.02	0.	0.	0.	.00		
+	HYDROGRAPH AT	M1	2.	4.02	0.	0.	0.	.00		

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

100-year HEC-1 Model

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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   15JUN16  TIME  20:29:36  *                           *          (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        Flood Control District of Maricopa County
            2         ID        DM19 EX - Desert Mountain 19 Existing Condition
            3         ID        100 YEAR
            4         ID        6 Hour  Storm
            5         ID        Unit Hydrograph: S-Graph
            6         ID        Storm: Multiple
            7         ID        06/14/2016
            8         ID        WOOD/PATEL FILE NAME: DM19EX100.DAT
                      *DIAGRAM
            9         IT       1  1JAN99       0    2000
           10         IO       5
           11         IN      15
                      *
           12         JD  3.313 0.0001
           13         PC  0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
           14         PC  0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
           15         PC  0.962   0.972   0.983   0.991   1.000
           16         JD  3.293 0.5000
           17         PC  0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
           18         PC  0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
           19         PC  0.962   0.972   0.983   0.991   1.000
           20         JD  3.230 2.8
           21         PC  0.000   0.009   0.016   0.025   0.034   0.042   0.051   0.059   0.067   0.076
           22         PC  0.087   0.100   0.120   0.163   0.252   0.451   0.694   0.837   0.900   0.938
           23         PC  0.950   0.963   0.975   0.988   1.000
                      *

           24         KK      A1   BASIN
           25         BA  0.197
           26         LG   0.29    0.25    5.34    0.26       5
           27         UI      0      39      39      39      50     114     146     182     223     254
           28         UI    279     323     344     355     374     378     378     369     357     338
           29         UI    302     275     245     222     200     181     164     147     133     120
           30         UI    108      94      88      75      74      62      61      53      42      42
           31         UI     42      31      27      27      27      27      25      10      10      10
           32         UI     10      10      10      10      10      10      10      10      10      10
           33         UI     10      10       0       0       0       0       0       0       0       0
                      *

           34         KK    R-A1   ROUTE
           35         RS       3    FLOW
           36         RC  0.060   0.040   0.060     980  0.0224   19.00
           37         RX   0.00   42.00   73.00  106.00  196.00  225.00  251.00  295.00
           38         RY  20.00   15.00   10.00    7.00    6.00    5.00   13.00   19.00
                      *

           39         KK      A2   BASIN
           40         BA  0.015
           41         LG   0.35    0.37    5.24    0.25       0
           42         UI      0      10      31      61      85      95      85      63      45      32
           43         UI     22      16      11       8       6       2       2       2       2       0
           44         UI      0       0       0       0       0       0       0       0       0       0
           45         UI      0       0       0       0       0       0       0       0       0       0
           46         UI      0       0       0       0       0       0       0       0       0       0
                      *
1                                                   HEC-1 INPUT                                                    PAGE  2

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


           47         KK   CP-A2 COMBINE
           48         HC       2
                      *

           49         KK      B1   BASIN
           50         BA  0.011
           51         LG   0.35    0.35    4.33    0.40       0
```

```
  52      UI      0      8     25     49     67     72     62     44     31     21
  53      UI     15     10      7      5      3      2      2      2      2      0
  54      UI      0      0      0      0      0      0      0      0      0      0
  55      UI      0      0      0      0      0      0      0      0      0      0
  56      UI      0      0      0      0      0      0      0      0      0      0
          *

  57      KK     C1  BASIN
  58      BA  0.008
  59      LG   0.35   0.35   4.33   0.40      0
  60      UI      0      6     22     41     54     55     43     29     20     13
  61      UI     10      6      4      3      1      1      1      0      0      0
  62      UI      0      0      0      0      0      0      0      0      0      0
  63      UI      0      0      0      0      0      0      0      0      0      0
  64      UI      0      0      0      0      0      0      0      0      0      0
          *

  65      KK     D1  BASIN
  66      BA  0.002
  67      LG   0.35   0.35   4.33   0.40      0
  68      UI      0      7     24     24     12      6      3      1      1      0
  69      UI      0      0      0      0      0      0      0      0      0      0
  70      UI      0      0      0      0      0      0      0      0      0      0
  71      UI      0      0      0      0      0      0      0      0      0      0
  72      UI      0      0      0      0      0      0      0      0      0      0
          *

  73      KK  CLEAR COMBINE
  74      HC      3
          *
          *

  75      KK     E1  BASIN
  76      BA  0.022
  77      LG   0.28   0.26   5.05   0.31      4
  78      UI      0     12     23     55     81    101    111    106     88     66
  79      UI     51     39     29     23     17     12      9      8      5      3
  80      UI      3      3      3      3      0      0      0      0      0      0
  81      UI      0      0      0      0      0      0      0      0      0      0
  82      UI      0      0      0      0      0      0      0      0      0      0
          *
```



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

  83      KK     E2  BASIN
  84      BA  0.001
  85      LG   0.35   0.36   5.05   0.28      0
  86      UI      0     10     19      7      2      1      0      0      0      0
  87      UI      0      0      0      0      0      0      0      0      0      0
  88      UI      0      0      0      0      0      0      0      0      0      0
  89      UI      0      0      0      0      0      0      0      0      0      0
  90      UI      0      0      0      0      0      0      0      0      0      0
          *

  91      KK     E3  BASIN
  92      BA  0.038
  93      LG   0.29   0.26   5.05   0.30      4
  94      UI      0     12     12     26     47     66     83     99    110    117
  95      UI    118    113    105     88     74     63     54     45     38     32
  96      UI     27     23     19     17     13     13      8      8      8      5
  97      UI      3      3      3      3      3      3      3      3      3      0
  98      UI      0      0      0      0      0      0      0      0      0      0
          *

  99      KK     E4  BASIN
 100      BA  0.921
 101      LG   0.28   0.27   5.24   0.28      6
 102      UI      0     84     84     84     84     84     84     84     84    173
 103      UI    243    243    297    329    364    405    445    470    511    545
 104      UI    580    602    598    694    695    721    747    752    771    764
 105      UI    810    810    810    810    810    810    803    777    766    760
 106      UI    748    720    694    650    614    589    589    531    511    494
 107      UI    463    445    432    399    393    367    360    329    329    299
 108      UI    299    274    259    259    235    231    231    198    189    189
 109      UI    188    159    159    159    159    143    130    130    130    130
 110      UI    128     90     90     90     90     90     90     90     87     58
 111      UI     58     58     58     58     58     58     58     58     58     58
 112      UI     58     30     21     21     21     21     21     21     21     21
 113      UI     21     21     21     21     21     21     21     21     21     21
 114      UI     21     21     21     21     21     21     21     21     21     21
 115      UI     21     21     21     21     21      0      0      0      0      0
          *

 116      KK  CP-E4 COMBINE
 117      HC      4   .982
          *

 118      KK R-CPE4  ROUTE
 119      RS      1   FLOW
 120      RC  0.060  0.040  0.060   2050 0.0234 2635.00
 121      RX   0.00  33.00  50.00 130.00 345.00 390.00 447.00 530.00
 122      RY  34.00  25.00  18.00  19.00  18.00  20.00  26.00  32.00
          *
```



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

 123      KK     E5  BASIN
 124      BA  0.063
 125      LG   0.35   0.36   5.14   0.27      0
 126      UI      0     23     23     65    105    143    176    204    217    221
 127      UI    209    184    152    126    105     86     71     58     48     41
```

```
 128      UI      35      25      24      16      16      16       7       6       6       6
 129      UI       6       6       6       6       0       0       0       0       0       0
 130      UI       0       0       0       0       0       0       0       0       0       0
          *

 131      KK   CP-E5 COMBINE
 132      HC       2   1.044
          *

 133      KK      F1   BASIN
 134      BA   0.001
 135      LG    0.35    0.30    7.94    0.09       0
 136      UI       0       9      19       8       2       1       0       0       0       0
 137      UI       0       0       0       0       0       0       0       0       0       0
 138      UI       0       0       0       0       0       0       0       0       0       0
 139      UI       0       0       0       0       0       0       0       0       0       0
 140      UI       0       0       0       0       0       0       0       0       0       0
          *

 141      KK      G1   BASIN
 142      BA   0.007
 143      LG    0.35    0.36    5.14    0.26       0
 144      UI       0       5      14      28      40      44      40      29      21      15
 145      UI      10       8       5       4       3       1       1       1       1       0
 146      UI       0       0       0       0       0       0       0       0       0       0
 147      UI       0       0       0       0       0       0       0       0       0       0
 148      UI       0       0       0       0       0       0       0       0       0       0
          *

 149      KK      H1   BASIN
 150      BA   0.005
 151      LG    0.35    0.36    5.05    0.28       0
 152      UI       0       5      20      35      41      34      22      14       9       6
 153      UI       4       2       1       1       1       0       0       0       0       0
 154      UI       0       0       0       0       0       0       0       0       0       0
 155      UI       0       0       0       0       0       0       0       0       0       0
 156      UI       0       0       0       0       0       0       0       0       0       0
          *

 157      KK      I1   BASIN
 158      BA   0.006
 159      LG    0.35    0.36    5.05    0.28       0
 160      UI       0       4      12      24      33      37      34      26      18      13
 161      UI       9       7       5       3       3       1       1       1       1       1
 162      UI       0       0       0       0       0       0       0       0       0       0
 163      UI       0       0       0       0       0       0       0       0       0       0
 164      UI       0       0       0       0       0       0       0       0       0       0
          *
```



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

 165      KK    CLR2 COMBINE
 166      HC       4
          *
          *

 167      KK      J1   BASIN
 168      BA   0.003
 169      LG    0.35    0.36    5.14    0.26       0
 170      UI       0       3      13      22      25      20      13       8       5       3
 171      UI       2       1       1       1       0       0       0       0       0       0
 172      UI       0       0       0       0       0       0       0       0       0       0
 173      UI       0       0       0       0       0       0       0       0       0       0
 174      UI       0       0       0       0       0       0       0       0       0       0
          *

 175      KK      K1   BASIN
 176      BA   0.020
 177      LG    0.35    0.37    5.24    0.26       0
 178      UI       0      11      25      55      81     100     106      97      75      57
 179      UI      43      32      23      18      13      10       8       6       3       3
 180      UI       3       3       3       0       0       0       0       0       0       0
 181      UI       0       0       0       0       0       0       0       0       0       0
 182      UI       0       0       0       0       0       0       0       0       0       0
          *

 183      KK      L1   BASIN
 184      BA   0.003
 185      LG    0.35    0.36    5.05    0.28       0
 186      UI       0       6      23      33      25      14       7       4       2       1
 187      UI       1       0       0       0       0       0       0       0       0       0
 188      UI       0       0       0       0       0       0       0       0       0       0
 189      UI       0       0       0       0       0       0       0       0       0       0
 190      UI       0       0       0       0       0       0       0       0       0       0
          *

 191      KK      M1   BASIN
 192      BA   0.001
 193      LG    0.35    0.36    5.05    0.28       0
 194      UI       0       3       9      12       7       4       2       1       0       0
 195      UI       0       0       0       0       0       0       0       0       0       0
 196      UI       0       0       0       0       0       0       0       0       0       0
 197      UI       0       0       0       0       0       0       0       0       0       0
 198      UI       0       0       0       0       0       0       0       0       0       0
          *

 199      ZZ
```

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

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

    24          A1
                 V
                 V
    34        R-A1
                 .
                 .
    39           .          A2
                 .           .
                 .           .
    47       CP-A2............
                 .
                 .
    49           .          B1
                 .           .
                 .           .
    57           .           .          C1
                 .           .           .
                 .           .           .
    65           .           .           .          D1
                 .           .           .           .
                 .           .           .           .
    73           .       CLEAR........................
                 .           .
                 .           .
    75           .           .          E1
                 .           .           .
                 .           .           .
    83           .           .           .          E2
                 .           .           .           .
                 .           .           .           .
    91           .           .           .           .          E3
                 .           .           .           .           .
                 .           .           .           .           .
    99           .           .           .           .           .          E4
                 .           .           .           .           .           .
                 .           .           .           .           .           .
   116           .           .       CP-E4....................................
                 .           .           V
                 .           .           V
   118           .           .      R-CPE4
                 .           .           .
                 .           .           .
   123           .           .           .          E5
                 .           .           .           .
                 .           .           .           .
   131           .           .       CP-E5............
                 .           .           .
                 .           .           .
   133           .           .           .          F1
                 .           .           .           .
                 .           .           .           .
   141           .           .           .           .          G1
                 .           .           .           .           .
                 .           .           .           .           .
   149           .           .           .           .           .          H1
                 .           .           .           .           .           .
                 .           .           .           .           .           .
   157           .           .           .           .           .           .          I1
                 .           .           .           .           .           .           .
                 .           .           .           .           .           .           .
   165           .           .           .        CLR2....................................
                 .           .           .           .
                 .           .           .           .
   167           .           .           .           .          J1
                 .           .           .           .           .
                 .           .           .           .           .
   175           .           .           .           .           .          K1
                 .           .           .           .           .           .
                 .           .           .           .           .           .
   183           .           .           .           .           .           .          L1
                 .           .           .           .           .           .           .
                 .           .           .           .           .           .           .
   191           .           .           .           .           .           .           .          M1
 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
```

```
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   15JUN16  TIME  20:29:36   *                        *          (916) 756-1104                *
 *                                       *                        *                                        *
 *****************************************                        ******************************************
```

```
                              Flood Control District of Maricopa County
                              DM19 EX - Desert Mountain 19 Existing Condition
                              100 YEAR
                              6 Hour  Storm
                              Unit Hydrograph: S-Graph
                              Storm: Multiple
                              06/14/2016
                              WOOD/PATEL FILE NAME: DM19EX100.DAT

  10 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

    IT           HYDROGRAPH TIME DATA
                        NMIN           1  MINUTES IN COMPUTATION INTERVAL
                       IDATE      1JAN99  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ        2000  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      2JAN99  ENDING DATE
                      NDTIME        0919  ENDING TIME
                       ICENT          19  CENTURY MARK

                   COMPUTATION INTERVAL     .02 HOURS
                        TOTAL TIME BASE   33.32 HOURS

         ENGLISH UNITS
              DRAINAGE AREA          SQUARE MILES
              PRECIPITATION DEPTH    INCHES
              LENGTH, ELEVATION      FEET
              FLOW                   CUBIC FEET PER SECOND
              STORAGE VOLUME         ACRE-FEET
              SURFACE AREA           ACRES
              TEMPERATURE            DEGREES FAHRENHEIT

  12 JD            INDEX STORM NO. 1
                        STRM        3.31  PRECIPITATION DEPTH
                        TRDA         .00  TRANSPOSITION DRAINAGE AREA

  13 PI              PRECIPITATION PATTERN
```

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

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  16 JD            INDEX STORM NO. 2
                        STRM        3.29  PRECIPITATION DEPTH
                        TRDA         .50  TRANSPOSITION DRAINAGE AREA

  17 PI              PRECIPITATION PATTERN
```

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.03	.03	.03	.03	.03
.03	.03	.03	.03	.03	.03	.03	.03	.03	.03
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.00	.00	.00	.00	.00
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.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

20 JD INDEX STORM NO. 3

STRM 3.23 PRECIPITATION DEPTH

TRDA 2.80 TRANSPOSITION DRAINAGE AREA

21 PI PRECIPITATION PATTERN

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.00	.00	.00	.00	.00	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.02	.02	.02	.02	.02
.02	.02	.02	.02	.02	.02	.02	.02	.02	.02
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
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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	A1	468.	4.13	38.	10.	7.	.20		
+	ROUTED TO	R-A1	462.	4.18	38.	10.	7.	.20		
+	HYDROGRAPH AT	A2	50.	4.02	3.	1.	0.	.01		
+	2 COMBINED AT	CP-A2	469.	4.17	41.	10.	7.	.21		
+	HYDROGRAPH AT	B1	35.	4.02	2.	0.	0.	.01		
+	HYDROGRAPH AT	C1	26.	4.02	1.	0.	0.	.01		
+	HYDROGRAPH AT	D1	7.	4.02	0.	0.	0.	.00		
+	3 COMBINED AT	CLEAR	67.	4.02	3.	1.	1.	.02		
+	HYDROGRAPH AT	E1	72.	4.02	4.	1.	1.	.02		
+	HYDROGRAPH AT	E2	3.	4.02	0.	0.	0.	.00		
+	HYDROGRAPH AT	E3	111.	4.07	7.	2.	1.	.04		
+	HYDROGRAPH AT	E4	1111.	4.42	165.	41.	30.	.92		
+	4 COMBINED AT	CP-E4	1115.	4.40	174.	44.	31.	.98		
+	ROUTED TO	R-CPE4	1116.	4.40	174.	44.	31.	.98		
+	HYDROGRAPH AT	E5	186.	4.05	11.	3.	2.	.06		
+	2 COMBINED AT	CP-E5	1124.	4.38	183.	46.	33.	1.04		
+	HYDROGRAPH AT	F1	4.	4.02	0.	0.	0.	.00		
+	HYDROGRAPH AT	G1	23.	4.02	1.	0.	0.	.01		
+	HYDROGRAPH AT	H1	17.	4.02	1.	0.	0.	.00		
+	HYDROGRAPH AT	I1	20.	4.02	1.	0.	0.	.01		
+	4 COMBINED AT	CLR2	63.	4.02	3.	1.	1.	.02		
+	HYDROGRAPH AT	J1	10.	4.02	1.	0.	0.	.00		
+	HYDROGRAPH AT	K1	65.	4.02	3.	1.	1.	.02		
+	HYDROGRAPH AT	L1	10.	4.02	1.	0.	0.	.00		
+	HYDROGRAPH AT	M1	3.	4.02	0.	0.	0.	.00		

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

APPENDIX B

Developed Condition Hydrologic Calculations

DDMSW Output Data

2-year HEC-1 Model

10-year HEC-1 Model

100-year HEC-1 Model

DDMSW Output Data

Area ID	Book Number	Map Unit	Soil ID	Area (sq mi)	Area (%)	XKSAT	Rock Percent (%)	Effective Rock (%)	Comments
Major Basin ID: 01									
A1	645	33	64533	0.085	43.00	0.230	-	100	
	645	40	64540	0.083	42.20	0.170	-	100	
	645	93	64593	0.023	11.50	0.330	-	100	
	645	96	64596	0.007	3.30	0.070	-	100	
A2	645	93	64593	0.010	69.20	0.330	-	100	
	645	96	64596	0.005	30.80	0.070	-	100	
B1	645	33	64533	0.022	100.00	0.230	-	100	
B10	645	93	64593	0.012	100.00	0.330	-	100	
B11	645	93	64593	0.009	92.70	0.330	-	100	
	645	34	64534	0.001	7.30	0.230	-	100	
B12	645	6	6456	0.002	49.00	0.620	-	100	
	645	93	64593	0.003	51.00	0.330	-	100	
B13	645	34	64534	0.000	3.40	0.230	-	100	
	645	96	64596	0.003	86.20	0.070	-	100	
	645	6	6456	0.000	10.30	0.620	-	100	
B14	645	6	6456	0.009	22.90	0.620	-	100	
	645	96	64596	0.016	41.60	0.070	-	100	
	645	34	64534	0.011	29.60	0.230	-	100	
	645	33	64533	0.002	5.20	0.230	-	100	
	645	93	64593	0.000	0.80	0.330	-	100	
B14A	645	96	64596	0.003	69.00	0.070	-	100	
	645	6	6456	0.001	31.00	0.620	-	100	
B2	645	33	64533	0.001	100.00	0.230	-	100	
B3	645	33	64533	0.038	100.00	0.230	-	100	
B4	645	6	6456	0.043	4.60	0.620	-	100	
	645	33	64533	0.712	77.30	0.230	-	100	
	645	34	64534	0.004	0.50	0.230	-	100	
	645	40	64540	0.014	1.50	0.170	-	100	
	645	63	64563	0.079	8.60	0.140	25.00	100	
	645	96	64596	0.069	7.50	0.070	-	100	
B5	645	34	64534	0.006	100.00	0.230	-	100	
B6	645	6	6456	0.002	20.90	0.620	-	100	
	645	33	64533	0.005	54.70	0.230	-	100	
	645	93	64593	0.002	24.40	0.330	-	100	
B6W	645	93	64593	0.000	3.30	0.330	-	100	
	645	33	64533	0.000	3.30	0.230	-	100	
	645	6	6456	0.003	93.30	0.620	-	100	
B8	645	33	64533	0.008	75.90	0.230	-	100	
	645	93	64593	0.002	22.20	0.330	-	100	
	645	6	6456	0.000	1.90	0.620	-	100	
B9	645	93	64593	0.008	100.00	0.330	-	100	
C1	645	33	64533	0.001	3.10	0.230	-	100	
	645	34	64534	0.022	94.70	0.230	-	100	
	645	96	64596	0.001	2.20	0.070	-	100	
L1	645	33	64533	0.003	100.00	0.230	-	100	
M1	645	33	64533	0.002	100.00	0.230	-	100	

Sub Basin	Land Use Code	Area (sq mi)	Area (%)	Initial Loss (IA)	Percent Impervious (RTIMP)	Vegetation Cover (%)	DTHETA	Kn	Description
Major Basin ID: 01									
A1	901	0.0181	9.2	0.20	0	75.0	NORMAL	0.030	Recreational Open Space
	902	0.1792	90.8	0.30	5	30.0	NORMAL	0.040	Rural (1 dwelling unit per acre or less)
		0.1973	**100.0**						
A2	900	0.0110	100.0	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)
		0.0110	**100.0**						
B1	900	0.0018	8.3	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)
	901	0.0045	20.7	0.20	0	75.0	NORMAL	0.030	Recreational Open Space
	902	0.0154	71.0	0.30	5	30.0	NORMAL	0.040	Rural (1 dwelling unit per acre or less)
		0.0217	**100.0**						
B10	110	0.0010	8.3	0.30	5	30.0	NORMAL	0.020	Rural Residential (<= 1/5 du per acre)
	150	0.0010	8.3	0.15	25	30.0	NORMAL	0.040	Small Lot Residential - (2-5 dwelling units per acre)
	901	0.0100	83.3	0.20	0	75.0	NORMAL	0.030	Recreational Open Space
		0.0120	**99.9**						
B11	150	0.0080	80.0	0.15	25	30.0	NORMAL	0.040	Small Lot Residential - (2-5 dwelling units per acre)
	600	0.0020	20.0	0.05	95	0.0	DRY	0.015	General Transportation (Transportation where no detail avail
		0.0100	**100.0**						
B12	730	0.0050	100.0	0.10	0	90.0	NORMAL	0.030	Passive Open Space (Includes mountain preserves and washes)
		0.0050	**100.0**						
B13	150	0.0004	13.3	0.15	25	30.0	NORMAL	0.040	Small Lot Residential - (2-5 dwelling units per acre)
	600	0.0015	50.0	0.05	95	0.0	DRY	0.015	General Transportation (Transportation where no detail avail
	901	0.0011	36.7	0.20	0	75.0	NORMAL	0.030	Recreational Open Space

* Non default value

Sub Basin	Land Use Code	Area (sq mi)	Area (%)	Initial Loss (IA)	Percent Impervious (RTIMP)	Vegetation Cover (%)	DTHETA	Kn	Description

Major Basin ID: 01

Sub Basin	Land Use Code	Area (sq mi)	Area (%)	Initial Loss (IA)	Percent Impervious (RTIMP)	Vegetation Cover (%)	DTHETA	Kn	Description
		0.0030	**100.0**						
B14	150	0.0070	17.9	0.15	25	30.0	NORMAL	0.040	Small Lot Residential - (2-5 dwelling units per acre)
	230	0.0040	10.3	0.10	80	30.0	NORMAL	0.020	Community Commercial (100,000 to 500,000 sq. ft.)
	600	0.0040	10.3	0.05	95	0.0	DRY	0.015	General Transportation (Transportation where no detail avail
	901	0.0240	61.5	0.20	0	75.0	NORMAL	0.030	Recreational Open Space
		0.0390	**100.0**						
B14A	150	0.0040	80.0	0.15	25	30.0	NORMAL	0.040	Small Lot Residential - (2-5 dwelling units per acre)
	600	0.0010	20.0	0.05	95	0.0	DRY	0.015	General Transportation (Transportation where no detail avail
		0.0050	**100.0**						
B2	900	0.0012	100.0	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)
		0.0012	**100.0**						
B3	900	0.0038	10.0	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)
	901	0.0057	15.0	0.20	0	75.0	NORMAL	0.030	Recreational Open Space
	902	0.0285	75.0	0.30	5	30.0	NORMAL	0.040	Rural (1 dwelling unit per acre or less)
		0.0380	**100.0**						
B4	130	0.0074	0.8	0.18	15	35.0	NORMAL	0.040	Large Lot Residential - Single Family (1 du per acre to 2 du
	150	0.0250	2.7	0.15	25	30.0	NORMAL	0.040	Small Lot Residential - (2-5 dwelling units per acre)
	220	0.0067	0.7	0.07	80	10.0	NORMAL	0.020	Neighborhood Retail Center
	900	0.1237	13.5	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)
	901	0.2047	22.3	0.20	0	75.0	NORMAL	0.030	Recreational Open Space
	902	0.5446	59.3	0.30	5	30.0	NORMAL	0.040	Rural (1 dwelling unit per acre or less)

Sub Basin	Land Use Code	Area (sq mi)	Area (%)	Initial Loss (IA)	Percent Impervious (RTIMP)	Vegetation Cover (%)	DTHETA	Kn	Description
Major Basin ID: 01									
B4	903	0.0066	0.7	0.20	0	35.0	NORMAL	0.050	Dedicated Open Space
		0.9187	**100.0**						
B5	900	0.0010	16.7	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)
	901	0.0050	83.3	0.20	0	75.0	NORMAL	0.030	Recreational Open Space
		0.0060	**100.0**						
B6	600	0.0003	3.4	0.05	95	0.0	DRY	0.015	General Transportation (Transportation where no detail avail
	730	0.0001	1.1	0.10	0	90.0	NORMAL	0.030	Passive Open Space (Includes mountain preserves and washes)
	901	0.0083	95.4	0.20	0	75.0	NORMAL	0.030	Recreational Open Space
		0.0087	**99.9**						
B6W	600	0.0002	6.5	0.05	95	0.0	DRY	0.015	General Transportation (Transportation where no detail avail
	730	0.0019	61.3	0.10	0	90.0	NORMAL	0.030	Passive Open Space (Includes mountain preserves and washes)
	901	0.0010	32.3	0.20	0	75.0	NORMAL	0.030	Recreational Open Space
		0.0031	**100.1**						
B8	150	0.0090	81.8	0.15	25	30.0	NORMAL	0.040	Small Lot Residential - (2-5 dwelling units per acre)
	600	0.0020	18.2	0.05	95	0.0	DRY	0.015	General Transportation (Transportation where no detail avail
		0.0110	**100.0**						
B9	150	0.0060	75.0	0.15	25	30.0	NORMAL	0.040	Small Lot Residential - (2-5 dwelling units per acre)
	600	0.0020	25.0	0.05	95	0.0	DRY	0.015	General Transportation (Transportation where no detail avail
		0.0080	**100.0**						
C1	150	0.0060	25.0	0.15	25	30.0	NORMAL	0.040	Small Lot Residential - (2-5 dwelling units per acre)
	600	0.0020	8.3	0.05	95	0.0	DRY	0.015	General Transportation (Transportation where no detail avail

Sub Basin	Land Use Code	Area (sq mi)	Area (%)	Initial Loss (IA)	Percent Impervious (RTIMP)	Vegetation Cover (%)	DTHETA	Kn	Description
Major Basin ID: 01									
C1	901	0.0160	66.7	0.20	0	75.0	NORMAL	0.030	Recreational Open Space
		0.0240	**100.0**						
L1	900	0.0027	100.0	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)
		0.0027	**100.0**						
M1	900	0.0015	100.0	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)
		0.0015	**100.0**						

Major Basin ID: 01

Area ID	Area (sq mi)	Length (mi)	Slope (ft/mi)	S-Graph	Lca (mi)	Lag (min)	Velocity (f/s)	Kn	IA (in)	DTHETA	PSIF (in)	XKSAT (in/hr)	RTIMP (%)
	Sub Basin Parameters								Rainfall Losses				
B14A	0.004	0.04	394.7	VALLEY	0.02	1.10	3.17	0.035	0.13	0.26	6.16	0.160	39
A1	0.197	0.95	134.1	DESERT/RANGE	0.51	16.80	4.96	0.039	0.29	0.25	5.34	0.258	5
B6W	0.003	0.17	126.5	VALLEY	0.08	3.20	4.53	0.029	0.13	0.28	3.37	1.041	6
A2	0.011	0.19	118.3	DESERT/RANGE	0.10	5.10	3.20	0.040	0.35	0.37	5.24	0.250	
B5	0.006	0.11	136.4	VALLEY	0.06	2.70	3.60	0.032	0.23	0.27	5.05	0.377	
B6	0.009	0.11	133.9	VALLEY	0.06	2.50	4.01	0.029	0.19	0.25	4.45	0.524	3
B8	0.010	0.18	61.5	VALLEY	0.09	4.80	3.28	0.035	0.13	0.27	4.87	0.295	38
B1	0.022	0.31	184.7	DESERT/RANGE	0.15	6.40	4.35	0.038	0.28	0.26	5.05	0.306	4
B9	0.008	0.08	144.6	VALLEY	0.04	2.20	3.36	0.034	0.13	0.28	4.33	0.376	43
B2	0.001	0.05	297.9	DESERT/RANGE	0.02	1.40	3.00	0.040	0.35	0.36	5.05	0.281	
B10	0.012	0.22	113.6	VALLEY	0.11	4.30	4.53	0.030	0.20	0.25	4.33	0.541	2
B3	0.038	0.57	146.3	DESERT/RANGE	0.25	10.40	4.85	0.039	0.29	0.26	5.05	0.299	4
B11	0.010	0.18	107.3	VALLEY	0.09	4.30	3.62	0.035	0.13	0.27	4.39	0.374	39
B4	0.921	3.33	259.5	DESERT/RANGE	1.69	36.70	7.99	0.038	0.28	0.27	5.24	0.281	6
B12	0.005	0.13	150.4	DESERT/RANGE	0.07	2.80	4.15	0.030	0.10	0.25	3.79	0.851	
B13	0.003	0.05	408.2	VALLEY	0.02	.80	5.44	0.024	0.12	0.24	7.27	0.114	51
B14	0.038	0.33	121.2	VALLEY	0.16	5.50	5.29	0.029	0.17	0.26	5.58	0.266	23
C1	0.023	0.30	82.5	VALLEY	0.15	6.00	4.47	0.031	0.18	0.26	5.05	0.344	14
L1	0.003	0.12	243.7	DESERT/RANGE	0.05	2.90	3.62	0.040	0.35	0.36	5.05	0.281	
M1	0.001	0.10	204.1	DESERT/RANGE	0.04	2.60	3.38	0.040	0.35	0.36	5.05	0.281	

* Non default value

2-year HEC-1 Model

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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   15JUN16  TIME  20:59:37    *                                         *          (916) 756-1104             *
 *                                       *                                         *                                     *
*****************************************                                          ***************************************


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


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

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


1                                        HEC-1 INPUT                                                    PAGE  1

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

             1       ID        Flood Control District of Maricopa County
             2       ID        DM19 PROP - Desert Mountain 19 Post Online Det Basins 1st Flush
             3       ID        2 YEAR
             4       ID        6 Hour  Storm
             5       ID        Unit Hydrograph: S-Graph
             6       ID        Storm: Multiple
             7       ID        06/14/2016
             8       ID        WOOD/PATEL FILE NAME: DM19FT2.DAT
                     *DIAGRAM
             9       IT       1  1JAN99       0    2000
            10       IO       5
            11       IN      15
                     *
            12       JD   1.475  0.0001
            13       PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
            14       PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
            15       PC   0.962   0.972   0.983   0.991   1.000
            16       JD   1.466  0.5000
            17       PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
            18       PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
            19       PC   0.962   0.972   0.983   0.991   1.000
            20       JD   1.456     1.0
            21       PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.075
            22       PC   0.087   0.099   0.119   0.148   0.230   0.407   0.778   0.881   0.919   0.945
            23       PC   0.957   0.968   0.980   0.990   1.000
            24       JD   1.438     2.8
            25       PC   0.000   0.009   0.016   0.025   0.034   0.042   0.051   0.059   0.067   0.076
            26       PC   0.087   0.100   0.120   0.163   0.252   0.451   0.694   0.837   0.900   0.938
            27       PC   0.950   0.963   0.975   0.988   1.000
                     *

            28       KK      A1   BASIN
            29       BA   0.197
            30       LG    0.29    0.25    5.34    0.26       5
            31       UI       0      39      39      39      50     114     146     182     223     254
            32       UI     279     323     344     355     374     378     378     369     357     338
            33       UI     302     275     245     222     200     181     164     147     133     120
            34       UI     108      94      88      75      74      62      61      53      42      42
            35       UI      42      31      27      27      27      27      25      10      10      10
            36       UI      10      10      10      10      10      10      10      10      10      10
            37       UI      10      10       0       0       0       0       0       0       0       0
                     *

            38       KK    R-A1   ROUTE
            39       RS       4    FLOW
            40       RC   0.060   0.040   0.060     980  0.0224   19.00
            41       RX    0.00   42.00   73.00  106.00  196.00  225.00  251.00  295.00
            42       RY   20.00   15.00   10.00    7.00    6.00    5.00   13.00   19.00
                     *
1                                        HEC-1 INPUT                                                    PAGE  2

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


            43       KK      A2   BASIN
            44       BA   0.011
            45       LG    0.35    0.37    5.24    0.25       0
            46       UI       0       7      22      45      62      70      63      46      33      23
            47       UI      16      12       8       6       5       2       2       2       2       0
            48       UI       0       0       0       0       0       0       0       0       0       0
            49       UI       0       0       0       0       0       0       0       0       0       0
            50       UI       0       0       0       0       0       0       0       0       0       0
                     *

            51       KK   CP-A2 COMBINE
            52       HC       2
                     *
```

```
  53           KK      B1   BASIN
  54           BA   0.022
  55           LG    0.28    0.26    5.05    0.31       4
  56           UI       0      12      23      55      81     101     111     106      88      66
  57           UI      51      39      29      23      17      12       9       8       5       3
  58           UI       3       3       3       3       0       0       0       0       0       0
  59           UI       0       0       0       0       0       0       0       0       0       0
  60           UI       0       0       0       0       0       0       0       0       0       0
               *

  61           KK    R-B1   ROUTE
  62           RK     500  0.0200   0.013            CIRC   3.500
               *

  63           KK      B2   BASIN
  64           BA   0.001
  65           LG    0.35    0.36    5.05    0.28       0
  66           UI       0      10      19       7       2       1       0       0       0       0
  67           UI       0       0       0       0       0       0       0       0       0       0
  68           UI       0       0       0       0       0       0       0       0       0       0
  69           UI       0       0       0       0       0       0       0       0       0       0
  70           UI       0       0       0       0       0       0       0       0       0       0
               *

  71           KK      B3   BASIN
  72           BA   0.038
  73           LG    0.29    0.26    5.05    0.30       4
  74           UI       0      12      12      26      47      66      83      99     110     117
  75           UI     118     113     105      88      74      63      54      45      38      32
  76           UI      27      23      19      17      13      13       8       8       8       5
  77           UI       3       3       3       3       3       3       3       3       3       0
  78           UI       0       0       0       0       0       0       0       0       0       0
               *

  79           KK   CP-B3 COMBINE
  80           HC       2
               *
1                                        HEC-1 INPUT                                            PAGE  3

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


  81           KK  R-CPB3   ROUTE
  82           RS       2    FLOW
  83           RC   0.060   0.040   0.060     300  0.0100   10.00
  84           RX    0.00    7.50   15.00   18.00   21.00   23.00   30.50   38.00
  85           RY   10.00    7.50    5.00    5.00    5.00    5.00    7.50   10.00
               *

  86           KK      B4   BASIN
  87           BA   0.921
  88           LG    0.28    0.27    5.24    0.28       6
  89           UI       0      84      84      84      84      84      84      84      84     173
  90           UI     243     243     297     329     364     405     445     470     511     545
  91           UI     580     602     598     694     695     721     747     752     771     764
  92           UI     810     810     810     810     810     810     803     777     766     760
  93           UI     748     720     694     650     614     589     589     531     511     494
  94           UI     463     445     432     399     393     367     360     329     329     299
  95           UI     299     274     259     259     235     231     231     198     189     189
  96           UI     188     159     159     159     159     143     130     130     130     130
  97           UI     128      90      90      90      90      90      90      90      87      58
  98           UI      58      58      58      58      58      58      58      58      58      58
  99           UI      58      30      21      21      21      21      21      21      21      21
 100           UI      21      21      21      21      21      21      21      21      21      21
 101           UI      21      21      21      21      21      21      21      21      21      21
 102           UI      21      21      21      21      21       0       0       0       0       0
               *

 103           KK    DVOC  DIVERT
 104           DT    DTOC    0.00  1050.0
 105           DI     0.0  2000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 106           DQ     0.0  2000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
               *

 107           KK   DETOC STORAGE
 108           KO
 109           RS       1    STOR
 110           SV            0.26    0.59    0.99    1.48
 111           SQ            4.00    9.00   12.00   15.00
 112           SE            1.00    2.00    3.00    4.00
               *

 113           KK    DVOCRETRIEVE
 114           DR    DTOC
               *

 115           KK     B4C COMBINE
 116           HC       2
               *

 117           KK    DVOD  DIVERT
 118           DT    DTOD    0.00   975.0
 119           DI     0.0 20000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 120           DQ     0.0 20000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
               *
1                                        HEC-1 INPUT                                            PAGE  4

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


 121           KK   DETOD STORAGE
 122           KO
 123           RS       1    STOR
 124           SV            0.42    0.89    1.42    2.01
```

```
 125          SQ          4.00   9.00  12.00  15.00
 126          SE          1.00   2.00   3.00   4.00
              *

 127          KK   DVODRETRIEVE
 128          DR   DTOD
              *

 129          KK     B4D COMBINE
 130          HC       2
              *

 131          KK   CP-B4 COMBINE
 132          HC       2
              *

 133          KK  R-CPB4   ROUTE
 134          RS       1    FLOW
 135          RC   0.060   0.040  0.060    300  0.0300 2631.00
 136          RX    0.00   18.90  43.80  54.80  81.50  91.60 120.00 160.00
 137          RY  2635.0 2630.00 2629.00 2625.00 2625.00 2629.00 2630.00 2631.00
              *

 138          KK   CP-B5 COMBINE
 139          HC       2
              *

 140          KK  R-CPB5   ROUTE
 141          RS       2    FLOW
 142          RC   0.060   0.040  0.060    650  0.0300 2631.00
 143          RX    0.00   18.90  43.80  54.80  81.50  91.60 120.00 160.00
 144          RY  2635.0 2630.00 2629.00 2625.00 2625.00 2629.00 2630.00 2631.00
              *

 145          KK      B6   BASIN
 146          BA   0.009
 147          LG    0.19    0.25   4.45   0.52      3
 148          UI       0      26     78    129     74     27      9      4      0      0
 149          UI       0       0      0      0      0      0      0      0      0      0
 150          UI       0       0      0      0      0      0      0      0      0      0
 151          UI       0       0      0      0      0      0      0      0      0      0
 152          UI       0       0      0      0      0      0      0      0      0      0
              *

 153          KK      B8   BASIN
 154          BA   0.010
 155          LG    0.13    0.27   4.87   0.30     38
 156          UI       0       7     25     39     55     83     63     46     31     15
 157          UI      10       6      2      2      2      0      0      0      0      0
 158          UI       0       0      0      0      0      0      0      0      0      0
1                                           HEC-1 INPUT                                   PAGE 5

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

 159          UI       0       0      0      0      0      0      0      0      0      0
 160          UI       0       0      0      0      0      0      0      0      0      0
              *

 161          KK    CP68 COMBINE
 162          HC       2
              *

 163          KK   DET68 STORAGE
 164          KO
 165          RS       1    STOR
 166          SV            0.09   0.21   0.37   0.58
 167          SQ            1.00   1.00   2.00   2.00
 168          SE  2608.0 2609.00 2610.00 2611.00 2612.00
 169          SS  2612.0   20.00   2.80   1.50
              *

 170          KK     B6W   BASIN
 171          BA   0.003
 172          LG    0.13    0.28   3.37   1.04      6
 173          UI       0       5     16     29     32     19      9      4      1      1
 174          UI       0       0      0      0      0      0      0      0      0      0
 175          UI       0       0      0      0      0      0      0      0      0      0
 176          UI       0       0      0      0      0      0      0      0      0      0
 177          UI       0       0      0      0      0      0      0      0      0      0
              *

 178          KK   CP-6W COMBINE
 179          HC       3
              *

 180          KK   DV-B7  DIVERT
 181          DT   DT-B7    0.00    0.0
 182          DI     0.0   150.0  300.0  450.0  600.0  750.0  900.0 1050.0 1200.0    0.0
 183          DQ     0.0     4.0    9.0   12.0   15.0   18.0   20.0   22.0   24.0    0.0
              *

 184          KK   DV-B7RETRIEVE
 185          DR   DT-B7
              *

 186          KK    B14A   BASIN
 187          BA   0.004
 188          LG    0.13    0.26   6.16   0.16     39
 189          UI       0      62     83      9      0      0      0      0      0      0
 190          UI       0       0      0      0      0      0      0      0      0      0
 191          UI       0       0      0      0      0      0      0      0      0      0
 192          UI       0       0      0      0      0      0      0      0      0      0
 193          UI       0       0      0      0      0      0      0      0      0      0
              *
1                                           HEC-1 INPUT                                   PAGE 6
```

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

 194          KK   CP-V7 COMBINE
 195          HC       2
              *

 196          KK  DETBV7 STORAGE
 197          KO
 198          RS       1    STOR
 199          SV            0.22    0.47    0.77    1.10
 200          SQ            1.00    1.00    2.00   50.00
 201          SE  2606.0 2607.00 2608.00 2609.00 2610.00
              *

 202          KK      B9   BASIN
 203          BA   0.008
 204          LG    0.13    0.28    4.33    0.38      43
 205          UI       0      31      93     116      50      15       4       0       0       0
 206          UI       0       0       0       0       0       0       0       0       0       0
 207          UI       0       0       0       0       0       0       0       0       0       0
 208          UI       0       0       0       0       0       0       0       0       0       0
 209          UI       0       0       0       0       0       0       0       0       0       0
              *

 210          KK   DV-B9  DIVERT
 211          DT   DT-B9    0.21     0.0
 212          DI     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 213          DQ     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
              *

 214          KK   CP-B9 COMBINE
 215          HC       3
              *

 216          KK  R-CPB9   ROUTE
 217          RS       1    FLOW
 218          RC   0.060   0.040   0.060     750  0.0300 2605.00
 219          RX    0.00   55.30  123.80  129.00  141.80  146.00  155.20  188.60
 220          RY  2608.0 2600.00 2598.00 2596.00 2596.00 2597.80 2598.00 2605.00
              *

 221          KK     B10   BASIN
 222          BA   0.012
 223          LG    0.20    0.25    4.33    0.54       2
 224          UI       0      10      39      58      90     102      69      47      23      13
 225          UI       7       3       3       0       0       0       0       0       0       0
 226          UI       0       0       0       0       0       0       0       0       0       0
 227          UI       0       0       0       0       0       0       0       0       0       0
 228          UI       0       0       0       0       0       0       0       0       0       0
              *
```



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

 229          KK  DV-B10  DIVERT
 230          DT  DT-B10    0.32     0.0
 231          DI     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 232          DQ     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
              *

 233          KK     B12   BASIN
 234          BA   0.005
 235          LG    0.10    0.25    3.79    0.85       0
 236          UI       0      11      41      56      40      22      12       6       3       1
 237          UI       1       0       0       0       0       0       0       0       0       0
 238          UI       0       0       0       0       0       0       0       0       0       0
 239          UI       0       0       0       0       0       0       0       0       0       0
 240          UI       0       0       0       0       0       0       0       0       0       0
              *

 241          KK     B14   BASIN
 242          BA   0.038
 243          LG    0.17    0.26    5.58    0.27      23
 244          UI       0      23      67     119     155     222     274     198     149     108
 245          UI      58      39      24      12       7       7       7       0       0       0
 246          UI       0       0       0       0       0       0       0       0       0       0
 247          UI       0       0       0       0       0       0       0       0       0       0
 248          UI       0       0       0       0       0       0       0       0       0       0
              *

 249          KK  DV-B14  DIVERT
 250          DT  DT-B14    1.03     0.0
 251          DI     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 252          DQ     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
              *

 253          KK  CP-B14 COMBINE
 254          HC       4
              *

 255          KK      C1   BASIN
 256          BA   0.023
 257          LG    0.18    0.26    5.05    0.34      14
 258          UI       0      13      33      61      79     104     155     128      99      76
 259          UI      55      29      22      13       8       4       4       4       0       0
 260          UI       0       0       0       0       0       0       0       0       0       0
 261          UI       0       0       0       0       0       0       0       0       0       0
 262          UI       0       0       0       0       0       0       0       0       0       0
              *

 263          KK   DV-C1  DIVERT
 264          DT   DT-C1    0.61     0.0
```

```
 265          DI     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 266          DQ     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
              *
```



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


 267          KK   DVC-K  DIVERT
 268          DT   DTC-K    0.00       1
 269          DI     0.0    1000     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 270          DQ     0.0    1000     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
              *

 271          KK   DVC-H  DIVERT
 272          DT   DTC-H    0.00       4
 273          DI     0.0    1000     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 274          DQ     0.0    1000     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
              *

 275          KK     B13   BASIN
 276          BA   0.003
 277          LG    0.12    0.24    7.27    0.11      51
 278          UI       0      82      33       0       0       0       0       0       0       0
 279          UI       0       0       0       0       0       0       0       0       0       0
 280          UI       0       0       0       0       0       0       0       0       0       0
 281          UI       0       0       0       0       0       0       0       0       0       0
 282          UI       0       0       0       0       0       0       0       0       0       0
              *

 283          KK  DV-B13  DIVERT
 284          DT  DT-B13    0.08     0.0
 285          DI     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 286          DQ     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
              *

 287          KK   CPB13 COMBINE
 288          HC       2
              *

 289          KK    DVGF  DIVERT
 290          DT    DVGF    0.00       1
 291          DI     0.0    1000     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 292          DQ     0.0    1000     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
              *

 293          KK   R-B13   ROUTE
 294          RK     450  0.0090   0.013            CIRC   4.000
              *

 295          KK   CPGAL COMBINE
 296          HC       2
              *

 297          KK      B5   BASIN
 298          BA   0.006
 299          LG    0.23    0.27    5.05    0.38       0
 300          UI       0      15      45      80      54      25      10       2       2       0
 301          UI       0       0       0       0       0       0       0       0       0       0
 302          UI       0       0       0       0       0       0       0       0       0       0
 303          UI       0       0       0       0       0       0       0       0       0       0
 304          UI       0       0       0       0       0       0       0       0       0       0
              *
```



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


 305          KK   DV-B5  DIVERT
 306          DT   DT-B5    0.55     0.0
 307          DI     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 308          DQ     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
              *

 309          KK     B11   BASIN
 310          BA   0.010
 311          LG    0.13    0.27    4.39    0.37      39
 312          UI       0       8      32      48      75      85      57      39      19      11
 313          UI       6       2       2       0       0       0       0       0       0       0
 314          UI       0       0       0       0       0       0       0       0       0       0
 315          UI       0       0       0       0       0       0       0       0       0       0
 316          UI       0       0       0       0       0       0       0       0       0       0
              *

 317          KK  DV-C11  DIVERT
 318          DT  DT-C11     0.0     5.0
 319          DI     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 320          DQ     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
              *

 321          KK  DV-B11  DIVERT
 322          DT  DT-B11    0.26     0.0
 323          DI     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 324          DQ     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
              *
              *

 325          KK      L1   BASIN
 326          BA   0.003
 327          LG    0.35    0.36    5.05    0.28       0
 328          UI       0       6      23      33      25      14       7       4       2       1
 329          UI       1       0       0       0       0       0       0       0       0       0
 330          UI       0       0       0       0       0       0       0       0       0       0
 331          UI       0       0       0       0       0       0       0       0       0       0
 332          UI       0       0       0       0       0       0       0       0       0       0
```

```
                 *

333              KK      M1   BASIN
334              BA   0.001
335              LG    0.35    0.36    5.05    0.28       0
336              UI       0       3       9      12       7       4       2       1       0       0
337              UI       0       0       0       0       0       0       0       0       0       0
338              UI       0       0       0       0       0       0       0       0       0       0
339              UI       0       0       0       0       0       0       0       0       0       0
340              UI       0       0       0       0       0       0       0       0       0       0
                 *
341              ZZ
```

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

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

    28          A1
                 V
                 V
    38        R-A1
                 .
                 .
    43           .          A2
                 .           .
                 .           .
    51       CP-A2............
                 .
                 .
    53           .          B1
                 .           V
                 .           V
    61           .        R-B1
                 .           .
                 .           .
    63           .           .          B2
                 .           .           .
                 .           .           .
    71           .           .           .          B3
                 .           .           .           .
                 .           .           .           .
    79           .           .       CP-B3............
                 .           .           V
                 .           .           V
    81           .           .      R-CPB3
                 .           .           .
                 .           .           .
    86           .           .           .          B4
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   104           .           .           .           .------->    DTOC
   103           .           .           .        DVOC
                 .           .           .           V
                 .           .           .           V
   107           .           .           .       DETOC
                 .           .           .           .
                 .           .           .           .
   114           .           .           .           .           .<-------    DTOC
   113           .           .           .           .        DVOC
                 .           .           .           .           .
                 .           .           .           .           .
   115           .           .           .         B4C............
                 .           .           .           .
                 .           .           .           .
   118           .           .           .           .------->    DTOD
   117           .           .           .        DVOD
                 .           .           .           V
                 .           .           .           V
   121           .           .           .       DETOD
                 .           .           .           .
                 .           .           .           .
   128           .           .           .           .           .<-------    DTOD
   127           .           .           .           .        DVOD
                 .           .           .           .           .
                 .           .           .           .           .
   129           .           .           .         B4D............
                 .           .           .           .
                 .           .           .           .
   131           .           .       CP-B4............
                 .           .           V
                 .           .           V
   133           .           .      R-CPB4
                 .           .           .
                 .           .           .
   138           .      CP-B5............
                 .           V
                 .           V
   140           .     R-CPB5
                 .           .
                 .           .
   145           .           .          B6
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                 .           .           .
   153           .           .           .          B8
                 .           .           .           .
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   161           .           .        CP68............
                 .           .           V
                 .           .           V
   163           .           .       DET68
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   170           .           .           .         B6W
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                 .           .           .           .
   178           .      CP-6W........................
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                 .           .
   181           .           .------->   DT-B7
   180           .       DV-B7
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   185           .           .           .<-------   DT-B7
   184           .           .       DV-B7
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    186            .           .           .        B14A
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    194            .           .       CP-V7............
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    196            .           .      DETBV7
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    202            .           .           .          B9
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    211            .           .           .           .------->  DT-B9
    210            .           .           .       DV-B9
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    214            .       CP-B9........................
                   .           V
                   .           V
    216            .      R-CPB9
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    221            .           .         B10
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                   .           .           .
    230            .           .           .------->  DT-B10
    229            .           .      DV-B10
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    233            .           .           .         B12
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    241            .           .           .           .         B14
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    250            .           .           .           .           .------->  DT-B14
    249            .           .           .           .      DV-B14
                   .           .           .           .           .
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    253            .      CP-B14....................................
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                   .           .
    255            .           .          C1
                   .           .           .
                   .           .           .
    264            .           .           .------->  DT-C1
    263            .           .       DV-C1
                   .           .           .
                   .           .           .
    268            .           .           .------->  DTC-K
    267            .           .       DVC-K
                   .           .           .
                   .           .           .
    272            .           .           .------->  DTC-H
    271            .           .       DVC-H
                   .           .           .
                   .           .           .
    275            .           .           .         B13
                   .           .           .           .
                   .           .           .           .
    284            .           .           .           .------->  DT-B13
    283            .           .           .      DV-B13
                   .           .           .           .
                   .           .           .           .
    287            .           .       CPB13............
                   .           .           .
                   .           .           .
    290            .           .           .------->  DVGF
    289            .           .        DVGF
                   .           .           V
                   .           .           V
    293            .           .       R-B13
                   .           .           .
                   .           .           .
    295            .       CPGAL............
                   .           .
                   .           .
    297            .           .          B5
                   .           .           .
                   .           .           .
    306            .           .           .------->  DT-B5
    305            .           .       DV-B5
                   .           .           .
                   .           .           .
    309            .           .           .         B11
                   .           .           .           .
                   .           .           .           .
    318            .           .           .           .------->  DT-C11
    317            .           .           .      DV-C11
                   .           .           .           .
                   .           .           .           .
    322            .           .           .           .------->  DT-B11
    321            .           .           .      DV-B11
                   .           .           .           .
                   .           .           .           .
    325            .           .           .           .          L1
                   .           .           .           .           .
                   .           .           .           .           .
    333            .           .           .           .           .          M1
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(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
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   15JUN16  TIME  20:59:37     *                          *          (916) 756-1104               *
*                                        *                          *                                       *
*****************************************                          *****************************************
```

Flood Control District of Maricopa County
DM19 PROP - Desert Mountain 19 Post Online Det Basins 1st Flush
2 YEAR
6 Hour Storm
Unit Hydrograph: S-Graph
Storm: Multiple
06/14/2016
WOOD/PATEL FILE NAME: DM19FT2.DAT

```
10 IO         OUTPUT CONTROL VARIABLES
                    IPRNT          5  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE

   IT         HYDROGRAPH TIME DATA
                     NMIN          1  MINUTES IN COMPUTATION INTERVAL
                    IDATE     1JAN99  STARTING DATE
                    ITIME       0000  STARTING TIME
                       NQ       2000  NUMBER OF HYDROGRAPH ORDINATES
                   NDDATE     2JAN99  ENDING DATE
                   NDTIME       0919  ENDING TIME
                    ICENT         19  CENTURY MARK

                COMPUTATION INTERVAL     .02 HOURS
                     TOTAL TIME BASE   33.32 HOURS

       ENGLISH UNITS
            DRAINAGE AREA          SQUARE MILES
            PRECIPITATION DEPTH    INCHES
            LENGTH, ELEVATION      FEET
            FLOW                   CUBIC FEET PER SECOND
            STORAGE VOLUME         ACRE-FEET
            SURFACE AREA           ACRES
            TEMPERATURE            DEGREES FAHRENHEIT

12 JD         INDEX STORM NO. 1
                     STRM       1.48  PRECIPITATION DEPTH
                     TRDA        .00  TRANSPOSITION DRAINAGE AREA
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13 PI PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.03	.03	.03	.03	.03
.03	.03	.03	.03	.03	.03	.03	.03	.03	.03
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16 JD         INDEX STORM NO. 2
                     STRM       1.47  PRECIPITATION DEPTH
                     TRDA        .50  TRANSPOSITION DRAINAGE AREA
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17 PI PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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20 JD INDEX STORM NO. 3

STRM 1.46 PRECIPITATION DEPTH

TRDA 1.00 TRANSPOSITION DRAINAGE AREA

21 PI PRECIPITATION PATTERN

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24 JD INDEX STORM NO. 4

STRM 1.44 PRECIPITATION DEPTH

TRDA 2.80 TRANSPOSITION DRAINAGE AREA

25 PI PRECIPITATION PATTERN

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              **************
              *            *
 107 KK       *   DETOC    *     STORAGE
              *            *
              **************

 108 KO            OUTPUT CONTROL VARIABLES
                         IPRNT          5  PRINT CONTROL
                         IPLOT          0  PLOT CONTROL
                         QSCAL         0.  HYDROGRAPH PLOT SCALE

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              **************
              *            *
 121 KK       *   DETOD    *     STORAGE
              *            *
              **************

 122 KO            OUTPUT CONTROL VARIABLES
                         IPRNT          5  PRINT CONTROL
                         IPLOT          0  PLOT CONTROL
                         QSCAL         0.  HYDROGRAPH PLOT SCALE

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              **************
              *            *
 163 KK       *   DET68    *     STORAGE
              *            *
              **************

 164 KO            OUTPUT CONTROL VARIABLES
                         IPRNT          5  PRINT CONTROL
                         IPLOT          0  PLOT CONTROL
                         QSCAL         0.  HYDROGRAPH PLOT SCALE

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              **************
              *            *
 196 KK       *  DETBV7    *     STORAGE
              *            *
              **************

 197 KO            OUTPUT CONTROL VARIABLES
                         IPRNT          5  PRINT CONTROL
                         IPLOT          0  PLOT CONTROL
                         QSCAL         0.  HYDROGRAPH PLOT SCALE
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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	A1	131.	4.15	9.	2.	2.	.20		
+	ROUTED TO	R-A1	128.	4.22	9.	2.	2.	.20		
+	HYDROGRAPH AT	A2	10.	4.03	0.	0.	0.	.01		
+	2 COMBINED AT	CP-A2	128.	4.22	10.	2.	2.	.21		
+	HYDROGRAPH AT	B1	21.	4.03	1.	0.	0.	.02		
+	ROUTED TO	R-B1	21.	4.05	1.	0.	0.	.02		
+	HYDROGRAPH AT	B2	1.	4.02	0.	0.	0.	.00		
+	HYDROGRAPH AT	B3	31.	4.08	2.	0.	0.	.04		
+	2 COMBINED AT	CP-B3	31.	4.07	2.	0.	0.	.04		
+	ROUTED TO	R-CPB3	31.	4.10	2.	0.	0.	.04		
+	HYDROGRAPH AT	B4	236.	4.43	33.	8.	6.	.92		
+	DIVERSION TO	DTOC	236.	4.43	33.	8.	6.	.92		
+	HYDROGRAPH AT	DVOC	0.	.00	0.	0.	0.	.92		
+	ROUTED TO	DETOC	0.	.00	0.	0.	0.	.92		
+	HYDROGRAPH AT	DVOC	236.	4.43	33.	8.	6.	.92		
+	2 COMBINED AT	B4C	236.	4.43	33.	8.	6.	.92		
+	DIVERSION TO	DTOD	236.	4.43	33.	8.	6.	.92		
+	HYDROGRAPH AT	DVOD	0.	.00	0.	0.	0.	.92		
+	ROUTED TO	DETOD	0.	.00	0.	0.	0.	.92		
+	HYDROGRAPH AT	DVOD	236.	4.43	33.	8.	6.	.92		
+	2 COMBINED AT	B4D	236.	4.43	33.	8.	6.	.92		
+	2 COMBINED AT	CP-B4	234.	4.43	34.	8.	6.	.96		
+	ROUTED TO	R-CPB4	233.	4.43	34.	8.	6.	.96		
+	2 COMBINED AT	CP-B5	231.	4.43	34.	9.	6.	.98		
+	ROUTED TO	R-CPB5	230.	4.47	34.	9.	6.	.98		
+	HYDROGRAPH AT	B6	8.	4.02	0.	0.	0.	.01		
+	HYDROGRAPH AT	B8	13.	4.02	1.	0.	0.	.01		
+	2 COMBINED AT	CP68	21.	4.02	1.	0.	0.	.02		
+	ROUTED TO	DET68	2.	4.03	1.	0.	0.	.02		
+	HYDROGRAPH AT	B6W	1.	4.03	0.	0.	0.	.00		
+	3 COMBINED AT	CP-6W	230.	4.47	35.	9.	6.	1.00		
+	DIVERSION TO	DT-B7	7.	4.47	1.	0.	0.	1.00		

+	HYDROGRAPH AT	DV-B7	223.	4.47	34.	8.	6.	1.00
+	HYDROGRAPH AT	DV-B7	7.	4.47	1.	0.	0.	1.00
+	HYDROGRAPH AT	B14A	6.	4.02	0.	0.	0.	.00
+	2 COMBINED AT	CP-V7	10.	4.45	2.	0.	0.	.00
+	ROUTED TO	DETBV7	2.	5.22	1.	0.	0.	.00
+	HYDROGRAPH AT	B9	11.	4.02	1.	0.	0.	.01
+	DIVERSION TO	DT-B9	10.	3.92	0.	0.	0.	.01
+	HYDROGRAPH AT	DV-B9	11.	4.02	0.	0.	0.	.01
+	3 COMBINED AT	CP-B9	223.	4.47	34.	9.	6.	1.02
+	ROUTED TO	R-CPB9	222.	4.48	34.	9.	6.	1.02
+	HYDROGRAPH AT	B10	10.	4.03	0.	0.	0.	.01
+	DIVERSION TO	DT-B10	10.	4.03	0.	0.	0.	.01
+	HYDROGRAPH AT	DV-B10	0.	.00	0.	0.	0.	.01
+	HYDROGRAPH AT	B12	3.	4.02	0.	0.	0.	.00
+	HYDROGRAPH AT	B14	47.	4.02	3.	1.	0.	.04
+	DIVERSION TO	DT-B14	47.	4.02	2.	1.	0.	.04
+	HYDROGRAPH AT	DV-B14	37.	4.08	1.	0.	0.	.04
+	4 COMBINED AT	CP-B14	222.	4.48	34.	9.	6.	1.07
+	HYDROGRAPH AT	C1	25.	4.03	1.	0.	0.	.02
+	DIVERSION TO	DT-C1	25.	4.03	1.	0.	0.	.02
+	HYDROGRAPH AT	DV-C1	1.	4.30	0.	0.	0.	.02
+	DIVERSION TO	DTC-K	1.	4.30	0.	0.	0.	.02
+	HYDROGRAPH AT	DVC-K	0.	4.23	0.	0.	0.	.02
+	DIVERSION TO	DTC-H	0.	4.23	0.	0.	0.	.02
+	HYDROGRAPH AT	DVC-H	0.	.00	0.	0.	0.	.02
+	HYDROGRAPH AT	B13	5.	4.02	0.	0.	0.	.00
+	DIVERSION TO	DT-B13	5.	3.85	0.	0.	0.	.00
+	HYDROGRAPH AT	DV-B13	5.	4.02	0.	0.	0.	.00
+	2 COMBINED AT	CPB13	5.	4.02	0.	0.	0.	.03
+	DIVERSION TO	DVGF	1.	3.87	0.	0.	0.	.03
+	HYDROGRAPH AT	DVGF	4.	4.02	0.	0.	0.	.03
+	ROUTED TO	R-B13	4.	4.00	0.	0.	0.	.03
+	2 COMBINED AT	CPGAL	222.	4.48	34.	9.	6.	1.10
+	HYDROGRAPH AT	B5	6.	4.02	0.	0.	0.	.01
+	DIVERSION TO	DT-B5	6.	4.02	0.	0.	0.	.01

	HYDROGRAPH AT							
+		DV-B5	0.	.00	0.	0.	0.	.01
	HYDROGRAPH AT							
+		B11	13.	4.02	1.	0.	0.	.01
	DIVERSION TO							
+		DT-C11	5.	3.83	1.	0.	0.	.01
	HYDROGRAPH AT							
+		DV-C11	8.	4.02	0.	0.	0.	.01
	DIVERSION TO							
+		DT-B11	8.	4.02	0.	0.	0.	.01
	HYDROGRAPH AT							
+		DV-B11	0.	.00	0.	0.	0.	.01
	HYDROGRAPH AT							
+		L1	3.	4.02	0.	0.	0.	.00
	HYDROGRAPH AT							
+		M1	1.	4.02	0.	0.	0.	.00

1

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	DT	PEAK	TIME TO PEAK	VOLUME
						INTERPOLATED TO COMPUTATION INTERVAL			
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
FOR STORM = 1 STORM AREA (SQ MI) = .00									
R-B1	MANE	.31	21.32	242.49	.40	1.00	21.29	243.00	.40

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4734E+00 EXCESS= .0000E+00 OUTFLOW= .4734E+00 BASIN STORAGE= .3981E-14 PERCENT ERROR= .0

FOR STORM = 2 STORM AREA (SQ MI) = .50									
R-B1	MANE	.31	21.05	242.51	.40	1.00	21.01	243.00	.40

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4667E+00 EXCESS= .0000E+00 OUTFLOW= .4667E+00 BASIN STORAGE= .3958E-14 PERCENT ERROR= .0

FOR STORM = 3 STORM AREA (SQ MI) = 1.00									
R-B1	MANE	.32	14.69	242.84	.29	1.00	14.68	243.00	.29

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3390E+00 EXCESS= .0000E+00 OUTFLOW= .3390E+00 BASIN STORAGE= .3900E-14 PERCENT ERROR= .0

FOR STORM = 4 STORM AREA (SQ MI) = 2.80									
R-B1	MANE	.31	5.30	243.35	.13	1.00	5.26	243.00	.13

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1480E+00 EXCESS= .0000E+00 OUTFLOW= .1480E+00 BASIN STORAGE= .3907E-14 PERCENT ERROR= .0

FOR STORM = 1 STORM AREA (SQ MI) = .00									
R-B13	MANE	.41	3.71	240.86	.04	1.00	3.71	240.00	.04

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5032E-01 EXCESS= .0000E+00 OUTFLOW= .5052E-01 BASIN STORAGE= .7473E-14 PERCENT ERROR= -.4

FOR STORM = 2 STORM AREA (SQ MI) = .50									
R-B13	MANE	.42	3.68	240.73	.04	1.00	3.67	240.00	.04

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4921E-01 EXCESS= .0000E+00 OUTFLOW= .4924E-01 BASIN STORAGE= .7400E-14 PERCENT ERROR= -.1

FOR STORM = 3 STORM AREA (SQ MI) = 1.00									
R-B13	MANE	.38	2.69	240.74	.03	1.00	2.69	241.00	.03

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3451E-01 EXCESS= .0000E+00 OUTFLOW= .3471E-01 BASIN STORAGE= .7444E-14 PERCENT ERROR= -.6

FOR STORM = 4 STORM AREA (SQ MI) = 2.80									
R-B13	MANE	.47	1.24	240.99	.01	1.00	1.24	241.00	.01

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1741E-01 EXCESS= .0000E+00 OUTFLOW= .1761E-01 BASIN STORAGE= .7703E-14 PERCENT ERROR= -1.1

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

10-year HEC-1 Model

```
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   15JUN16  TIME  20:59:46    *                           *         (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        Flood Control District of Maricopa County
             2      ID        DM19 PROP - Desert Mountain 19 Post Online Det Basins 1st Flush
             3      ID        10 YEAR
             4      ID        6 Hour  Storm
             5      ID        Unit Hydrograph: S-Graph
             6      ID        Storm: Multiple
             7      ID        06/14/2016
             8      ID        WOOD/PATEL FILE NAME: DM19FT10.DAT
                    *DIAGRAM
             9      IT       1  1JAN99       0    2000
            10      IO       5
            11      IN      15
                    *
            12      JD   2.182  0.0001
            13      PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
            14      PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
            15      PC   0.962   0.972   0.983   0.991   1.000
            16      JD   2.169  0.5000
            17      PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
            18      PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
            19      PC   0.962   0.972   0.983   0.991   1.000
            20      JD   2.154     1.0
            21      PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.075
            22      PC   0.087   0.099   0.119   0.148   0.230   0.407   0.778   0.881   0.919   0.945
            23      PC   0.957   0.968   0.980   0.990   1.000
            24      JD   2.127     2.8
            25      PC   0.000   0.009   0.016   0.025   0.034   0.042   0.051   0.059   0.067   0.076
            26      PC   0.087   0.100   0.120   0.163   0.252   0.451   0.694   0.837   0.900   0.938
            27      PC   0.950   0.963   0.975   0.988   1.000
                    *

            28      KK      A1   BASIN
            29      BA   0.197
            30      LG    0.29    0.25    5.34    0.26       5
            31      UI       0      39      39      39      50     114     146     182     223     254
            32      UI     279     323     344     355     374     378     378     369     357     338
            33      UI     302     275     245     222     200     181     164     147     133     120
            34      UI     108      94      88      75      74      62      61      53      42      42
            35      UI      42      31      27      27      27      27      25      10      10      10
            36      UI      10      10      10      10      10      10      10      10      10      10
            37      UI      10      10       0       0       0       0       0       0       0       0
                    *

            38      KK    R-A1   ROUTE
            39      RS       3    FLOW
            40      RC   0.060   0.040   0.060     980  0.0224   19.00
            41      RX    0.00   42.00   73.00  106.00  196.00  225.00  251.00  295.00
            42      RY   20.00   15.00   10.00    7.00    6.00    5.00   13.00   19.00
                    *
1                                                 HEC-1 INPUT                                                  PAGE  2

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


            43      KK      A2   BASIN
            44      BA   0.011
            45      LG    0.35    0.37    5.24    0.25       0
            46      UI       0       7      22      45      62      70      63      46      33      23
            47      UI      16      12       8       6       5       2       2       2       2       0
            48      UI       0       0       0       0       0       0       0       0       0       0
            49      UI       0       0       0       0       0       0       0       0       0       0
            50      UI       0       0       0       0       0       0       0       0       0       0
                    *

            51      KK   CP-A2 COMBINE
            52      HC       2
                    *
```

```
   53          KK      B1   BASIN
   54          BA   0.022
   55          LG    0.28    0.26    5.05    0.31       4
   56          UI       0      12      23      55      81     101     111     106      88      66
   57          UI      51      39      29      23      17      12       9       8       5       3
   58          UI       3       3       3       3       0       0       0       0       0       0
   59          UI       0       0       0       0       0       0       0       0       0       0
   60          UI       0       0       0       0       0       0       0       0       0       0
               *

   61          KK    R-B1   ROUTE
   62          RK     500  0.0200   0.013            CIRC   3.500
               *

   63          KK      B2   BASIN
   64          BA   0.001
   65          LG    0.35    0.36    5.05    0.28       0
   66          UI       0      10      19       7       2       1       0       0       0       0
   67          UI       0       0       0       0       0       0       0       0       0       0
   68          UI       0       0       0       0       0       0       0       0       0       0
   69          UI       0       0       0       0       0       0       0       0       0       0
   70          UI       0       0       0       0       0       0       0       0       0       0
               *

   71          KK      B3   BASIN
   72          BA   0.038
   73          LG    0.29    0.26    5.05    0.30       4
   74          UI       0      12      12      26      47      66      83      99     110     117
   75          UI     118     113     105      88      74      63      54      45      38      32
   76          UI      27      23      19      17      13      13       8       8       8       5
   77          UI       3       3       3       3       3       3       3       3       3       0
   78          UI       0       0       0       0       0       0       0       0       0       0
               *

   79          KK   CP-B3 COMBINE
   80          HC       2
               *
1                                            HEC-1 INPUT                                        PAGE  3

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


   81          KK  R-CPB3   ROUTE
   82          RS       1    FLOW
   83          RC   0.060   0.040   0.060     300  0.0100   10.00
   84          RX    0.00    7.50   15.00   18.00   21.00   23.00   30.50   38.00
   85          RY   10.00    7.50    5.00    5.00    5.00    5.00    7.50   10.00
               *

   86          KK      B4   BASIN
   87          BA   0.921
   88          LG    0.28    0.27    5.24    0.28       6
   89          UI       0      84      84      84      84      84      84      84      84     173
   90          UI     243     243     297     329     364     405     445     470     511     545
   91          UI     580     602     598     694     695     721     747     752     771     764
   92          UI     810     810     810     810     810     810     803     777     766     760
   93          UI     748     720     694     650     614     589     589     531     511     494
   94          UI     463     445     432     399     393     367     360     329     329     299
   95          UI     299     274     259     259     235     231     231     198     189     189
   96          UI     188     159     159     159     159     143     130     130     130     130
   97          UI     128      90      90      90      90      90      90      90      87      58
   98          UI      58      58      58      58      58      58      58      58      58      58
   99          UI      58      30      21      21      21      21      21      21      21      21
  100          UI      21      21      21      21      21      21      21      21      21      21
  101          UI      21      21      21      21      21      21      21      21      21      21
  102          UI      21      21      21      21      21       0       0       0       0       0
               *

  103          KK    DVOC  DIVERT
  104          DT    DTOC    0.00  1050.0
  105          DI     0.0  2000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
  106          DQ     0.0  2000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
               *

  107          KK   DETOC STORAGE
  108          KO
  109          RS       1    STOR
  110          SV            0.26    0.59    0.99    1.48
  111          SQ            4.00    9.00   12.00   15.00
  112          SE            1.00    2.00    3.00    4.00
               *

  113          KK    DVOCRETRIEVE
  114          DR    DTOC
               *

  115          KK     B4C COMBINE
  116          HC       2
               *

  117          KK    DVOD  DIVERT
  118          DT    DTOD    0.00   975.0
  119          DI     0.0 20000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
  120          DQ     0.0 20000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
               *
1                                            HEC-1 INPUT                                        PAGE  4

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


  121          KK   DETOD STORAGE
  122          KO
  123          RS       1    STOR
  124          SV            0.42    0.89    1.42    2.01
```

```
          125           SQ            4.00    9.00   12.00   15.00
          126           SE            1.00    2.00    3.00    4.00
                        *

          127           KK    DVODRETRIEVE
          128           DR    DTOD
                        *

          129           KK     B4D COMBINE
          130           HC       2
                        *

          131           KK    CP-B4 COMBINE
          132           HC       2
                        *

          133           KK   R-CPB4   ROUTE
          134           RS       1    FLOW
          135           RC   0.060   0.040   0.060     300  0.0300 2631.00
          136           RX    0.00   18.90   43.80   54.80   81.50   91.60  120.00  160.00
          137           RY  2635.0 2630.00 2629.00 2625.00 2625.00 2629.00 2630.00 2631.00
                        *

          138           KK    CP-B5 COMBINE
          139           HC       2
                        *

          140           KK   R-CPB5   ROUTE
          141           RS       1    FLOW
          142           RC   0.060   0.040   0.060     650  0.0300 2631.00
          143           RX    0.00   18.90   43.80   54.80   81.50   91.60  120.00  160.00
          144           RY  2635.0 2630.00 2629.00 2625.00 2625.00 2629.00 2630.00 2631.00
                        *

          145           KK      B6   BASIN
          146           BA   0.009
          147           LG    0.19    0.25    4.45    0.52       3
          148           UI       0      26      78     129      74      27       9       4       0       0
          149           UI       0       0       0       0       0       0       0       0       0       0
          150           UI       0       0       0       0       0       0       0       0       0       0
          151           UI       0       0       0       0       0       0       0       0       0       0
          152           UI       0       0       0       0       0       0       0       0       0       0
                        *

          153           KK      B8   BASIN
          154           BA   0.010
          155           LG    0.13    0.27    4.87    0.30      38
          156           UI       0       7      25      39      55      83      63      46      31      15
          157           UI      10       6       2       2       2       0       0       0       0       0
          158           UI       0       0       0       0       0       0       0       0       0       0
1                                                  HEC-1 INPUT                                            PAGE  5

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

          159           UI       0       0       0       0       0       0       0       0       0       0
          160           UI       0       0       0       0       0       0       0       0       0       0
                        *

          161           KK     CP68 COMBINE
          162           HC       2
                        *

          163           KK    DET68 STORAGE
          164           KO
          165           RS       1    STOR
          166           SV            0.09    0.21    0.37    0.58
          167           SQ            1.00    1.00    2.00    2.00
          168           SE  2608.0 2609.00 2610.00 2611.00 2612.00
          169           SS  2612.0   20.00    2.80    1.50
                        *

          170           KK     B6W   BASIN
          171           BA   0.003
          172           LG    0.13    0.28    3.37    1.04       6
          173           UI       0       5      16      29      32      19       9       4       1       1
          174           UI       0       0       0       0       0       0       0       0       0       0
          175           UI       0       0       0       0       0       0       0       0       0       0
          176           UI       0       0       0       0       0       0       0       0       0       0
          177           UI       0       0       0       0       0       0       0       0       0       0
                        *

          178           KK    CP-6W COMBINE
          179           HC       3
                        *

          180           KK    DV-B7  DIVERT
          181           DT    DT-B7    0.00     0.0
          182           DI     0.0   150.0   300.0   450.0   600.0   750.0   900.0  1050.0  1200.0     0.0
          183           DQ     0.0     4.0     9.0    12.0    15.0    18.0    20.0    22.0    24.0     0.0
                        *

          184           KK    DV-B7RETRIEVE
          185           DR    DT-B7
                        *

          186           KK     B14A   BASIN
          187           BA   0.004
          188           LG    0.13    0.26    6.16    0.16      39
          189           UI       0      62      83       9       0       0       0       0       0       0
          190           UI       0       0       0       0       0       0       0       0       0       0
          191           UI       0       0       0       0       0       0       0       0       0       0
          192           UI       0       0       0       0       0       0       0       0       0       0
          193           UI       0       0       0       0       0       0       0       0       0       0
                        *
1                                                  HEC-1 INPUT                                            PAGE  6
```

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

 194           KK   CP-V7 COMBINE
 195           HC       2
               *

 196           KK  DETBV7 STORAGE
 197           KO
 198           RS       1    STOR
 199           SV            0.22    0.47    0.77    1.10
 200           SQ            1.00    1.00    2.00   50.00
 201           SE  2606.0 2607.00 2608.00 2609.00 2610.00
               *

 202           KK      B9   BASIN
 203           BA   0.008
 204           LG    0.13    0.28    4.33    0.38      43
 205           UI       0      31      93     116      50      15       4       0       0       0
 206           UI       0       0       0       0       0       0       0       0       0       0
 207           UI       0       0       0       0       0       0       0       0       0       0
 208           UI       0       0       0       0       0       0       0       0       0       0
 209           UI       0       0       0       0       0       0       0       0       0       0
               *

 210           KK   DV-B9  DIVERT
 211           DT   DT-B9    0.21     0.0
 212           DI     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 213           DQ     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
               *

 214           KK   CP-B9 COMBINE
 215           HC       3
               *

 216           KK  R-CPB9   ROUTE
 217           RS       2    FLOW
 218           RC   0.060   0.040   0.060     750  0.0300 2605.00
 219           RX    0.00   55.30  123.80  129.00  141.80  146.00  155.20  188.60
 220           RY  2608.0 2600.00 2598.00 2596.00 2596.00 2597.80 2598.00 2605.00
               *

 221           KK     B10   BASIN
 222           BA   0.012
 223           LG    0.20    0.25    4.33    0.54       2
 224           UI       0      10      39      58      90     102      69      47      23      13
 225           UI       7       3       3       0       0       0       0       0       0       0
 226           UI       0       0       0       0       0       0       0       0       0       0
 227           UI       0       0       0       0       0       0       0       0       0       0
 228           UI       0       0       0       0       0       0       0       0       0       0
               *
1                                                 HEC-1 INPUT                                        PAGE  7

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

 229           KK  DV-B10  DIVERT
 230           DT  DT-B10    0.32     0.0
 231           DI     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 232           DQ     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
               *

 233           KK     B12   BASIN
 234           BA   0.005
 235           LG    0.10    0.25    3.79    0.85       0
 236           UI       0      11      41      56      40      22      12       6       3       1
 237           UI       1       0       0       0       0       0       0       0       0       0
 238           UI       0       0       0       0       0       0       0       0       0       0
 239           UI       0       0       0       0       0       0       0       0       0       0
 240           UI       0       0       0       0       0       0       0       0       0       0
               *

 241           KK     B14   BASIN
 242           BA   0.038
 243           LG    0.17    0.26    5.58    0.27      23
 244           UI       0      23      67     119     155     222     274     198     149     108
 245           UI      58      39      24      12       7       7       7       0       0       0
 246           UI       0       0       0       0       0       0       0       0       0       0
 247           UI       0       0       0       0       0       0       0       0       0       0
 248           UI       0       0       0       0       0       0       0       0       0       0
               *

 249           KK  DV-B14  DIVERT
 250           DT  DT-B14    1.03     0.0
 251           DI     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 252           DQ     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
               *

 253           KK  CP-B14 COMBINE
 254           HC       4
               *

 255           KK      C1   BASIN
 256           BA   0.023
 257           LG    0.18    0.26    5.05    0.34      14
 258           UI       0      13      33      61      79     104     155     128      99      76
 259           UI      55      29      22      13       8       4       4       4       0       0
 260           UI       0       0       0       0       0       0       0       0       0       0
 261           UI       0       0       0       0       0       0       0       0       0       0
 262           UI       0       0       0       0       0       0       0       0       0       0
               *

 263           KK   DV-C1  DIVERT
 264           DT   DT-C1    0.61     0.0
```

```
 265          DI     0.0  1000.0    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 266          DQ     0.0  1000.0    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
              *
```



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


 267          KK   DVC-K  DIVERT
 268          DT   DTC-K    0.00     18
 269          DI     0.0    1000    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 270          DQ     0.0    1000    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
              *

 271          KK   DVC-H  DIVERT
 272          DT   DTC-H    0.00      8
 273          DI     0.0    1000    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 274          DQ     0.0    1000    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
              *

 275          KK     B13   BASIN
 276          BA   0.003
 277          LG    0.12    0.24   7.27    0.11      51
 278          UI       0      82     33       0       0       0       0       0       0       0
 279          UI       0       0      0       0       0       0       0       0       0       0
 280          UI       0       0      0       0       0       0       0       0       0       0
 281          UI       0       0      0       0       0       0       0       0       0       0
 282          UI       0       0      0       0       0       0       0       0       0       0
              *

 283          KK  DV-B13  DIVERT
 284          DT  DT-B13    0.08    0.0
 285          DI     0.0  1000.0    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 286          DQ     0.0  1000.0    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
              *

 287          KK   CPB13 COMBINE
 288          HC       2
              *

 289          KK    DVGF  DIVERT
 290          DT    DTGF    0.00      1
 291          DI     0.0    1000    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 292          DQ     0.0    1000    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
              *

 293          KK   R-B13   ROUTE
 294          RK     450  0.0090  0.013            CIRC   4.000
              *

 295          KK   CPGAL COMBINE
 296          HC       2
              *

 297          KK      B5   BASIN
 298          BA   0.006
 299          LG    0.23    0.27   5.05    0.38       0
 300          UI       0      15     45      80      54      25      10       2       2       0
 301          UI       0       0      0       0       0       0       0       0       0       0
 302          UI       0       0      0       0       0       0       0       0       0       0
 303          UI       0       0      0       0       0       0       0       0       0       0
 304          UI       0       0      0       0       0       0       0       0       0       0
              *
```



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


 305          KK   DV-B5  DIVERT
 306          DT   DT-B5    0.42    0.0
 307          DI     0.0  1000.0    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 308          DQ     0.0  1000.0    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
              *

 309          KK     B11   BASIN
 310          BA   0.010
 311          LG    0.13    0.27   4.39    0.37      39
 312          UI       0       8     32      48      75      85      57      39      19      11
 313          UI       6       2      2       0       0       0       0       0       0       0
 314          UI       0       0      0       0       0       0       0       0       0       0
 315          UI       0       0      0       0       0       0       0       0       0       0
 316          UI       0       0      0       0       0       0       0       0       0       0
              *

 317          KK  DV-C11  DIVERT
 318          DT  DT-C11     0.0    5.0
 319          DI     0.0  1000.0    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 320          DQ     0.0  1000.0    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
              *

 321          KK  DV-B11  DIVERT
 322          DT  DV-B11    0.26    0.0
 323          DI     0.0  1000.0    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 324          DQ     0.0  1000.0    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
              *
              *

 325          KK      L1   BASIN
 326          BA   0.003
 327          LG    0.35    0.36   5.05    0.28       0
 328          UI       0       6     23      33      25      14       7       4       2       1
 329          UI       1       0      0       0       0       0       0       0       0       0
 330          UI       0       0      0       0       0       0       0       0       0       0
 331          UI       0       0      0       0       0       0       0       0       0       0
 332          UI       0       0      0       0       0       0       0       0       0       0
```

```
              *
333           KK      M1   BASIN
334           BA   0.001
335           LG    0.35    0.36    5.05    0.28       0
336           UI       0       3       9      12       7       4       2       1       0       0
337           UI       0       0       0       0       0       0       0       0       0       0
338           UI       0       0       0       0       0       0       0       0       0       0
339           UI       0       0       0       0       0       0       0       0       0       0
340           UI       0       0       0       0       0       0       0       0       0       0
              *
341           ZZ
```

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

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

    28          A1
                 V
                 V
    38        R-A1
                 .
                 .
    43           .          A2
                 .           .
                 .           .
    51       CP-A2............
                 .
                 .
    53           .          B1
                 .           V
                 .           V
    61           .        R-B1
                 .           .
                 .           .
    63           .           .          B2
                 .           .           .
                 .           .           .
    71           .           .           .          B3
                 .           .           .           .
                 .           .           .           .
    79           .           .       CP-B3............
                 .           .           V
                 .           .           V
    81           .           .      R-CPB3
                 .           .           .
                 .           .           .
    86           .           .           .          B4
                 .           .           .           .
                 .           .           .           .
   104           .           .           .           .------->    DTOC
   103           .           .           .        DVOC
                 .           .           .           V
                 .           .           .           V
   107           .           .           .       DETOC
                 .           .           .           .
                 .           .           .           .
   114           .           .           .           .           .<-------    DTOC
   113           .           .           .           .        DVOC
                 .           .           .           .           .
                 .           .           .           .           .
   115           .           .           .         B4C............
                 .           .           .           .
                 .           .           .           .
   118           .           .           .           .------->    DTOD
   117           .           .           .        DVOD
                 .           .           .           V
                 .           .           .           V
   121           .           .           .       DETOD
                 .           .           .           .
                 .           .           .           .
   128           .           .           .           .           .<-------    DTOD
   127           .           .           .           .        DVOD
                 .           .           .           .           .
                 .           .           .           .           .
   129           .           .           .         B4D............
                 .           .           .           .
                 .           .           .           .
   131           .           .       CP-B4............
                 .           .           V
                 .           .           V
   133           .           .      R-CPB4
                 .           .           .
                 .           .           .
   138           .       CP-B5............
                 .           V
                 .           V
   140           .      R-CPB5
                 .           .
                 .           .
   145           .           .          B6
                 .           .           .
                 .           .           .
   153           .           .           .          B8
                 .           .           .           .
                 .           .           .           .
   161           .           .        CP68............
                 .           .           V
                 .           .           V
   163           .           .       DET68
                 .           .           .
                 .           .           .
   170           .           .           .         B6W
                 .           .           .           .
                 .           .           .           .
   178           .       CP-6W........................
                 .           .
                 .           .
   181           .           .------->  DT-B7
   180           .       DV-B7
                 .           .
                 .           .
   185           .           .           .<-------  DT-B7
   184           .           .       DV-B7
                 .           .           .
```

```
            .         .         .
186         .         .         .      B14A
            .         .         .         .
            .         .         .         .
194         .         .     CP-V7..........
            .         .         V
            .         .         V
196         .         .    DETBV7
            .         .         .
            .         .         .
202         .         .         .        B9
            .         .         .         .
            .         .         .         .
211         .         .         .         .------->  DT-B9
210         .         .         .    DV-B9
            .         .         .         .
            .         .         .         .
214         .     CP-B9....................
            .         V
            .         V
216         .    R-CPB9
            .         .
            .         .
221         .         .       B10
            .         .         .
            .         .         .
230         .         .         .------->  DT-B10
229         .         .    DV-B10
            .         .         .
            .         .         .
233         .         .         .       B12
            .         .         .         .
            .         .         .         .
241         .         .         .         .       B14
            .         .         .         .         .
            .         .         .         .         .
250         .         .         .         .         .------->  DT-B14
249         .         .         .         .    DV-B14
            .         .         .         .         .
            .         .         .         .         .
253         .    CP-B14..............................
            .         .
            .         .
255         .         .        C1
            .         .         .
            .         .         .
264         .         .         .------->  DT-C1
263         .         .     DV-C1
            .         .         .
            .         .         .
268         .         .         .------->  DTC-K
267         .         .     DVC-K
            .         .         .
            .         .         .
272         .         .         .------->  DTC-H
271         .         .     DVC-H
            .         .         .
            .         .         .
275         .         .         .       B13
            .         .         .         .
            .         .         .         .
284         .         .         .         .------->  DT-B13
283         .         .         .    DV-B13
            .         .         .         .
            .         .         .         .
287         .         .     CPB13..........
            .         .         .
            .         .         .
290         .         .         .------->   DTGF
289         .         .      DVGF
            .         .         V
            .         .         V
293         .         .     R-B13
            .         .         .
            .         .         .
295         .     CPGAL..........
            .         .
            .         .
297         .         .        B5
            .         .         .
            .         .         .
306         .         .         .------->  DT-B5
305         .         .     DV-B5
            .         .         .
            .         .         .
309         .         .         .       B11
            .         .         .         .
            .         .         .         .
318         .         .         .         .------->  DT-C11
317         .         .         .    DV-C11
            .         .         .         .
            .         .         .         .
322         .         .         .         .------->  DV-B11
321         .         .         .    DV-B11
            .         .         .         .
            .         .         .         .
325         .         .         .         .        L1
            .         .         .         .         .
            .         .         .         .         .
333         .         .         .         .         .       M1
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              JUN  1998                *
*             VERSION 4.1               *
*                                       *
* RUN DATE   15JUN16  TIME  20:59:46    *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*   HYDROLOGIC ENGINEERING CENTER       *
*         609 SECOND STREET             *
*      DAVIS, CALIFORNIA 95616          *
*          (916) 756-1104               *
*                                       *
*****************************************
```

```
                    Flood Control District of Maricopa County
                    DM19 PROP - Desert Mountain 19 Post Online Det Basins 1st Flush
                    10 YEAR
                    6 Hour  Storm
                    Unit Hydrograph: S-Graph
                    Storm: Multiple
                    06/14/2016
                    WOOD/PATEL FILE NAME: DM19FT10.DAT

 10 IO        OUTPUT CONTROL VARIABLES
                 IPRNT          5  PRINT CONTROL
                 IPLOT          0  PLOT CONTROL
                 QSCAL         0.  HYDROGRAPH PLOT SCALE

    IT        HYDROGRAPH TIME DATA
                  NMIN          1  MINUTES IN COMPUTATION INTERVAL
                 IDATE     1JAN99  STARTING DATE
                 ITIME       0000  STARTING TIME
                    NQ       2000  NUMBER OF HYDROGRAPH ORDINATES
                NDDATE     2JAN99  ENDING DATE
                NDTIME       0919  ENDING TIME
                 ICENT         19  CENTURY MARK

               COMPUTATION INTERVAL     .02 HOURS
                    TOTAL TIME BASE   33.32 HOURS

       ENGLISH UNITS
            DRAINAGE AREA          SQUARE MILES
            PRECIPITATION DEPTH    INCHES
            LENGTH, ELEVATION      FEET
            FLOW                   CUBIC FEET PER SECOND
            STORAGE VOLUME         ACRE-FEET
            SURFACE AREA           ACRES
            TEMPERATURE            DEGREES FAHRENHEIT

 12 JD         INDEX STORM NO. 1
                  STRM       2.18  PRECIPITATION DEPTH
                  TRDA        .00  TRANSPOSITION DRAINAGE AREA

 13 PI           PRECIPITATION PATTERN
```

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.03	.03	.03	.03	.03
.03	.03	.03	.03	.03	.03	.03	.03	.03	.03
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

```
 16 JD         INDEX STORM NO. 2
                  STRM       2.17  PRECIPITATION DEPTH
                  TRDA        .50  TRANSPOSITION DRAINAGE AREA

 17 PI           PRECIPITATION PATTERN
```

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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20 JD INDEX STORM NO. 3

STRM 2.15 PRECIPITATION DEPTH

TRDA 1.00 TRANSPOSITION DRAINAGE AREA

21 PI PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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24 JD INDEX STORM NO. 4

STRM 2.13 PRECIPITATION DEPTH

TRDA 2.80 TRANSPOSITION DRAINAGE AREA

25 PI PRECIPITATION PATTERN

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           **************
           *            *
 107 KK    *   DETOC    *     STORAGE
           *            *
           **************

 108 KO         OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

           **************
           *            *
 121 KK    *   DETOD    *     STORAGE
           *            *
           **************

 122 KO         OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE


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           *            *
 163 KK    *   DET68    *     STORAGE
           *            *
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 164 KO         OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE


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           *            *
 196 KK    *   DETBV7   *     STORAGE
           *            *
           **************

 197 KO         OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE
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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	A1	262.	4.13	19.	5.	3.	.20		
+	ROUTED TO	R-A1	258.	4.18	19.	5.	3.	.20		
+	HYDROGRAPH AT	A2	21.	4.02	1.	0.	0.	.01		
+	2 COMBINED AT	CP-A2	260.	4.18	20.	5.	4.	.21		
+	HYDROGRAPH AT	B1	42.	4.02	2.	0.	0.	.02		
+	ROUTED TO	R-B1	42.	4.03	2.	0.	0.	.02		
+	HYDROGRAPH AT	B2	2.	4.02	0.	0.	0.	.00		
+	HYDROGRAPH AT	B3	63.	4.07	3.	1.	1.	.04		
+	2 COMBINED AT	CP-B3	64.	4.07	3.	1.	1.	.04		
+	ROUTED TO	R-CPB3	63.	4.08	3.	1.	1.	.04		
+	HYDROGRAPH AT	B4	546.	4.43	76.	19.	14.	.92		
+	DIVERSION TO	DTOC	546.	4.43	76.	19.	14.	.92		
+	HYDROGRAPH AT	DVOC	0.	.00	0.	0.	0.	.92		
+	ROUTED TO	DETOC	0.	.00	0.	0.	0.	.92		
+	HYDROGRAPH AT	DVOC	546.	4.43	76.	19.	14.	.92		
+	2 COMBINED AT	B4C	546.	4.43	76.	19.	14.	.92		
+	DIVERSION TO	DTOD	546.	4.43	76.	19.	14.	.92		
+	HYDROGRAPH AT	DVOD	0.	.00	0.	0.	0.	.92		
+	ROUTED TO	DETOD	0.	.00	0.	0.	0.	.92		
+	HYDROGRAPH AT	DVOD	546.	4.43	76.	19.	14.	.92		
+	2 COMBINED AT	B4D	546.	4.43	76.	19.	14.	.92		
+	2 COMBINED AT	CP-B4	546.	4.42	79.	20.	14.	.96		
+	ROUTED TO	R-CPB4	546.	4.43	79.	20.	14.	.96		
+	2 COMBINED AT	CP-B5	543.	4.43	80.	20.	14.	.98		
+	ROUTED TO	R-CPB5	543.	4.43	80.	20.	14.	.98		
+	HYDROGRAPH AT	B6	16.	4.02	1.	0.	0.	.01		
+	HYDROGRAPH AT	B8	22.	4.02	1.	0.	0.	.01		
+	2 COMBINED AT	CP68	39.	4.02	2.	1.	0.	.02		
+	ROUTED TO	DET68	2.	3.92	2.	1.	0.	.02		
+	HYDROGRAPH AT	B6W	4.	4.02	0.	0.	0.	.00		
+	3 COMBINED AT	CP-6W	543.	4.43	81.	20.	15.	1.00		
+	DIVERSION TO	DT-B7	14.	4.43	2.	1.	0.	1.00		

+	HYDROGRAPH AT	DV-B7	527.	4.43	79.	20.	14.	1.00
+	HYDROGRAPH AT	DV-B7	14.	4.43	2.	1.	0.	1.00
+	HYDROGRAPH AT	B14A	9.	4.02	1.	0.	0.	.00
+	2 COMBINED AT	CP-V7	16.	4.02	3.	1.	1.	.00
+	ROUTED TO	DETBV7	13.	4.65	2.	1.	1.	.00
+	HYDROGRAPH AT	B9	18.	4.02	1.	0.	0.	.01
+	DIVERSION TO	DT-B9	16.	3.83	0.	0.	0.	.01
+	HYDROGRAPH AT	DV-B9	18.	4.02	1.	0.	0.	.01
+	3 COMBINED AT	CP-B9	528.	4.43	81.	21.	15.	1.02
+	ROUTED TO	R-CPB9	527.	4.47	81.	21.	15.	1.02
+	HYDROGRAPH AT	B10	21.	4.02	1.	0.	0.	.01
+	DIVERSION TO	DT-B10	21.	4.00	1.	0.	0.	.01
+	HYDROGRAPH AT	DV-B10	21.	4.03	0.	0.	0.	.01
+	HYDROGRAPH AT	B12	8.	4.02	0.	0.	0.	.00
+	HYDROGRAPH AT	B14	82.	4.02	5.	1.	1.	.04
+	DIVERSION TO	DT-B14	77.	3.93	2.	1.	0.	.04
+	HYDROGRAPH AT	DV-B14	82.	4.02	3.	1.	0.	.04
+	4 COMBINED AT	CP-B14	527.	4.47	83.	21.	15.	1.07
+	HYDROGRAPH AT	C1	47.	4.02	2.	1.	0.	.02
+	DIVERSION TO	DT-C1	45.	3.97	1.	0.	0.	.02
+	HYDROGRAPH AT	DV-C1	47.	4.02	1.	0.	0.	.02
+	DIVERSION TO	DTC-K	18.	4.00	1.	0.	0.	.02
+	HYDROGRAPH AT	DVC-K	29.	4.02	0.	0.	0.	.02
+	DIVERSION TO	DTC-H	8.	4.00	0.	0.	0.	.02
+	HYDROGRAPH AT	DVC-H	21.	4.02	0.	0.	0.	.02
+	HYDROGRAPH AT	B13	7.	4.02	1.	0.	0.	.00
+	DIVERSION TO	DT-B13	2.	3.75	0.	0.	0.	.00
+	HYDROGRAPH AT	DV-B13	7.	4.02	0.	0.	0.	.00
+	2 COMBINED AT	CPB13	28.	4.02	1.	0.	0.	.03
+	DIVERSION TO	DTGF	1.	3.78	0.	0.	0.	.03
+	HYDROGRAPH AT	DVGF	27.	4.02	1.	0.	0.	.03
+	ROUTED TO	R-B13	27.	4.02	1.	0.	0.	.03
+	2 COMBINED AT	CPGAL	527.	4.47	83.	21.	15.	1.10
+	HYDROGRAPH AT	B5	11.	4.02	0.	0.	0.	.01
+	DIVERSION TO	DT-B5	11.	4.02	0.	0.	0.	.01

+	HYDROGRAPH AT	DV-B5	0.	.00	0.	0.	0.	.01
+	HYDROGRAPH AT	B11	22.	4.02	1.	0.	0.	.01
+	DIVERSION TO	DT-C11	5.	3.80	1.	0.	0.	.01
+	HYDROGRAPH AT	DV-C11	17.	4.02	1.	0.	0.	.01
+	DIVERSION TO	DV-B11	17.	4.02	1.	0.	0.	.01
+	HYDROGRAPH AT	DV-B11	15.	4.05	0.	0.	0.	.01
+	HYDROGRAPH AT	L1	6.	4.02	0.	0.	0.	.00
+	HYDROGRAPH AT	M1	2.	4.02	0.	0.	0.	.00

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	INTERPOLATED TO COMPUTATION INTERVAL DT	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
FOR STORM = 1 STORM AREA (SQ MI) = .00									
R-B1	MANE	.17	42.15	241.37	.84	1.00	42.13	242.00	.84

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9822E+00 EXCESS= .0000E+00 OUTFLOW= .9825E+00 BASIN STORAGE= .3951E-14 PERCENT ERROR= .0

FOR STORM = 2 STORM AREA (SQ MI) = .50									
R-B1	MANE	.18	41.78	241.51	.83	1.00	41.77	242.00	.83

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9720E+00 EXCESS= .0000E+00 OUTFLOW= .9723E+00 BASIN STORAGE= .3979E-14 PERCENT ERROR= .0

FOR STORM = 3 STORM AREA (SQ MI) = 1.00									
R-B1	MANE	.17	31.78	241.47	.70	1.00	31.77	242.00	.70

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8268E+00 EXCESS= .0000E+00 OUTFLOW= .8269E+00 BASIN STORAGE= .3940E-14 PERCENT ERROR= .0

FOR STORM = 4 STORM AREA (SQ MI) = 2.80									
R-B1	MANE	.27	16.95	242.35	.57	1.00	16.94	242.00	.57

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6687E+00 EXCESS= .0000E+00 OUTFLOW= .6687E+00 BASIN STORAGE= .3984E-14 PERCENT ERROR= .0

FOR STORM = 1 STORM AREA (SQ MI) = .00									
R-B13	MANE	.30	26.83	241.14	.21	1.00	26.82	241.00	.21

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2869E+00 EXCESS= .0000E+00 OUTFLOW= .2870E+00 BASIN STORAGE= .7598E-14 PERCENT ERROR= -.1

FOR STORM = 2 STORM AREA (SQ MI) = .50									
R-B13	MANE	.37	26.43	241.00	.20	1.00	26.43	241.00	.20

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2821E+00 EXCESS= .0000E+00 OUTFLOW= .2826E+00 BASIN STORAGE= .7502E-14 PERCENT ERROR= -.2

FOR STORM = 3 STORM AREA (SQ MI) = 1.00									
R-B13	MANE	.34	13.15	241.76	.11	1.00	12.37	242.00	.11

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1582E+00 EXCESS= .0000E+00 OUTFLOW= .1584E+00 BASIN STORAGE= .7731E-14 PERCENT ERROR= -.2

FOR STORM = 4 STORM AREA (SQ MI) = 2.80									
R-B13	MANE	.44	2.57	240.86	.06	1.00	2.57	240.00	.06

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8541E-01 EXCESS= .0000E+00 OUTFLOW= .8564E-01 BASIN STORAGE= .7698E-14 PERCENT ERROR= -.3

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

100-year HEC-1 Model

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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   15JUN16  TIME  20:59:52    *                               *         (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        Flood Control District of Maricopa County
       2         ID        DM19 PROP - Desert Mountain 19 Post Online Det Basins 1st Flush
       3         ID        100 YEAR
       4         ID        6 Hour  Storm
       5         ID        Unit Hydrograph: S-Graph
       6         ID        Storm: Multiple
       7         ID        06/14/2016
       8         ID        WOOD/PATEL FILE NAME: DM19FT100.DAT
                 *DIAGRAM
       9         IT       1  1JAN99       0    2000
      10         IO       5
      11         IN      15
                 *
      12         JD   3.313  0.0001
      13         PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
      14         PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
      15         PC   0.962   0.972   0.983   0.991   1.000
      16         JD   3.293  0.5000
      17         PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
      18         PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
      19         PC   0.962   0.972   0.983   0.991   1.000
      20         JD   3.270     1.0
      21         PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.075
      22         PC   0.087   0.099   0.119   0.148   0.230   0.407   0.778   0.881   0.919   0.945
      23         PC   0.957   0.968   0.980   0.990   1.000
      24         JD   3.230     2.8
      25         PC   0.000   0.009   0.016   0.025   0.034   0.042   0.051   0.059   0.067   0.076
      26         PC   0.087   0.100   0.120   0.163   0.252   0.451   0.694   0.837   0.900   0.938
      27         PC   0.950   0.963   0.975   0.988   1.000
                 *

      28         KK      A1   BASIN
      29         BA   0.197
      30         LG    0.29    0.25    5.34    0.26       5
      31         UI       0      39      39      39      50     114     146     182     223     254
      32         UI     279     323     344     355     374     378     378     369     357     338
      33         UI     302     275     245     222     200     181     164     147     133     120
      34         UI     108      94      88      75      74      62      61      53      42      42
      35         UI      42      31      27      27      27      27      25      10      10      10
      36         UI      10      10      10      10      10      10      10      10      10      10
      37         UI      10      10       0       0       0       0       0       0       0       0
                 *

      38         KK    R-A1   ROUTE
      39         RS       3    FLOW
      40         RC   0.060   0.040   0.060     980  0.0224   19.00
      41         RX    0.00   42.00   73.00  106.00  196.00  225.00  251.00  295.00
      42         RY   20.00   15.00   10.00    7.00    6.00    5.00   13.00   19.00
                 *
1                                          HEC-1 INPUT                                                        PAGE  2

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


      43         KK      A2   BASIN
      44         BA   0.011
      45         LG    0.35    0.37    5.24    0.25       0
      46         UI       0       7      22      45      62      70      63      46      33      23
      47         UI      16      12       8       6       5       2       2       2       2       0
      48         UI       0       0       0       0       0       0       0       0       0       0
      49         UI       0       0       0       0       0       0       0       0       0       0
      50         UI       0       0       0       0       0       0       0       0       0       0
                 *

      51         KK   CP-A2 COMBINE
      52         HC       2
                 *
```

```
  53           KK      B1   BASIN
  54           BA   0.022
  55           LG    0.28    0.26    5.05    0.31       4
  56           UI       0      12      23      55      81     101     111     106      88      66
  57           UI      51      39      29      23      17      12       9       8       5       3
  58           UI       3       3       3       3       0       0       0       0       0       0
  59           UI       0       0       0       0       0       0       0       0       0       0
  60           UI       0       0       0       0       0       0       0       0       0       0
               *

  61           KK    R-B1   ROUTE
  62           RK     500  0.0200   0.013            CIRC   3.500
               *

  63           KK      B2   BASIN
  64           BA   0.001
  65           LG    0.35    0.36    5.05    0.28       0
  66           UI       0      10      19       7       2       1       0       0       0       0
  67           UI       0       0       0       0       0       0       0       0       0       0
  68           UI       0       0       0       0       0       0       0       0       0       0
  69           UI       0       0       0       0       0       0       0       0       0       0
  70           UI       0       0       0       0       0       0       0       0       0       0
               *

  71           KK      B3   BASIN
  72           BA   0.038
  73           LG    0.29    0.26    5.05    0.30       4
  74           UI       0      12      12      26      47      66      83      99     110     117
  75           UI     118     113     105      88      74      63      54      45      38      32
  76           UI      27      23      19      17      13      13       8       8       8       5
  77           UI       3       3       3       3       3       3       3       3       3       0
  78           UI       0       0       0       0       0       0       0       0       0       0
               *

  79           KK   CP-B3 COMBINE
  80           HC       2
               *
1                                             HEC-1 INPUT                                             PAGE  3

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


  81           KK  R-CPB3   ROUTE
  82           RS       1    FLOW
  83           RC   0.060   0.040   0.060     300  0.0100   10.00
  84           RX    0.00    7.50   15.00   18.00   21.00   23.00   30.50   38.00
  85           RY   10.00    7.50    5.00    5.00    5.00    5.00    7.50   10.00
               *

  86           KK      B4   BASIN
  87           BA   0.921
  88           LG    0.28    0.27    5.24    0.28       6
  89           UI       0      84      84      84      84      84      84      84      84     173
  90           UI     243     243     297     329     364     405     445     470     511     545
  91           UI     580     602     598     694     695     721     747     752     771     764
  92           UI     810     810     810     810     810     810     803     777     766     760
  93           UI     748     720     694     650     614     589     589     531     511     494
  94           UI     463     445     432     399     393     367     360     329     329     299
  95           UI     299     274     259     259     235     231     231     198     189     189
  96           UI     188     159     159     159     159     143     130     130     130     130
  97           UI     128      90      90      90      90      90      90      90      87      58
  98           UI      58      58      58      58      58      58      58      58      58      58
  99           UI      58      30      21      21      21      21      21      21      21      21
 100           UI      21      21      21      21      21      21      21      21      21      21
 101           UI      21      21      21      21      21      21      21      21      21      21
 102           UI      21      21      21      21      21       0       0       0       0       0
               *

 103           KK    DVOC  DIVERT
 104           DT    DTOC    0.00  1050.0
 105           DI     0.0  2000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 106           DQ     0.0  2000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
               *

 107           KK   DETOC STORAGE
 108           KO
 109           RS       1    STOR
 110           SV            0.26    0.59    0.99    1.48
 111           SQ            4.00    9.00   12.00   15.00
 112           SE            1.00    2.00    3.00    4.00
               *

 113           KK    DVOCRETRIEVE
 114           DR    DTOC
               *

 115           KK     B4C COMBINE
 116           HC       2
               *

 117           KK    DVOD  DIVERT
 118           DT    DTOD    0.00   975.0
 119           DI     0.0 20000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 120           DQ     0.0 20000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
               *
1                                             HEC-1 INPUT                                             PAGE  4

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


 121           KK   DETOD STORAGE
 122           KO
 123           RS       1    STOR
 124           SV            0.42    0.89    1.42    2.01
```

```
      125            SQ            4.00    9.00   12.00   15.00
      126            SE            1.00    2.00    3.00    4.00
                     *

      127            KK     DVODRETRIEVE
      128            DR     DTOD
                     *

      129            KK      B4D COMBINE
      130            HC        2
                     *

      131            KK    CP-B4 COMBINE
      132            HC        2
                     *

      133            KK   R-CPB4   ROUTE
      134            RS        1    FLOW
      135            RC    0.060   0.040   0.060     300  0.0300 2631.00
      136            RX     0.00   18.90   43.80   54.80   81.50   91.60  120.00  160.00
      137            RY   2635.0 2630.00 2629.00 2625.00 2625.00 2629.00 2630.00 2631.00
                     *

      138            KK    CP-B5 COMBINE
      139            HC        2
                     *

      140            KK   R-CPB5   ROUTE
      141            RS        1    FLOW
      142            RC    0.060   0.040   0.060     650  0.0300 2631.00
      143            RX     0.00   18.90   43.80   54.80   81.50   91.60  120.00  160.00
      144            RY   2635.0 2630.00 2629.00 2625.00 2625.00 2629.00 2630.00 2631.00
                     *

      145            KK       B6   BASIN
      146            BA    0.009
      147            LG     0.19    0.25    4.45    0.52       3
      148            UI        0      26      78     129      74      27       9       4       0       0
      149            UI        0       0       0       0       0       0       0       0       0       0
      150            UI        0       0       0       0       0       0       0       0       0       0
      151            UI        0       0       0       0       0       0       0       0       0       0
      152            UI        0       0       0       0       0       0       0       0       0       0
                     *

      153            KK       B8   BASIN
      154            BA    0.010
      155            LG     0.13    0.27    4.87    0.30      38
      156            UI        0       7      25      39      55      83      63      46      31      15
      157            UI       10       6       2       2       2       0       0       0       0       0
      158            UI        0       0       0       0       0       0       0       0       0       0
1                                               HEC-1 INPUT                                             PAGE  5

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

      159            UI        0       0       0       0       0       0       0       0       0       0
      160            UI        0       0       0       0       0       0       0       0       0       0
                     *

      161            KK     CP68 COMBINE
      162            HC        2
                     *

      163            KK    DET68 STORAGE
      164            KO
      165            RS        1    STOR
      166            SV            0.09    0.21    0.37    0.58
      167            SQ            1.00    1.00    2.00    2.00
      168            SE   2608.0 2609.00 2610.00 2611.00 2612.00
      169            SS   2612.0   20.00    2.80    1.50
                     *

      170            KK      B6W   BASIN
      171            BA    0.003
      172            LG     0.13    0.28    3.37    1.04       6
      173            UI        0       5      16      29      32      19       9       4       1       1
      174            UI        0       0       0       0       0       0       0       0       0       0
      175            UI        0       0       0       0       0       0       0       0       0       0
      176            UI        0       0       0       0       0       0       0       0       0       0
      177            UI        0       0       0       0       0       0       0       0       0       0
                     *

      178            KK    CP-6W COMBINE
      179            HC        3
                     *

      180            KK    DV-B7  DIVERT
      181            DT    DT-B7    0.00     0.0
      182            DI      0.0   150.0   300.0   450.0   600.0   750.0   900.0  1050.0  1200.0     0.0
      183            DQ      0.0     4.0     9.0    12.0    15.0    18.0    20.0    22.0    24.0     0.0
                     *

      184            KK    DV-B7RETRIEVE
      185            DR    DT-B7
                     *

      186            KK     B14A   BASIN
      187            BA    0.004
      188            LG     0.13    0.26    6.16    0.16      39
      189            UI        0      62      83       9       0       0       0       0       0       0
      190            UI        0       0       0       0       0       0       0       0       0       0
      191            UI        0       0       0       0       0       0       0       0       0       0
      192            UI        0       0       0       0       0       0       0       0       0       0
      193            UI        0       0       0       0       0       0       0       0       0       0
                     *
1                                               HEC-1 INPUT                                             PAGE  6
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LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 194        KK   CP-V7 COMBINE
 195        HC       2
            *

 196        KK  DETBV7 STORAGE
 197        KO
 198        RS       1    STOR
 199        SV            0.22    0.47    0.77    1.10
 200        SQ            1.00    1.00    2.00   50.00
 201        SE  2606.0 2607.00 2608.00 2609.00 2610.00
            *

 202        KK      B9   BASIN
 203        BA   0.008
 204        LG    0.13    0.28    4.33    0.38      43
 205        UI       0      31      93     116      50      15       4       0       0       0
 206        UI       0       0       0       0       0       0       0       0       0       0
 207        UI       0       0       0       0       0       0       0       0       0       0
 208        UI       0       0       0       0       0       0       0       0       0       0
 209        UI       0       0       0       0       0       0       0       0       0       0
            *

 210        KK   DV-B9  DIVERT
 211        DT   DT-B9    0.21     0.0
 212        DI     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 213        DQ     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
            *

 214        KK   CP-B9 COMBINE
 215        HC       3
            *

 216        KK  R-CPB9   ROUTE
 217        RS       1    FLOW
 218        RC   0.060   0.040   0.060     750  0.0300 2605.00
 219        RX    0.00   55.30  123.80  129.00  141.80  146.00  155.20  188.60
 220        RY  2608.0 2600.00 2598.00 2596.00 2596.00 2597.80 2598.00 2605.00
            *

 221        KK     B10   BASIN
 222        BA   0.012
 223        LG    0.20    0.25    4.33    0.54       2
 224        UI       0      10      39      58      90     102      69      47      23      13
 225        UI       7       3       3       0       0       0       0       0       0       0
 226        UI       0       0       0       0       0       0       0       0       0       0
 227        UI       0       0       0       0       0       0       0       0       0       0
 228        UI       0       0       0       0       0       0       0       0       0       0
            *
1                                             HEC-1 INPUT                                              PAGE  7

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

 229        KK  DT-B10  DIVERT
 230        DT  DT-B10    0.32     0.0
 231        DI     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 232        DQ     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
            *

 233        KK     B12   BASIN
 234        BA   0.005
 235        LG    0.10    0.25    3.79    0.85       0
 236        UI       0      11      41      56      40      22      12       6       3       1
 237        UI       1       0       0       0       0       0       0       0       0       0
 238        UI       0       0       0       0       0       0       0       0       0       0
 239        UI       0       0       0       0       0       0       0       0       0       0
 240        UI       0       0       0       0       0       0       0       0       0       0
            *

 241        KK     B14   BASIN
 242        BA   0.038
 243        LG    0.17    0.26    5.58    0.27      23
 244        UI       0      23      67     119     155     222     274     198     149     108
 245        UI      58      39      24      12       7       7       7       0       0       0
 246        UI       0       0       0       0       0       0       0       0       0       0
 247        UI       0       0       0       0       0       0       0       0       0       0
 248        UI       0       0       0       0       0       0       0       0       0       0
            *

 249        KK  DV-B14  DIVERT
 250        DT  DT-B14    1.03     0.0
 251        DI     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 252        DQ     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
            *

 253        KK  CP-B14 COMBINE
 254        HC       4
            *

 255        KK      C1   BASIN
 256        BA   0.023
 257        LG    0.18    0.26    5.05    0.34      14
 258        UI       0      13      33      61      79     104     155     128      99      76
 259        UI      55      29      22      13       8       4       4       4       0       0
 260        UI       0       0       0       0       0       0       0       0       0       0
 261        UI       0       0       0       0       0       0       0       0       0       0
 262        UI       0       0       0       0       0       0       0       0       0       0
            *

 263        KK   DV-C1  DIVERT
 264        DT   DT-C1    0.61     0.0
```

```
 265          DI     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 266          DQ     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
              *
```



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


 267          KK   DVC-K  DIVERT
 268          DT   DTC-K    0.00      50
 269          DI     0.0    1000     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 270          DQ     0.0    1000     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
              *

 271          KK   DVC-H  DIVERT
 272          DT   DTC-H    0.00      15
 273          DI     0.0    1000     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 274          DQ     0.0    1000     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
              *

 275          KK     B13   BASIN
 276          BA   0.003
 277          LG    0.12    0.24    7.27    0.11      51
 278          UI       0      82      33       0       0       0       0       0       0       0
 279          UI       0       0       0       0       0       0       0       0       0       0
 280          UI       0       0       0       0       0       0       0       0       0       0
 281          UI       0       0       0       0       0       0       0       0       0       0
 282          UI       0       0       0       0       0       0       0       0       0       0
              *

 283          KK  DV-B13  DIVERT
 284          DT  DT-B13    0.08     0.0
 285          DI     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 286          DQ     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
              *

 287          KK   CPB13 COMBINE
 288          HC       2
              *

 289          KK    DVGF  DIVERT
 290          DT    DTGF    0.00       3
 291          DI     0.0    1000     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 292          DQ     0.0    1000     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
              *

 293          KK   R-B13   ROUTE
 294          RK     450  0.0090   0.013            CIRC   4.000
              *

 295          KK   CPGAL COMBINE
 296          HC       2
              *

 297          KK      B5   BASIN
 298          BA   0.006
 299          LG    0.23    0.27    5.05    0.38       0
 300          UI       0      15      45      80      54      25      10       2       2       0
 301          UI       0       0       0       0       0       0       0       0       0       0
 302          UI       0       0       0       0       0       0       0       0       0       0
 303          UI       0       0       0       0       0       0       0       0       0       0
 304          UI       0       0       0       0       0       0       0       0       0       0
              *
```



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


 305          KK   DV-B5  DIVERT
 306          DT   DT-B5    0.42     0.0
 307          DI     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 308          DQ     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
              *

 309          KK     B11   BASIN
 310          BA   0.010
 311          LG    0.13    0.27    4.39    0.37      39
 312          UI       0       8      32      48      75      85      57      39      19      11
 313          UI       6       2       2       0       0       0       0       0       0       0
 314          UI       0       0       0       0       0       0       0       0       0       0
 315          UI       0       0       0       0       0       0       0       0       0       0
 316          UI       0       0       0       0       0       0       0       0       0       0
              *

 317          KK  DV-C11  DIVERT
 318          DT  DT-C11     0.0     5.0
 319          DI     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 320          DQ     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
              *

 321          KK  DV-B11  DIVERT
 322          DT  DT-B11    0.26     0.0
 323          DI     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 324          DQ     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
              *
              *

 325          KK      L1   BASIN
 326          BA   0.003
 327          LG    0.35    0.36    5.05    0.28       0
 328          UI       0       6      23      33      25      14       7       4       2       1
 329          UI       1       0       0       0       0       0       0       0       0       0
 330          UI       0       0       0       0       0       0       0       0       0       0
 331          UI       0       0       0       0       0       0       0       0       0       0
 332          UI       0       0       0       0       0       0       0       0       0       0
```

```
                *

333             KK      M1   BASIN
334             BA   0.001
335             LG    0.35    0.36    5.05    0.28       0
336             UI       0       3       9      12       7       4       2       1       0       0
337             UI       0       0       0       0       0       0       0       0       0       0
338             UI       0       0       0       0       0       0       0       0       0       0
339             UI       0       0       0       0       0       0       0       0       0       0
340             UI       0       0       0       0       0       0       0       0       0       0
                *
341             ZZ
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1
                 SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

    28          A1
                 V
                 V
    38        R-A1
                 .
                 .
    43           .          A2
                 .           .
                 .           .
    51       CP-A2............
                 .
                 .
    53           .          B1
                 .           V
                 .           V
    61           .        R-B1
                 .           .
                 .           .
    63           .           .          B2
                 .           .           .
                 .           .           .
    71           .           .           .          B3
                 .           .           .           .
                 .           .           .           .
    79           .           .       CP-B3............
                 .           .           V
                 .           .           V
    81           .           .      R-CPB3
                 .           .           .
                 .           .           .
    86           .           .           .          B4
                 .           .           .           .
                 .           .           .           .
   104           .           .           .           .------->   DTOC
   103           .           .           .        DVOC
                 .           .           .           V
                 .           .           .           V
   107           .           .           .       DETOC
                 .           .           .           .
                 .           .           .           .
   114           .           .           .           .           .<-------   DTOC
   113           .           .           .           .        DVOC
                 .           .           .           .           .
                 .           .           .           .           .
   115           .           .           .         B4C............
                 .           .           .           .
                 .           .           .           .
   118           .           .           .           .------->   DTOD
   117           .           .           .        DVOD
                 .           .           .           V
                 .           .           .           V
   121           .           .           .       DETOD
                 .           .           .           .
                 .           .           .           .
   128           .           .           .           .           .<-------   DTOD
   127           .           .           .           .        DVOD
                 .           .           .           .           .
                 .           .           .           .           .
   129           .           .           .         B4D............
                 .           .           .           .
                 .           .           .           .
   131           .           .       CP-B4............
                 .           .           V
                 .           .           V
   133           .           .      R-CPB4
                 .           .           .
                 .           .           .
   138           .       CP-B5............
                 .           V
                 .           V
   140           .      R-CPB5
                 .           .
                 .           .
   145           .           .          B6
                 .           .           .
                 .           .           .
   153           .           .           .          B8
                 .           .           .           .
                 .           .           .           .
   161           .           .        CP68............
                 .           .           V
                 .           .           V
   163           .           .       DET68
                 .           .           .
                 .           .           .
   170           .           .           .         B6W
                 .           .           .           .
                 .           .           .           .
   178           .       CP-6W........................
                 .           .
                 .           .
   181           .           .------->  DT-B7
   180           .       DV-B7
                 .           .
                 .           .
   185           .           .           .<-------  DT-B7
   184           .           .       DV-B7
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  186           .           .           .       B14A
                .           .           .           .
                .           .           .           .
  194           .           .       CP-V7............
                .           .           V
                .           .           V
  196           .           .      DETBV7
                .           .           .
                .           .           .
  202           .           .           .          B9
                .           .           .           .
                .           .           .           .
  211           .           .           .           .------->  DT-B9
  210           .           .           .       DV-B9
                .           .           .           .
                .           .           .           .
  214           .       CP-B9........................
                .           V
                .           V
  216           .      R-CPB9
                .           .
                .           .
  221           .           .         B10
                .           .           .
                .           .           .
  230           .           .           .------->  DT-B10
  229           .           .      DT-B10
                .           .           .
                .           .           .
  233           .           .           .         B12
                .           .           .           .
                .           .           .           .
  241           .           .           .           .         B14
                .           .           .           .           .
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  250           .           .           .           .           .------->  DT-B14
  249           .           .           .           .      DV-B14
                .           .           .           .           .
                .           .           .           .           .
  253           .      CP-B14....................................
                .           .
                .           .
  255           .           .          C1
                .           .           .
                .           .           .
  264           .           .           .------->  DT-C1
  263           .           .       DV-C1
                .           .           .
                .           .           .
  268           .           .           .------->  DTC-K
  267           .           .       DVC-K
                .           .           .
                .           .           .
  272           .           .           .------->  DTC-H
  271           .           .       DVC-H
                .           .           .
                .           .           .
  275           .           .           .         B13
                .           .           .           .
                .           .           .           .
  284           .           .           .           .------->  DT-B13
  283           .           .           .      DV-B13
                .           .           .           .
                .           .           .           .
  287           .           .       CPB13............
                .           .           .
                .           .           .
  290           .           .           .------->   DTGF
  289           .           .        DVGF
                .           .           V
                .           .           V
  293           .           .       R-B13
                .           .           .
                .           .           .
  295           .       CPGAL............
                .           .
                .           .
  297           .           .          B5
                .           .           .
                .           .           .
  306           .           .           .------->  DT-B5
  305           .           .       DV-B5
                .           .           .
                .           .           .
  309           .           .           .         B11
                .           .           .           .
                .           .           .           .
  318           .           .           .           .------->  DT-C11
  317           .           .           .      DV-C11
                .           .           .           .
                .           .           .           .
  322           .           .           .           .------->  DT-B11
  321           .           .           .      DV-B11
                .           .           .           .
                .           .           .           .
  325           .           .           .           .          L1
                .           .           .           .           .
                .           .           .           .           .
  333           .           .           .           .           .         M1
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(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
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   15JUN16  TIME  20:59:52    *                         *          (916) 756-1104                *
*                                       *                         *                                        *
*****************************************                         ******************************************
```

Flood Control District of Maricopa County
DM19 PROP - Desert Mountain 19 Post Online Det Basins 1st Flush
100 YEAR
6 Hour Storm
Unit Hydrograph: S-Graph
Storm: Multiple
06/14/2016
WOOD/PATEL FILE NAME: DM19FT100.DAT

```
10 IO         OUTPUT CONTROL VARIABLES
                    IPRNT          5  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL          0.  HYDROGRAPH PLOT SCALE

   IT         HYDROGRAPH TIME DATA
                     NMIN          1  MINUTES IN COMPUTATION INTERVAL
                    IDATE     1JAN99  STARTING DATE
                    ITIME       0000  STARTING TIME
                       NQ       2000  NUMBER OF HYDROGRAPH ORDINATES
                   NDDATE     2JAN99  ENDING DATE
                   NDTIME       0919  ENDING TIME
                    ICENT         19  CENTURY MARK

              COMPUTATION INTERVAL     .02 HOURS
                   TOTAL TIME BASE   33.32 HOURS

      ENGLISH UNITS
           DRAINAGE AREA          SQUARE MILES
           PRECIPITATION DEPTH    INCHES
           LENGTH, ELEVATION      FEET
           FLOW                   CUBIC FEET PER SECOND
           STORAGE VOLUME         ACRE-FEET
           SURFACE AREA           ACRES
           TEMPERATURE            DEGREES FAHRENHEIT

12 JD         INDEX STORM NO. 1
                     STRM       3.31  PRECIPITATION DEPTH
                     TRDA        .00  TRANSPOSITION DRAINAGE AREA

13 PI           PRECIPITATION PATTERN
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.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.03	.03	.03	.03	.03
.03	.03	.03	.03	.03	.03	.03	.03	.03	.03
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16 JD         INDEX STORM NO. 2
                     STRM       3.29  PRECIPITATION DEPTH
                     TRDA        .50  TRANSPOSITION DRAINAGE AREA

17 PI           PRECIPITATION PATTERN
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.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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20 JD INDEX STORM NO. 3
STRM 3.27 PRECIPITATION DEPTH
TRDA 1.00 TRANSPOSITION DRAINAGE AREA

21 PI PRECIPITATION PATTERN

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24 JD INDEX STORM NO. 4
STRM 3.23 PRECIPITATION DEPTH
TRDA 2.80 TRANSPOSITION DRAINAGE AREA

25 PI PRECIPITATION PATTERN

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          **************
          *            *
107 KK    *   DETOC    *    STORAGE
          *            *
          **************

108 KO        OUTPUT CONTROL VARIABLES
                   IPRNT          5  PRINT CONTROL
                   IPLOT          0  PLOT CONTROL
                   QSCAL         0.  HYDROGRAPH PLOT SCALE


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

          **************
          *            *
121 KK    *   DETOD    *    STORAGE
          *            *
          **************

122 KO        OUTPUT CONTROL VARIABLES
                   IPRNT          5  PRINT CONTROL
                   IPLOT          0  PLOT CONTROL
                   QSCAL         0.  HYDROGRAPH PLOT SCALE


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

          **************
          *            *
163 KK    *   DET68    *    STORAGE
          *            *
          **************

164 KO        OUTPUT CONTROL VARIABLES
                   IPRNT          5  PRINT CONTROL
                   IPLOT          0  PLOT CONTROL
                   QSCAL         0.  HYDROGRAPH PLOT SCALE


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

          **************
          *            *
196 KK    *   DETBV7   *    STORAGE
          *            *
          **************

197 KO        OUTPUT CONTROL VARIABLES
                   IPRNT          5  PRINT CONTROL
                   IPLOT          0  PLOT CONTROL
                   QSCAL         0.  HYDROGRAPH PLOT SCALE
```

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	A1	468.	4.13	38.	10.	7.	.20		
+	ROUTED TO	R-A1	462.	4.18	38.	10.	7.	.20		
+	HYDROGRAPH AT	A2	36.	4.02	2.	0.	0.	.01		
+	2 COMBINED AT	CP-A2	467.	4.18	40.	10.	7.	.21		
+	HYDROGRAPH AT	B1	72.	4.02	4.	1.	1.	.02		
+	ROUTED TO	R-B1	72.	4.03	4.	1.	1.	.02		
+	HYDROGRAPH AT	B2	3.	4.02	0.	0.	0.	.00		
+	HYDROGRAPH AT	B3	111.	4.07	7.	2.	1.	.04		
+	2 COMBINED AT	CP-B3	111.	4.05	7.	2.	1.	.04		
+	ROUTED TO	R-CPB3	111.	4.07	7.	2.	1.	.04		
+	HYDROGRAPH AT	B4	1110.	4.42	163.	41.	29.	.92		
+	DIVERSION TO	DTOC	1050.	4.33	161.	40.	29.	.92		
+	HYDROGRAPH AT	DVOC	60.	4.42	2.	0.	0.	.92		
+	ROUTED TO	DETOC	8.	4.52	2.	0.	0.	.92		
+	HYDROGRAPH AT	DVOC	1050.	4.33	161.	40.	29.	.92		
+	2 COMBINED AT	B4C	1058.	4.50	163.	41.	29.	.92		
+	DIVERSION TO	DTOD	975.	4.28	159.	40.	29.	.92		
+	HYDROGRAPH AT	DVOD	83.	4.50	3.	1.	1.	.92		
+	ROUTED TO	DETOD	12.	4.58	3.	1.	1.	.92		
+	HYDROGRAPH AT	DVOD	975.	4.28	159.	40.	29.	.92		
+	2 COMBINED AT	B4D	987.	4.57	162.	41.	29.	.92		
+	2 COMBINED AT	CP-B4	1012.	4.27	168.	42.	30.	.96		
+	ROUTED TO	R-CPB4	1013.	4.28	168.	42.	30.	.96		
+	2 COMBINED AT	CP-B5	1024.	4.28	172.	43.	31.	.98		
+	ROUTED TO	R-CPB5	1021.	4.30	172.	43.	31.	.98		
+	HYDROGRAPH AT	B6	29.	4.02	1.	0.	0.	.01		
+	HYDROGRAPH AT	B8	36.	4.02	2.	1.	0.	.01		
+	2 COMBINED AT	CP68	65.	4.02	4.	1.	1.	.02		
+	ROUTED TO	DET68	2.	3.83	2.	1.	1.	.02		
+	HYDROGRAPH AT	B6W	9.	4.02	0.	0.	0.	.00		
+	3 COMBINED AT	CP-6W	1022.	4.30	173.	44.	32.	1.00		
+	DIVERSION TO	DT-B7	22.	4.30	4.	1.	1.	1.00		

+	HYDROGRAPH AT	DV-B7	1001.	4.30	169.	43.	31.	1.00
+	HYDROGRAPH AT	DV-B7	22.	4.30	4.	1.	1.	1.00
+	HYDROGRAPH AT	B14A	15.	4.02	1.	0.	0.	.00
+	2 COMBINED AT	CP-V7	29.	4.02	5.	1.	1.	.00
+	ROUTED TO	DETBV7	22.	4.53	5.	1.	1.	.00
+	HYDROGRAPH AT	B9	29.	4.02	2.	1.	0.	.01
+	DIVERSION TO	DT-B9	8.	3.67	0.	0.	0.	.01
+	HYDROGRAPH AT	DV-B9	29.	4.02	2.	0.	0.	.01
+	3 COMBINED AT	CP-B9	1022.	4.30	174.	45.	32.	1.02
+	ROUTED TO	R-CPB9	1016.	4.33	174.	45.	32.	1.02
+	HYDROGRAPH AT	B10	38.	4.02	2.	0.	0.	.01
+	DIVERSION TO	DT-B10	35.	3.88	1.	0.	0.	.01
+	HYDROGRAPH AT	DT-B10	38.	4.02	1.	0.	0.	.01
+	HYDROGRAPH AT	B12	15.	4.02	1.	0.	0.	.00
+	HYDROGRAPH AT	B14	134.	4.02	9.	2.	2.	.04
+	DIVERSION TO	DT-B14	50.	3.82	2.	1.	0.	.04
+	HYDROGRAPH AT	DV-B14	134.	4.02	6.	2.	1.	.04
+	4 COMBINED AT	CP-B14	1027.	4.32	181.	46.	33.	1.07
+	HYDROGRAPH AT	C1	78.	4.02	5.	1.	1.	.02
+	DIVERSION TO	DT-C1	48.	3.87	1.	0.	0.	.02
+	HYDROGRAPH AT	DV-C1	78.	4.02	3.	1.	1.	.02
+	DIVERSION TO	DTC-K	50.	3.88	3.	1.	0.	.02
+	HYDROGRAPH AT	DVC-K	28.	4.02	1.	0.	0.	.02
+	DIVERSION TO	DTC-H	15.	3.92	1.	0.	0.	.02
+	HYDROGRAPH AT	DVC-H	13.	4.02	0.	0.	0.	.02
+	HYDROGRAPH AT	B13	11.	4.02	1.	0.	0.	.00
+	DIVERSION TO	DT-B13	4.	3.55	0.	0.	0.	.00
+	HYDROGRAPH AT	DV-B13	11.	4.02	1.	0.	0.	.00
+	2 COMBINED AT	CPB13	24.	4.02	1.	0.	0.	.03
+	DIVERSION TO	DTGF	3.	3.58	0.	0.	0.	.03
+	HYDROGRAPH AT	DVGF	21.	4.02	1.	0.	0.	.03
+	ROUTED TO	R-B13	21.	4.02	1.	0.	0.	.03
+	2 COMBINED AT	CPGAL	1025.	4.32	181.	46.	33.	1.10
+	HYDROGRAPH AT	B5	20.	4.02	1.	0.	0.	.01
+	DIVERSION TO	DT-B5	20.	4.02	1.	0.	0.	.01

	HYDROGRAPH AT							
+		DV-B5	17.	4.03	0.	0.	0.	.01
	HYDROGRAPH AT							
+		B11	35.	4.02	2.	1.	0.	.01
	DIVERSION TO							
+		DT-C11	5.	3.58	1.	0.	0.	.01
	HYDROGRAPH AT							
+		DV-C11	30.	4.02	1.	0.	0.	.01
	DIVERSION TO							
+		DT-B11	28.	3.90	1.	0.	0.	.01
	HYDROGRAPH AT							
+		DV-B11	30.	4.02	1.	0.	0.	.01
	HYDROGRAPH AT							
+		L1	10.	4.02	1.	0.	0.	.00
	HYDROGRAPH AT							
+		M1	3.	4.02	0.	0.	0.	.00

1

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	INTERPOLATED TO COMPUTATION INTERVAL DT	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
FOR STORM = 1 STORM AREA (SQ MI) = .00									
R-B1	MANE	.30	72.25	241.40	1.72	1.00	72.12	242.00	1.72

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2021E+01 EXCESS= .0000E+00 OUTFLOW= .2021E+01 BASIN STORAGE= .3970E-14 PERCENT ERROR= .0

FOR STORM = 2 STORM AREA (SQ MI) = .50									
R-B1	MANE	.18	71.78	241.39	1.71	1.00	71.60	242.00	1.71

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2002E+01 EXCESS= .0000E+00 OUTFLOW= .2003E+01 BASIN STORAGE= .3981E-14 PERCENT ERROR= .0

FOR STORM = 3 STORM AREA (SQ MI) = 1.00									
R-B1	MANE	.17	56.32	241.36	1.57	1.00	56.19	242.00	1.57

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1841E+01 EXCESS= .0000E+00 OUTFLOW= .1842E+01 BASIN STORAGE= .3970E-14 PERCENT ERROR= .0

FOR STORM = 4 STORM AREA (SQ MI) = 2.80									
R-B1	MANE	.17	33.58	241.35	1.40	1.00	33.53	242.00	1.40

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1647E+01 EXCESS= .0000E+00 OUTFLOW= .1647E+01 BASIN STORAGE= .3963E-14 PERCENT ERROR= .0

FOR STORM = 1 STORM AREA (SQ MI) = .00									
R-B13	MANE	.35	21.50	240.86	.23	1.00	21.47	241.00	.23

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3152E+00 EXCESS= .0000E+00 OUTFLOW= .3155E+00 BASIN STORAGE= .7448E-14 PERCENT ERROR= -.1

FOR STORM = 2 STORM AREA (SQ MI) = .50									
R-B13	MANE	.39	20.87	240.84	.22	1.00	20.79	241.00	.22

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3053E+00 EXCESS= .0000E+00 OUTFLOW= .3054E+00 BASIN STORAGE= .7516E-14 PERCENT ERROR= .0

FOR STORM = 3 STORM AREA (SQ MI) = 1.00									
R-B13	MANE	.31	5.94	240.94	.10	1.00	5.94	241.00	.10

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1403E+00 EXCESS= .0000E+00 OUTFLOW= .1408E+00 BASIN STORAGE= .7520E-14 PERCENT ERROR= -.4

FOR STORM = 4 STORM AREA (SQ MI) = 2.80									
R-B13	MANE	.45	2.67	240.59	.06	1.00	2.67	240.00	.06

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8898E-01 EXCESS= .0000E+00 OUTFLOW= .8918E-01 BASIN STORAGE= .7557E-14 PERCENT ERROR= -.2

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

APPENDIX C

Site Retention Calculations

Required First Flush Storm Water Calculations

Provided Storm Water Calculations

Required First Flush Storm Water Calculations

WOOD/PATEL

CIVIL ENGINEERS * HYDROLOGISTS * LAND SURVEYORS * CONSTRUCTION MANAGERS

First Flush Volume Required

Description: Desert Mountain Parcel 19
Date: 05/06/16
Location: City of Scottsdale
Reference:

City of Scottsdale, *Design Standards and Policies Manual Chapter 4 Grading & Drainage*, January 2010.

Known Values: First Flush
0.5 inches

Calc. Values: V=(P/12)*A*C

V = Retention Volume Required
C = Runoff Coefficient
P = Precipitation amount=100-year 2 hour rainfall
A = Area of Watershed Contributing

Drainage Area	Area (SF)	Area (ac)	Weighted Runoff Coefficient	First Flush Volume (ac-ft)	Required Pre vs Post Volume (ac-ft)
B5	165024	3.79	1.00	0.16	0.42
B6	322261	5.50	1.00	0.23	N/A
B8	300366	6.90	1.00	0.29	N/A
B9	217378	4.99	1.00	0.21	N/A
B10	335363	7.70	1.00	0.32	N/A
B11	269364	6.18	1.00	0.26	N/A
B13	80916	1.86	1.00	0.08	N/A
B14	1072718	24.63	1.00	1.03	N/A
B14A	115650	2.65	1.00	0.11	N/A
C1	636403	14.61	1.00	0.61	N/A
			TOTAL =	**3.28**	

Provided Storm Water Calculations

Off-Site Detention Basin Capacity

Description: Proposed Detention Basin Capacities
Project: **Desert Mountain Parcel 19**
Reference: *Drainage Design Manual for Maricopa County, Arizona - Hydrology*
City of Scottsdale, *Design Standards and Policies Manual*

Basin IDs	Bottom Contour Area	Top Contour	Bottom Elevation	Top Elevation	Volume Provided	Volume Provided
Basin 3	17,184	19,439	0.0	1	**0.42**	**2.01**
	19,439	21,796	1.0	2	**0.47**	
	21,796	24,252	2.0	3	**0.53**	
	24,252	26,810.00	3.0	4	**0.59**	

Basin IDs	Bottom Contour Area	Top Contour	Bottom Elevation	Top Elevation	Volume Provided	Volume Provided
Basin 4	10,798	13,254	2680.0	2681.0	**0.28**	**1.39**
	13,254	15,028	2681.0	2682.0	**0.32**	
	15,028	17,134	2682.0	2683.0	**0.37**	
	17,134	19,270	2683.0	2684.0	**0.42**	
	19,270	22,350	2684.0	2684.0	**0.00**	

On-Site Detention Basin Capacity

Description: Proposed Detention Basin Capacities
Project: **Desert Mountain Parcel 19**
Reference: *Drainage Design Manual for Maricopa County, Arizona - Hydrology*
City of Scottsdale, *Design Standards and Policies Manual*

Basin IDs	Bottom Contour Area	Top Contour	Bottom Elevation	Top Elevation	Volume Provided	Volume Provided
Basin 1	8,584	10,210	2,606.0	2,607	**0.22**	**1.10**
	10,210	11,949	2,607.0	2,608	**0.25**	
	11,949	13,800	2,608.0	2,609	**0.30**	
	13,800	15,757	2,609.0	2,610	**0.34**	

Basin IDs	Bottom Contour Area	Top Contour	Bottom Elevation	Top Elevation	Volume Provided	Volume Provided
Basin 2	3,232	4,553	2,608.0	2,609	**0.09**	**0.58**
	4,553	6,056	2,609.0	2,610	**0.12**	
	6,056	7,964	2,610.0	2,611	**0.16**	
	7,964	10,184	2,611.0	2,612	**0.21**	

APPENDIX D

Hydraulic Calculations

HEC-RAS Output Files Existing & Proposed Conditions

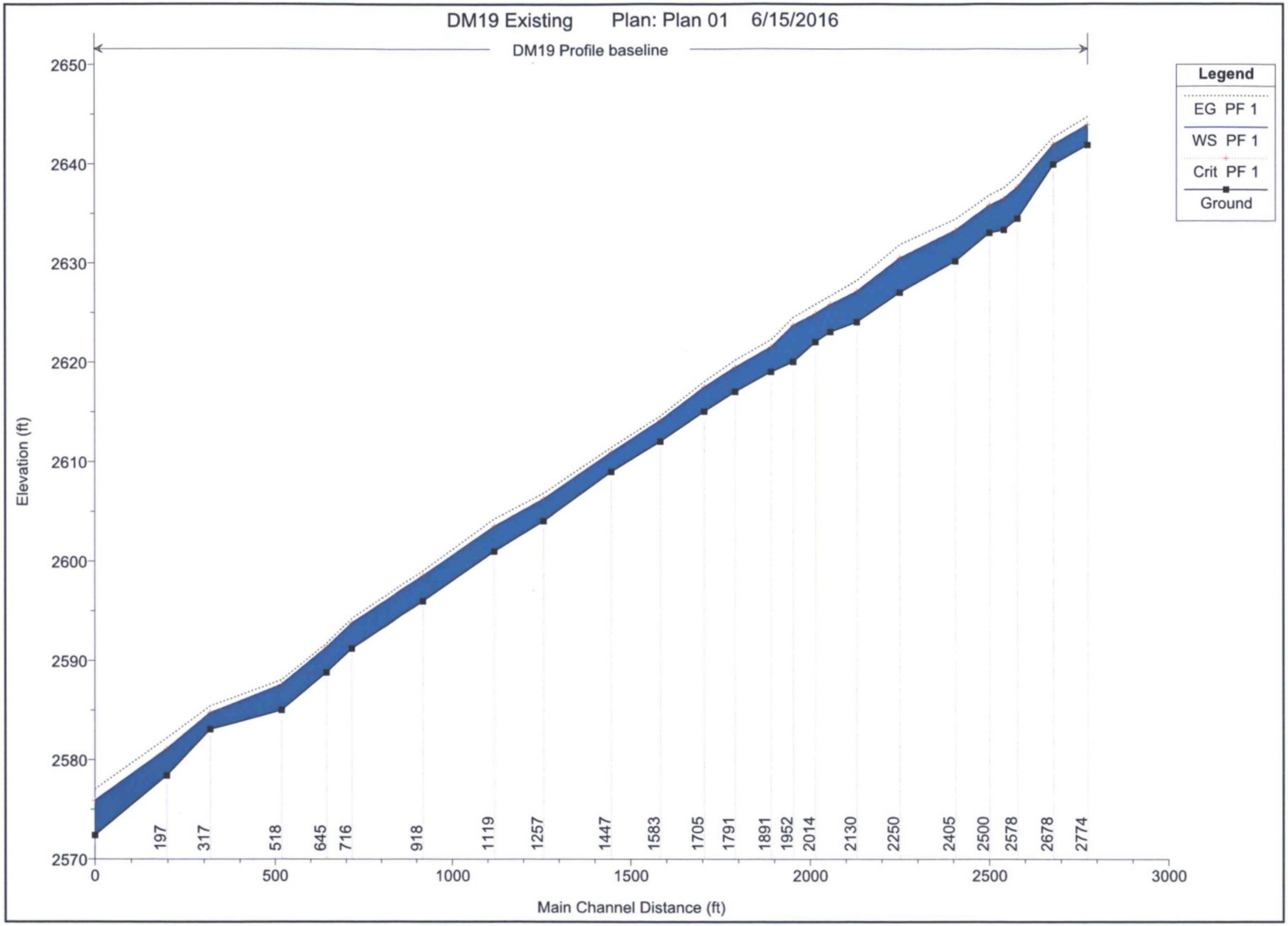
Scour Calculations

Erosion Hazard Setback Calculations

HEC-RAS Output Files Existing & Proposed Conditions

EXISTING

GALLOWAY WASH



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DM19 Profile baseline
Legend
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WS PF 1
Crit PF 1
Ground
Elevation (ft)
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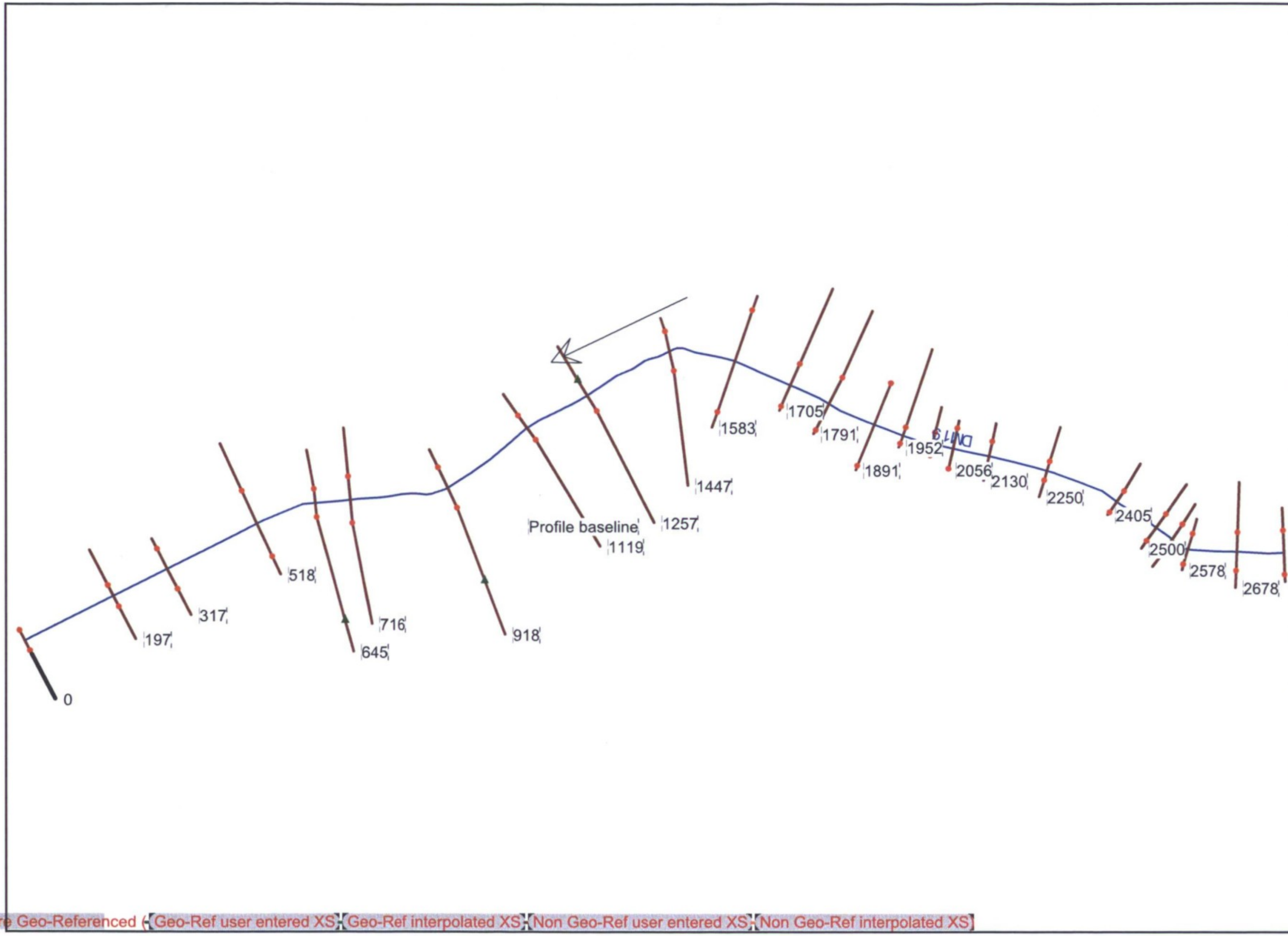
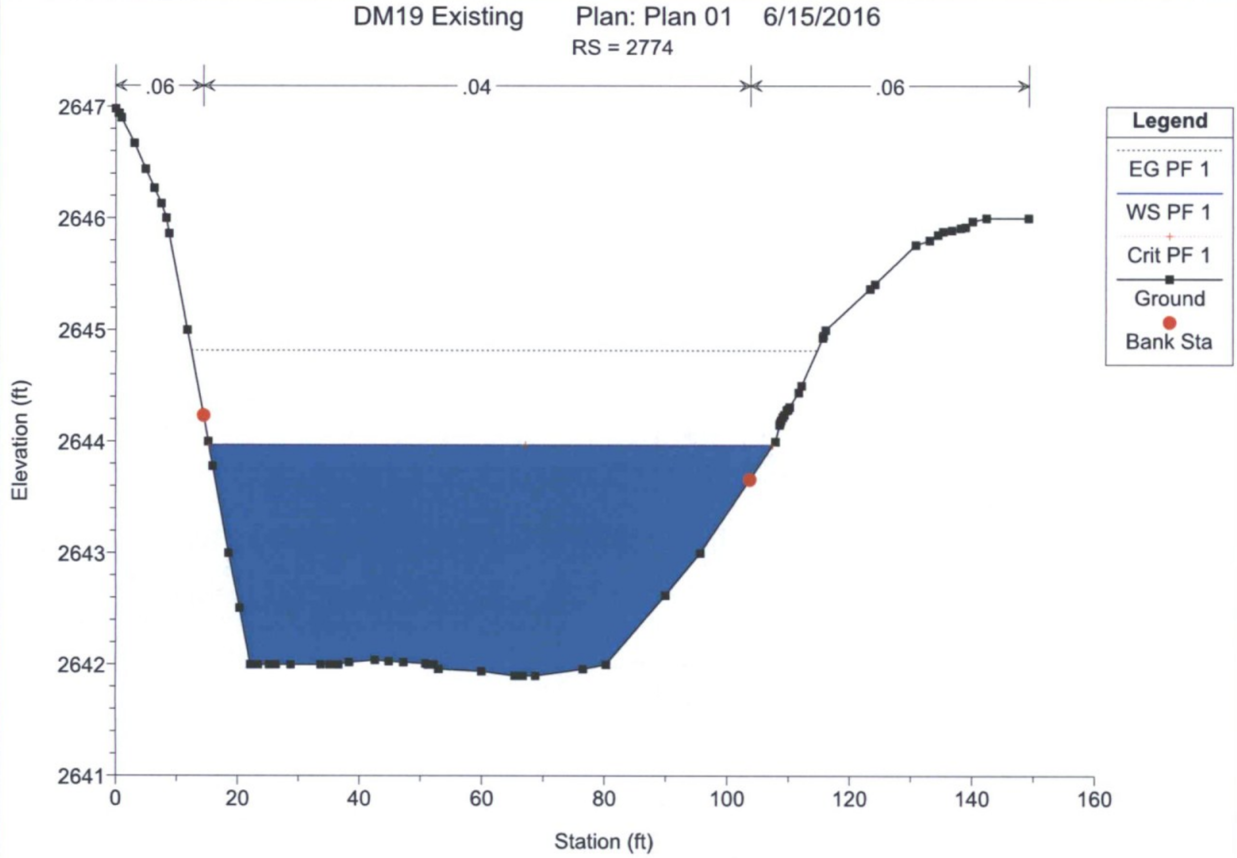
2640
2630
2620
2610
2600
2590
2580
2570
197
317
518
645
716
918
1119
1257
1447
1583
1705
1791
1891
1952
2014
2130
2250
2405
2500
2578
2678
2774
0
500
1000
1500
2000
2500
3000
Main Channel Distance (ft)



ne of the XS's are Geo-Referenced (Geo-Ref user entered XS Geo-Ref interpolated XS Non Geo-Ref user entered XS Non Geo-Ref interpolated XS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.04
.06
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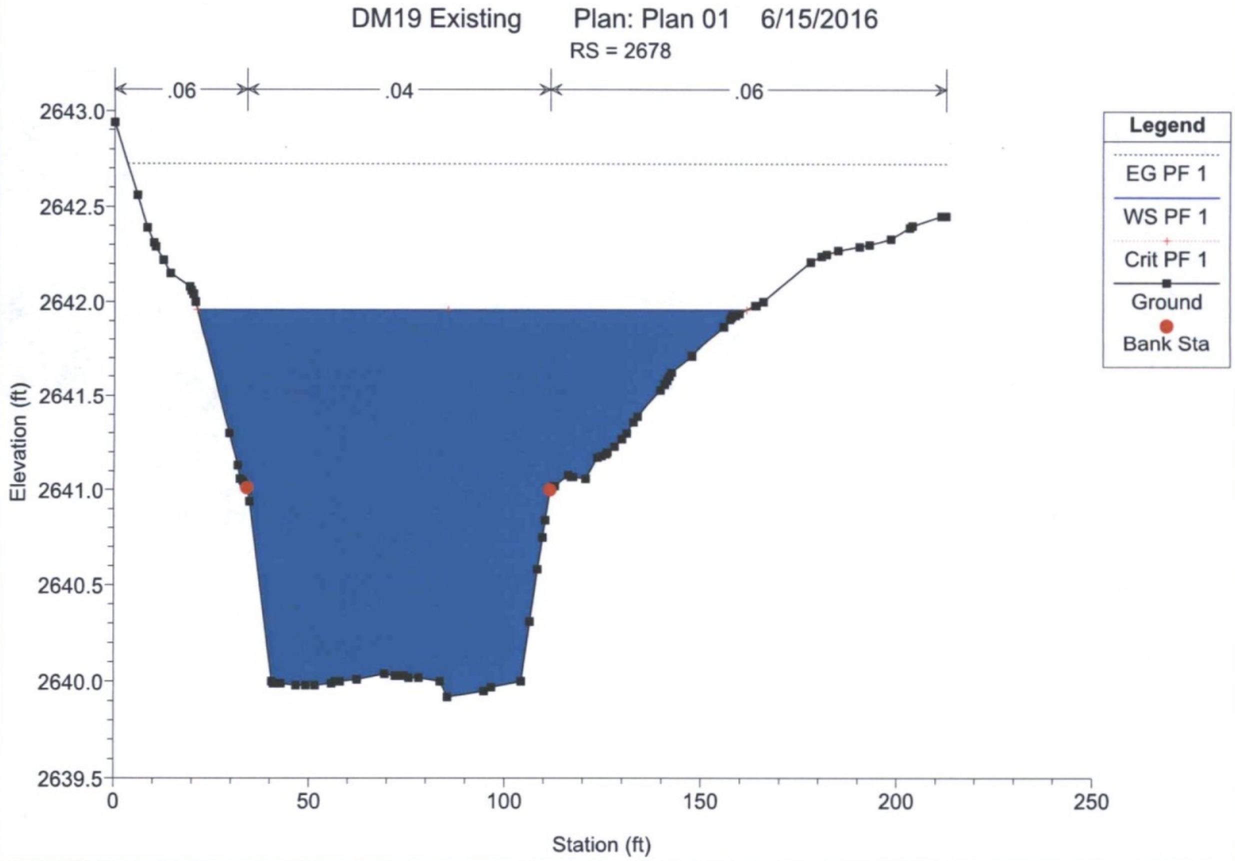
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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Crit PF 1
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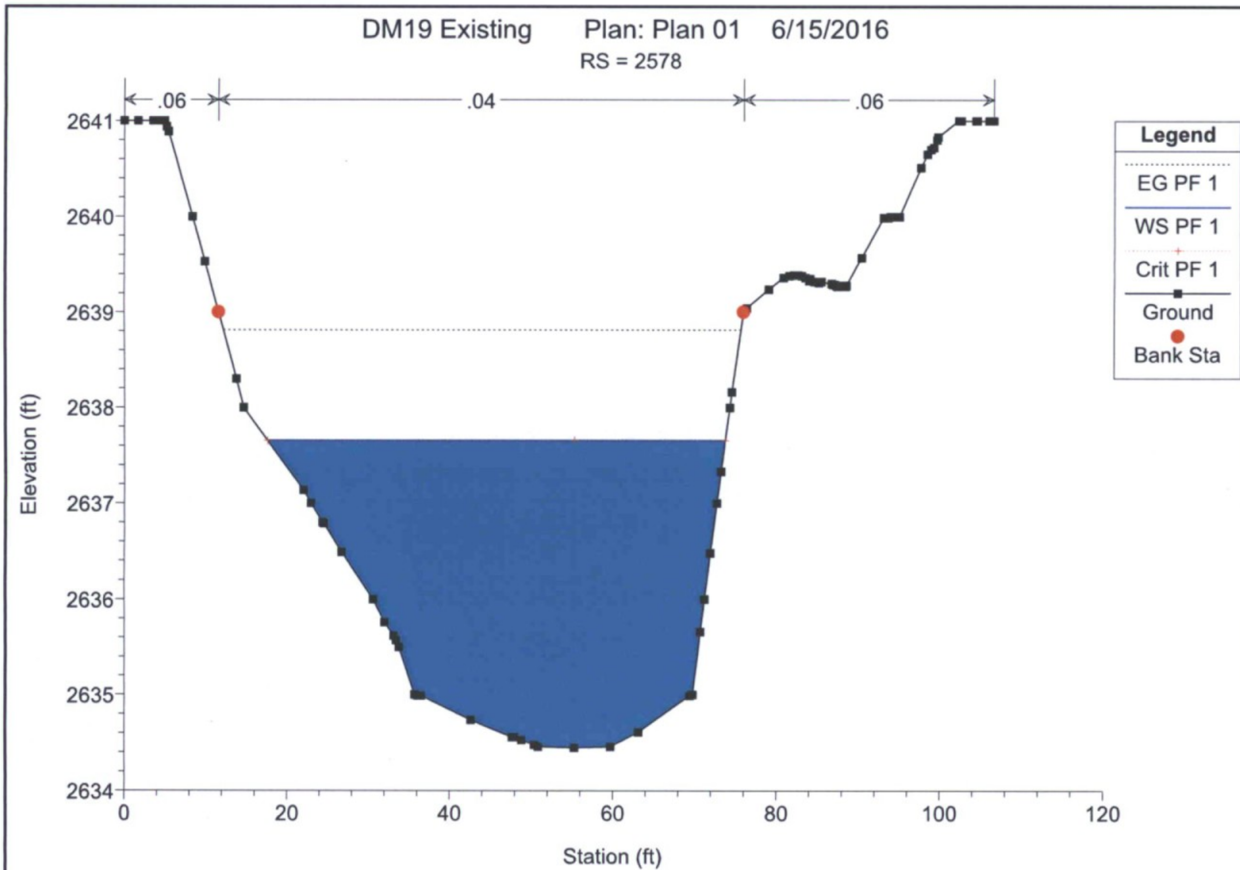
Bank Sta
Elevation (ft)
Station (ft)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WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
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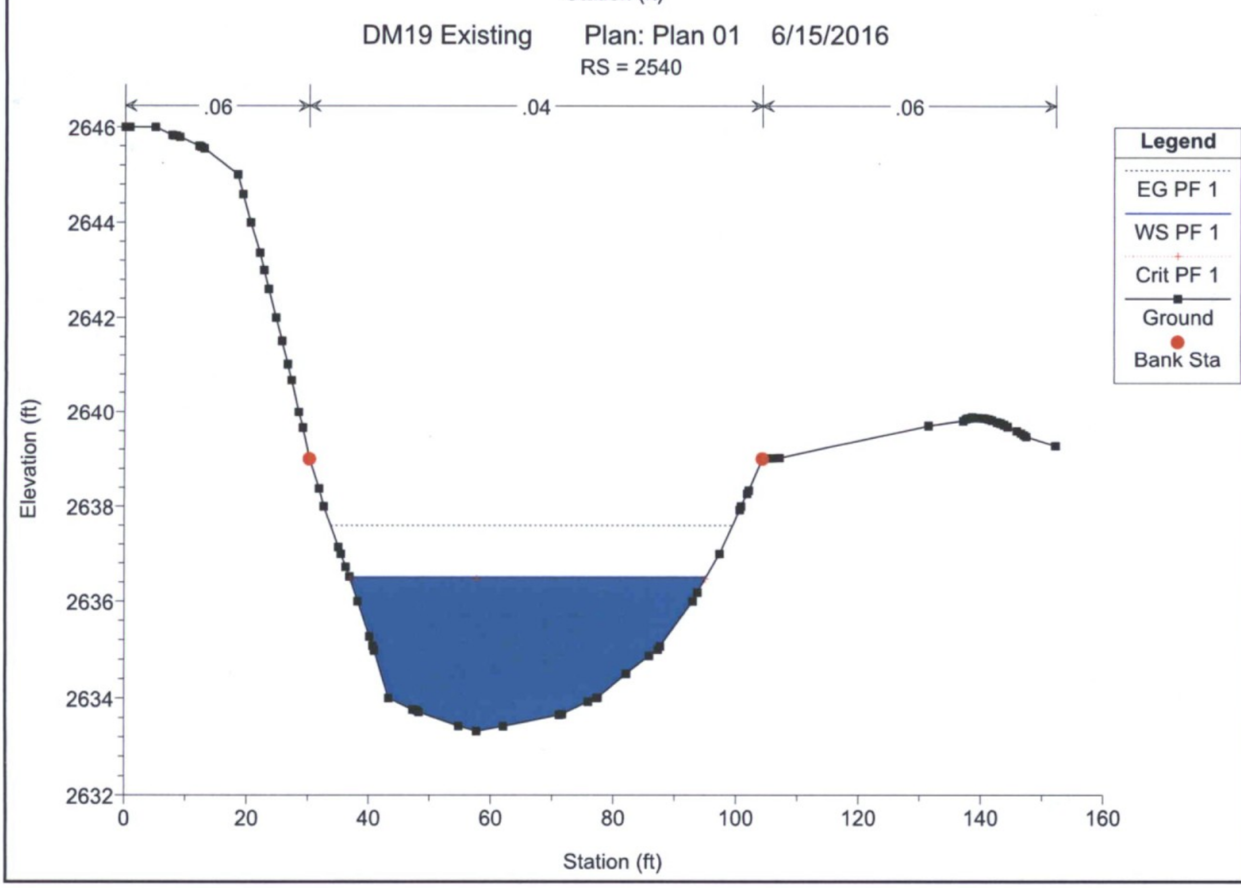
2640
2639
2638
2637
2636
2635
2634
0
20
40
60
80
100
120
Station (ft)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Legend
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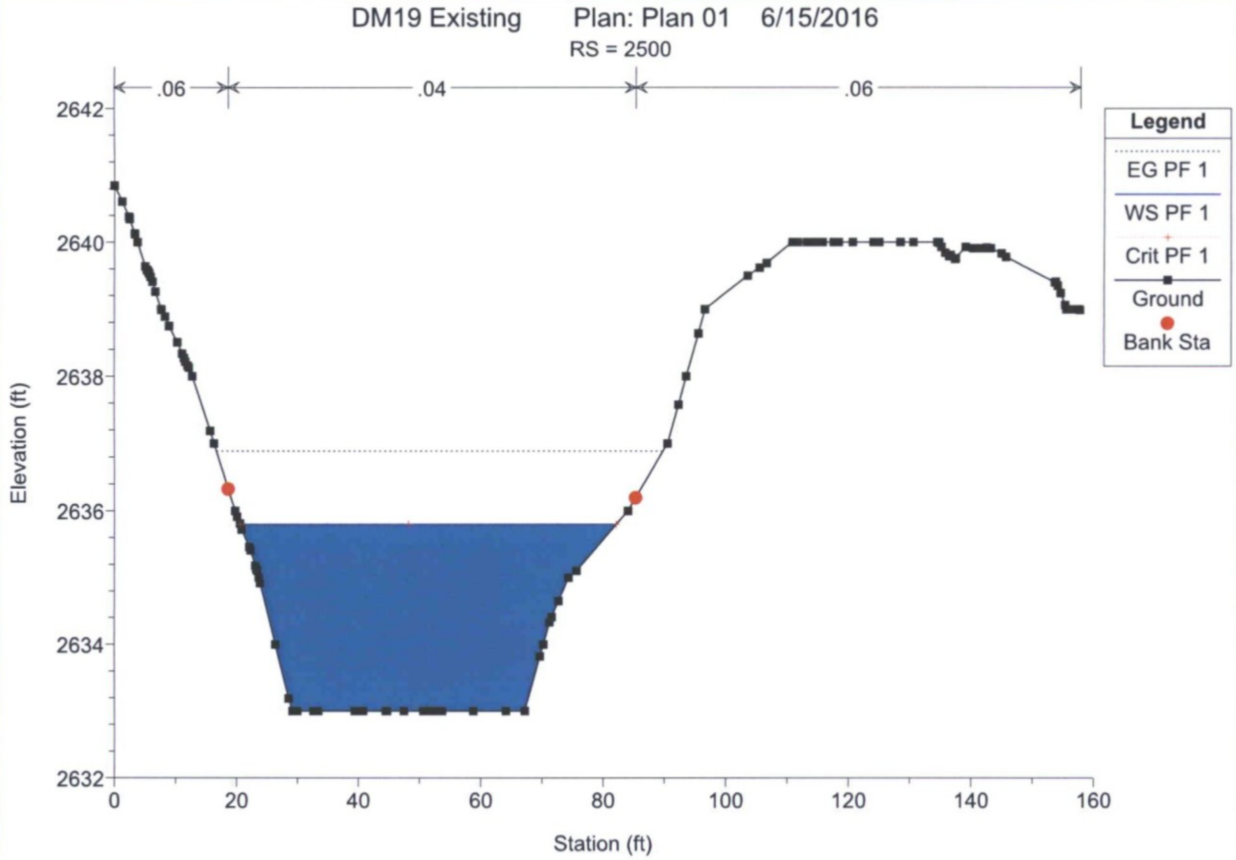
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2646
2644
2642
2640
2638
2636
2634
2632
0
20
40
60
80
100
120
140
160
Station (ft)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Station (ft)
Legend
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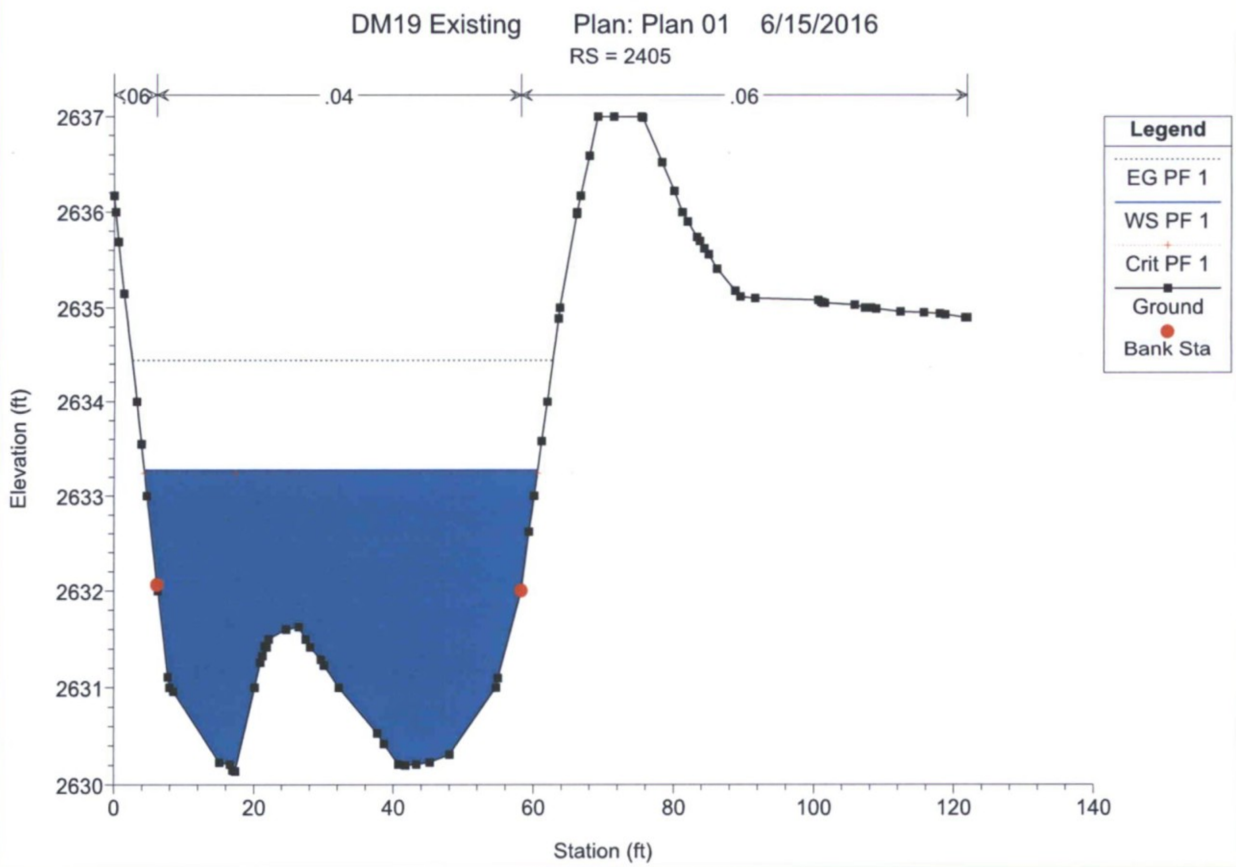
WS PF 1
Crit PF 1
Ground
Bank Sta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Station (ft)
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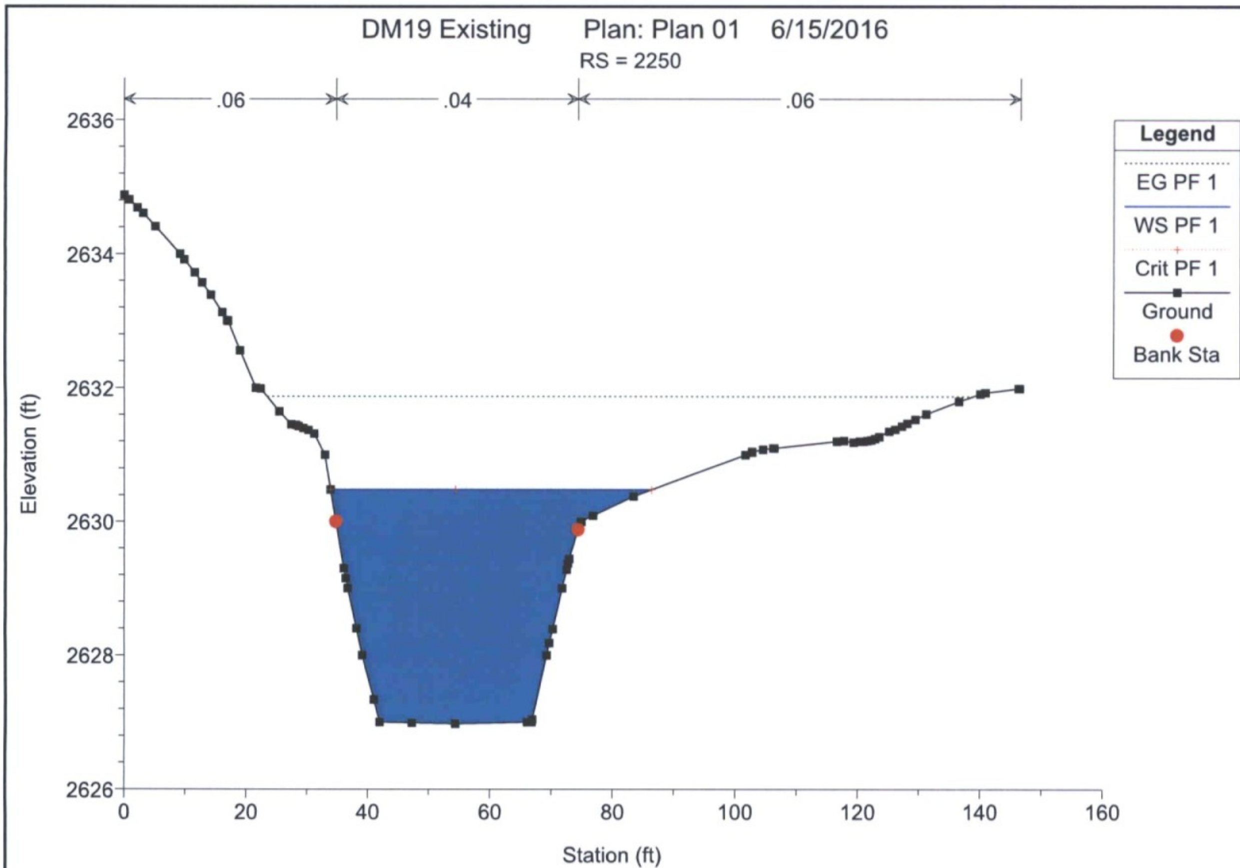
WS PF 1
Crit PF 1
Ground
Bank Sta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.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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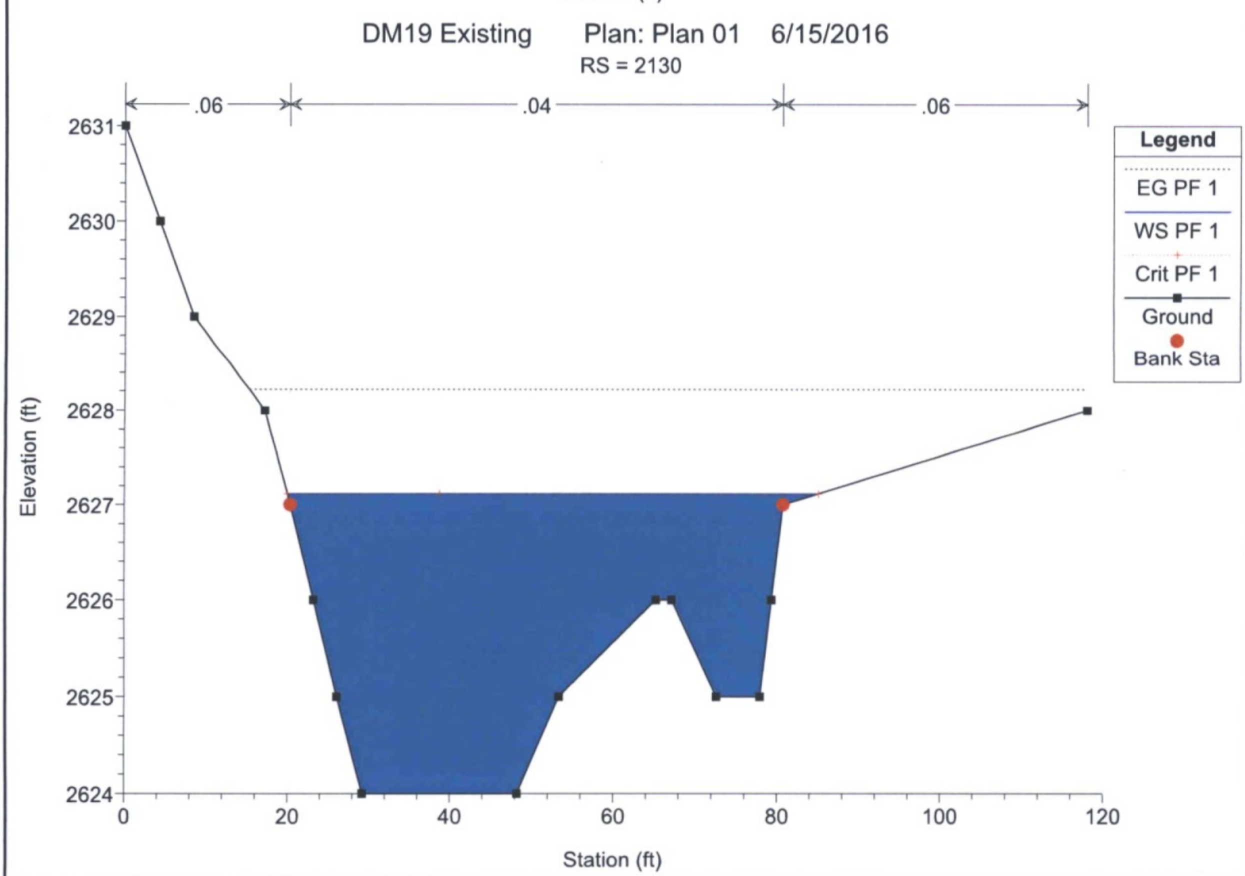
2628
2630
2632
2634
2636
0
20
40
60
80
100
120
140
160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.06
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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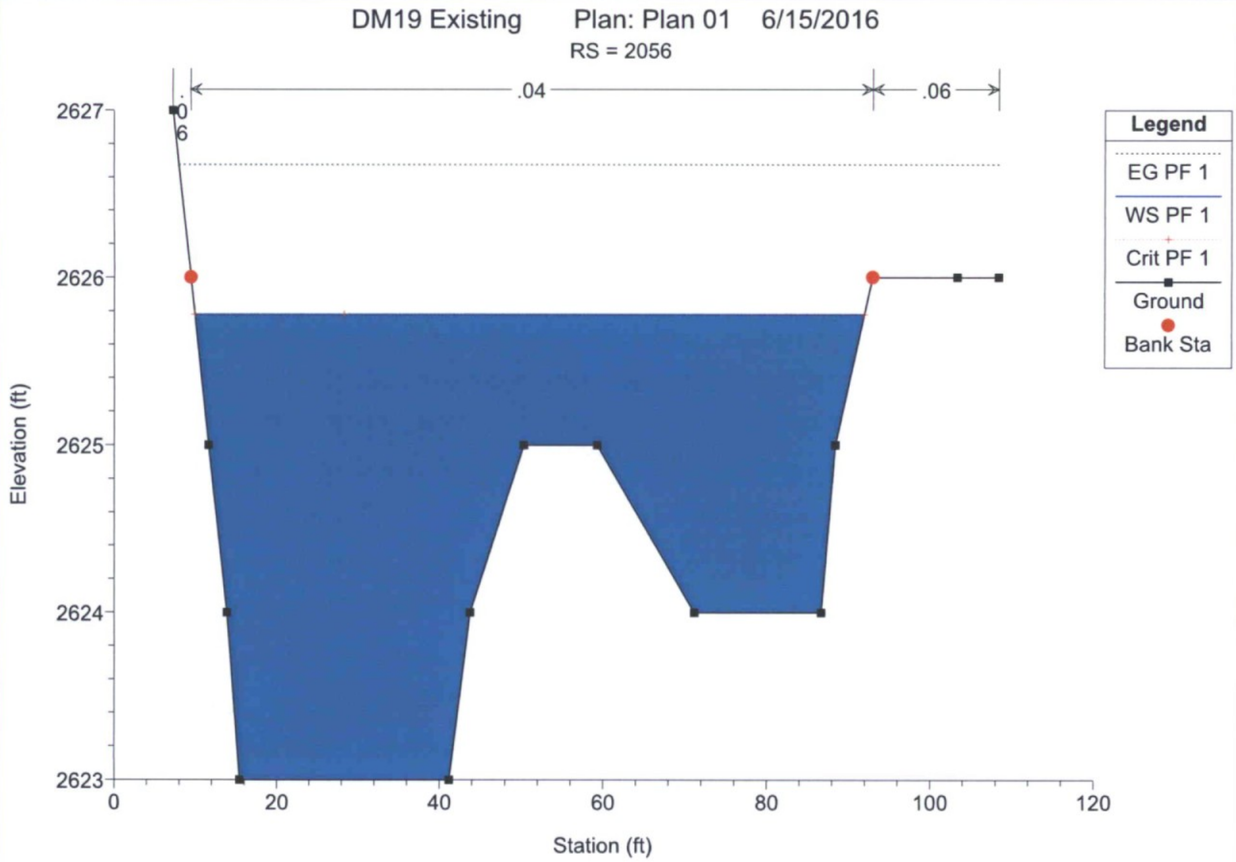
2625
2626
2627
2628
2629
2630
2631
0
20
40
60
80
100
120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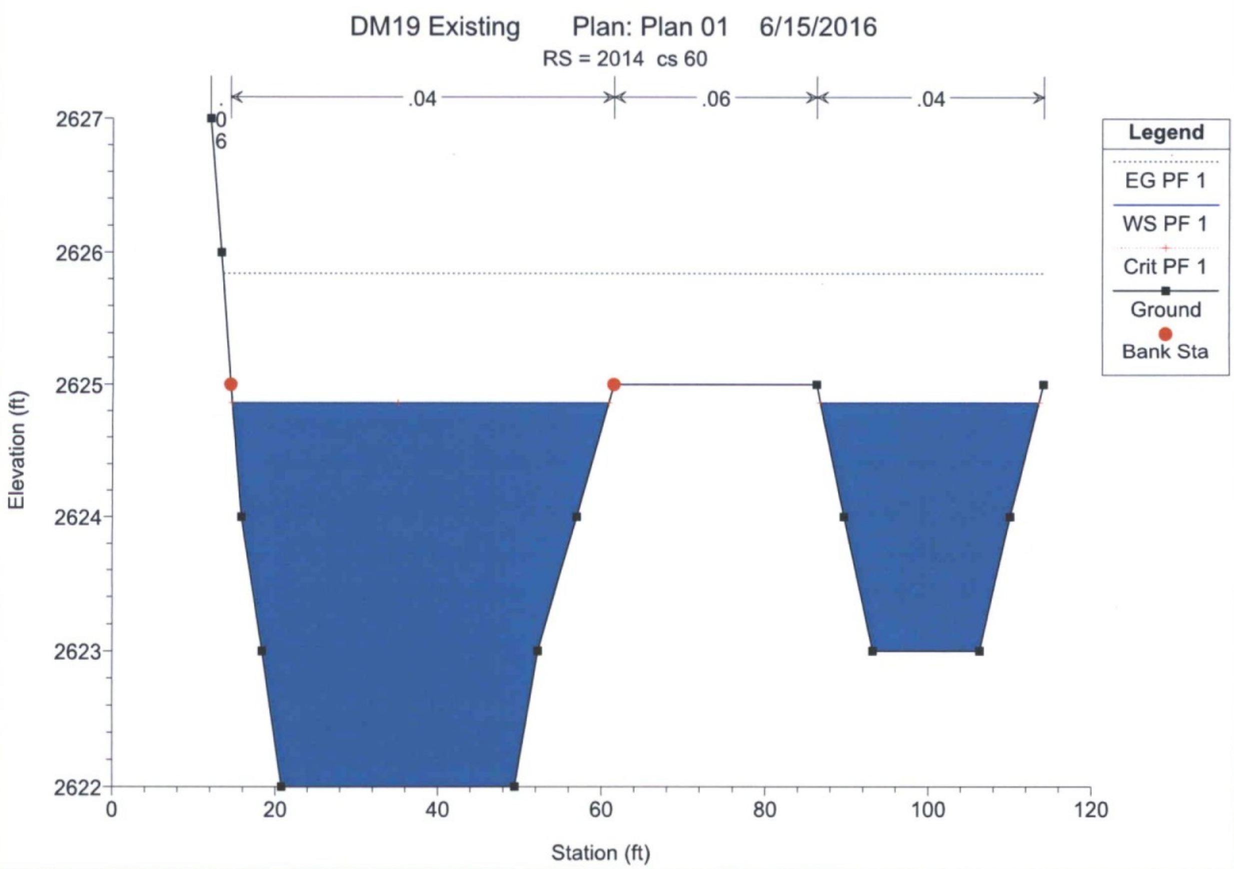
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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.04
.06
.04
Legend
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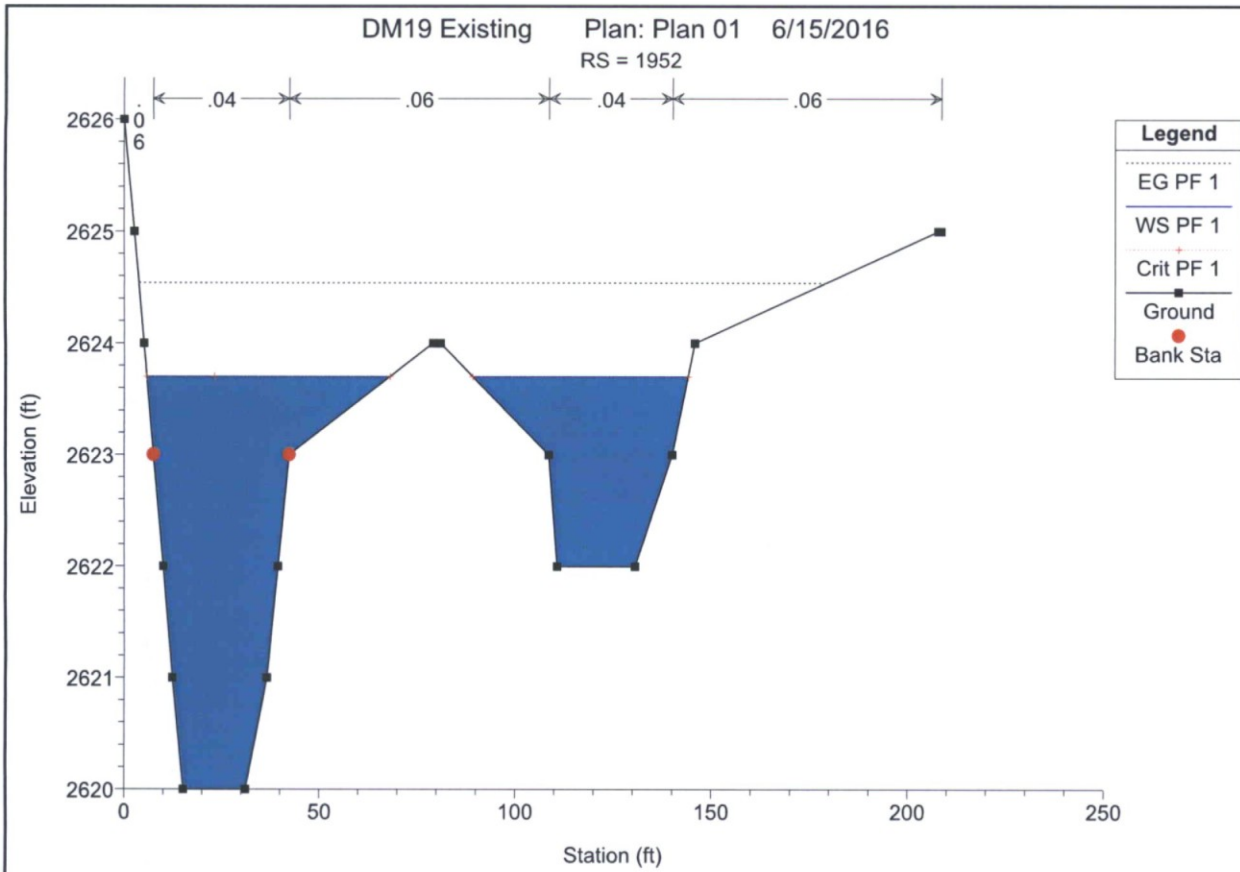
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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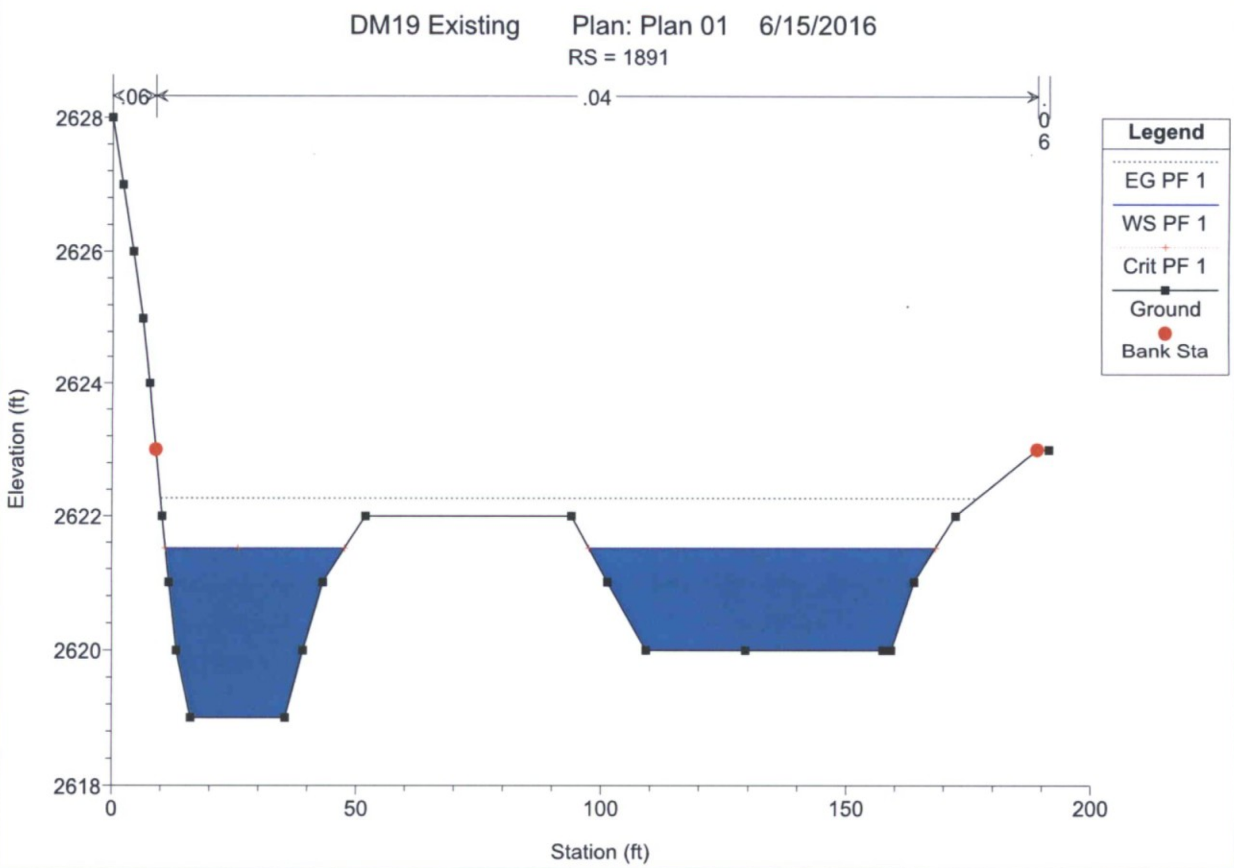
RS = 1952
.04
.06
.04
.06
0
6
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta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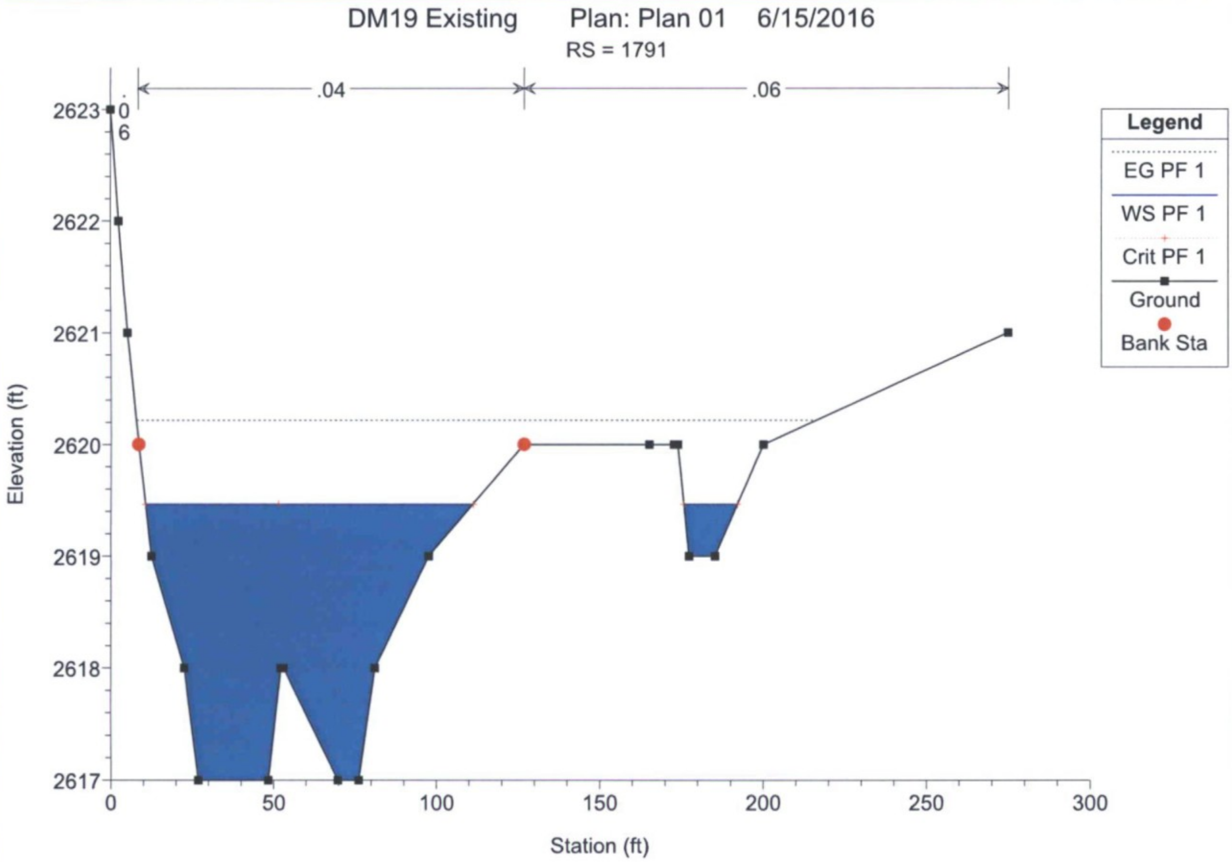
0
6
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta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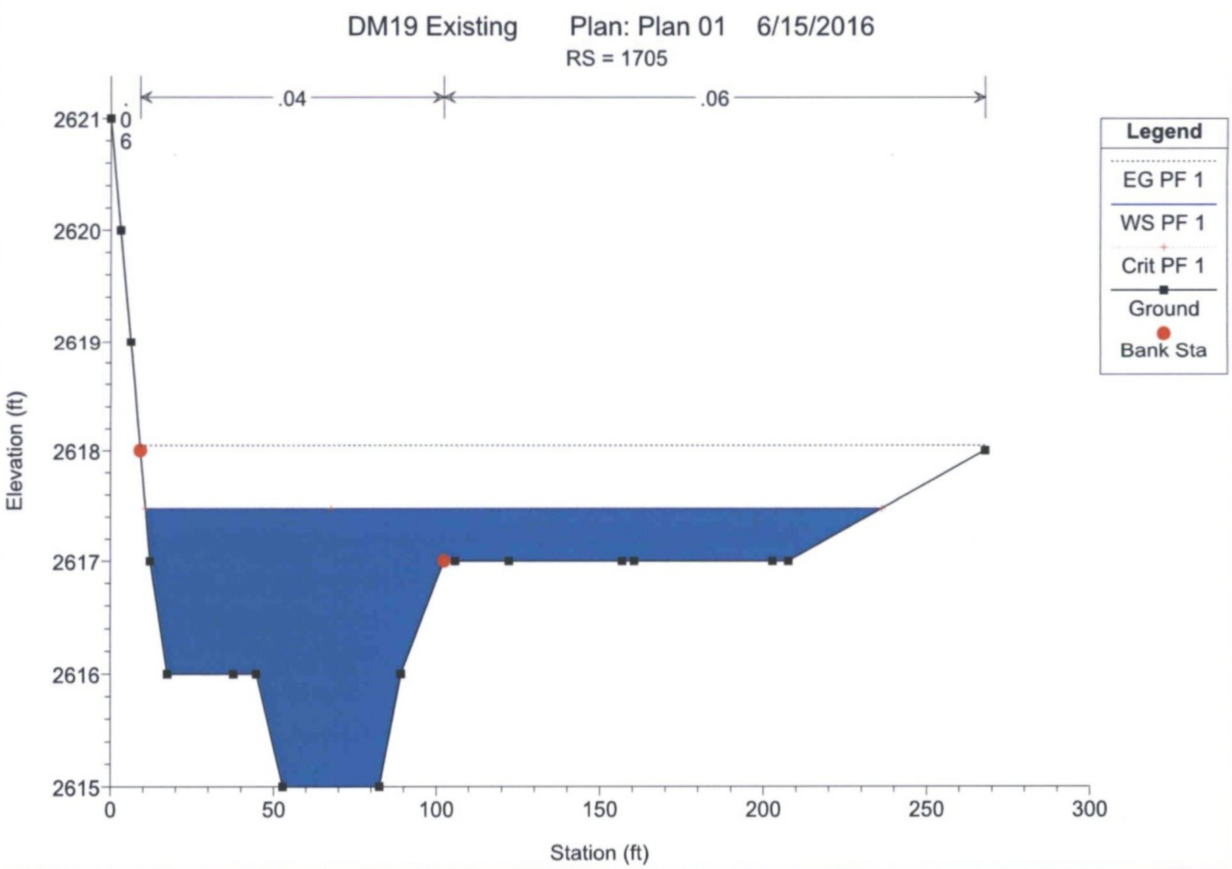
RS = 1791
.04
.06
Elevation (ft)
Station (ft)
2623
2622
2621
2620
2619
2618
2617
0
50
100
150
200
250
300
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta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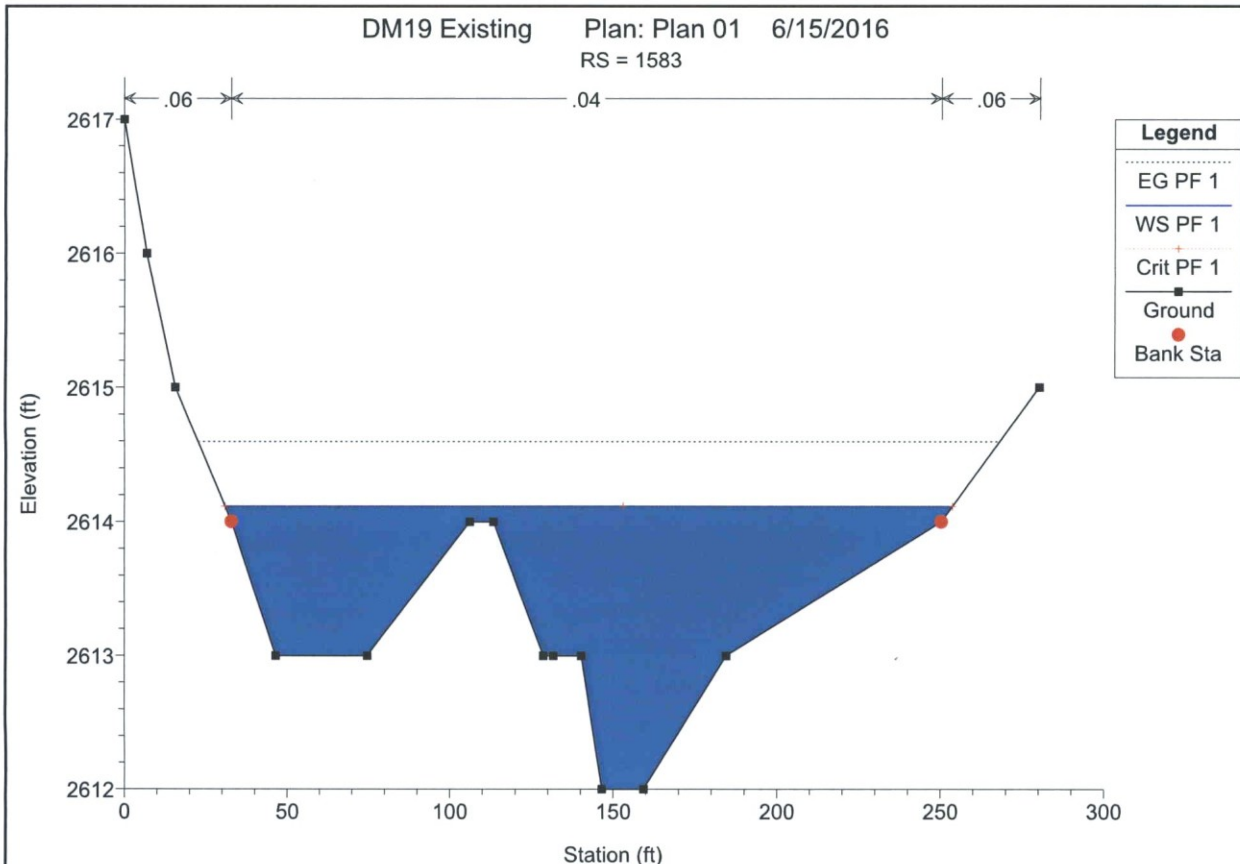
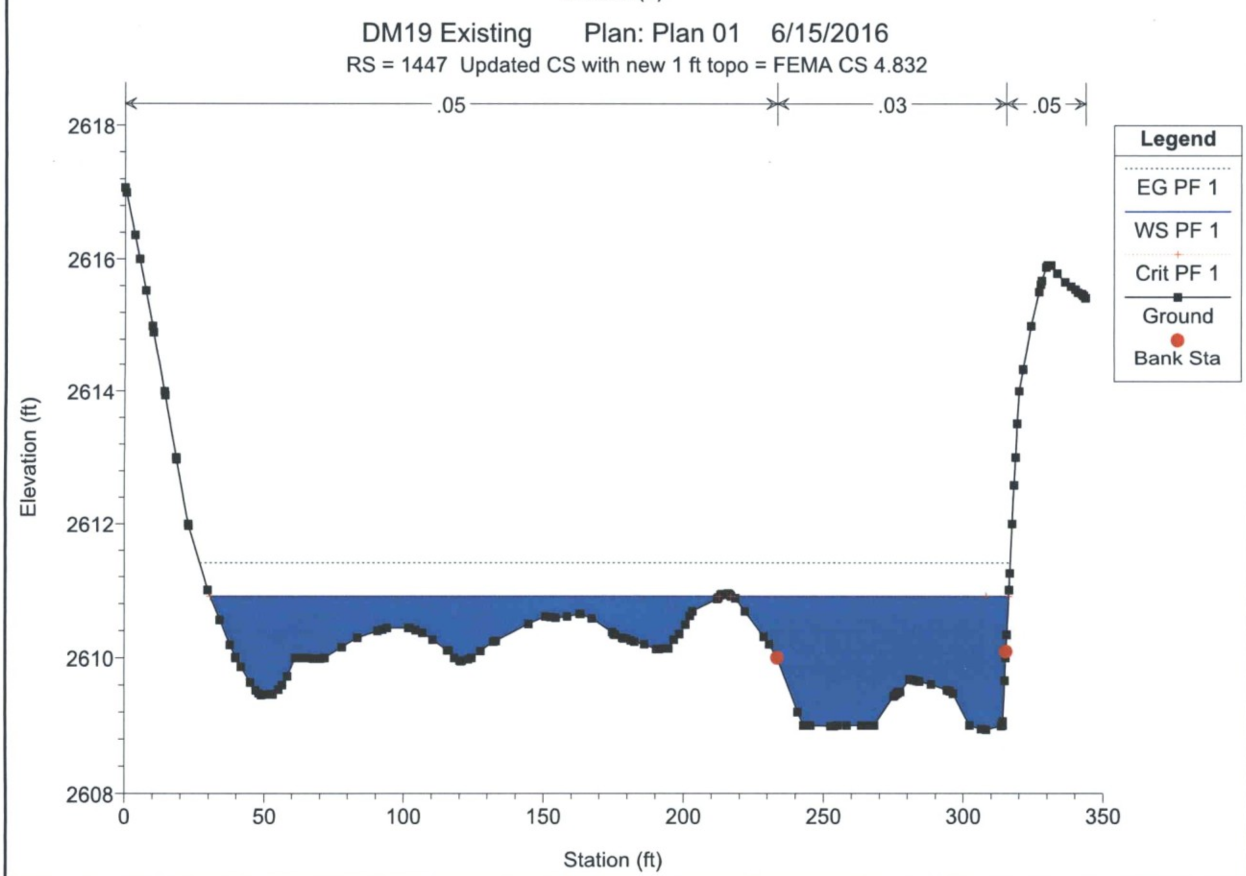
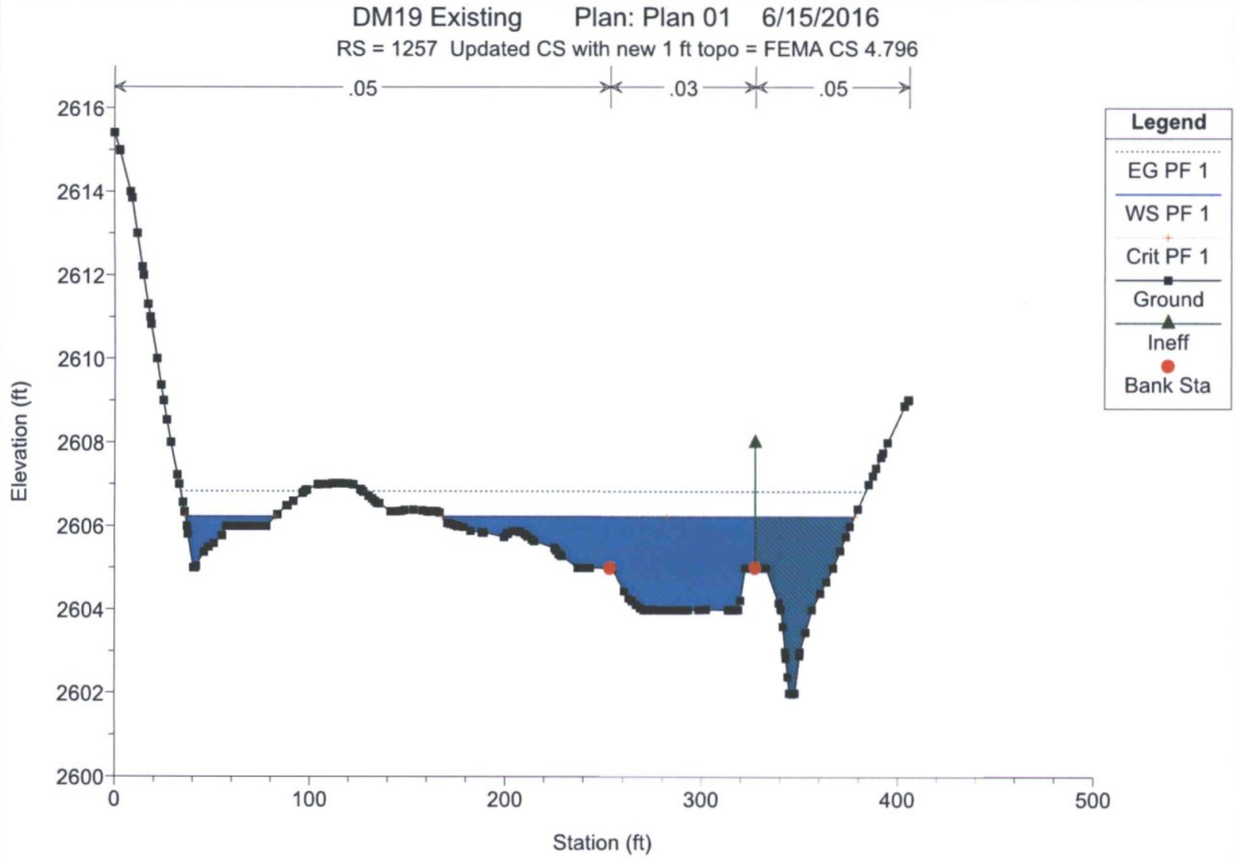
.04
.06
Elevation (ft)
Station (ft)
2621
2620
2619
2618
2617
2616
2615
0
50
100
150
200
250
300
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta



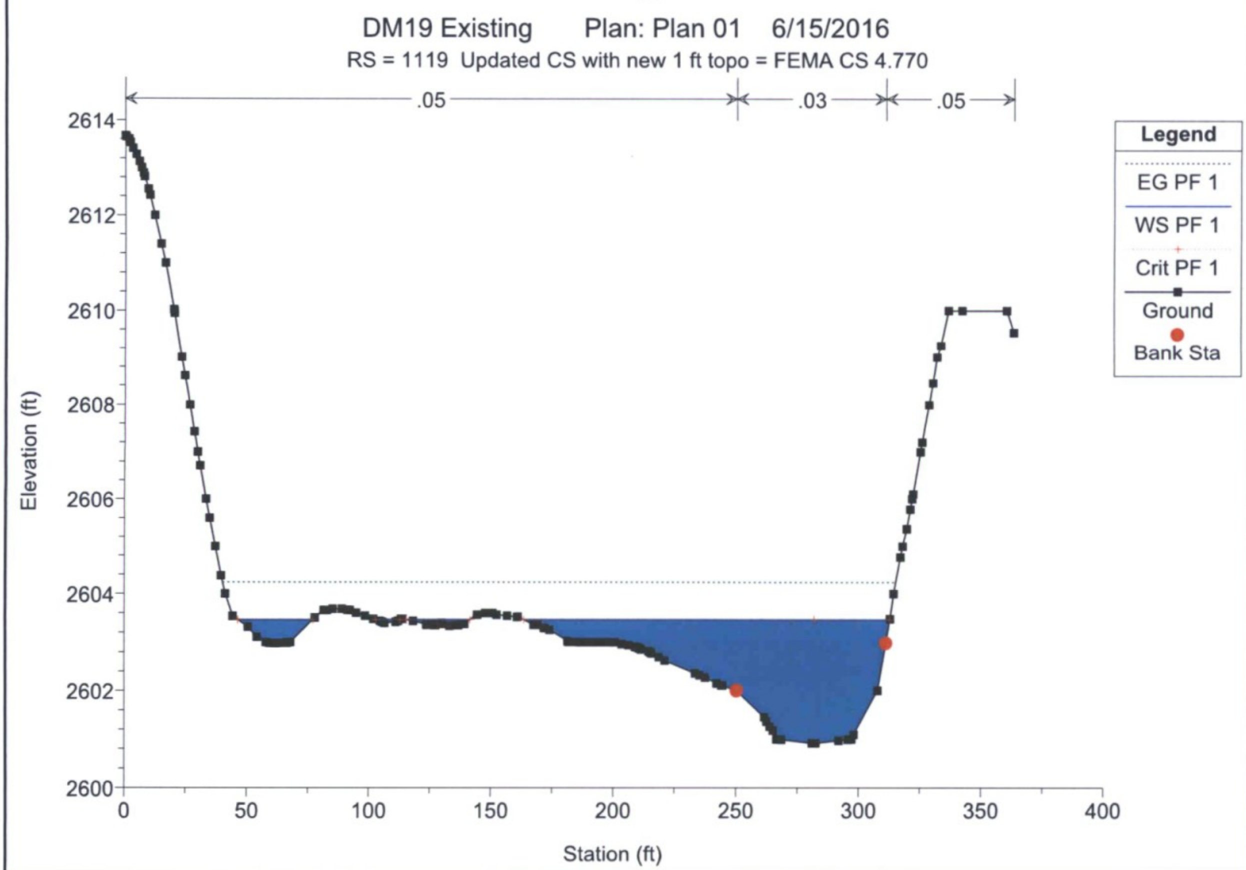
DM19 Existing Plan: Plan 01 6/15/2016
RS = 1583
.06
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2617
2616
2615
2614
2613
2612
0
50
100
150
200
250
300
Station (ft)



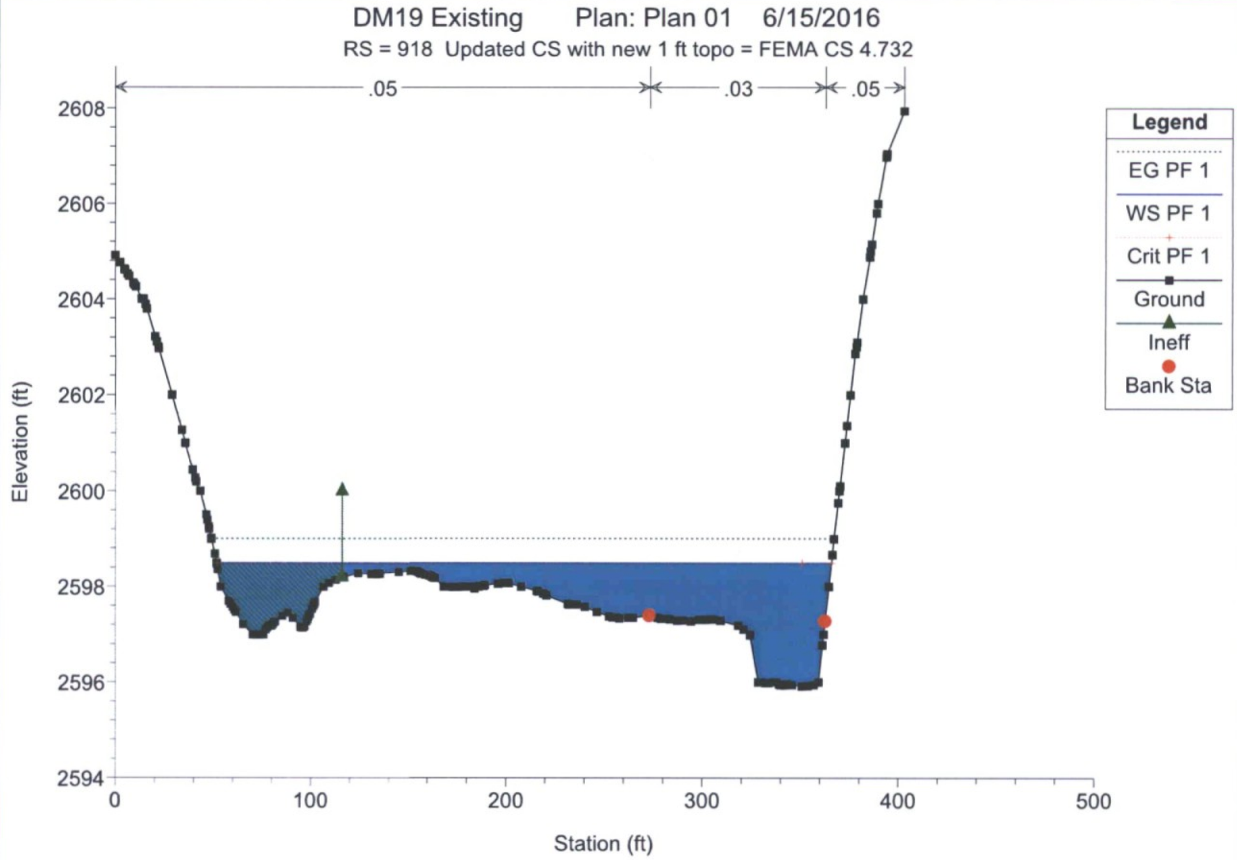
DM19 Existing Plan: Plan 01 6/15/2016
RS = 1447 Updated CS with new 1 ft topo = FEMA CS 4.832
.05
.03
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2618
2616
2614
2612
2610
2608
0
50
100
150
200
250
300
350
Station (ft)

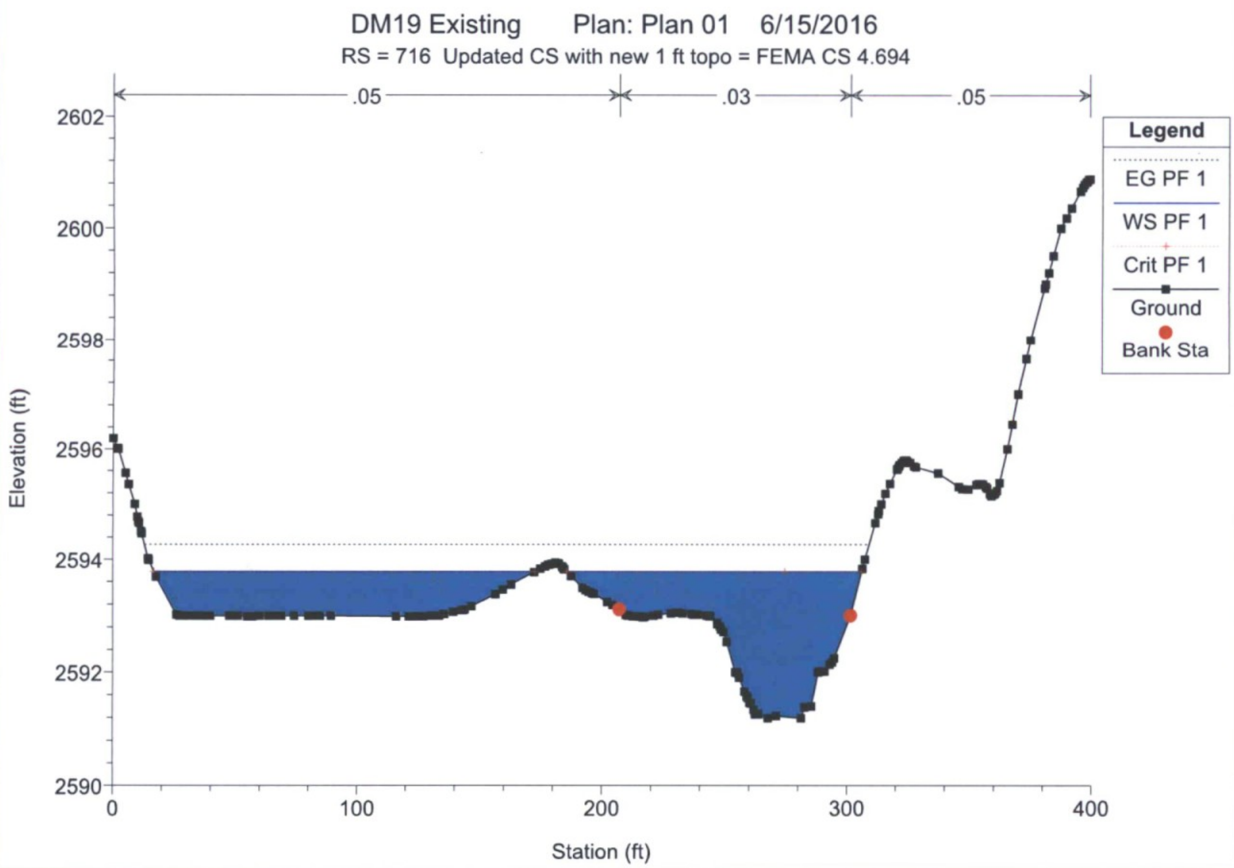


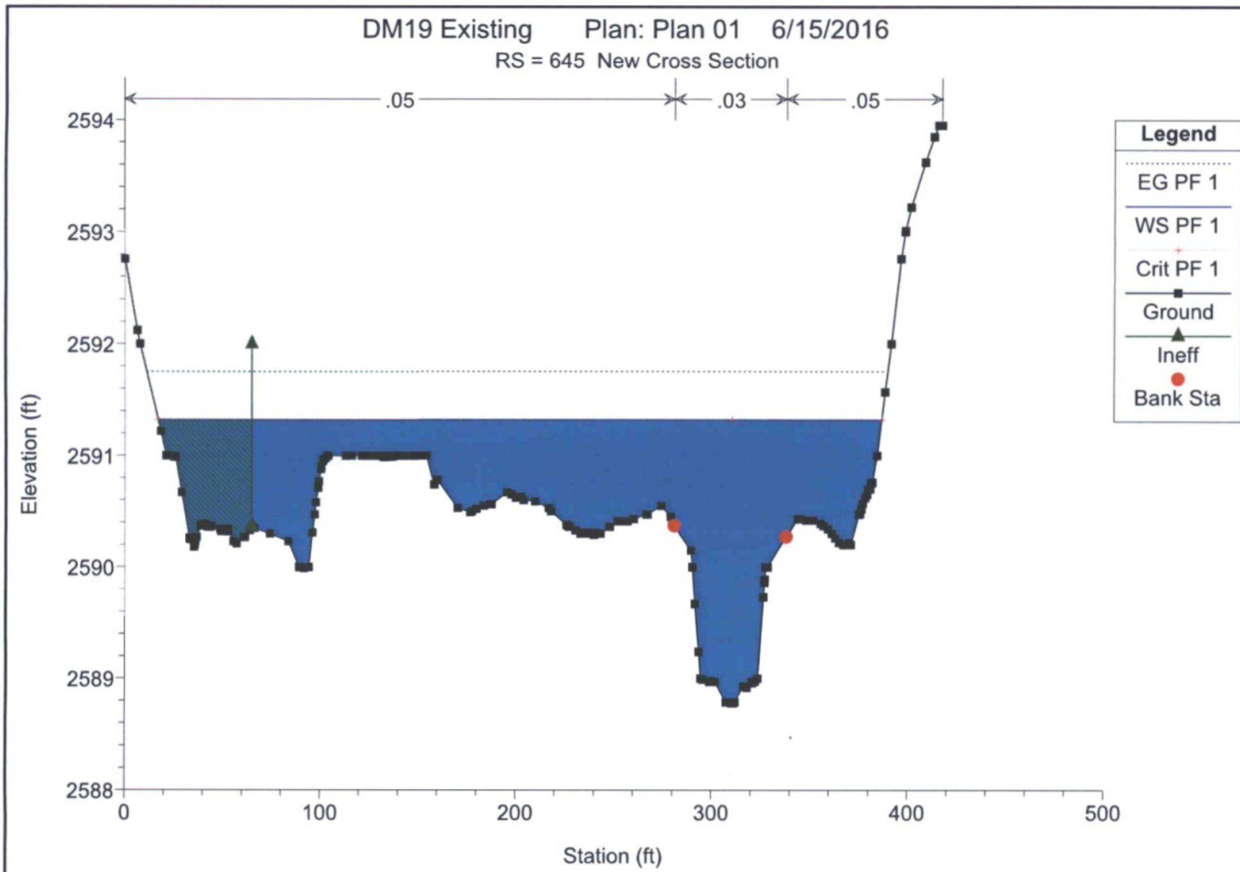
DM19 Existing Plan: Plan 01 6/15/2016
RS = 1257 Updated CS with new 1 ft topo = FEMA CS 4.796
.05
.03
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
2616
2614
2612
2610
2608
2606
2604
2602
2600
0
100
200
300
400
500
Station (ft)

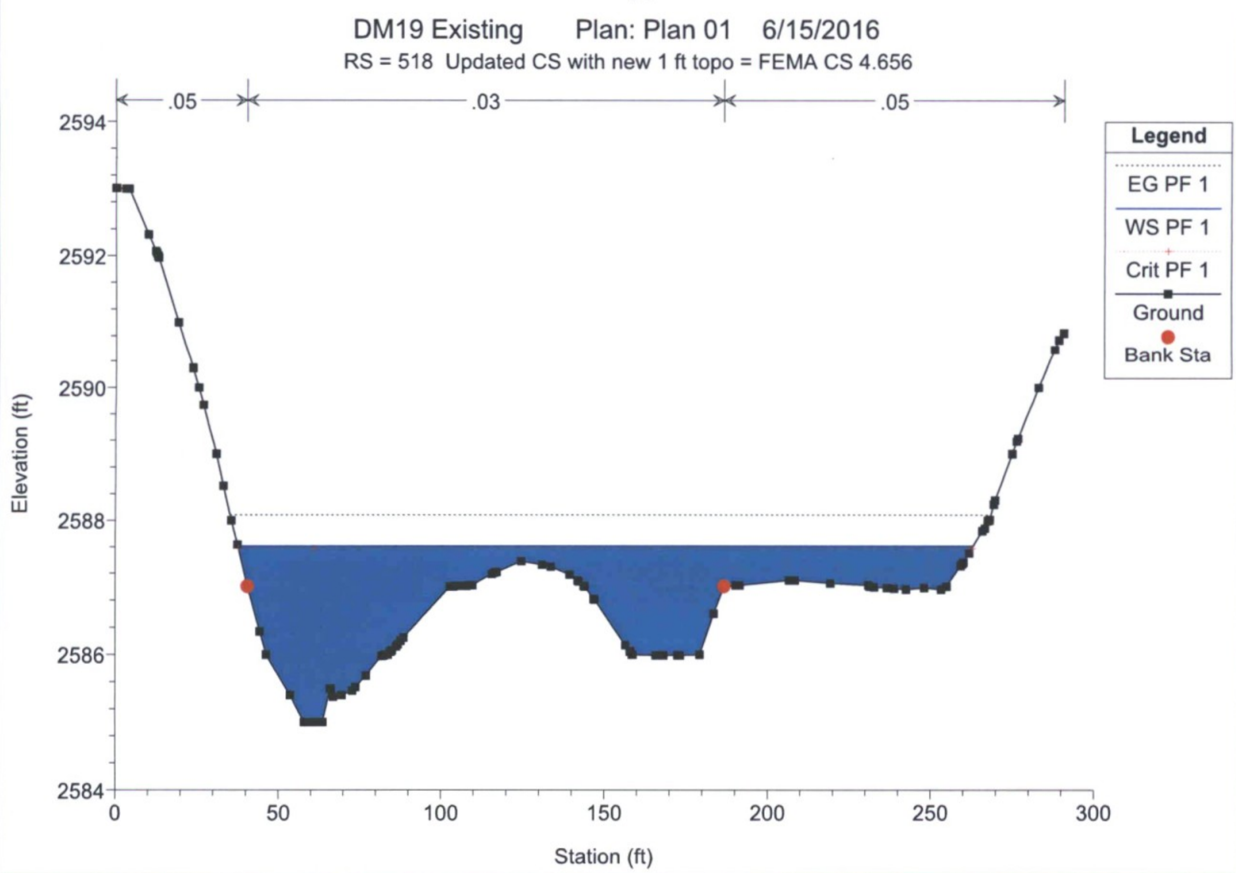


DM19 Existing Plan: Plan 01 6/15/2016
RS = 1119 Updated CS with new 1 ft topo = FEMA CS 4.770
.05
.03
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2614
2612
2610
2608
2606
2604
2602
2600
0
50
100
150
200
250
300
350
400
Station (ft)

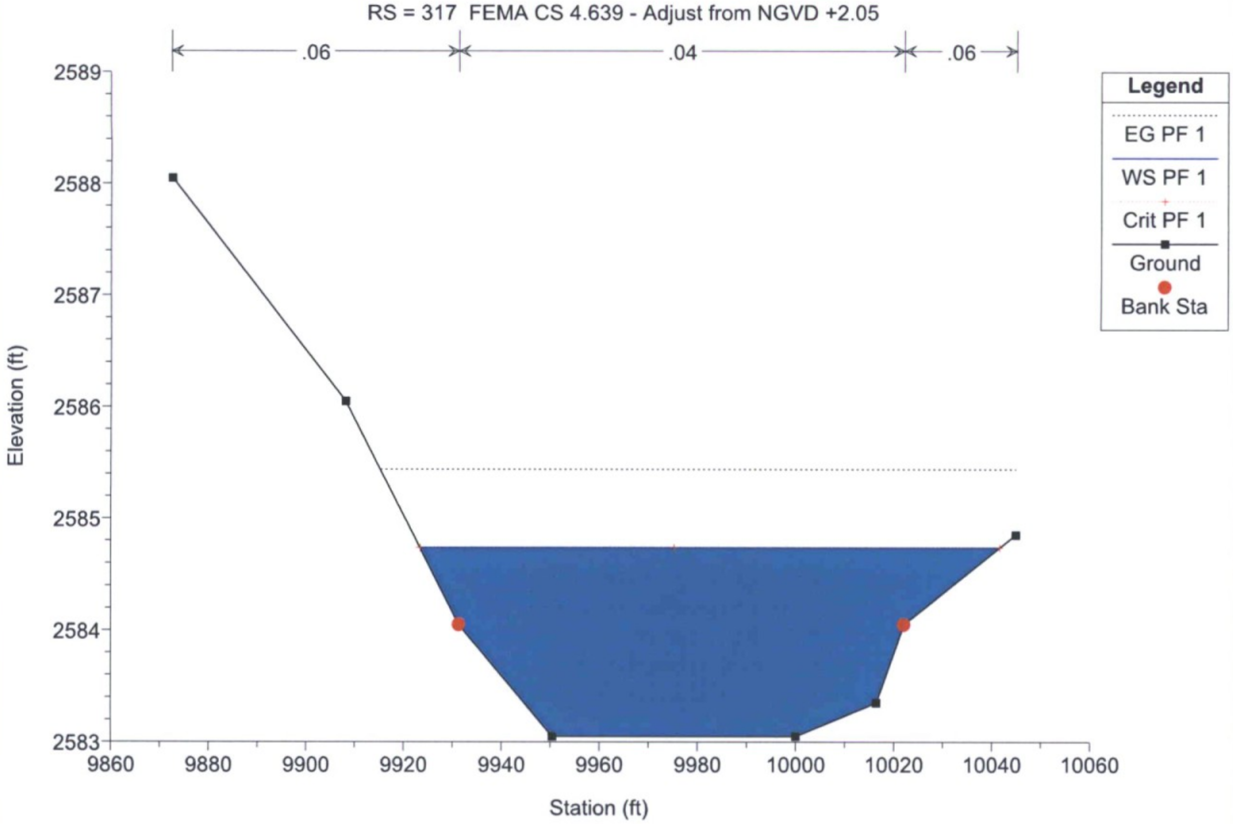

DM19 Existing Plan: Plan 01 6/15/2016
RS = 918 Updated CS with new 1 ft topo = FEMA CS 4.732
.05
.03
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
2594
2596
2598
2600
2602
2604
2606
2608
0
100
200
300
400
500
Station (ft)


DM19 Existing Plan: Plan 01 6/15/2016
RS = 716 Updated CS with new 1 ft topo = FEMA CS 4.694
.05
.03
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2590
2592
2594
2596
2598
2600
2602
0
100
200
300
400
Station (ft)

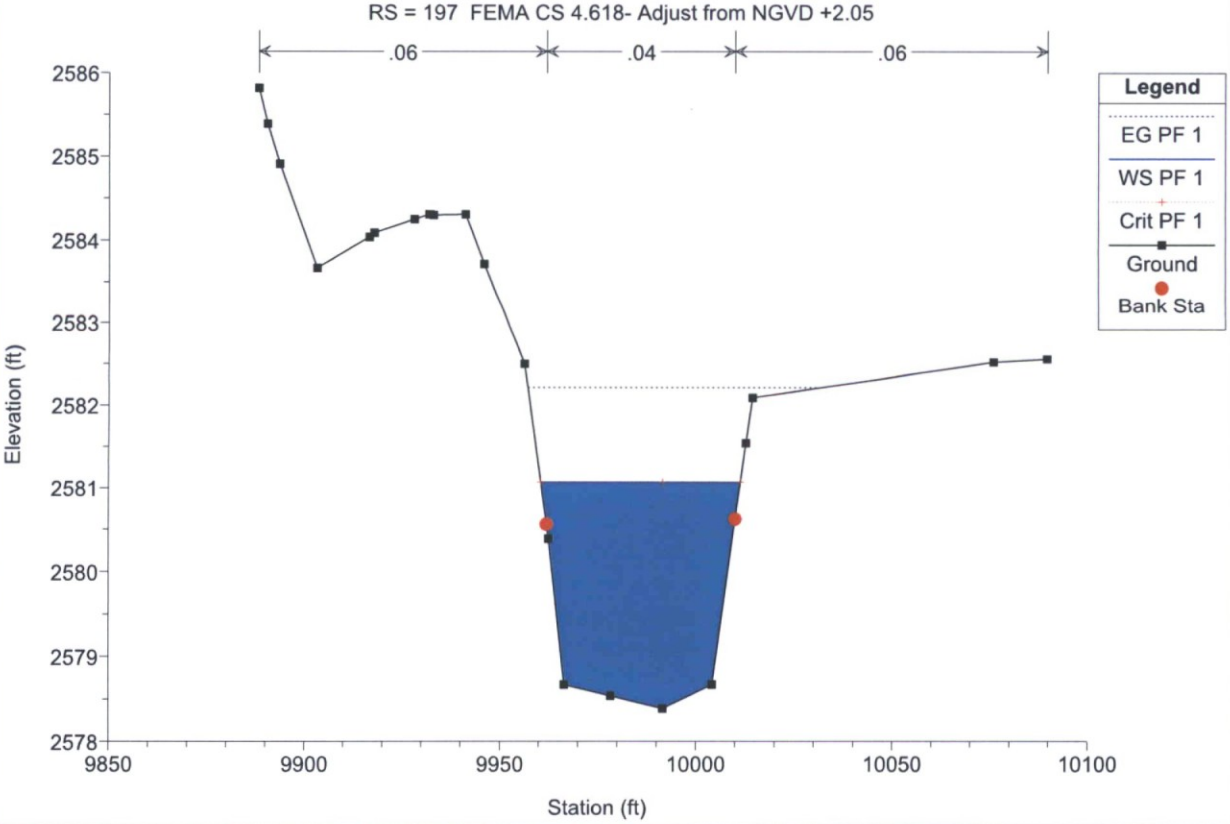

DM19 Existing Plan: Plan 01 6/15/2016
RS = 645 New Cross Section
.05
.03
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
2588
2589
2590
2591
2592
2593
2594
0
100
200
300
400
500

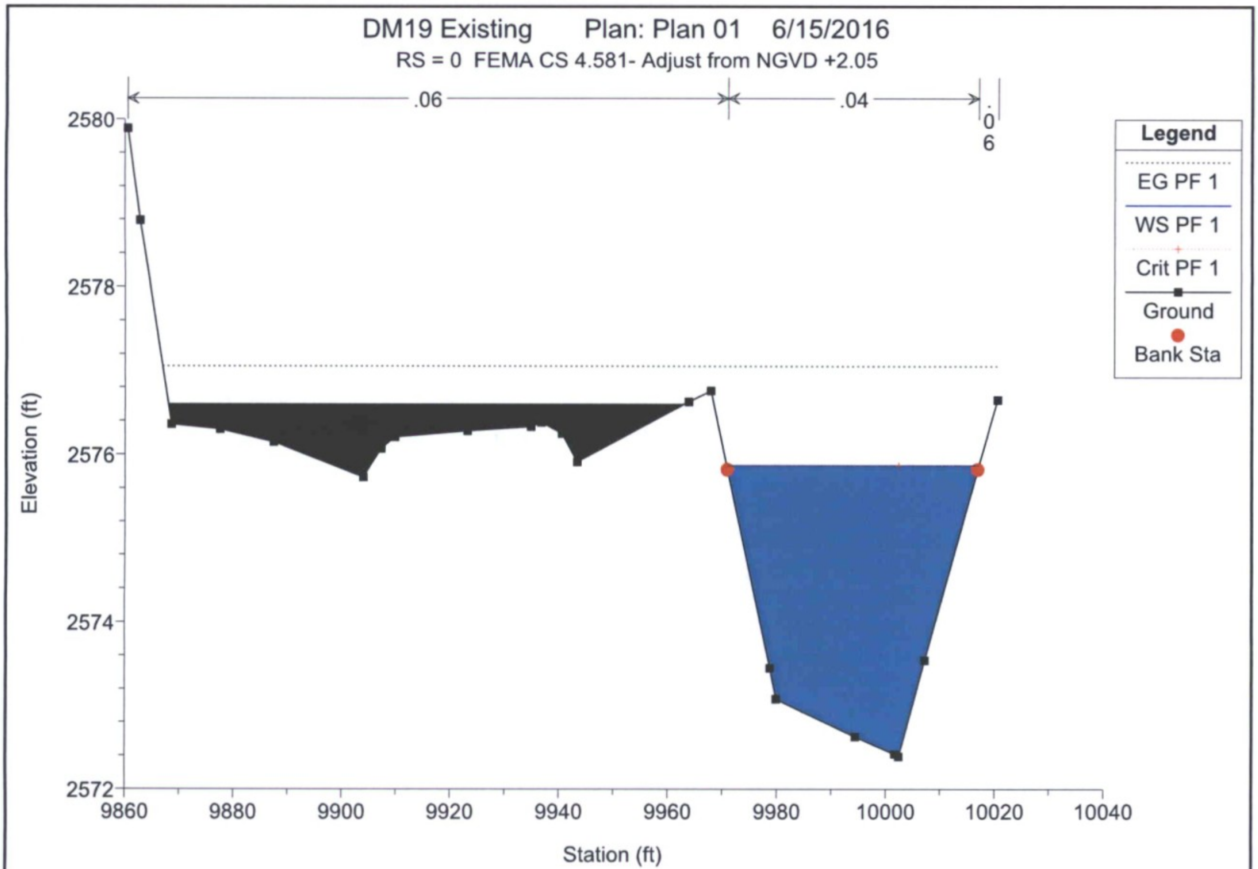

DM19 Existing Plan: Plan 01 6/15/2016
RS = 518 Updated CS with new 1 ft topo = FEMA CS 4.656
.05
.03
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2584
2586
2588
2590
2592
2594
0
50
100
150
200
250
300

DM19 Existing Plan: Plan 01 6/15/2016
RS = 317 FEMA CS 4.639 - Adjust from NGVD +2.05



DM19 Existing Plan: Plan 01 6/15/2016
RS = 197 FEMA CS 4.618- Adjust from NGVD +2.05





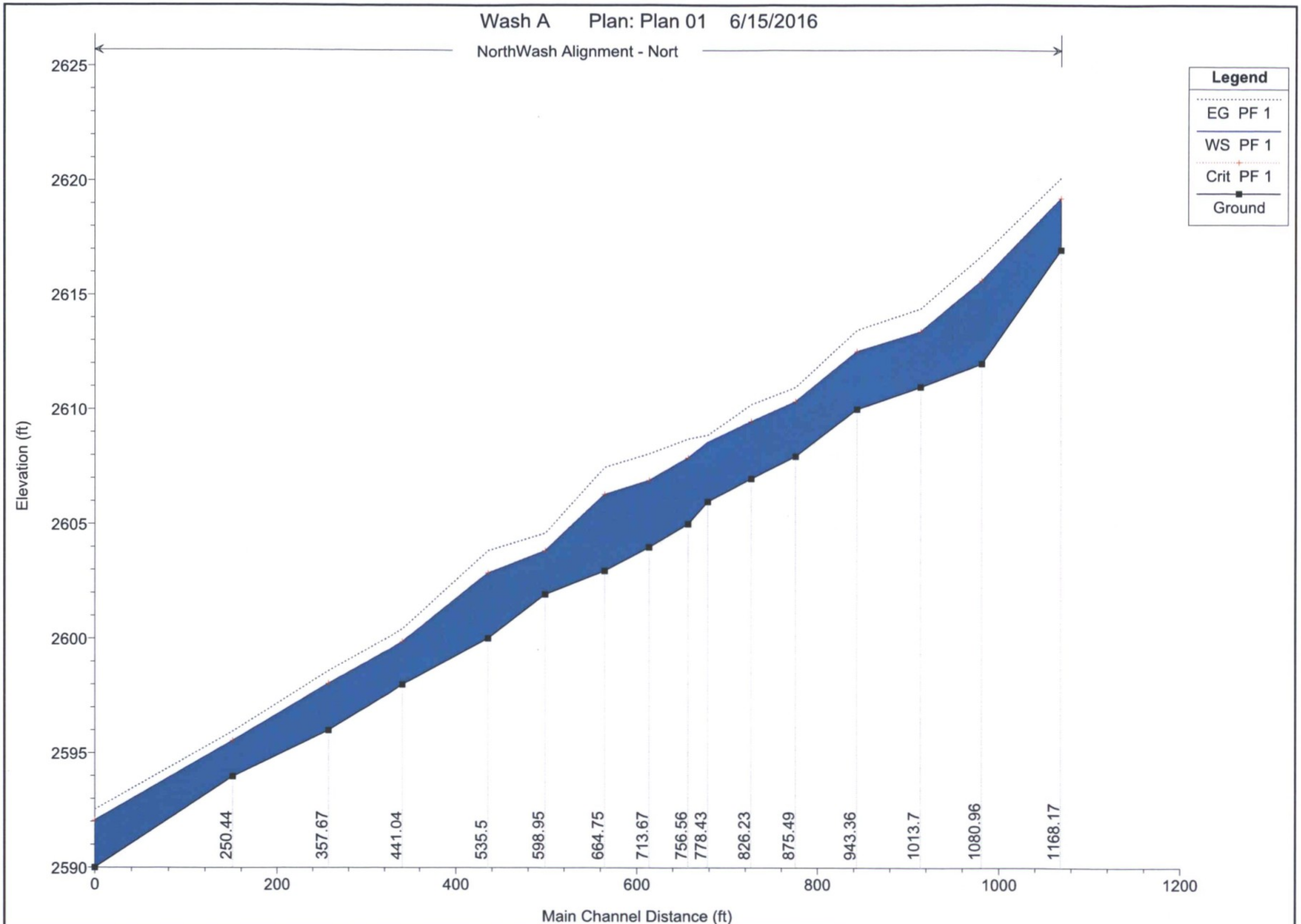
DM19 Existing Plan: Plan 01 6/15/2016
RS = 0 FEMA CS 4.581- Adjust from NGVD +2.05
.06
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2580
2578
2576
2574
2572
9860
9880
9900
9920
9940
9960
9980
10000
10020
10040
Station (ft)

HEC-RAS Plan: Plan 01 River: DM19 Reach: Profile baseline Profile: PF 1

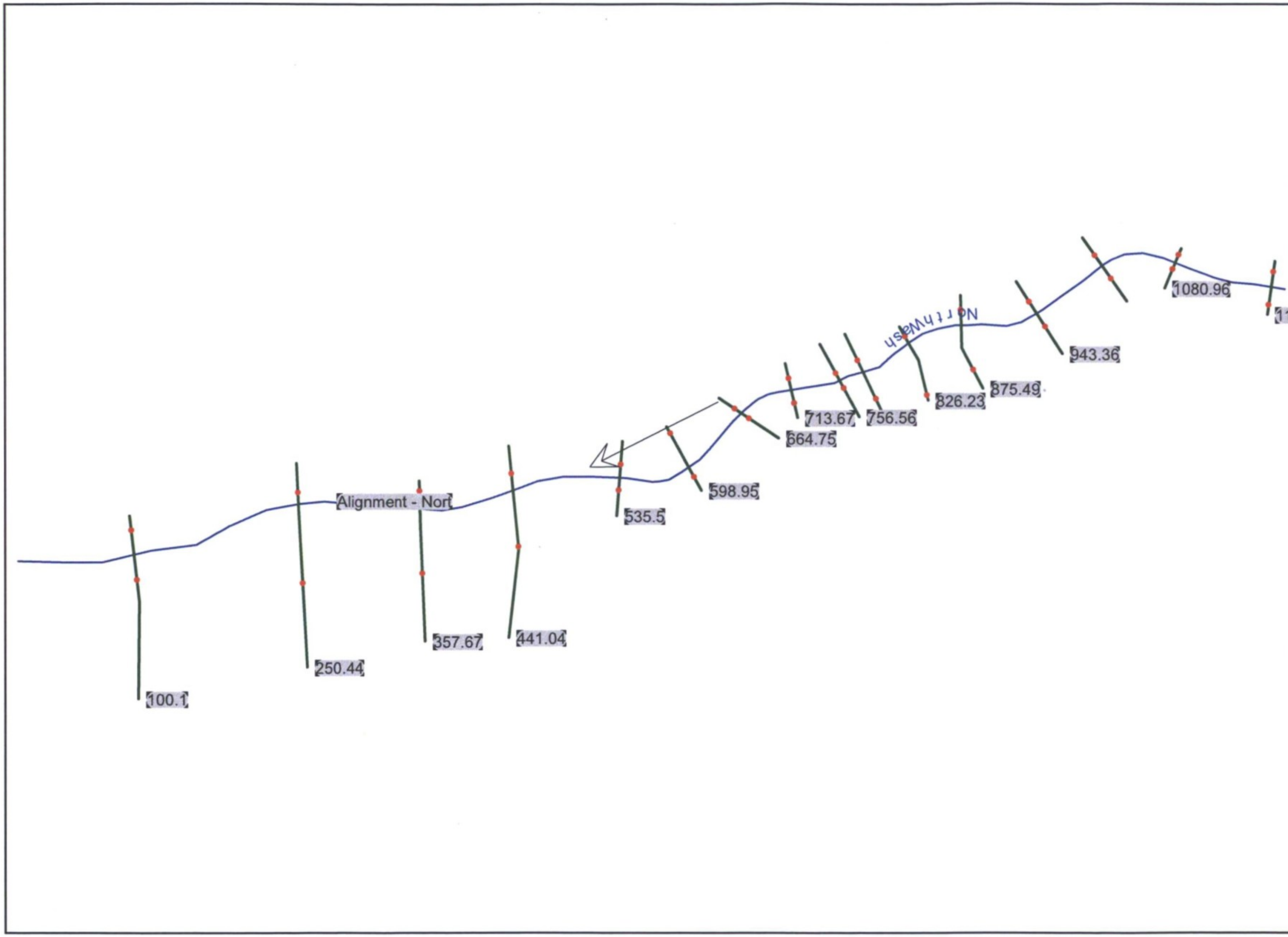
Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Profile baseline	2774	1111.00	2641.90	2643.97	2643.97	2644.81	0.019573	7.39	150.93	92.16	1.00
Profile baseline	2678	1111.00	2639.92	2641.96	2641.96	2642.72	0.016336	7.21	176.81	140.34	0.93
Profile baseline	2578	1111.00	2634.45	2637.66	2637.66	2638.81	0.018331	8.64	128.65	56.14	1.01
Profile baseline	2540	1111.00	2633.32	2636.51	2636.47	2637.60	0.017260	8.38	132.63	58.28	0.98
Profile baseline	2500	1111.00	2633.00	2635.79	2635.79	2636.88	0.018543	8.37	132.70	61.54	1.00
Profile baseline	2405	1111.00	2630.14	2633.27	2633.24	2634.43	0.016829	8.67	130.22	56.37	0.98
Profile baseline	2250	1111.00	2626.98	2630.48	2630.48	2631.87	0.015983	9.48	119.91	52.49	0.97
Profile baseline	2130	1111.00	2624.00	2627.12	2627.12	2628.22	0.018673	8.42	132.18	65.10	1.00
Profile baseline	2056	1111.00	2623.00	2625.78	2625.78	2626.68	0.019778	7.60	146.23	82.05	1.00
Profile baseline	2014	1111.00	2622.00	2624.86	2624.86	2625.84	0.017091	8.35	143.71	73.05	0.97
Profile baseline	1952	1111.00	2620.00	2623.70	2623.70	2624.54	0.011525	8.10	169.11	117.24	0.83
Profile baseline	1891	1111.00	2619.00	2621.51	2621.51	2622.27	0.021132	6.97	159.31	107.40	1.01
Profile baseline	1791	1111.00	2617.00	2619.46	2619.46	2620.22	0.019554	6.99	163.30	116.96	0.98
Profile baseline	1705	1111.00	2615.00	2617.47	2617.47	2618.05	0.013724	6.32	217.73	225.56	0.84
Profile baseline	1583	1119.00	2612.00	2614.11	2614.11	2614.60	0.025216	5.58	200.71	222.84	1.02
Profile baseline	1447	1119.00	2608.94	2610.91	2610.91	2611.41	0.008431	6.36	261.67	281.66	0.87
Profile baseline	1257	1119.00	2603.99	2606.23	2606.23	2606.83	0.006824	6.57	226.00	256.00	0.81
Profile baseline	1119	1119.00	2600.92	2603.47	2603.47	2604.24	0.008223	7.49	202.58	215.74	0.90
Profile baseline	918	1119.00	2595.92	2598.49	2598.49	2599.01	0.007552	6.18	246.50	314.23	0.83
Profile baseline	716	1124.00	2591.19	2593.78	2593.78	2594.27	0.009506	6.27	254.38	276.24	0.91
Profile baseline	645	1124.00	2588.78	2591.32	2591.32	2591.75	0.007358	6.47	308.55	369.92	0.83
Profile baseline	518	1124.00	2585.00	2587.61	2587.58	2588.08	0.009846	5.69	226.02	225.58	0.90
Profile baseline	317	947.00	2583.05	2584.74	2584.74	2585.44	0.019229	6.79	146.67	118.24	0.97
Profile baseline	197	947.00	2578.39	2581.07	2581.07	2582.21	0.017926	8.58	110.98	50.82	1.00
Profile baseline	0	947.00	2572.39	2575.87	2575.87	2577.05	0.017992	8.73	108.53	46.37	1.00

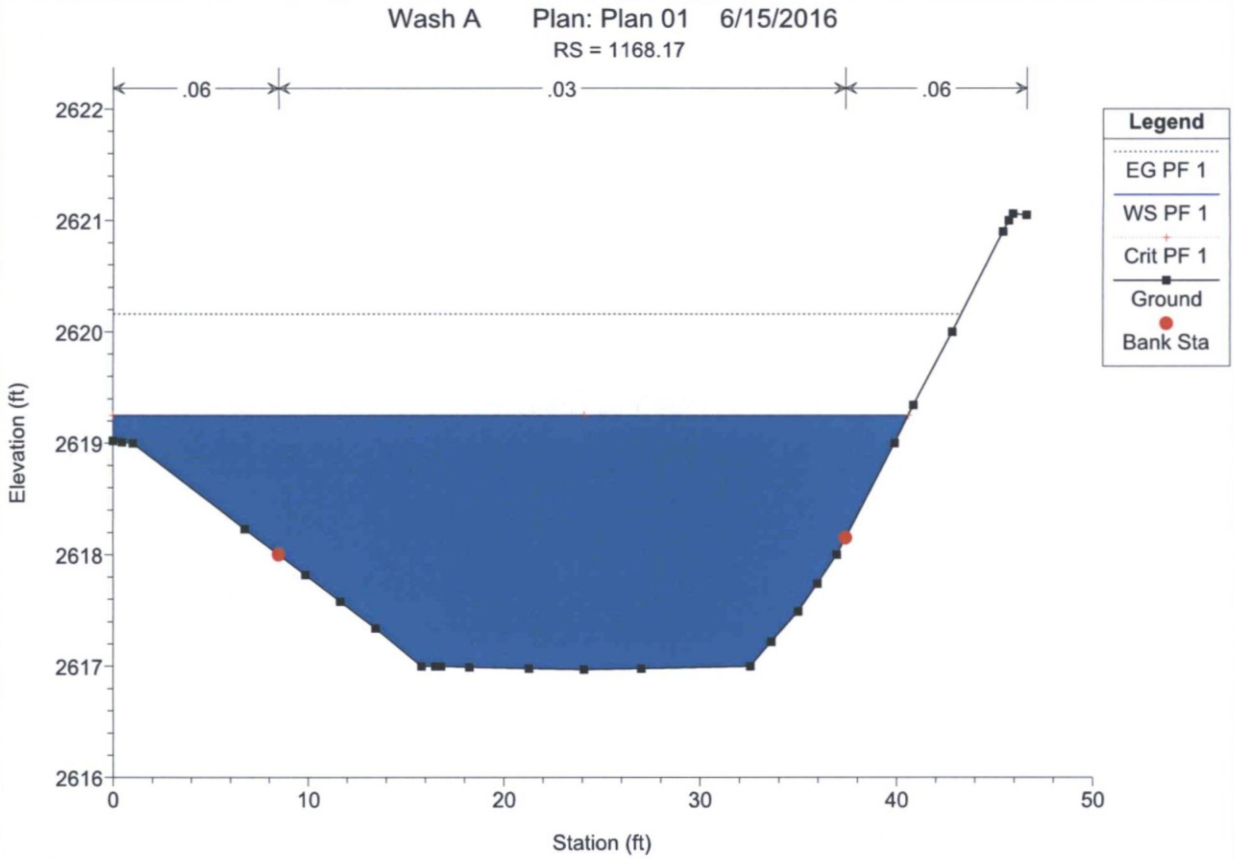
EXISTING

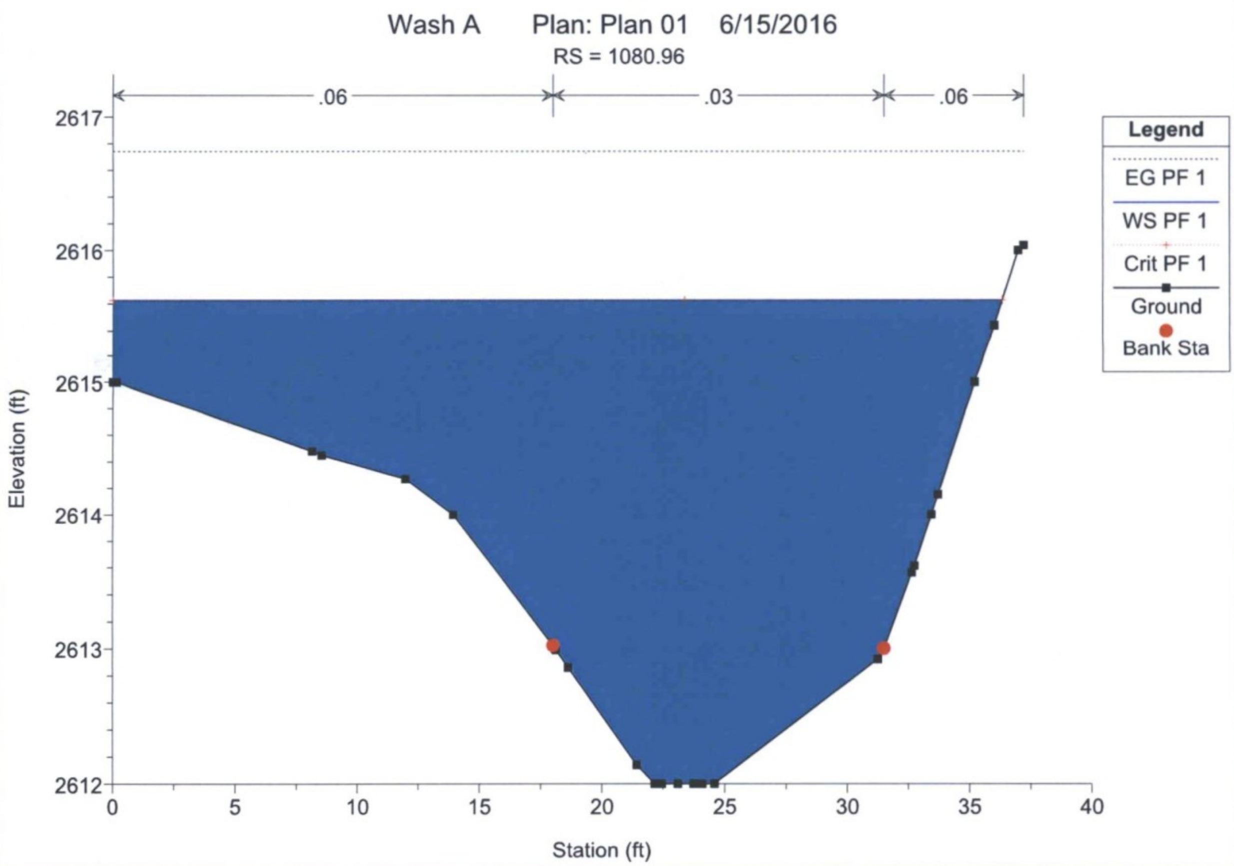
WASH A

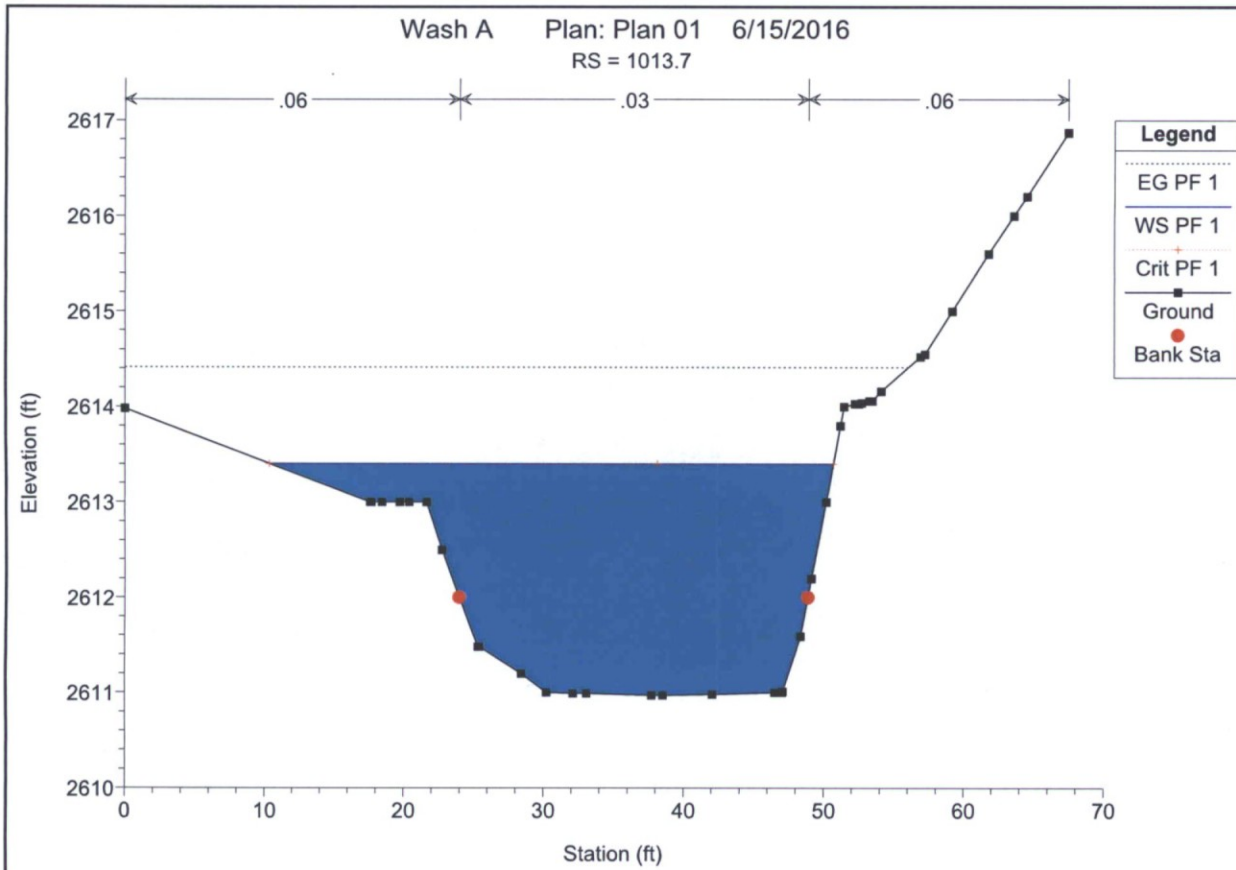


Wash A Plan: Plan 01 6/15/2016
NorthWash Alignment - Nort
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
2625
2620
2615
2610
2605
2600
2595
2590
250.44
357.67
441.04
535.5
598.95
664.75
713.67
756.56
778.43
826.23
875.49
943.36
1013.7
1080.96
1168.17
0
200
400
600
800
1000
1200
Main Channel Distance (ft)

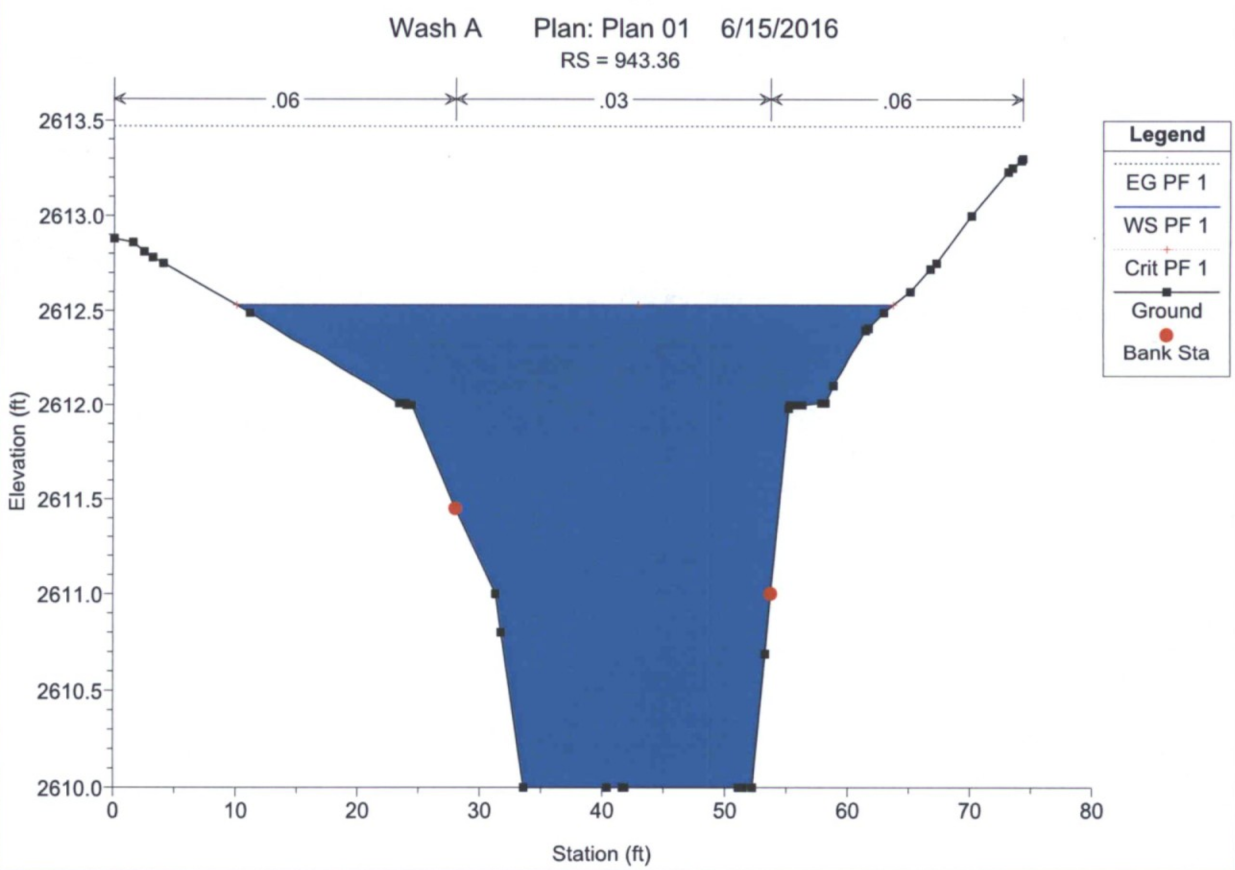

Alignment - Nort
North Wash
100.1
250.44
357.67
441.04
535.5
598.95
664.75
713.67
756.56
826.23
875.49
943.36
1080.96
1168.17


Wash A Plan: Plan 01 6/15/2016
RS = 1168.17
.06
.03
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2616
2617
2618
2619
2620
2621
2622
Station (ft)
0
10
20
30
40
50

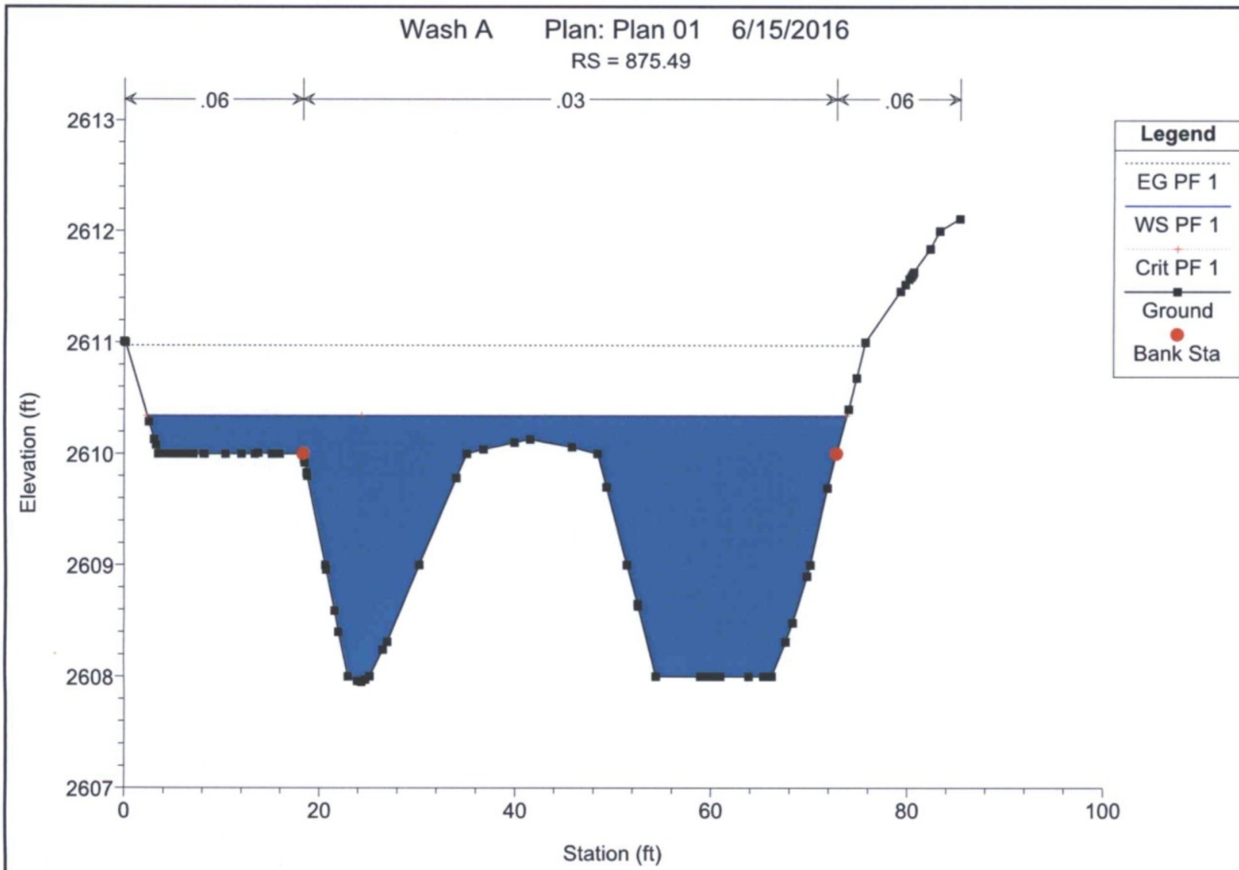

Wash A Plan: Plan 01 6/15/2016
RS = 1080.96
.06
.03
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2612
2613
2614
2615
2616
2617
Station (ft)
0
5
10
15
20
25
30
35
40

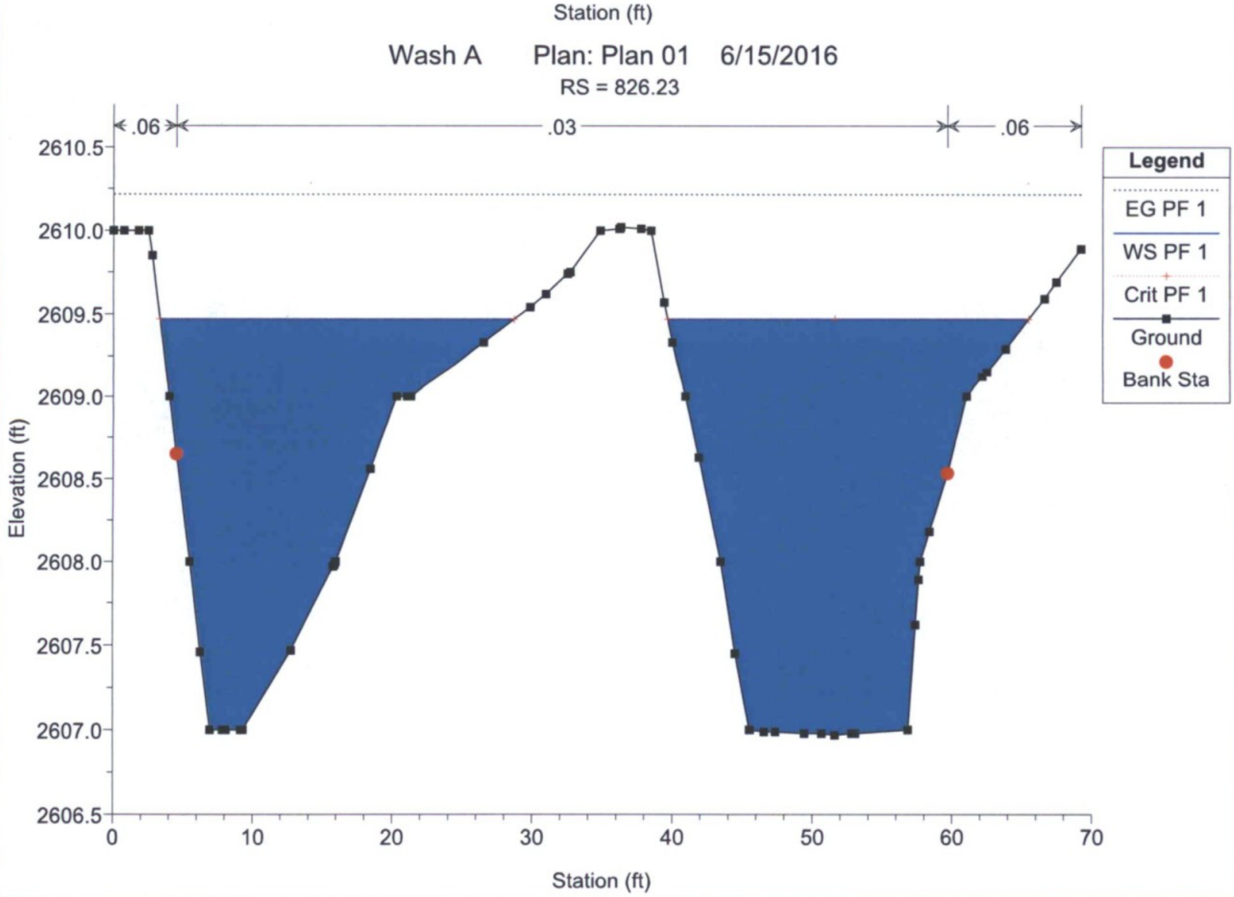


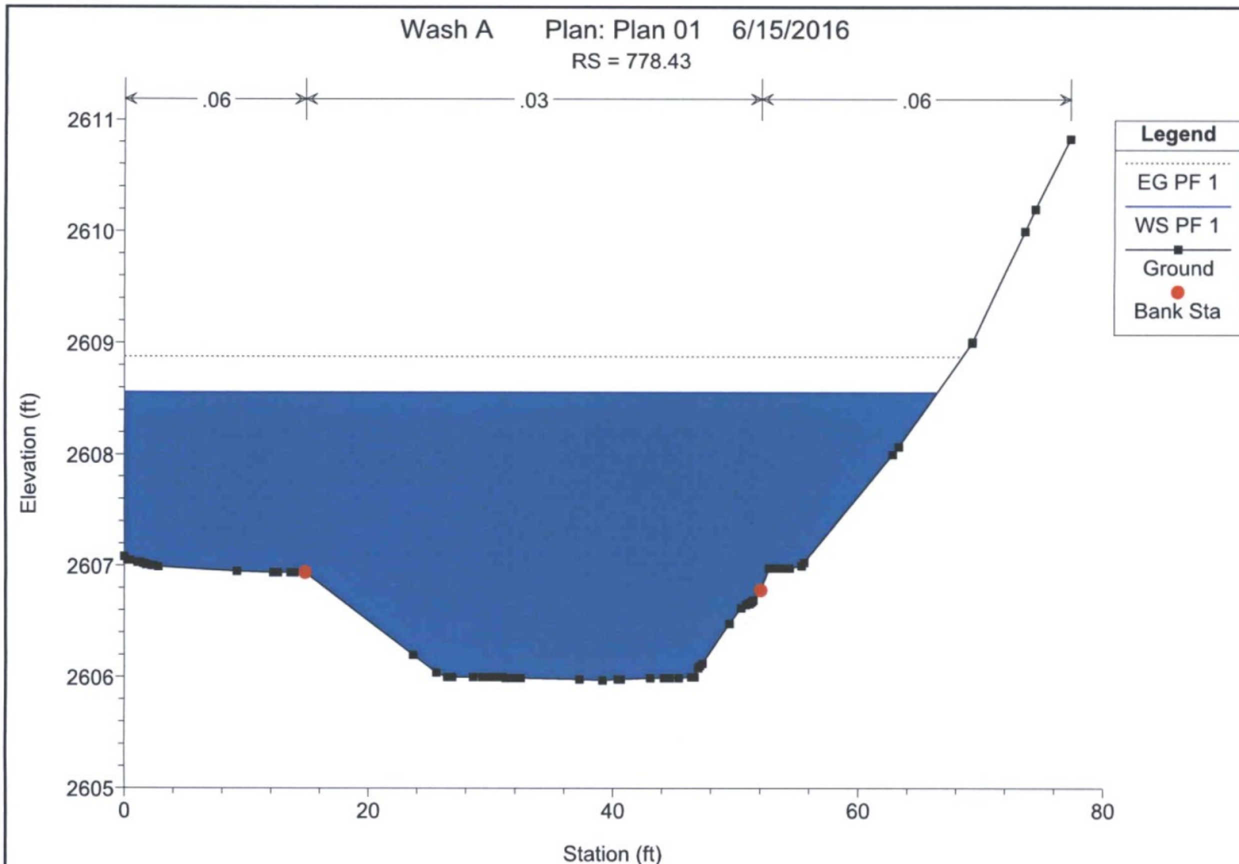
Wash A Plan: Plan 01 6/15/2016
RS = 1013.7
.06
.03
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2617
2616
2615
2614
2613
2612
2611
2610
0
10
20
30
40
50
60
70
Station (ft)



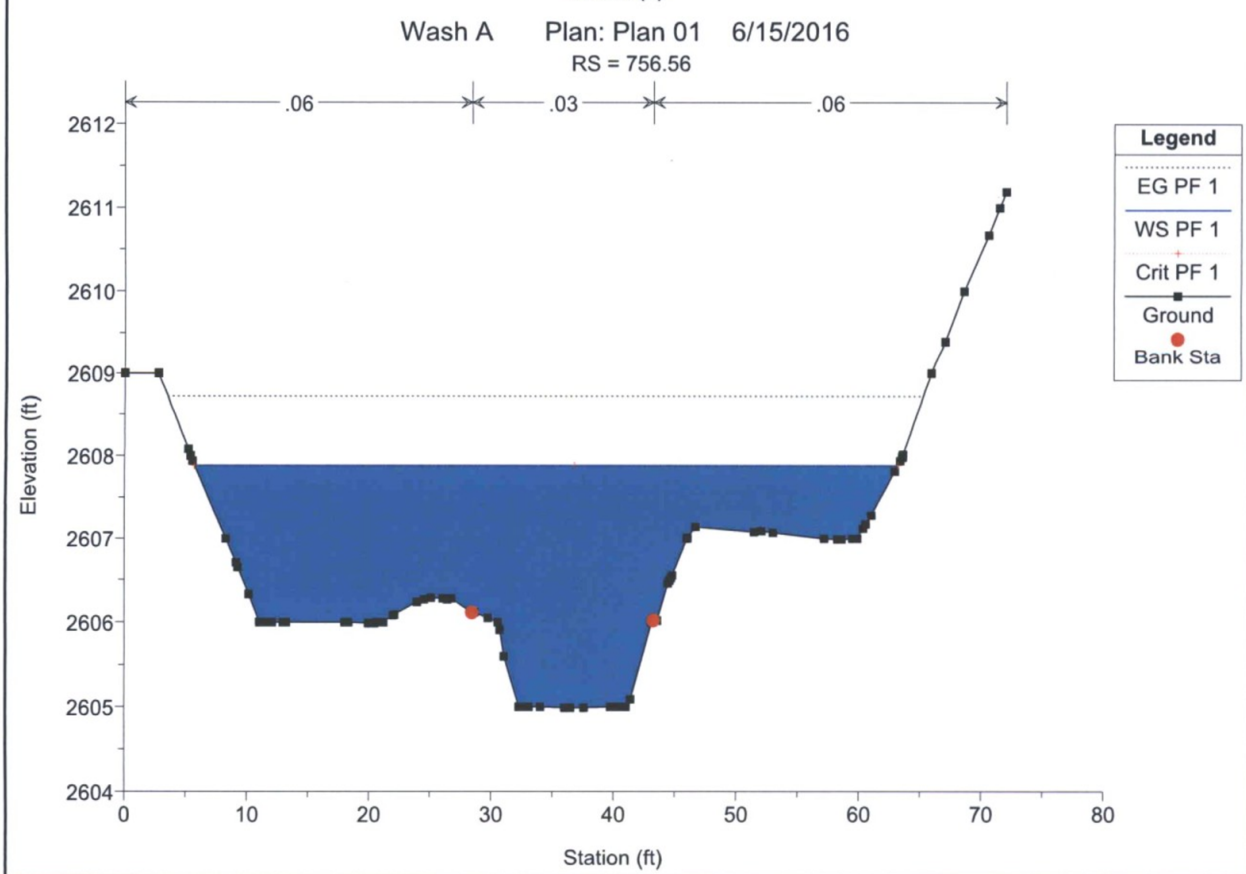
Wash A Plan: Plan 01 6/15/2016
RS = 943.36
.06
.03
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2613.5
2613.0
2612.5
2612.0
2611.5
2611.0
2610.5
2610.0
0
10
20
30
40
50
60
70
80
Station (ft)


Wash A Plan: Plan 01 6/15/2016
RS = 875.49
.06
.03
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2613
2612
2611
2610
2609
2608
2607
0
20
40
60
80
100
Station (ft)

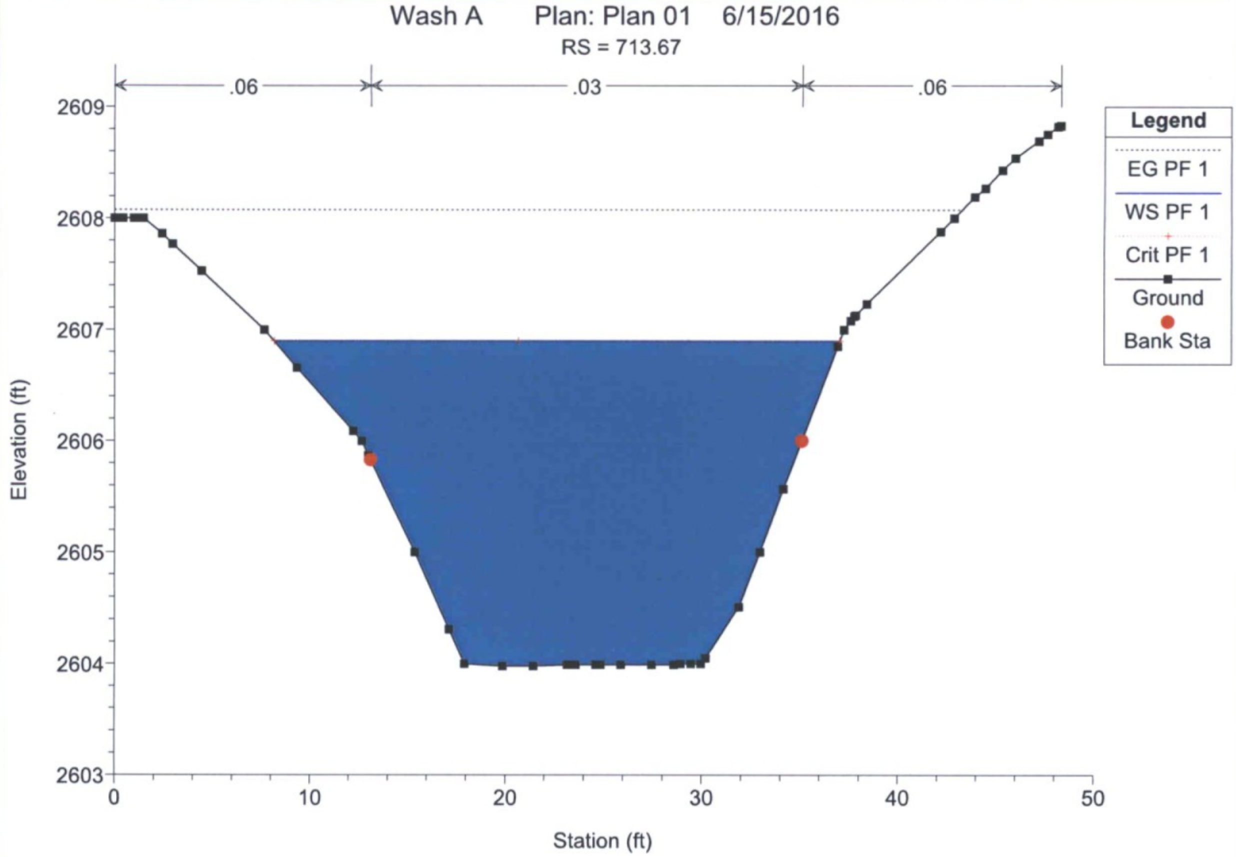

Wash A Plan: Plan 01 6/15/2016
RS = 826.23
.06
.03
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2610.5
2610.0
2609.5
2609.0
2608.5
2608.0
2607.5
2607.0
2606.5
0
10
20
30
40
50
60
70
Station (ft)

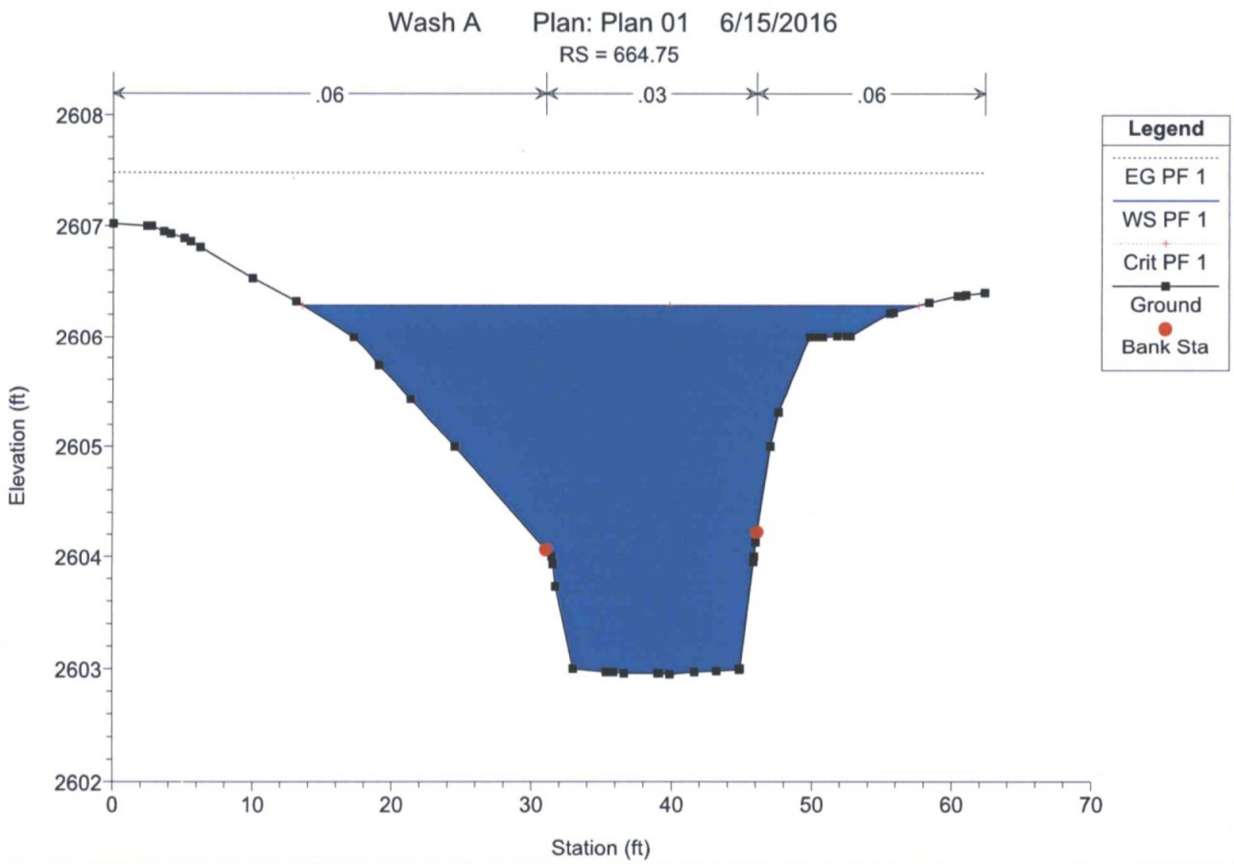


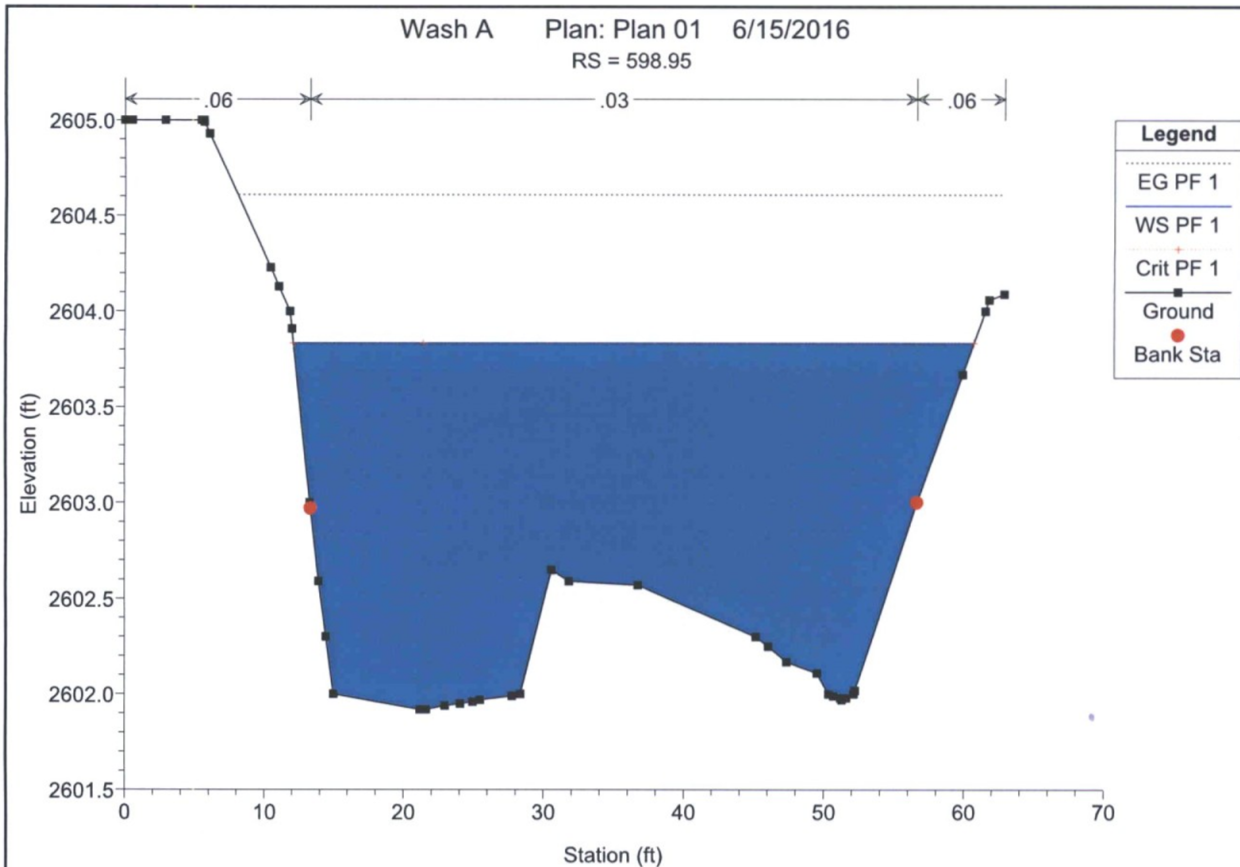
Wash A Plan: Plan 01 6/15/2016
RS = 778.43
.06
.03
.06
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
2605
2606
2607
2608
2609
2610
2611
0
20
40
60
80
Station (ft)



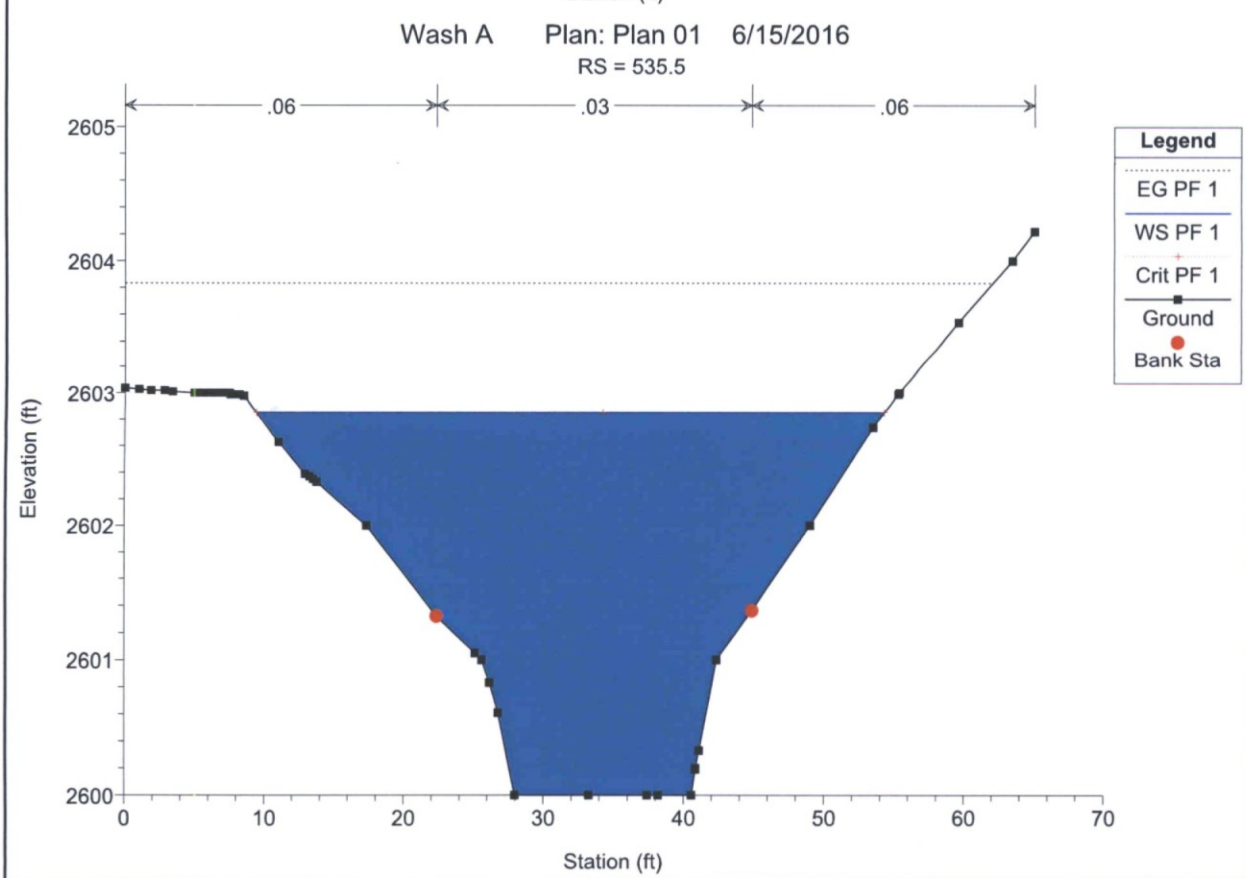
Wash A Plan: Plan 01 6/15/2016
RS = 756.56
.06
.03
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2604
2605
2606
2607
2608
2609
2610
2611
2612
0
10
20
30
40
50
60
70
80
Station (ft)


Wash A Plan: Plan 01 6/15/2016
RS = 713.67
.06
.03
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2609
2608
2607
2606
2605
2604
2603
0
10
20
30
40
50
Station (ft)

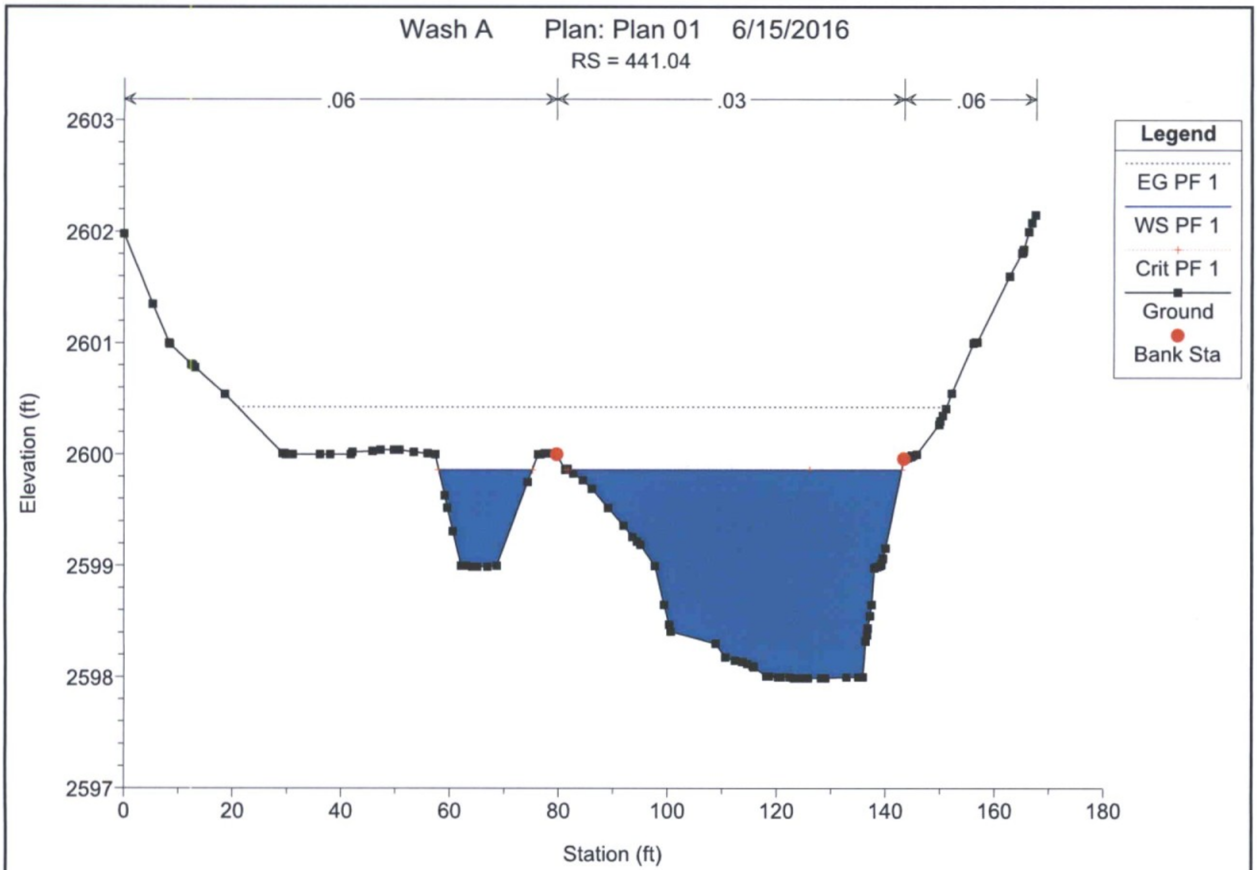

Wash A Plan: Plan 01 6/15/2016
RS = 664.75
.06
.03
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2608
2607
2606
2605
2604
2603
2602
0
10
20
30
40
50
60
70
Station (ft)



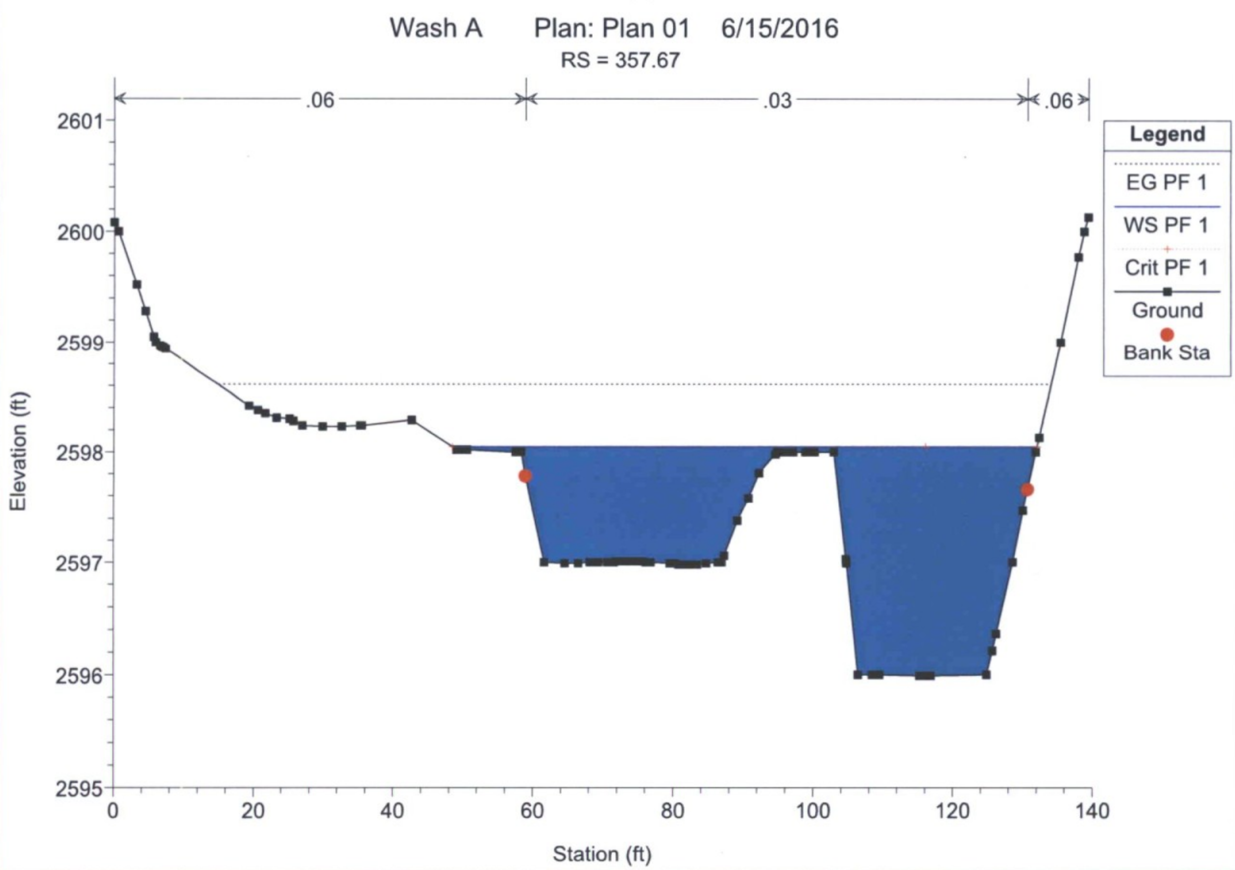
Wash A Plan: Plan 01 6/15/2016
RS = 598.95
.06
.03
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2605.0
2604.5
2604.0
2603.5
2603.0
2602.5
2602.0
2601.5
0
10
20
30
40
50
60
70
Station (ft)



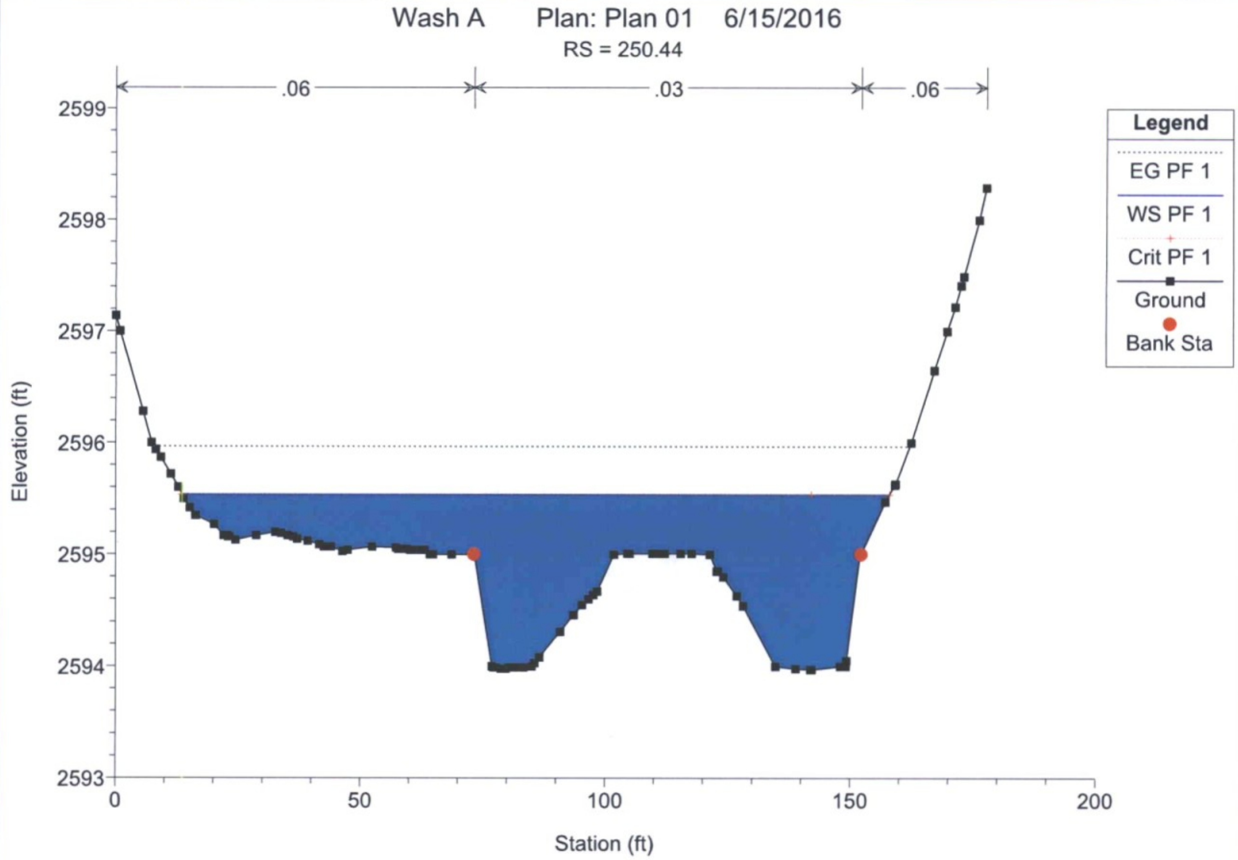
Wash A Plan: Plan 01 6/15/2016
RS = 535.5
.06
.03
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2605
2604
2603
2602
2601
2600
0
10
20
30
40
50
60
70
Station (ft)

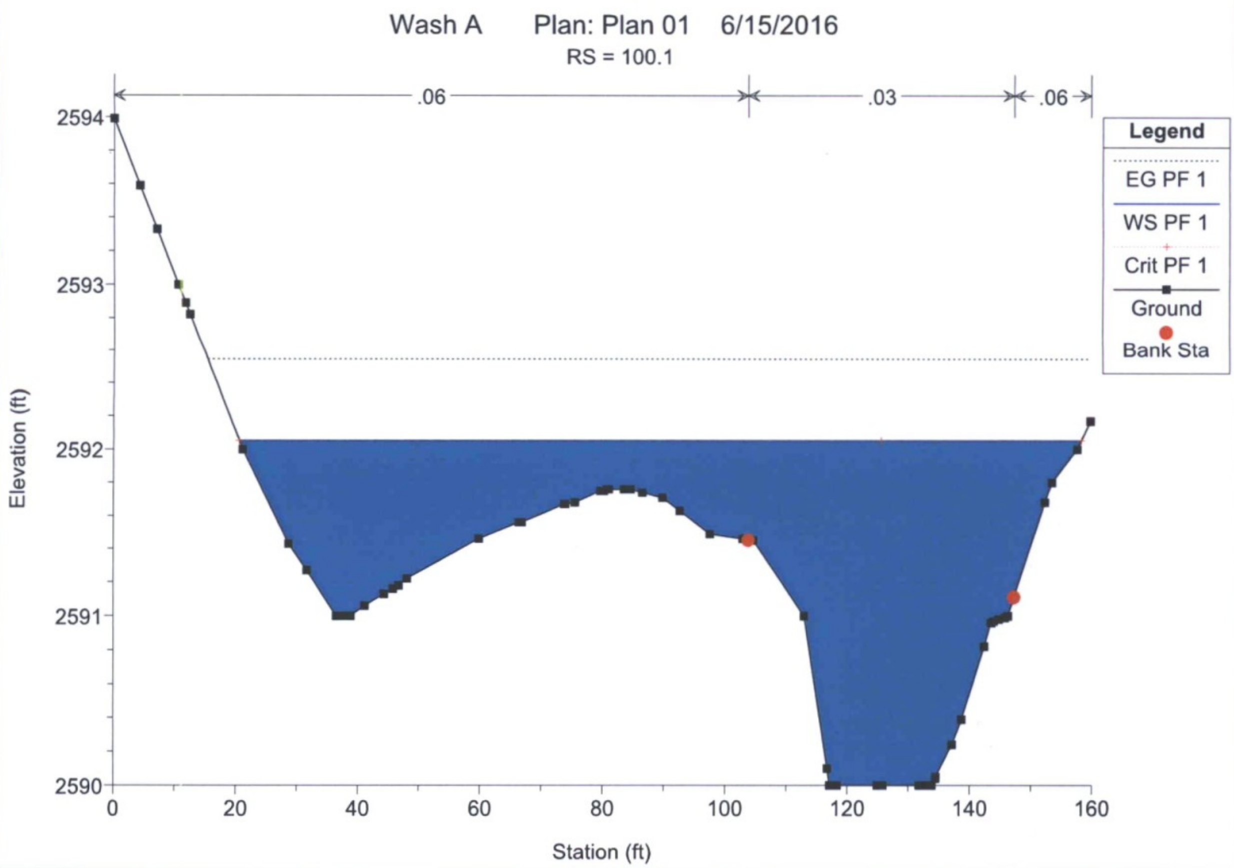


Wash A Plan: Plan 01 6/15/2016
RS = 441.04
.06
.03
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2603
2602
2601
2600
2599
2598
2597
0
20
40
60
80
100
120
140
160
180
Station (ft)



Wash A Plan: Plan 01 6/15/2016
RS = 357.67
.06
.03
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2601
2600
2599
2598
2597
2596
2595
0
20
40
60
80
100
120
140
Station (ft)


Wash A Plan: Plan 01 6/15/2016
RS = 250.44
.06
.03
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2593
2594
2595
2596
2597
2598
2599
0
50
100
150
200

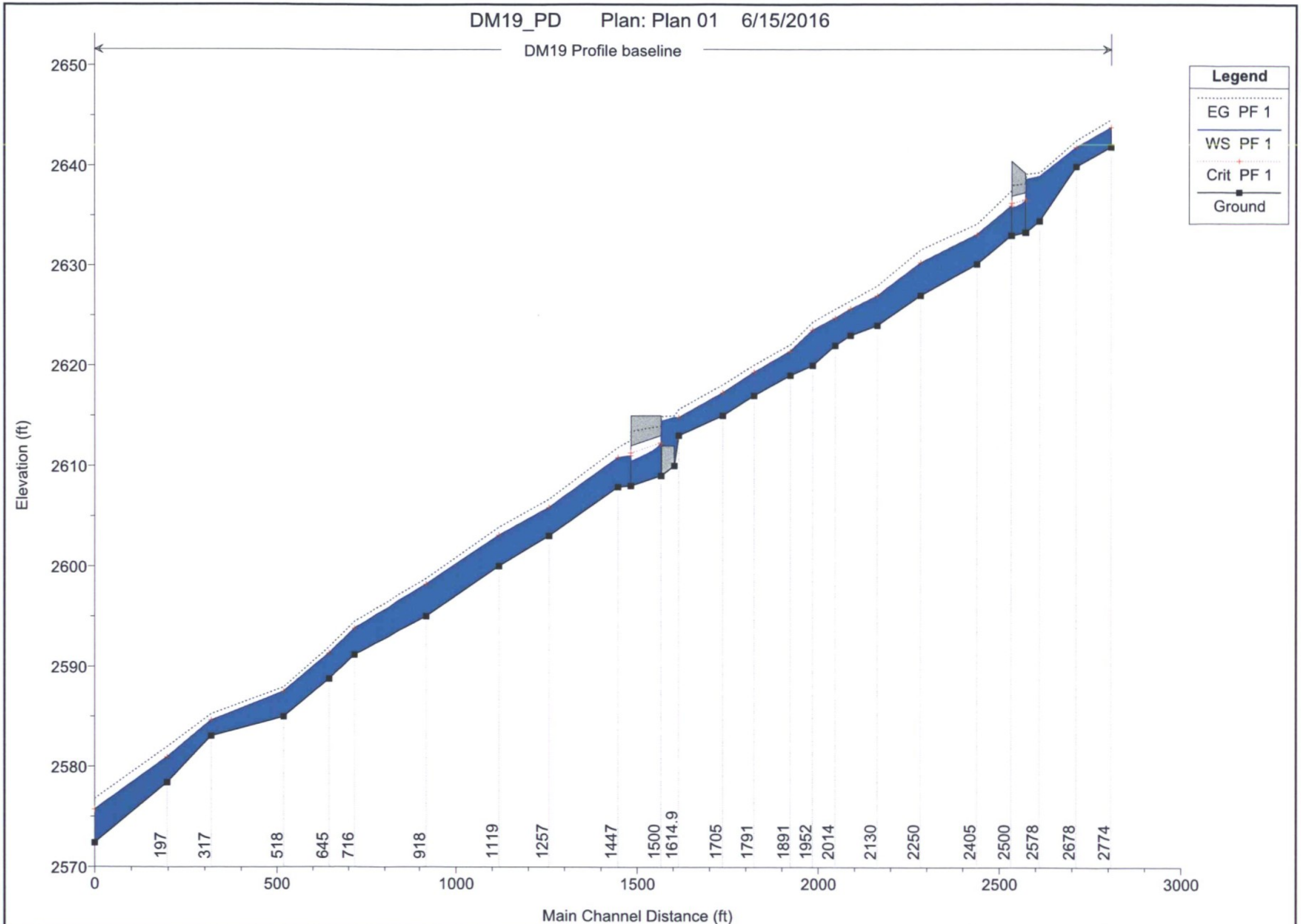

Wash A Plan: Plan 01 6/15/2016
RS = 100.1
.06
.03
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2590
2591
2592
2593
2594
0
20
40
60
80
100
120
140
160

HEC-RAS Plan: Plan 01 River: NorthWash Reach: Alignment - Nort Profile: PF 1

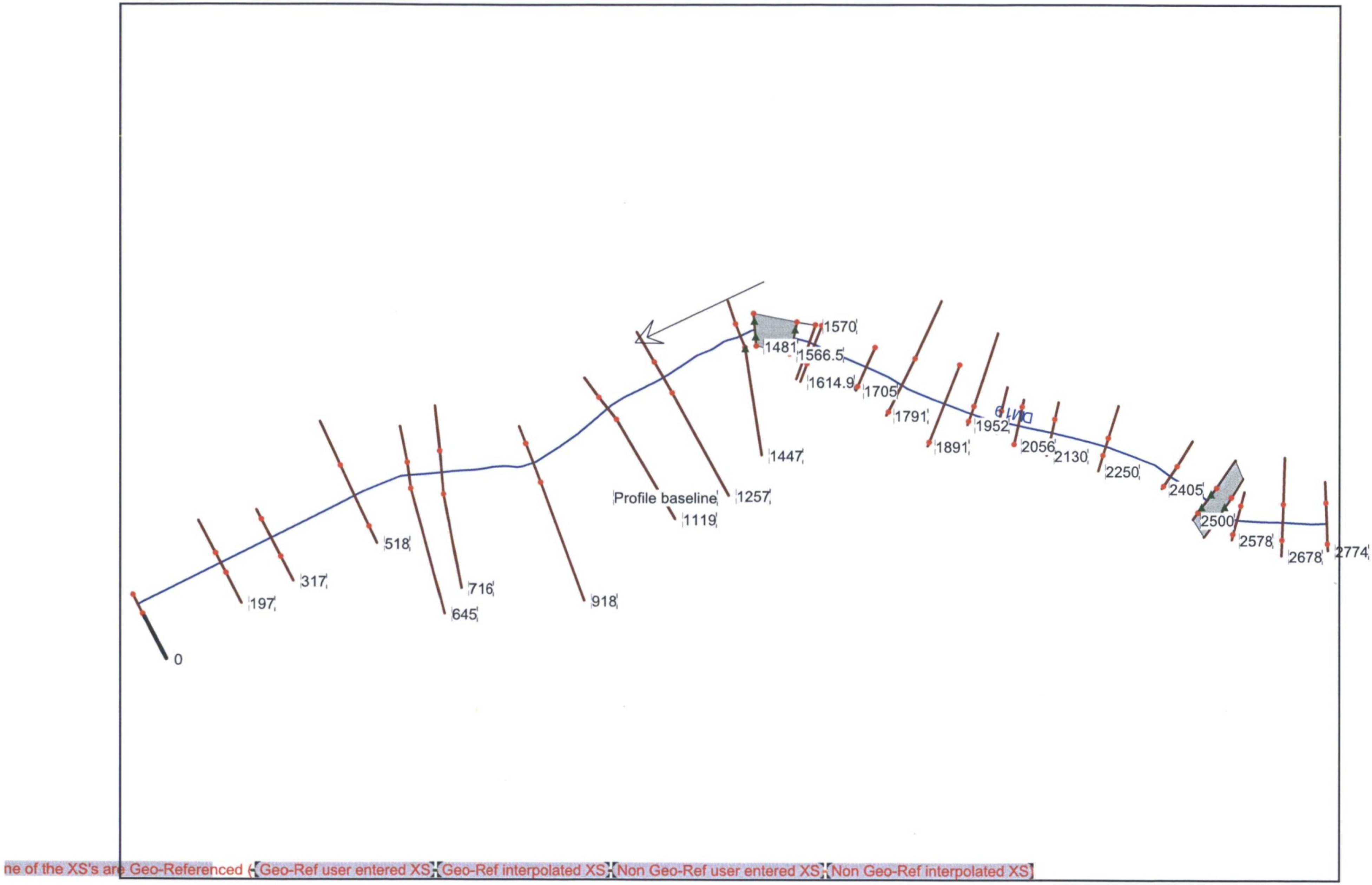
Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Alignment - Nort	1168.17	472.00	2616.97	2619.25	2619.25	2620.16	0.009615	7.77	66.58	40.60	0.96
Alignment - Nort	1080.96	472.00	2612.00	2615.63	2615.63	2616.74	0.007289	9.15	73.61	36.33	0.90
Alignment - Nort	1013.7	472.00	2610.97	2613.40	2613.40	2614.41	0.009090	8.13	63.57	40.35	0.95
Alignment - Nort	943.36	480.00	2610.00	2612.53	2612.53	2613.47	0.008585	7.89	70.29	53.67	0.92
Alignment - Nort	875.49	480.00	2607.95	2610.34	2610.34	2610.97	0.011524	6.41	79.21	71.47	0.97
Alignment - Nort	826.23	480.00	2606.97	2609.47	2609.47	2610.22	0.011584	6.96	71.02	51.19	0.98
Alignment - Nort	778.43	480.00	2605.97	2608.56		2608.88	0.002981	4.79	125.60	66.45	0.55
Alignment - Nort	756.56	480.00	2604.99	2607.89	2607.89	2608.72	0.008770	8.59	91.77	57.49	0.94
Alignment - Nort	713.67	485.00	2603.98	2606.90	2606.90	2608.08	0.009615	8.74	58.25	28.88	0.98
Alignment - Nort	664.75	485.00	2602.95	2606.28	2606.28	2607.48	0.007889	9.19	70.56	44.05	0.91
Alignment - Nort	598.95	485.00	2601.92	2603.83	2603.83	2604.61	0.011333	7.08	70.34	48.65	0.99
Alignment - Nort	535.5	485.00	2600.00	2602.85	2602.85	2603.84	0.008559	8.21	72.00	44.88	0.92
Alignment - Nort	441.04	490.00	2597.99	2599.86	2599.86	2600.43	0.011514	6.13	87.05	78.67	0.97
Alignment - Nort	357.67	490.00	2595.99	2598.05	2598.05	2598.61	0.012877	6.04	81.71	83.58	1.00
Alignment - Nort	250.44	495.00	2593.97	2595.54	2595.54	2595.97	0.011294	5.46	110.14	144.51	0.93
Alignment - Nort	100.1	495.00	2590.00	2592.05	2592.05	2592.55	0.008482	6.12	119.82	137.73	0.86

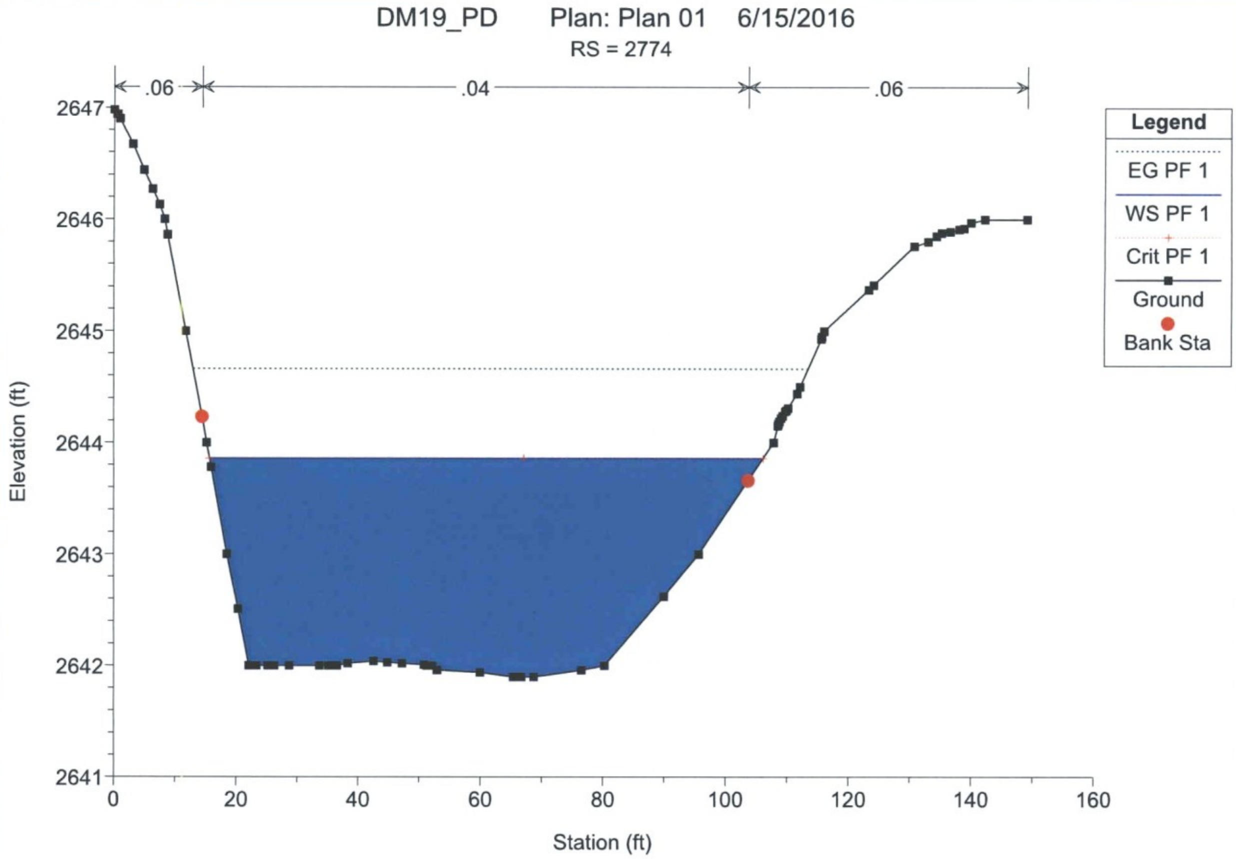
POST-DEVELOPMENT

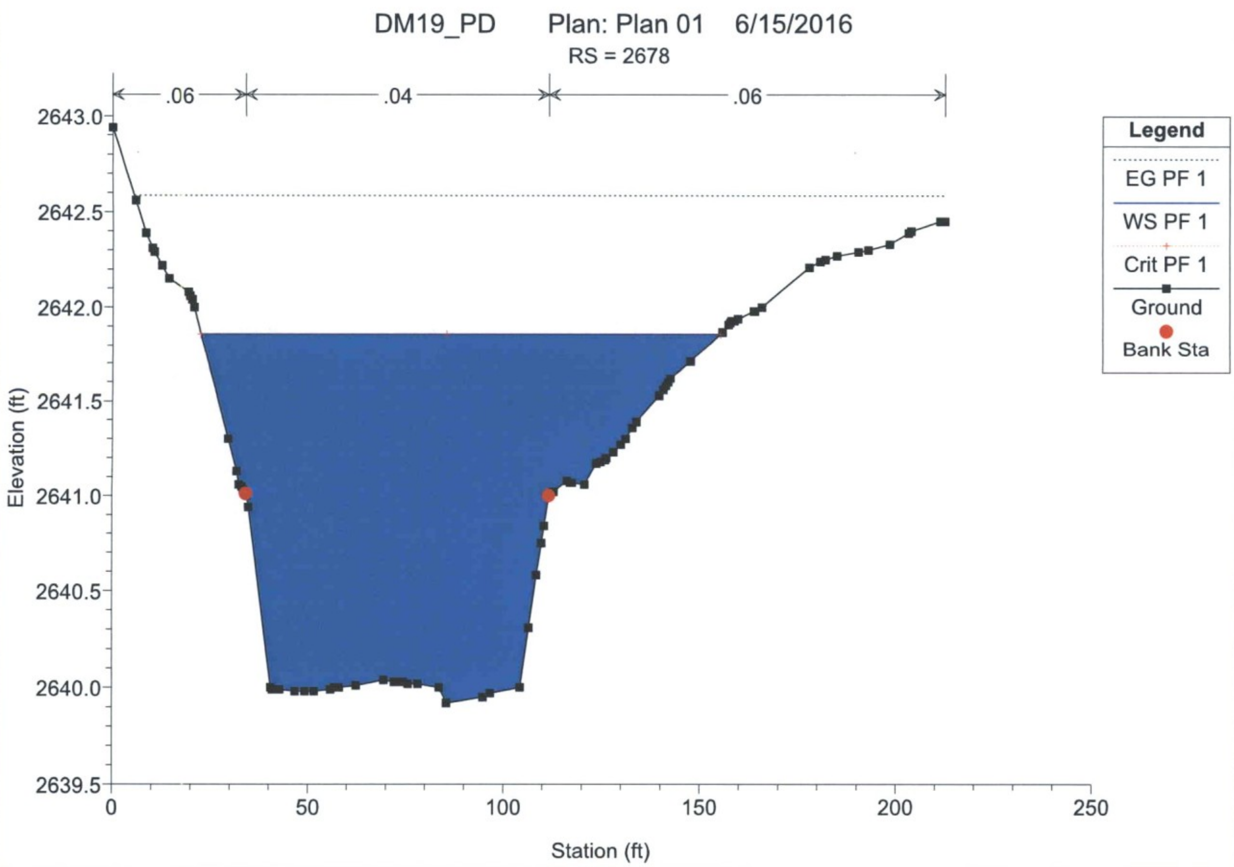
GALLOWAY WASH

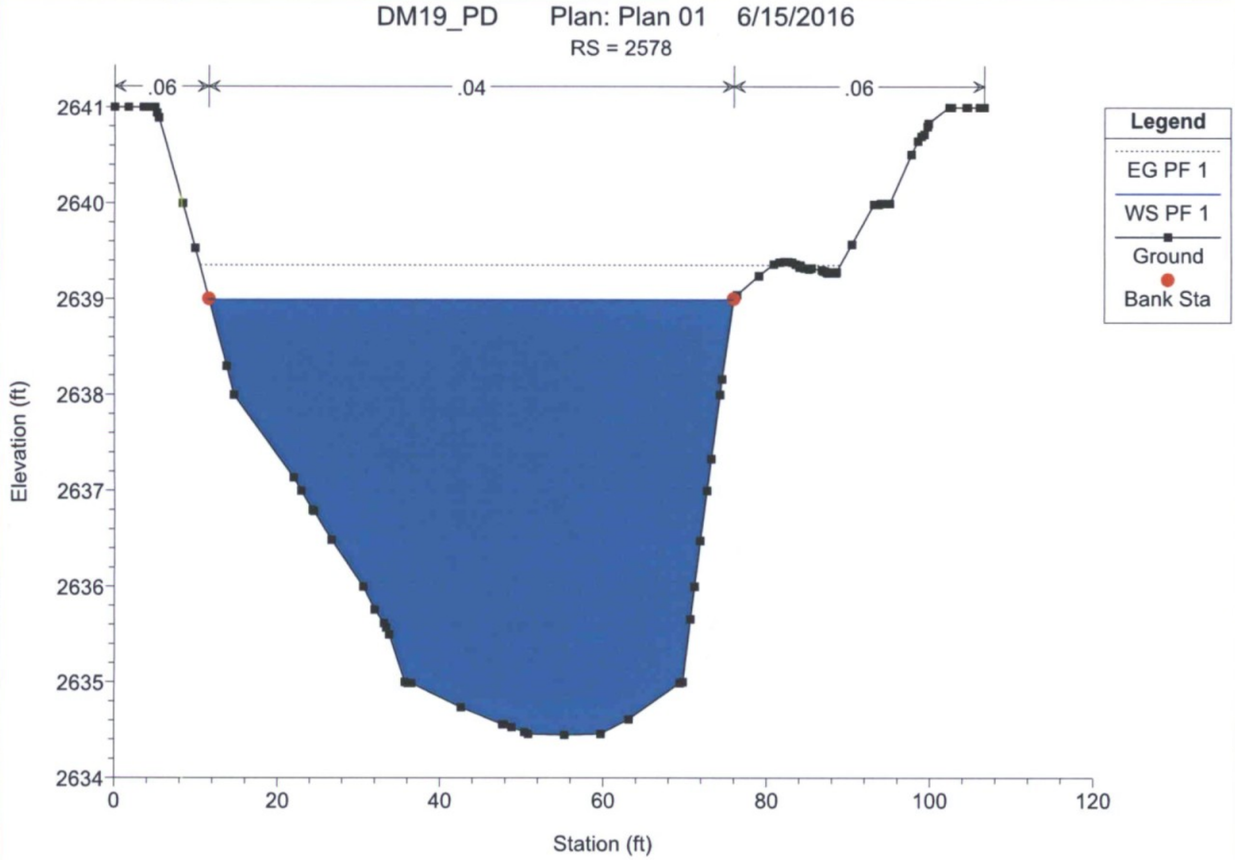


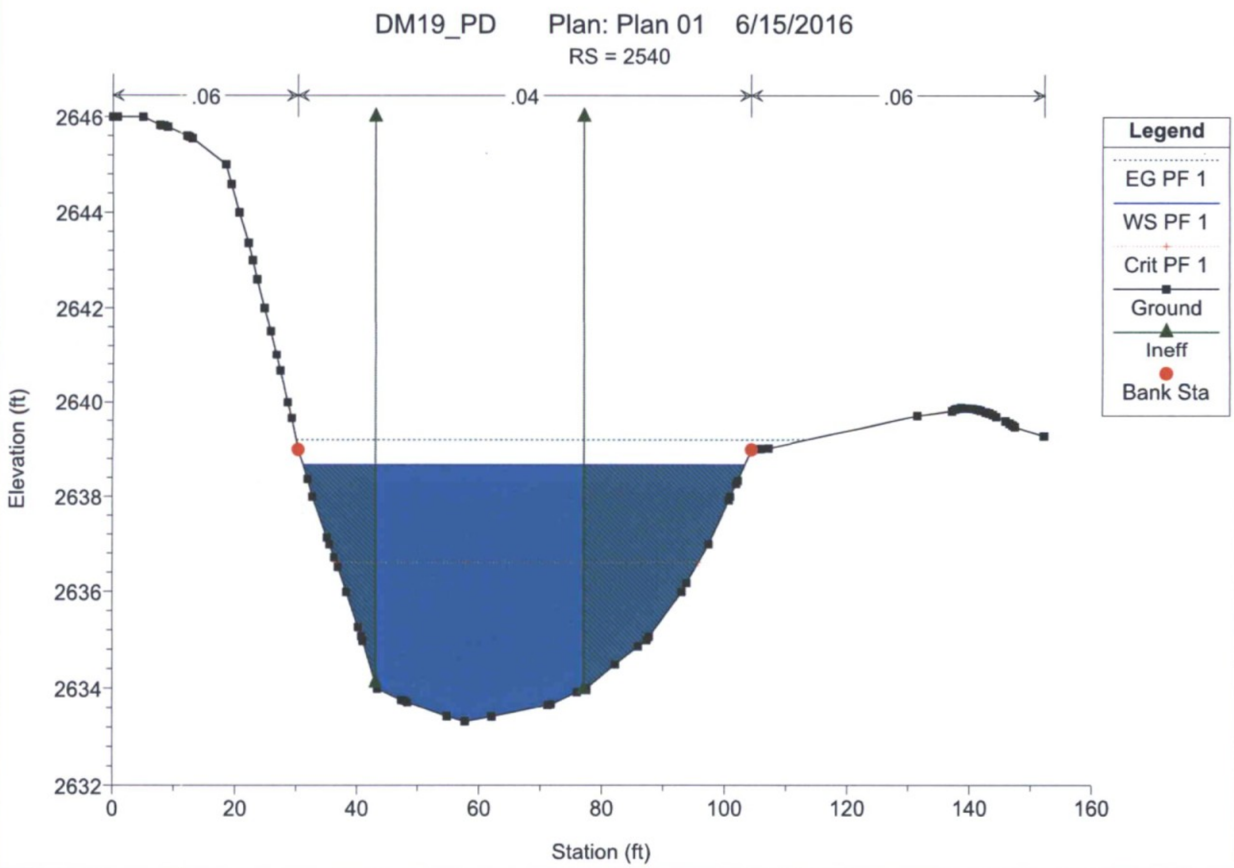
DM19_PD Plan: Plan 01 6/15/2016
DM19 Profile baseline
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
Main Channel Distance (ft)
2570
2580
2590
2600
2610
2620
2630
2640
2650
0
500
1000
1500
2000
2500
3000
197
317
518
645
716
918
1119
1257
1447
1500
1614.9
1705
1791
1891
1952
2014
2130
2250
2405
2500
2578
2678
2774

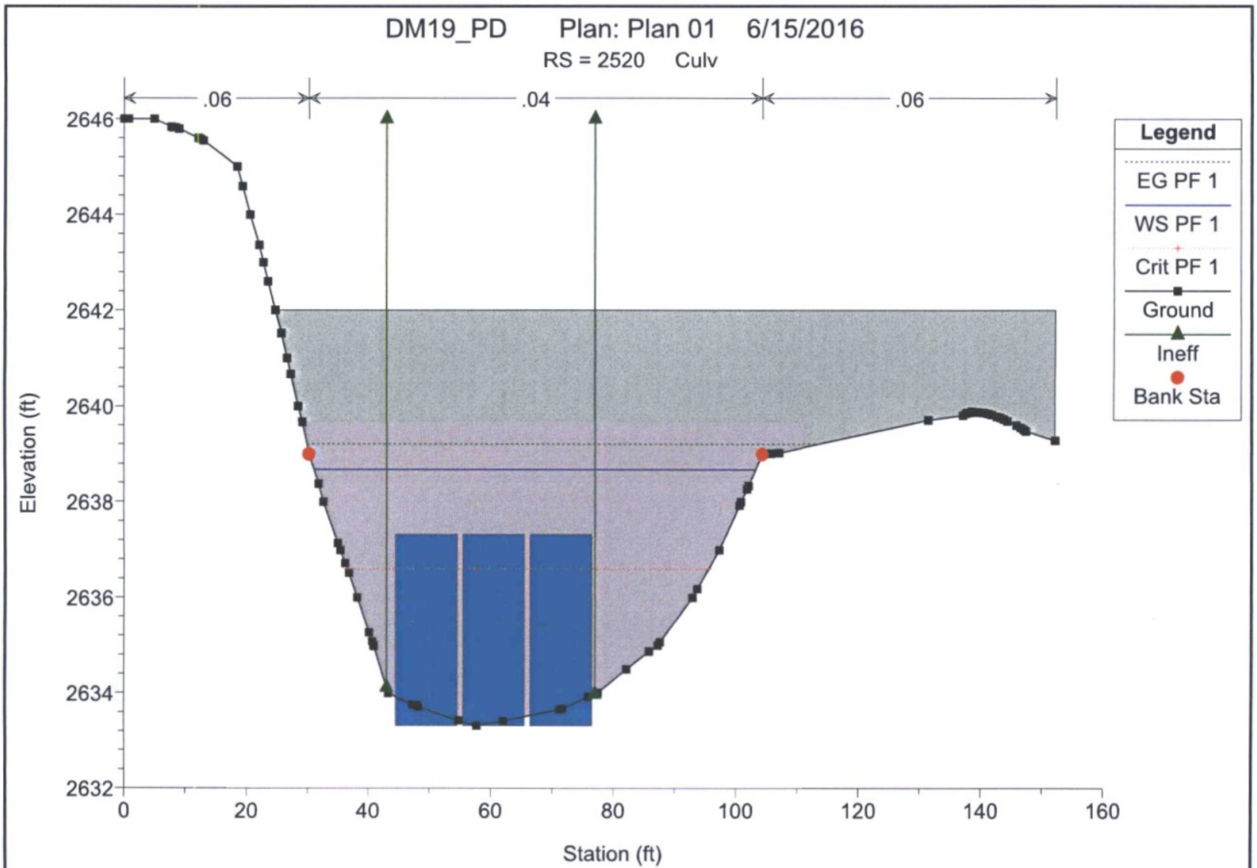

Profile baseline
0
197
317
518
645
716
918
1119
1257
1447
1481
1566.5
1570
1614.9
1705
1791
1891
1952
2056
2130
2250
2405
2500
2578
2678
2774
ne of the XS's are Geo-Referenced (Geo-Ref user entered XS Geo-Ref interpolated XS Non Geo-Ref user entered XS Non Geo-Ref interpolated XS)

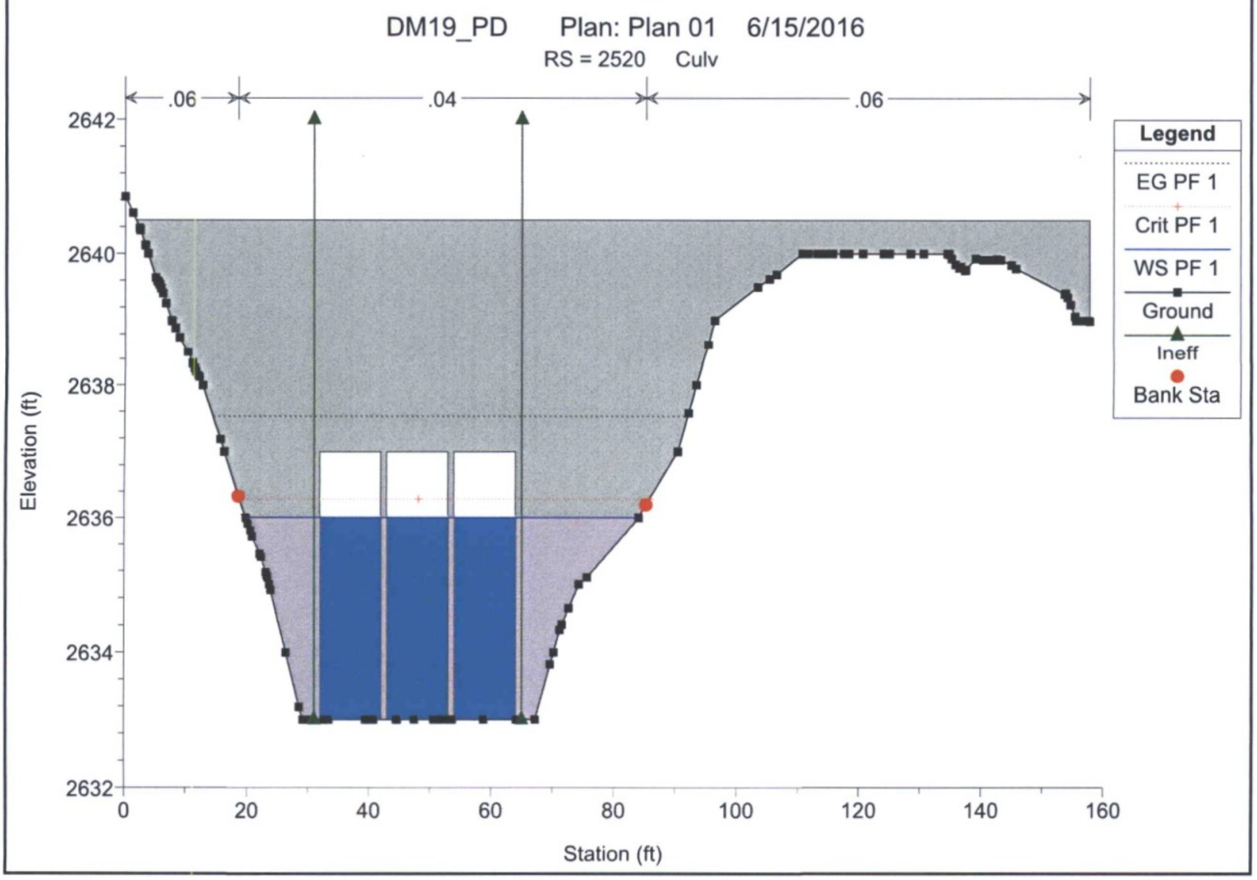

DM19_PD Plan: Plan 01 6/15/2016
RS = 2774
.06
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2647
2646
2645
2644
2643
2642
2641
0
20
40
60
80
100
120
140
160

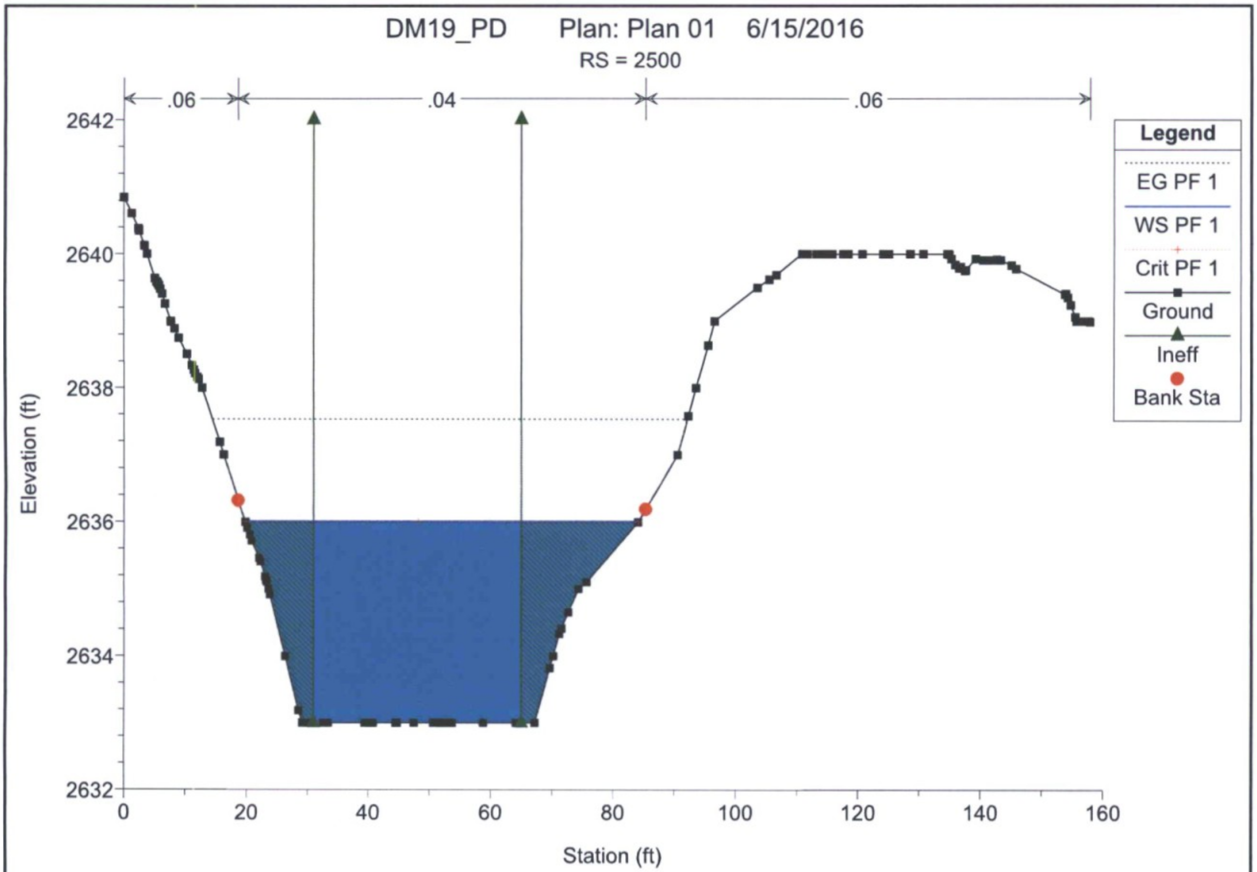

DM19_PD Plan: Plan 01 6/15/2016
RS = 2678
.06
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2643.0
2642.5
2642.0
2641.5
2641.0
2640.5
2640.0
2639.5
0
50
100
150
200
250

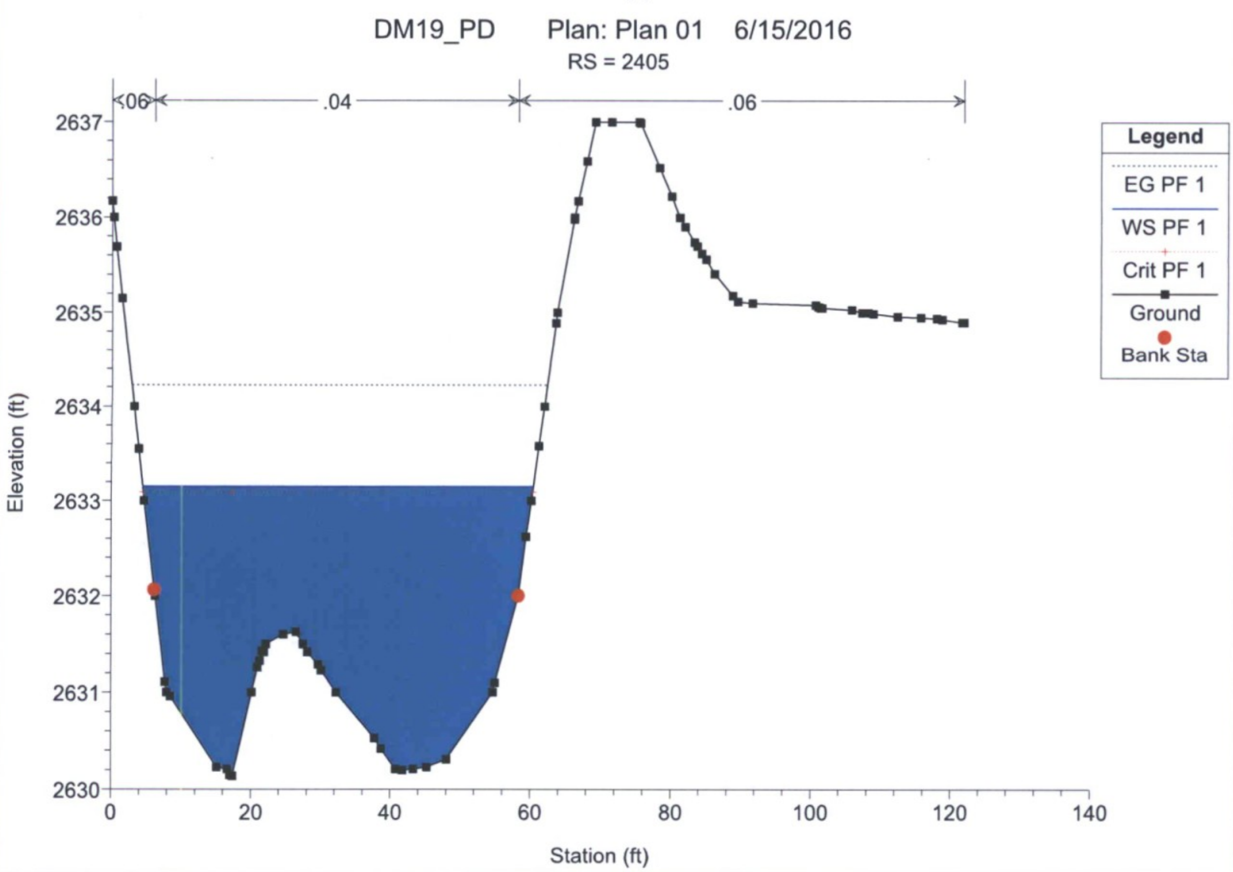

DM19_PD Plan: Plan 01 6/15/2016
RS = 2578
.06
.04
.06
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2641
2640
2639
2638
2637
2636
2635
2634
0
20
40
60
80
100
120

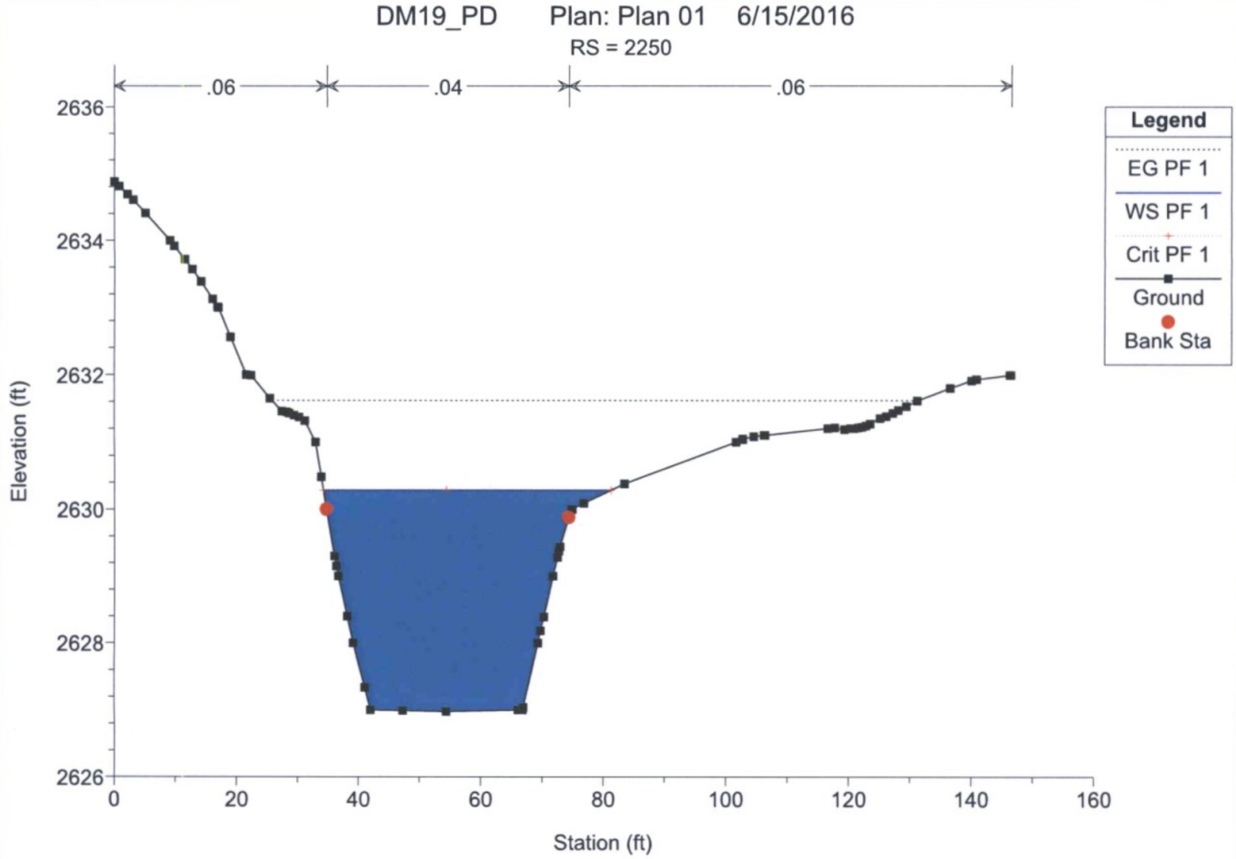

DM19_PD Plan: Plan 01 6/15/2016
RS = 2540
.06
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
2646
2644
2642
2640
2638
2636
2634
2632
0
20
40
60
80
100
120
140
160

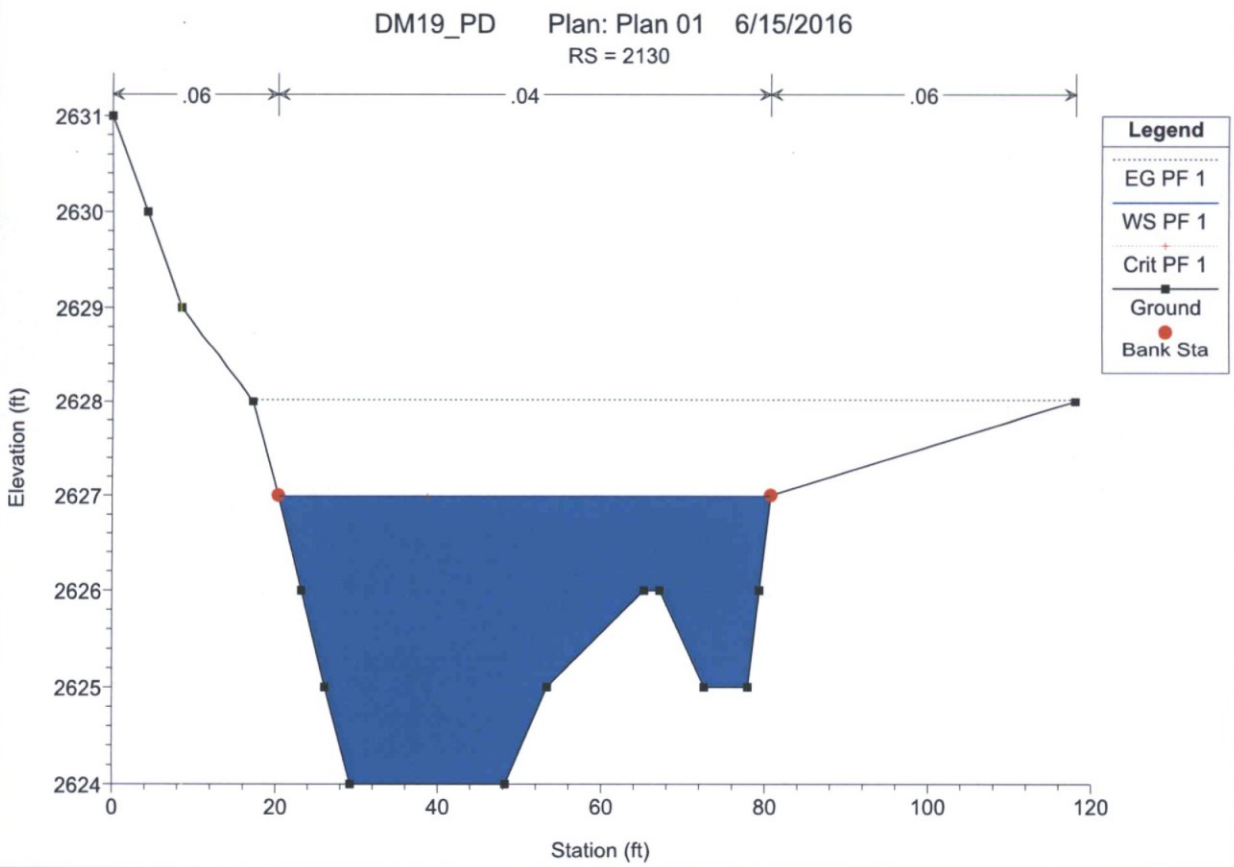

DM19_PD Plan: Plan 01 6/15/2016
RS = 2520 Culv
.06
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
2632
2634
2636
2638
2640
2642
2644
2646
0
20
40
60
80
100
120
140
160

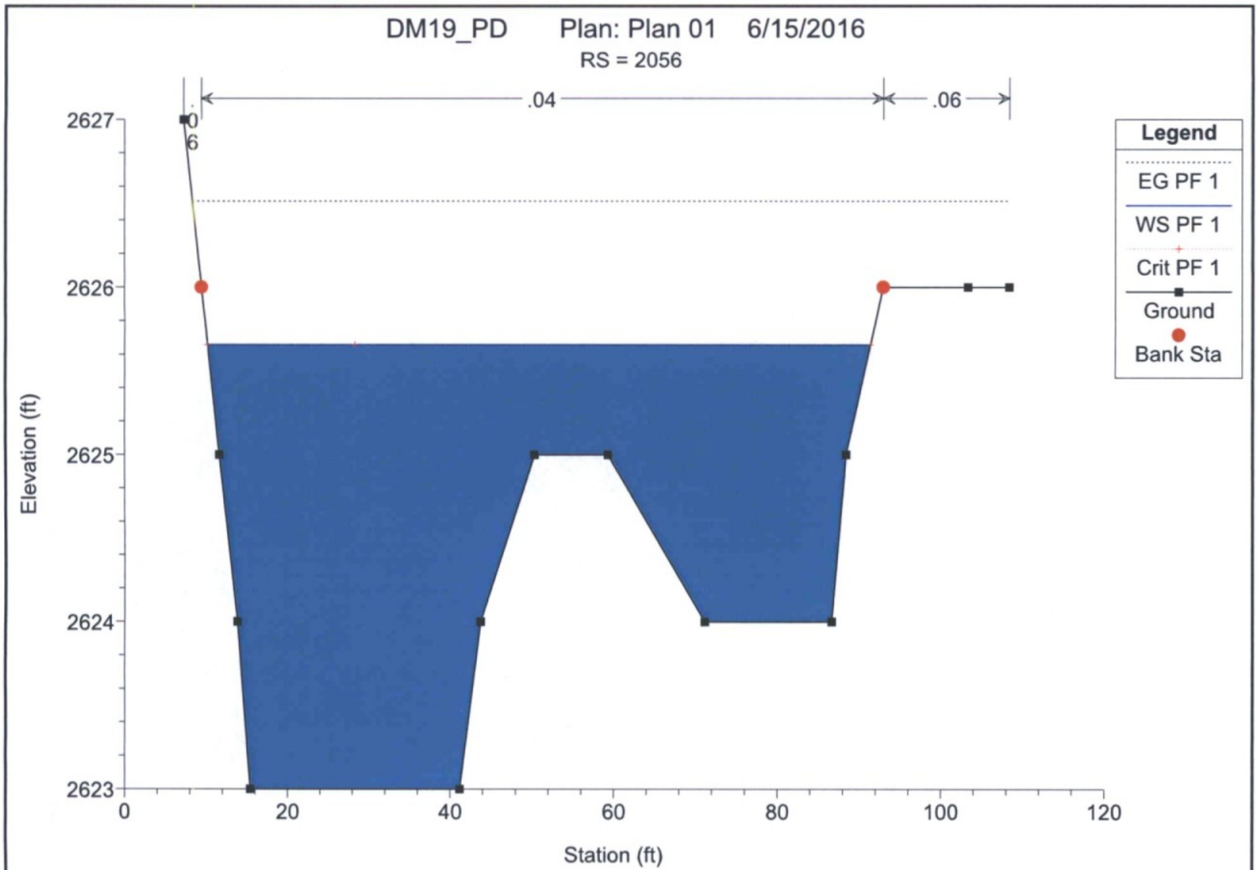

DM19_PD Plan: Plan 01 6/15/2016
RS = 2520 Culv
.06
.04
.06
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
2632
2634
2636
2638
2640
2642
0
20
40
60
80
100
120
140
160


DM19_PD Plan: Plan 01 6/15/2016
RS = 2500
.06
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
2642
2640
2638
2636
2634
2632
0
20
40
60
80
100
120
140
160

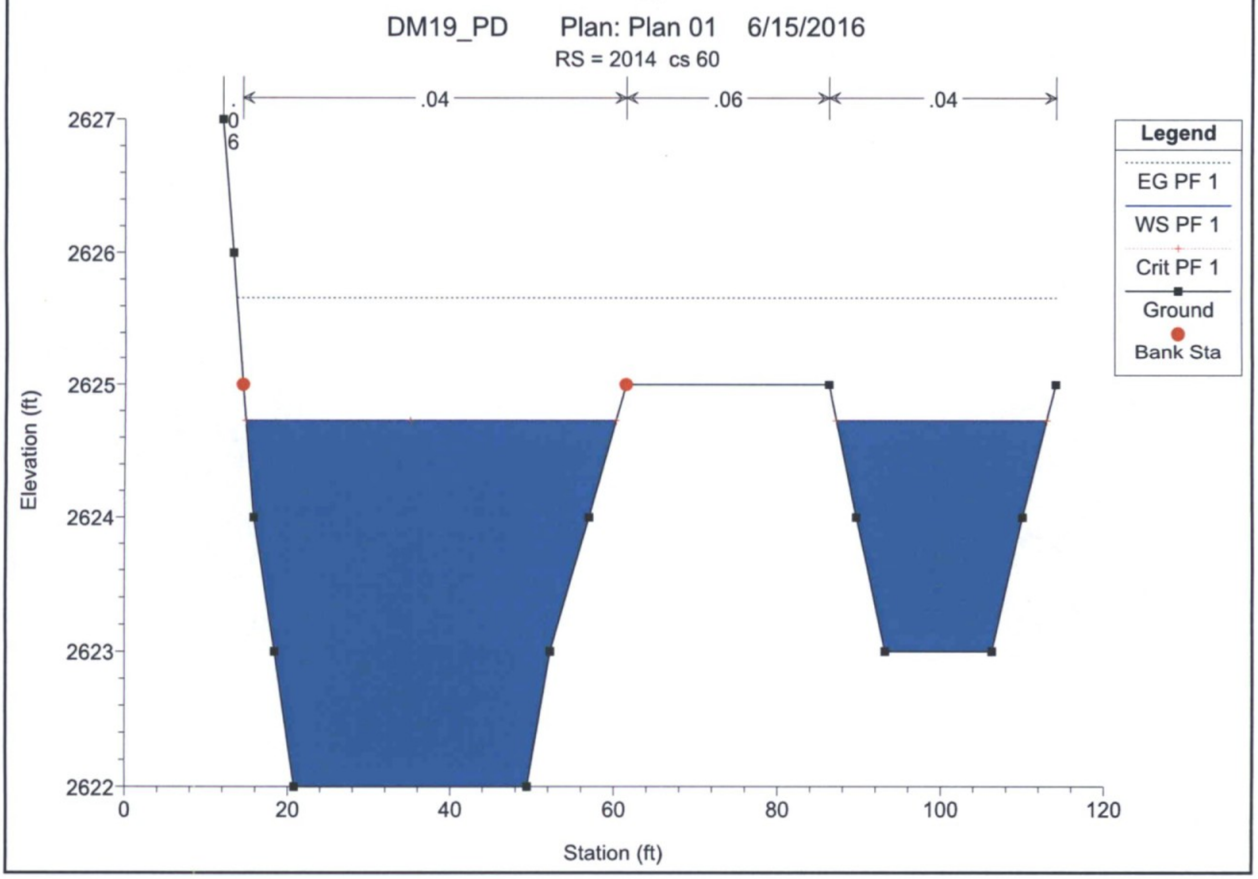

DM19_PD Plan: Plan 01 6/15/2016
RS = 2405
.06
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2637
2636
2635
2634
2633
2632
2631
2630
0
20
40
60
80
100
120
140


DM19_PD Plan: Plan 01 6/15/2016
RS = 2250
.06
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2636
2634
2632
2630
2628
2626
0
20
40
60
80
100
120
140
160
Station (ft)

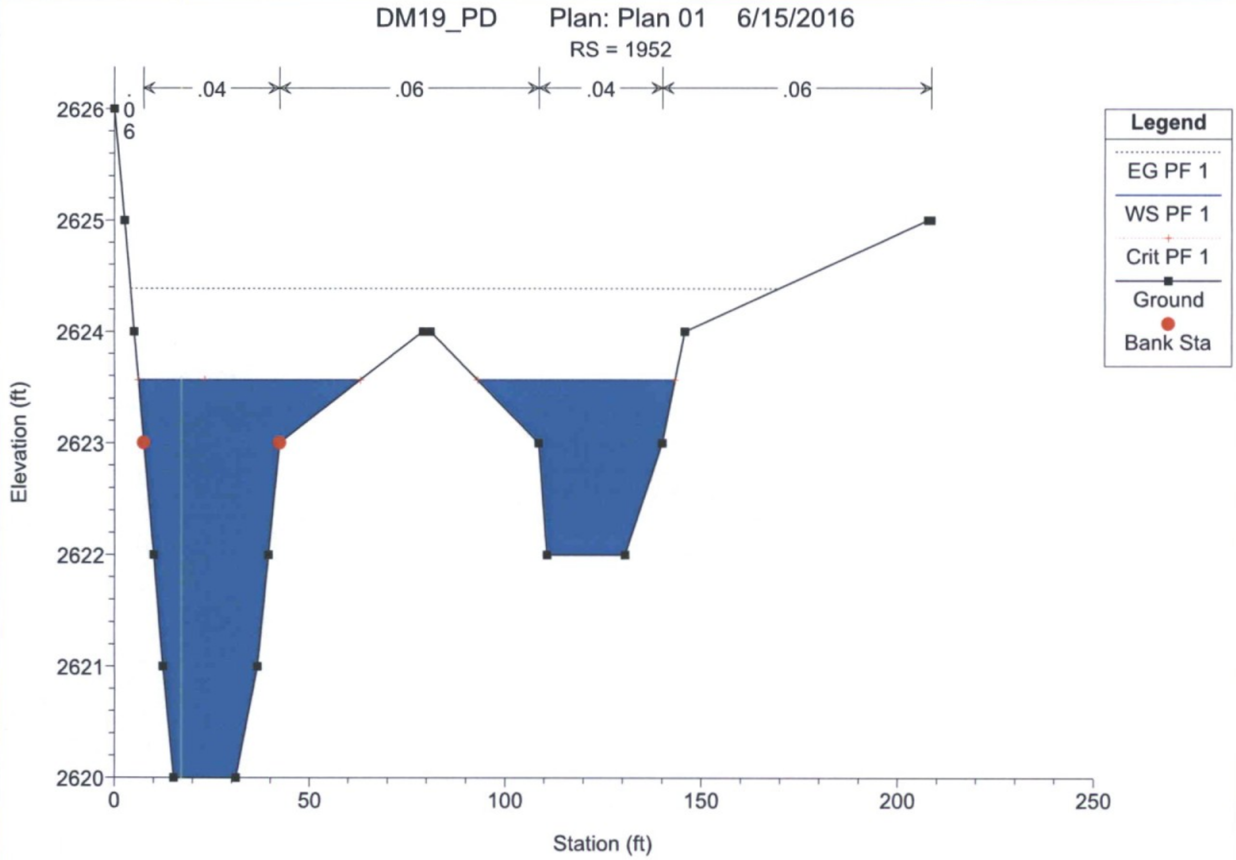

DM19_PD Plan: Plan 01 6/15/2016
RS = 2130
.06
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2631
2630
2629
2628
2627
2626
2625
2624
0
20
40
60
80
100
120
Station (ft)

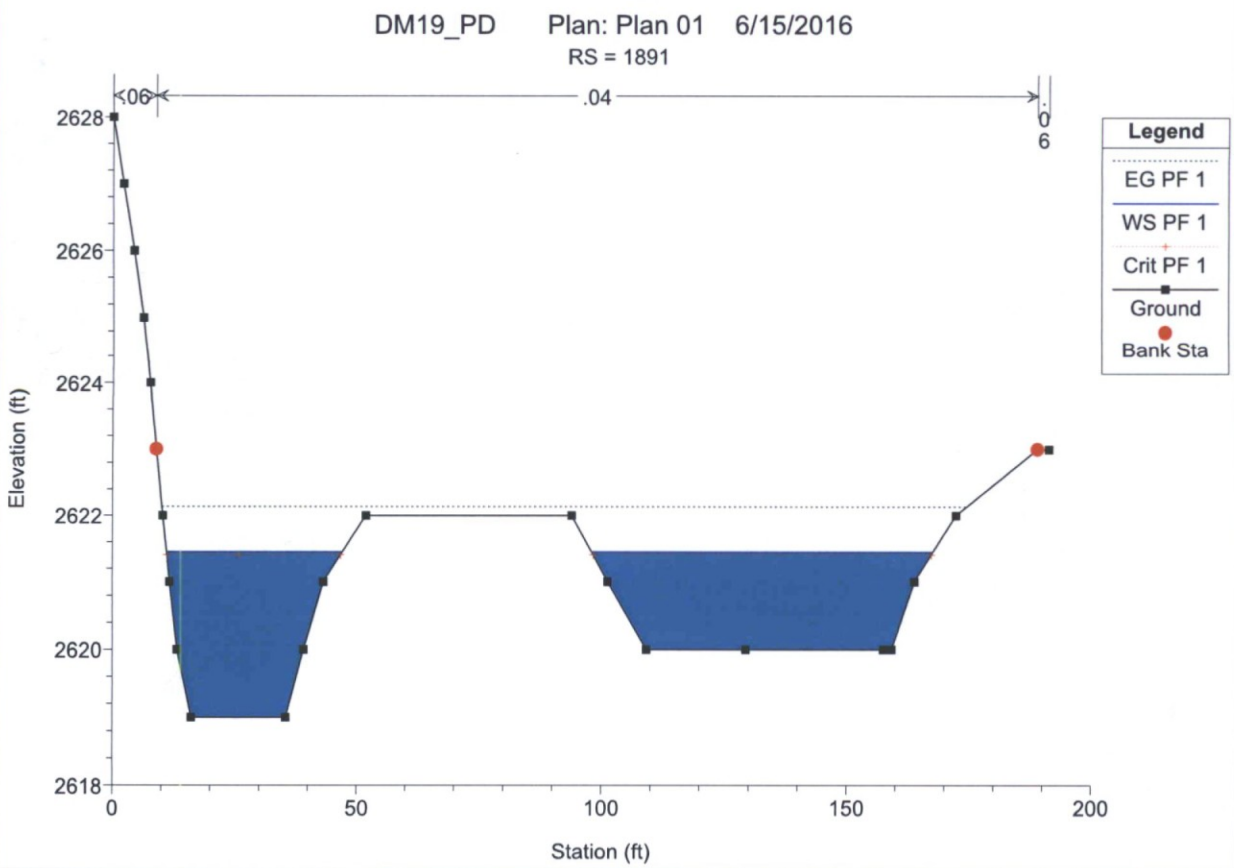


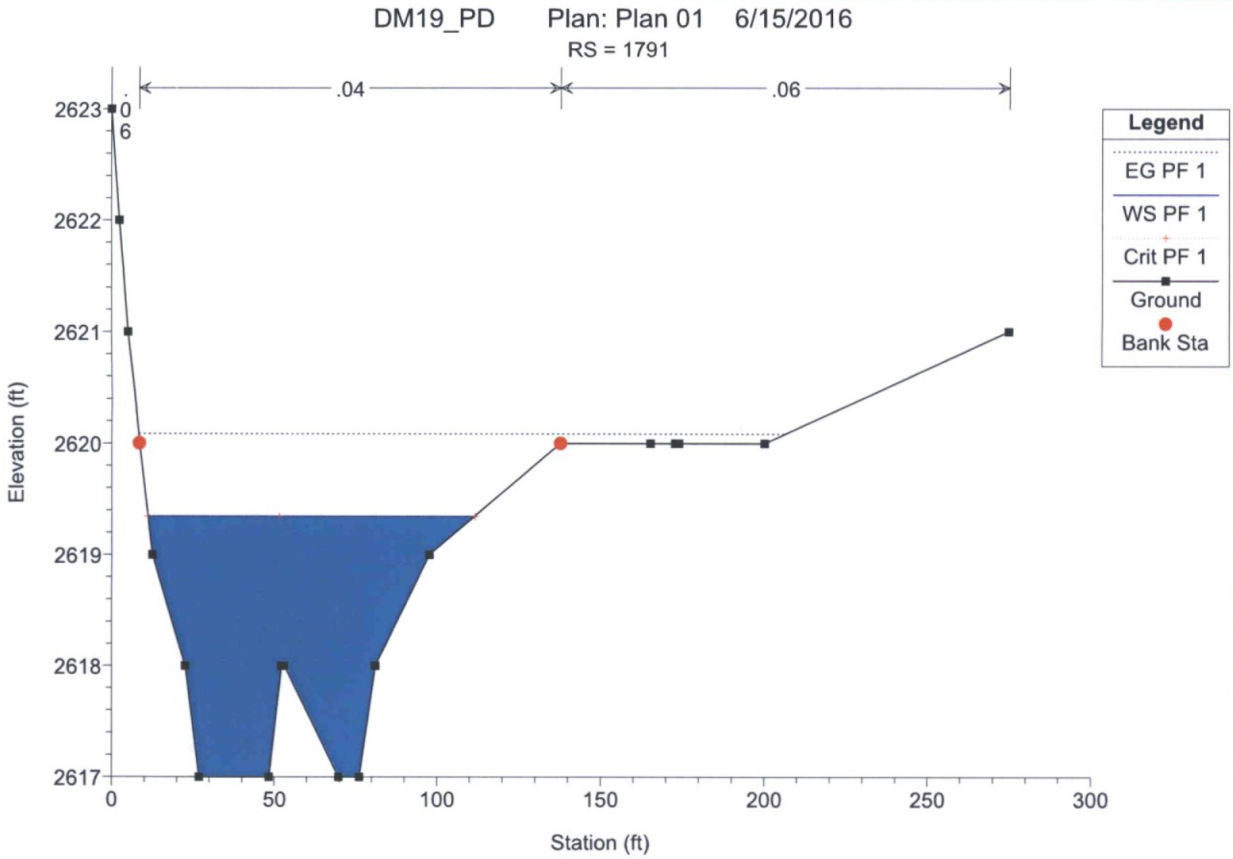
DM19_PD Plan: Plan 01 6/15/2016
RS = 2056
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2623
2624
2625
2626
2627
0
20
40
60
80
100
120

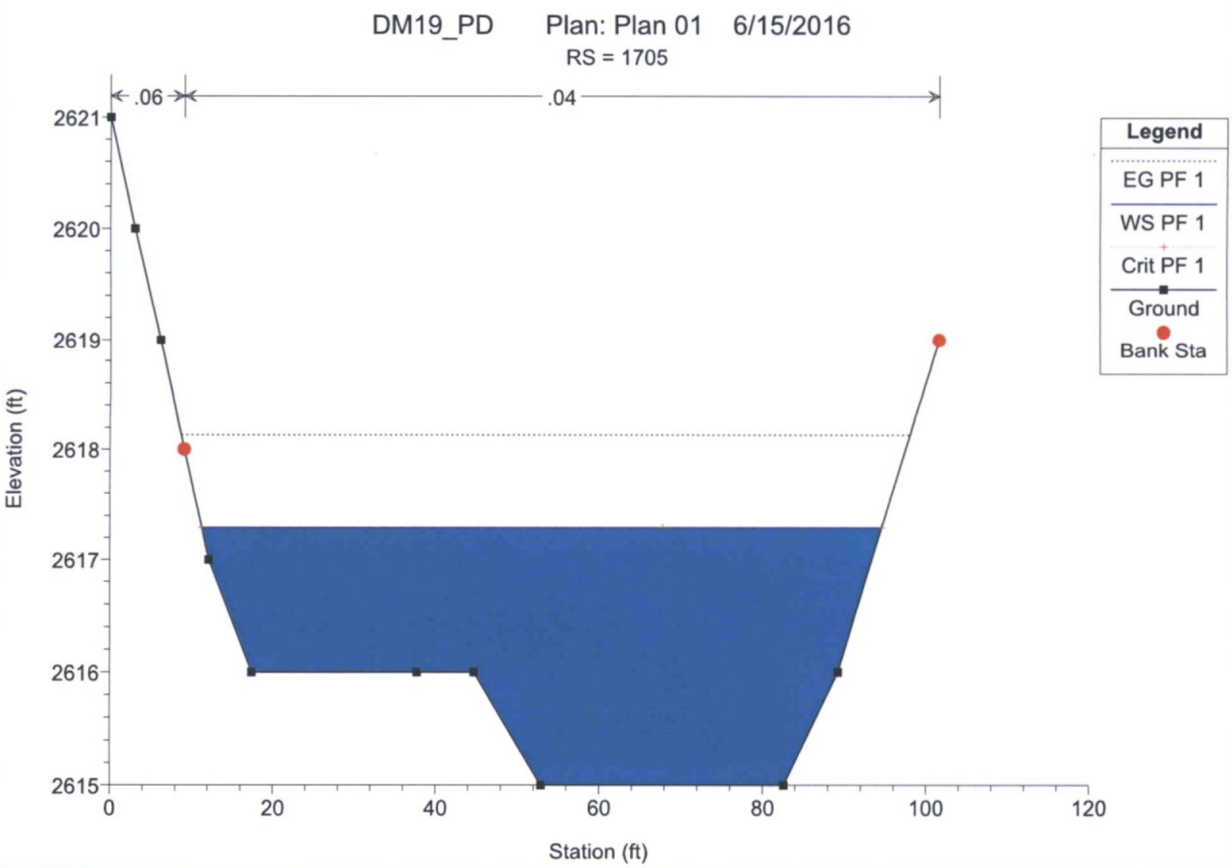


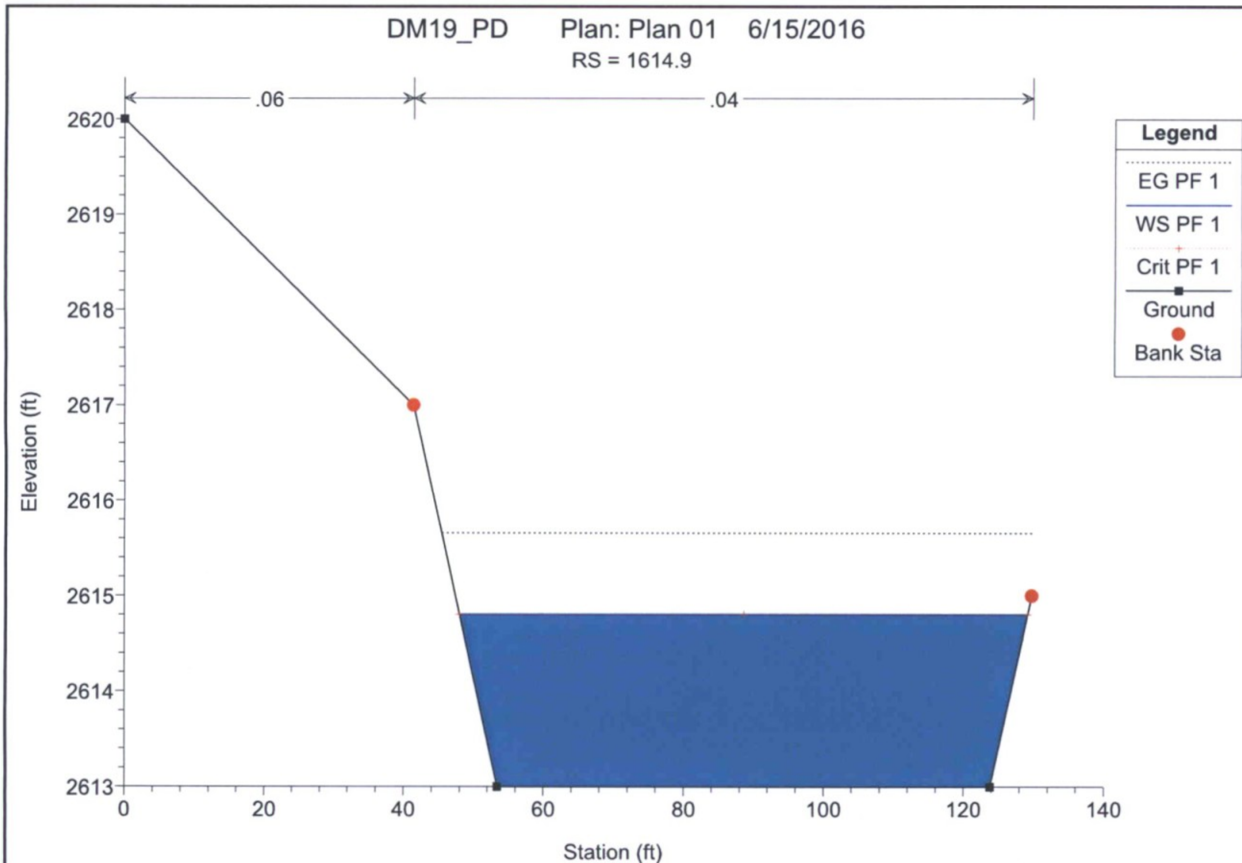
DM19_PD Plan: Plan 01 6/15/2016
RS = 2014 cs 60
.04
.06
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2622
2623
2624
2625
2626
2627
0
20
40
60
80
100
120

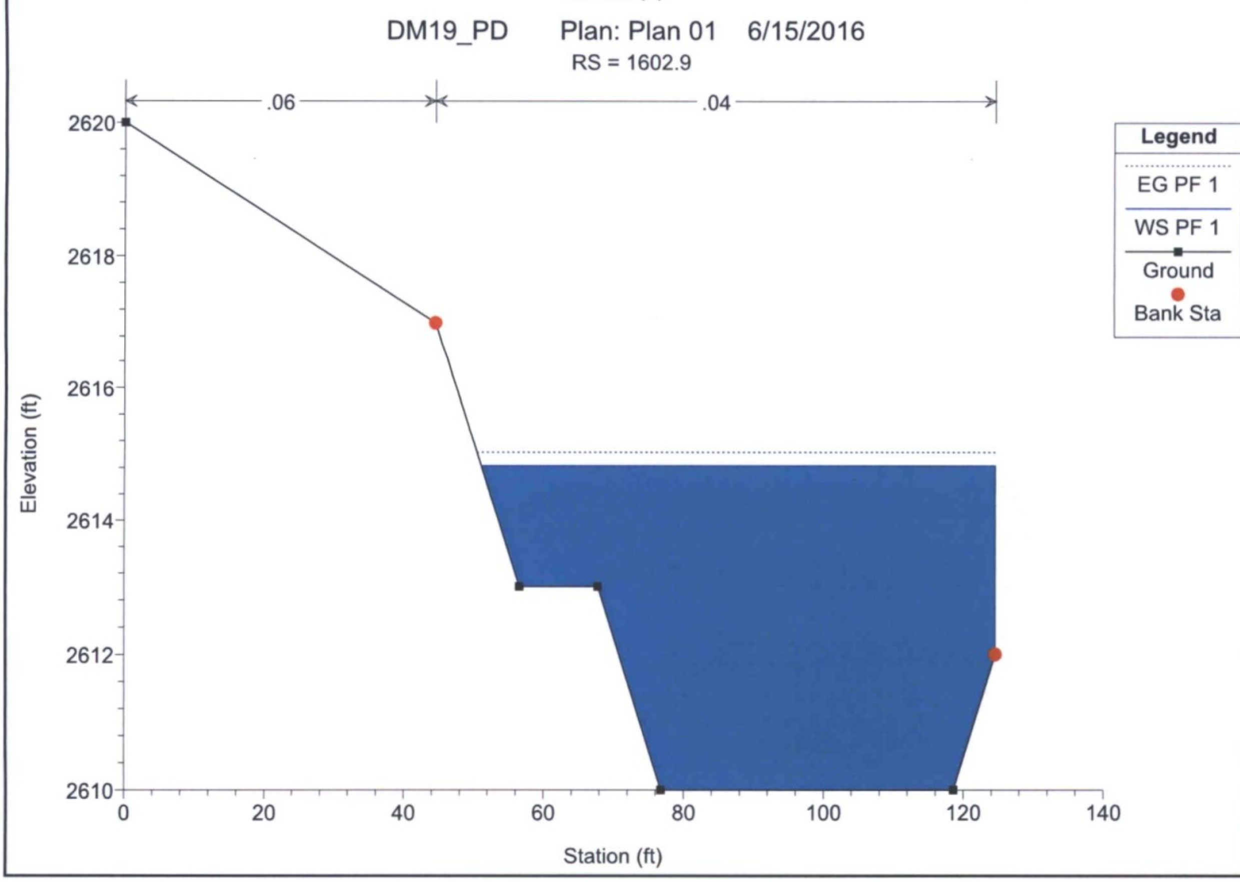

DM19_PD Plan: Plan 01 6/15/2016
RS = 1952
.04
.06
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

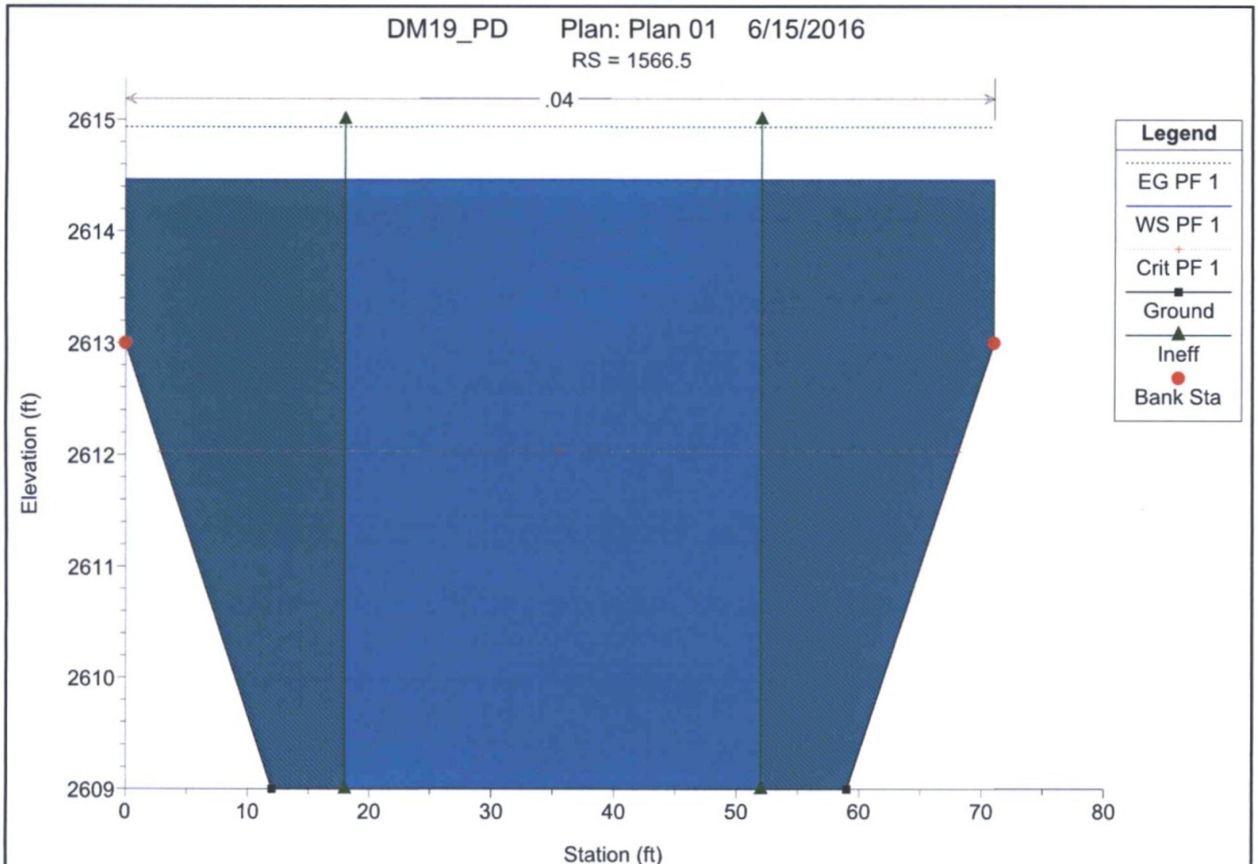

DM19_PD Plan: Plan 01 6/15/2016
RS = 1891
.06
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

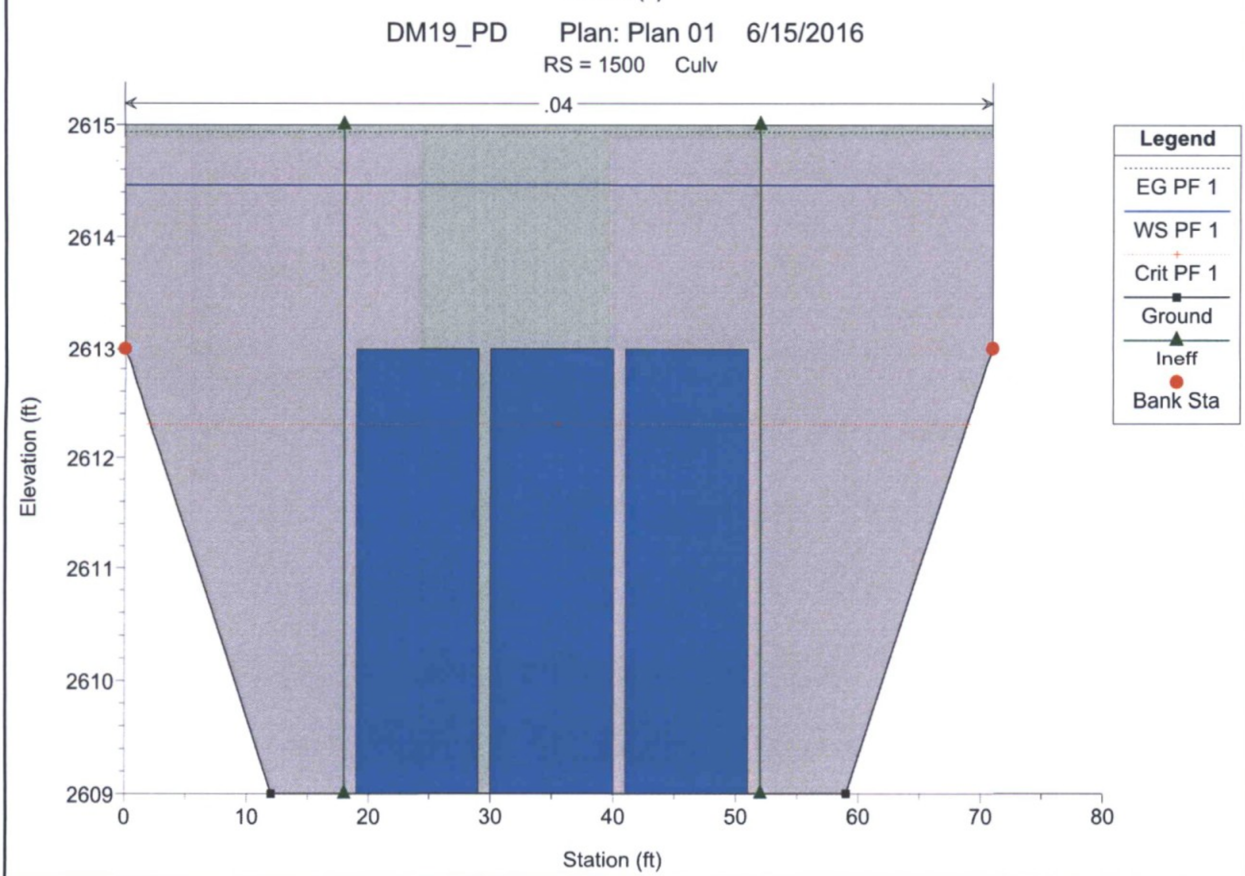

DM19_PD Plan: Plan 01 6/15/2016
RS = 1791
.04
.06
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2617
2618
2619
2620
2621
2622
2623
0
50
100
150
200
250
300

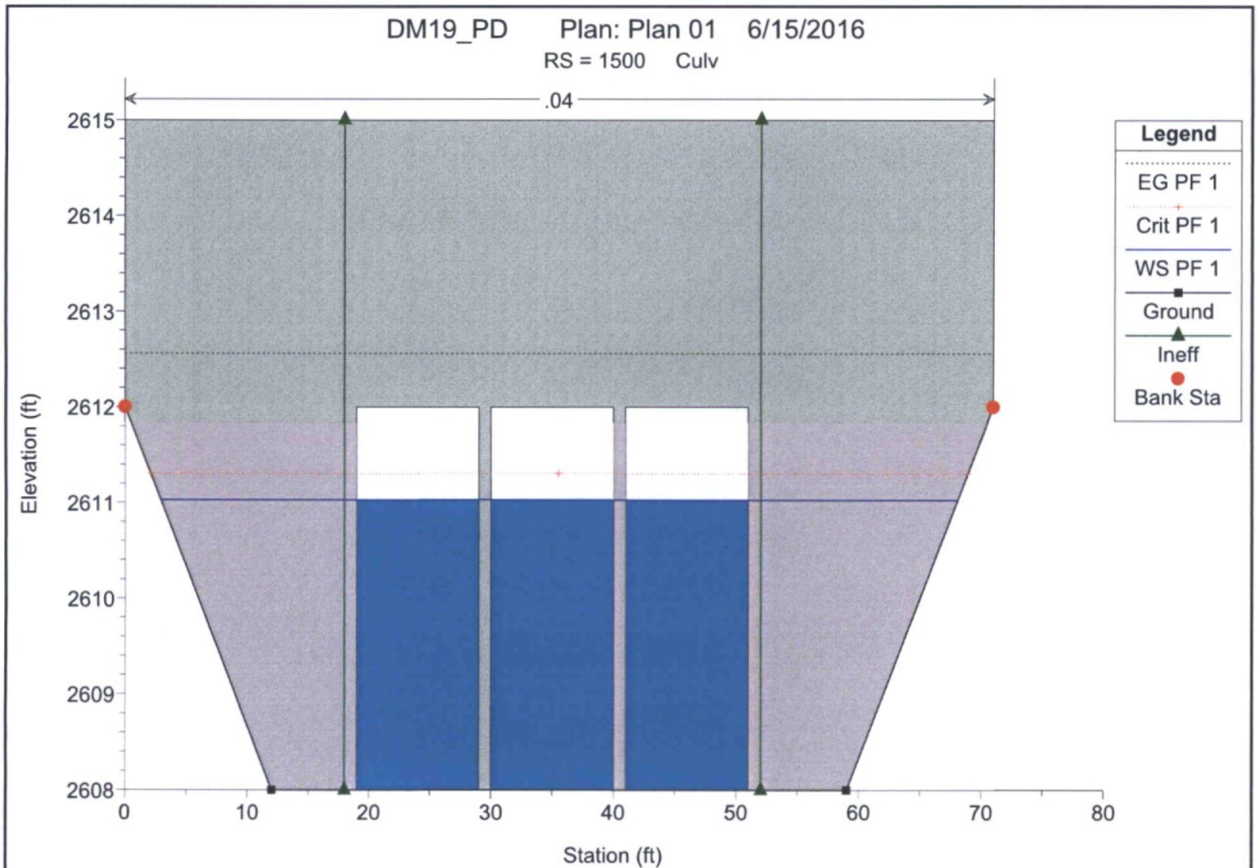

DM19_PD Plan: Plan 01 6/15/2016
RS = 1705
.06
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2615
2616
2617
2618
2619
2620
2621
0
20
40
60
80
100
120

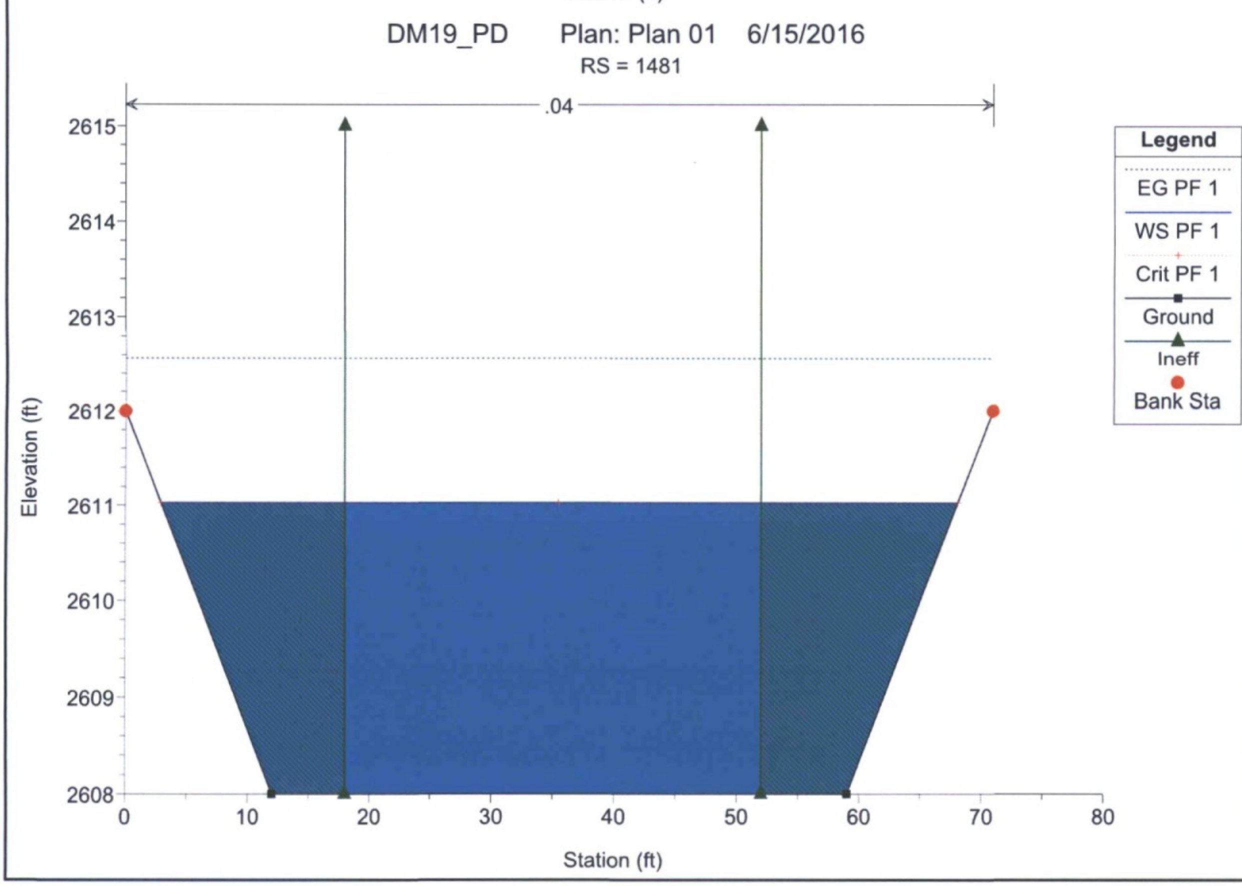

DM19_PD Plan: Plan 01 6/15/2016
RS = 1614.9
.06
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2613
2614
2615
2616
2617
2618
2619
2620
0
20
40
60
80
100
120
140
Station (ft)

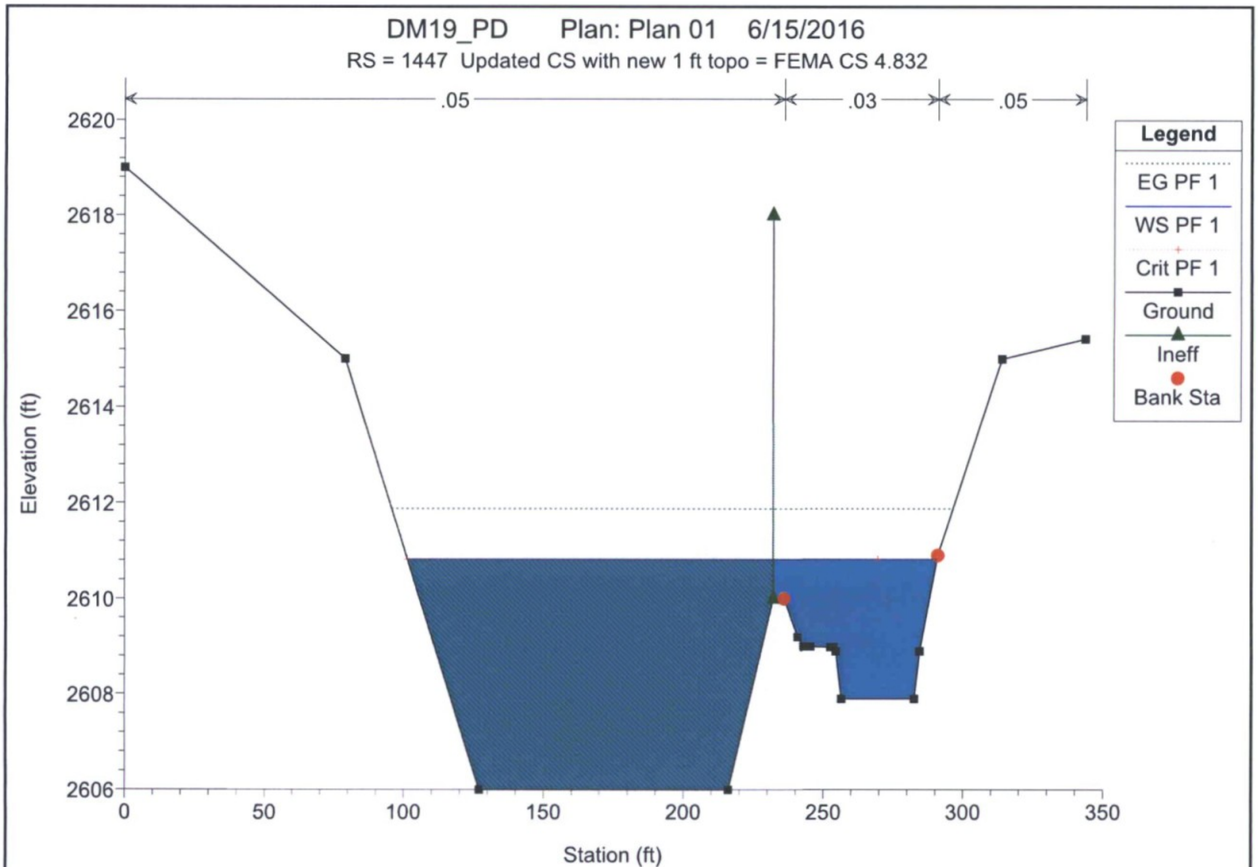

DM19_PD Plan: Plan 01 6/15/2016
RS = 1602.9
.06
.04
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
2610
2612
2614
2616
2618
2620
0
20
40
60
80
100
120
140
Station (ft)

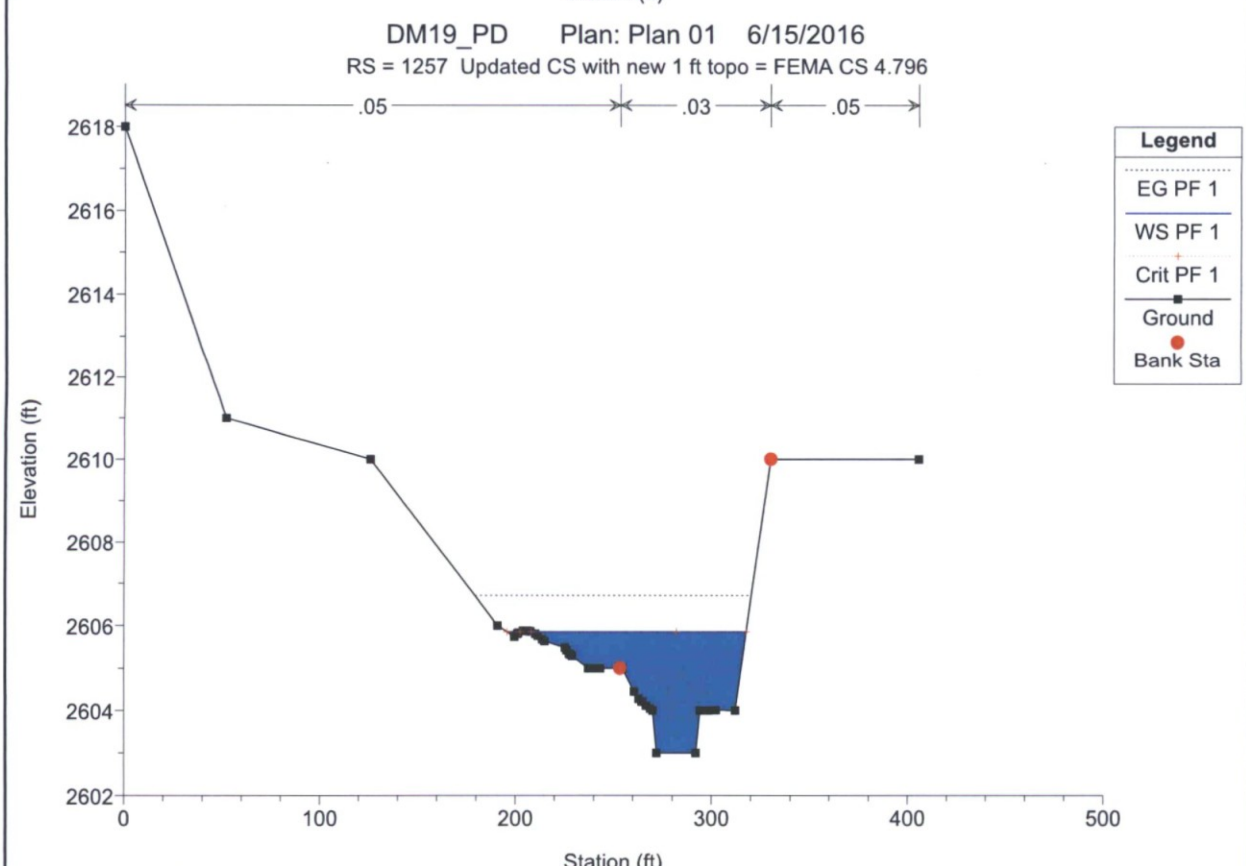

DM19_PD Plan: Plan 01 6/15/2016
RS = 1566.5
.04
Elevation (ft)
2609
2610
2611
2612
2613
2614
2615
Station (ft)
0
10
20
30
40
50
60
70
80
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta

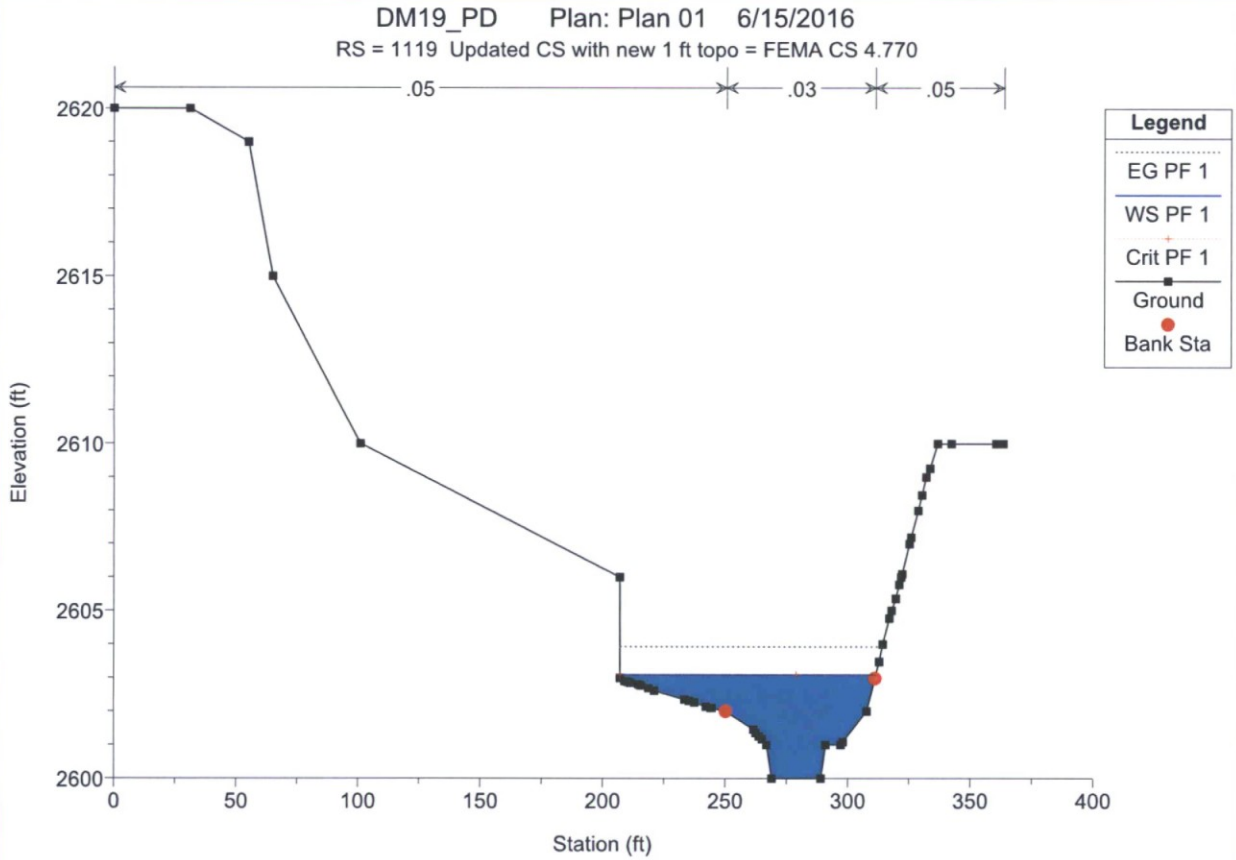

DM19_PD Plan: Plan 01 6/15/2016
RS = 1500 Culv
.04
Elevation (ft)
2609
2610
2611
2612
2613
2614
2615
Station (ft)
0
10
20
30
40
50
60
70
80
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta

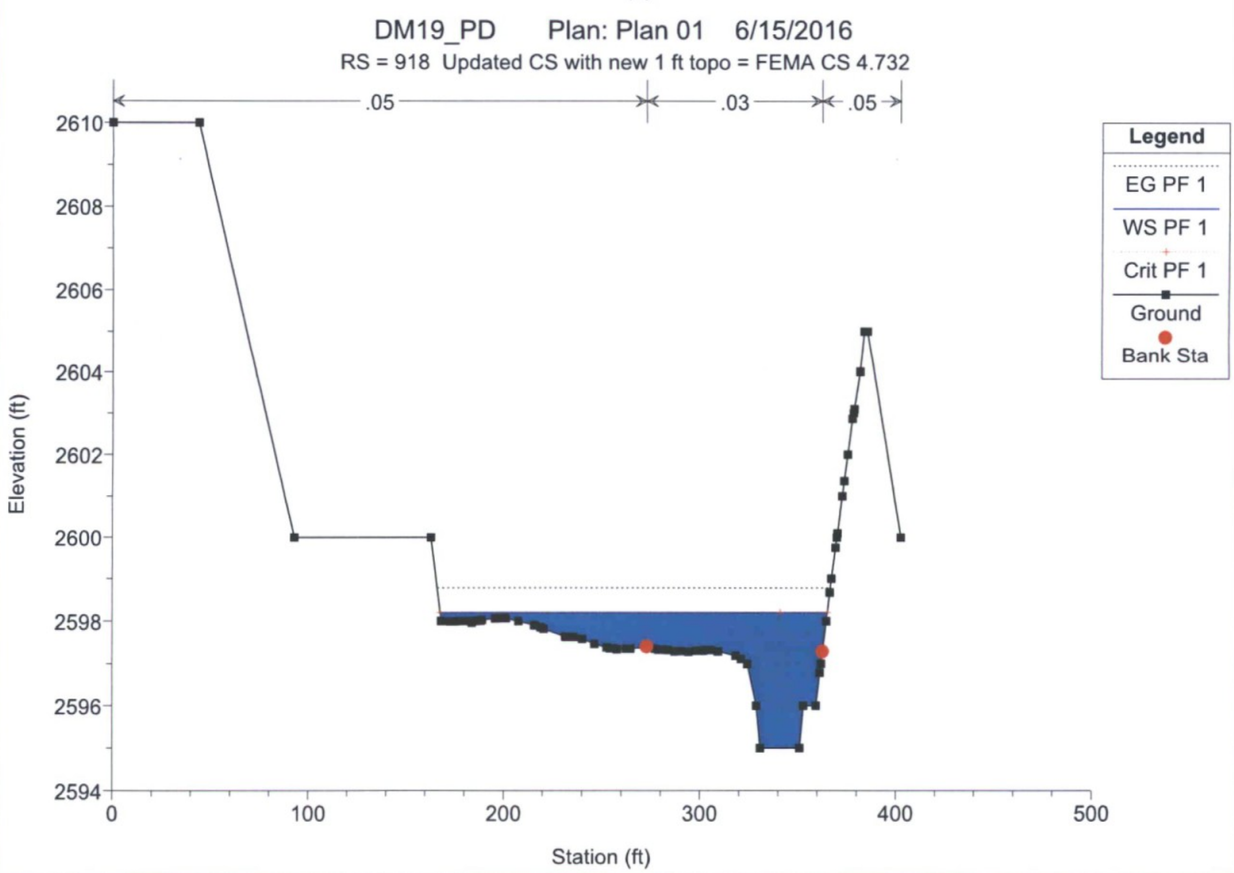

DM19_PD Plan: Plan 01 6/15/2016
RS = 1500 Culv
.04
Elevation (ft)
2608
2609
2610
2611
2612
2613
2614
2615
Station (ft)
0
10
20
30
40
50
60
70
80
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Ineff
Bank Sta

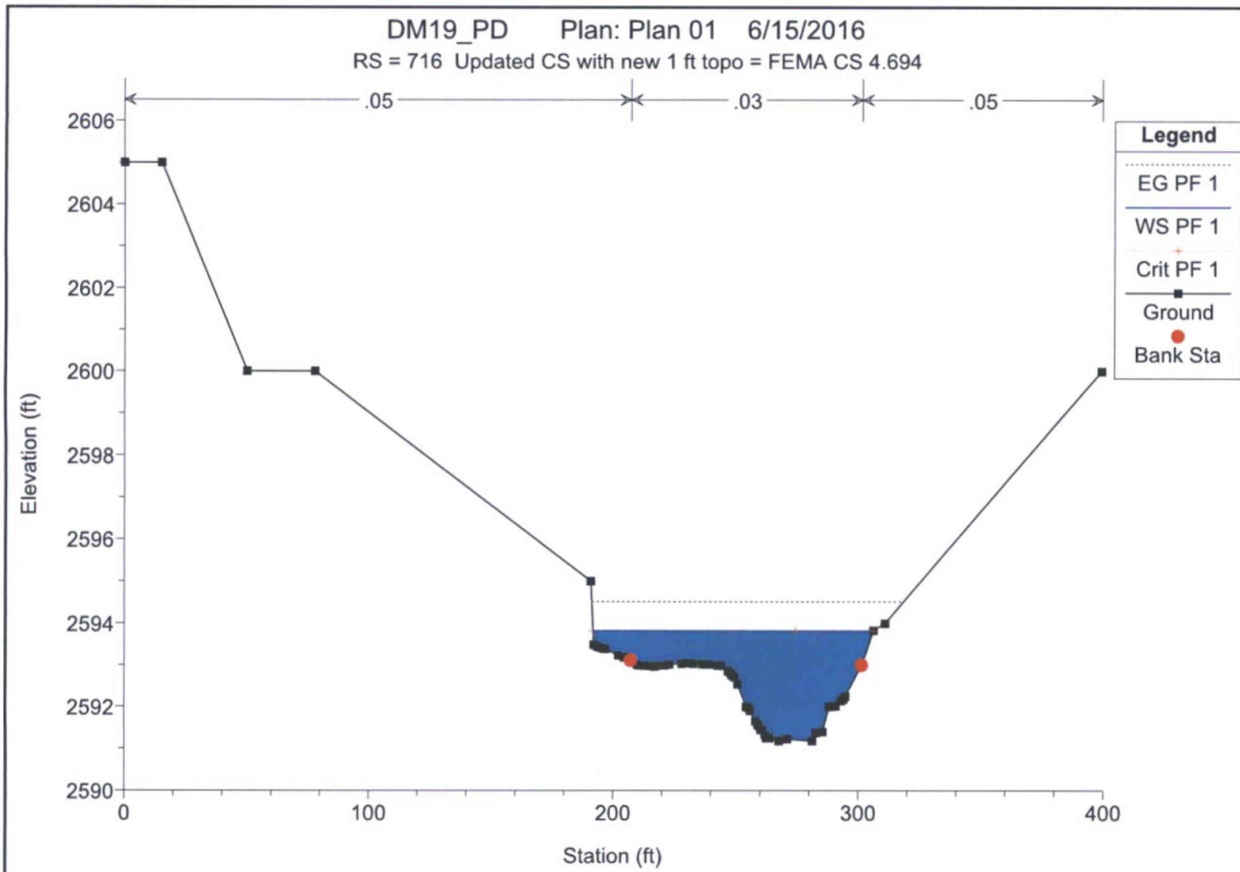

DM19_PD Plan: Plan 01 6/15/2016
RS = 1481
.04
Elevation (ft)
2608
2609
2610
2611
2612
2613
2614
2615
Station (ft)
0
10
20
30
40
50
60
70
80
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta

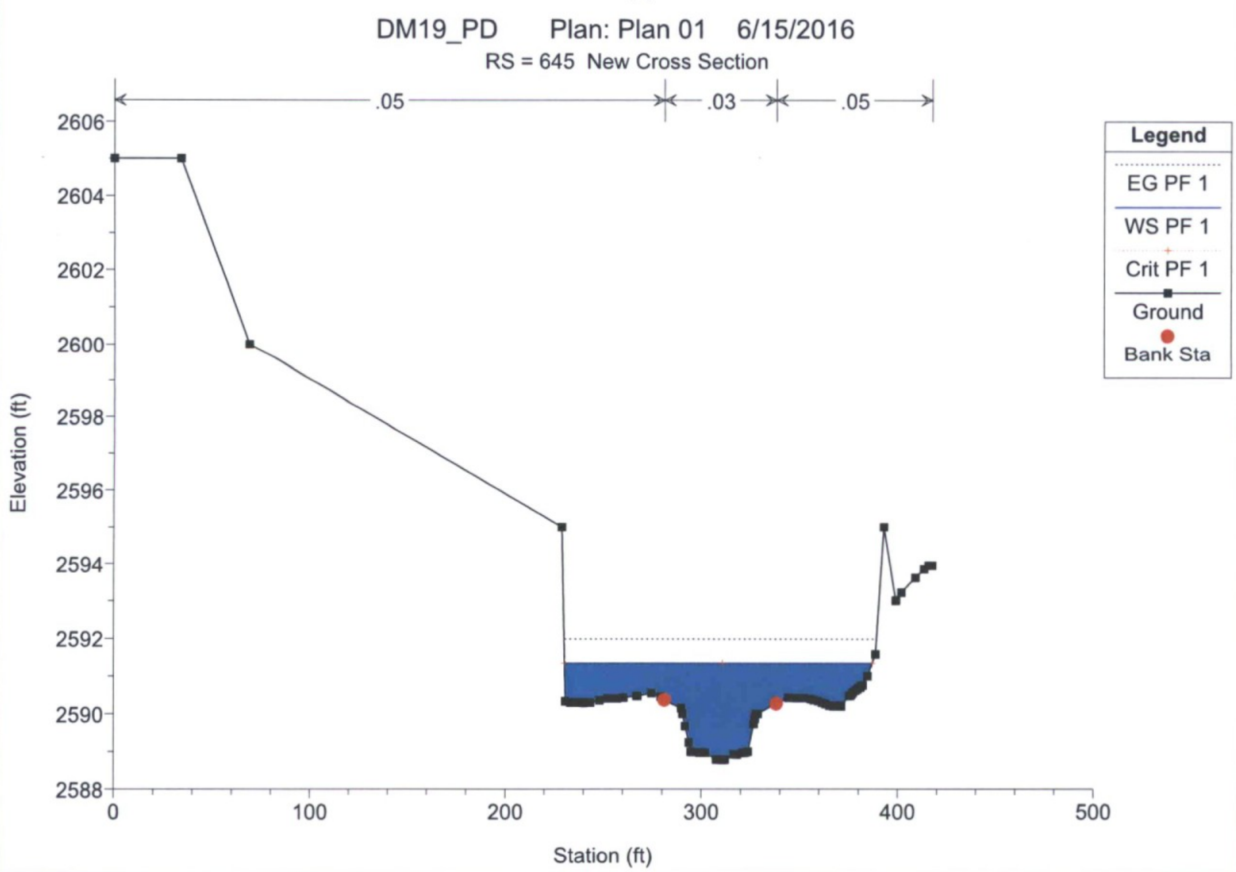

DM19_PD Plan: Plan 01 6/15/2016
RS = 1447 Updated CS with new 1 ft topo = FEMA CS 4.832
.05
.03
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
2606
2608
2610
2612
2614
2616
2618
2620
0
50
100
150
200
250
300
350

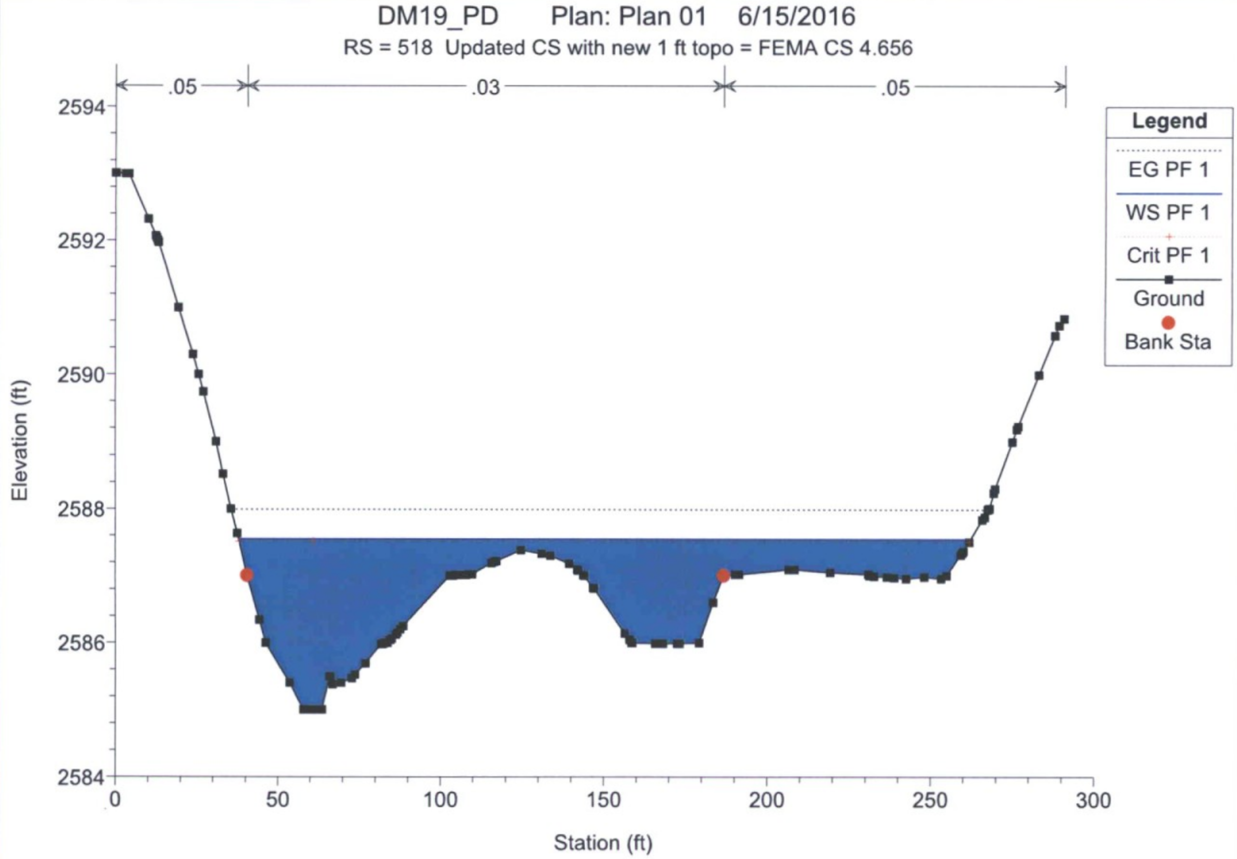

DM19_PD Plan: Plan 01 6/15/2016
RS = 1257 Updated CS with new 1 ft topo = FEMA CS 4.796
.05
.03
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2602
2604
2606
2608
2610
2612
2614
2616
2618
0
100
200
300
400
500

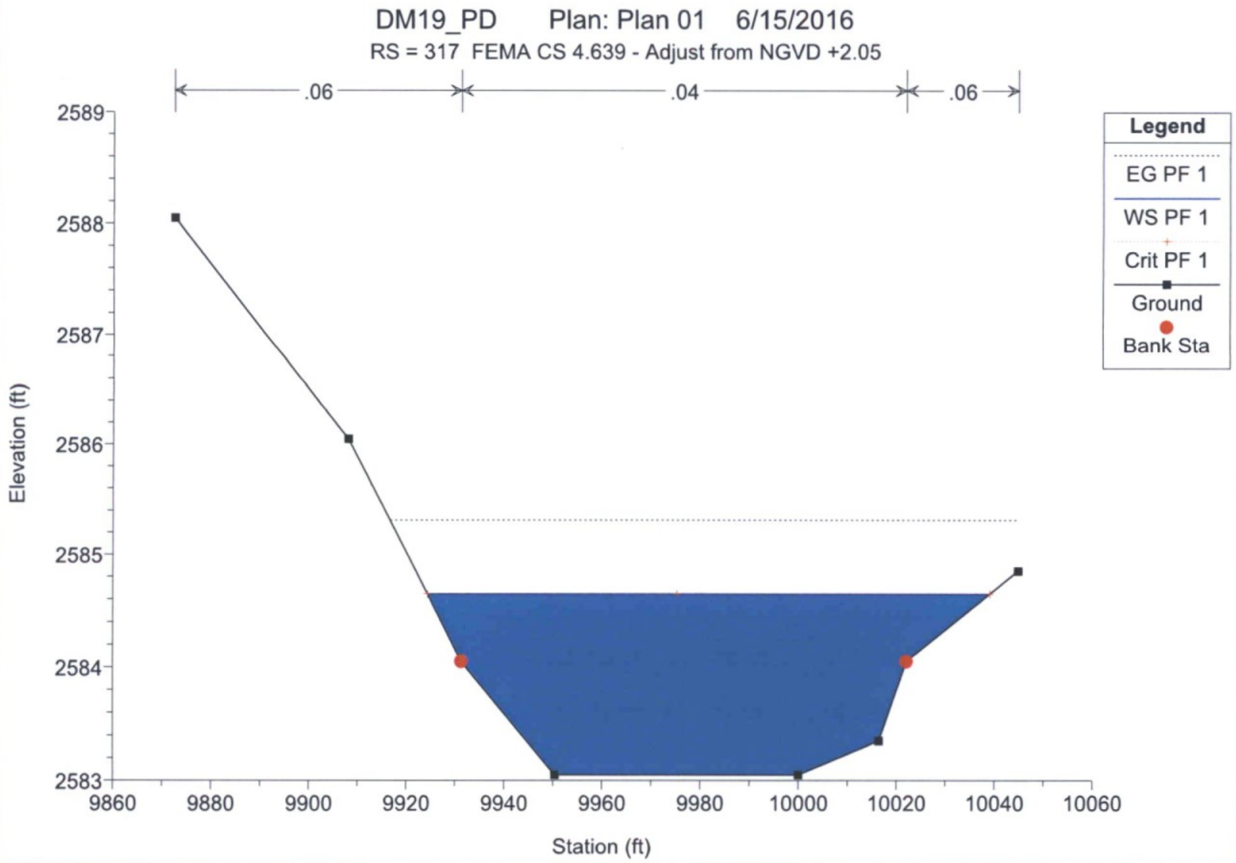

DM19_PD Plan: Plan 01 6/15/2016
RS = 1119 Updated CS with new 1 ft topo = FEMA CS 4.770
.05
.03
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2620
2615
2610
2605
2600
0
50
100
150
200
250
300
350
400
Station (ft)

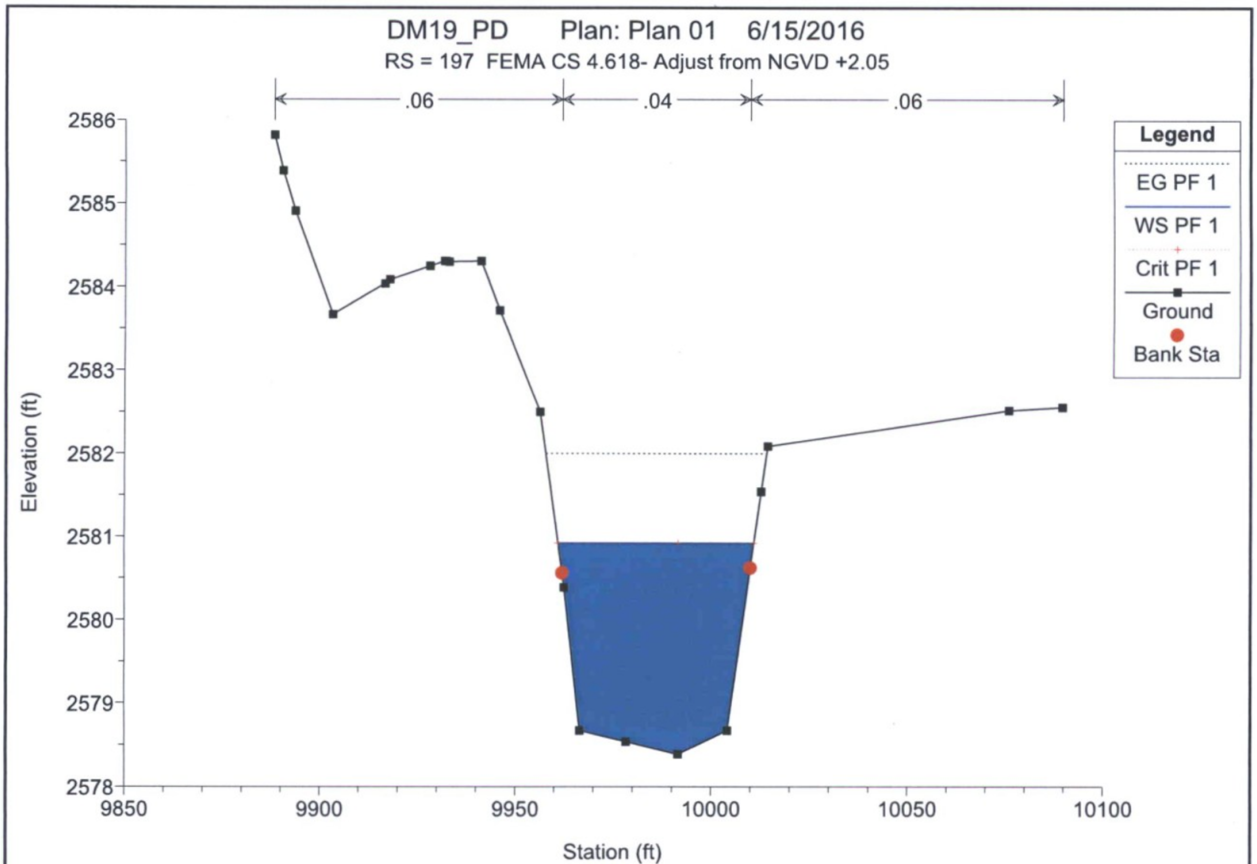

DM19_PD Plan: Plan 01 6/15/2016
RS = 918 Updated CS with new 1 ft topo = FEMA CS 4.732
.05
.03
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2610
2608
2606
2604
2602
2600
2598
2596
2594
0
100
200
300
400
500
Station (ft)

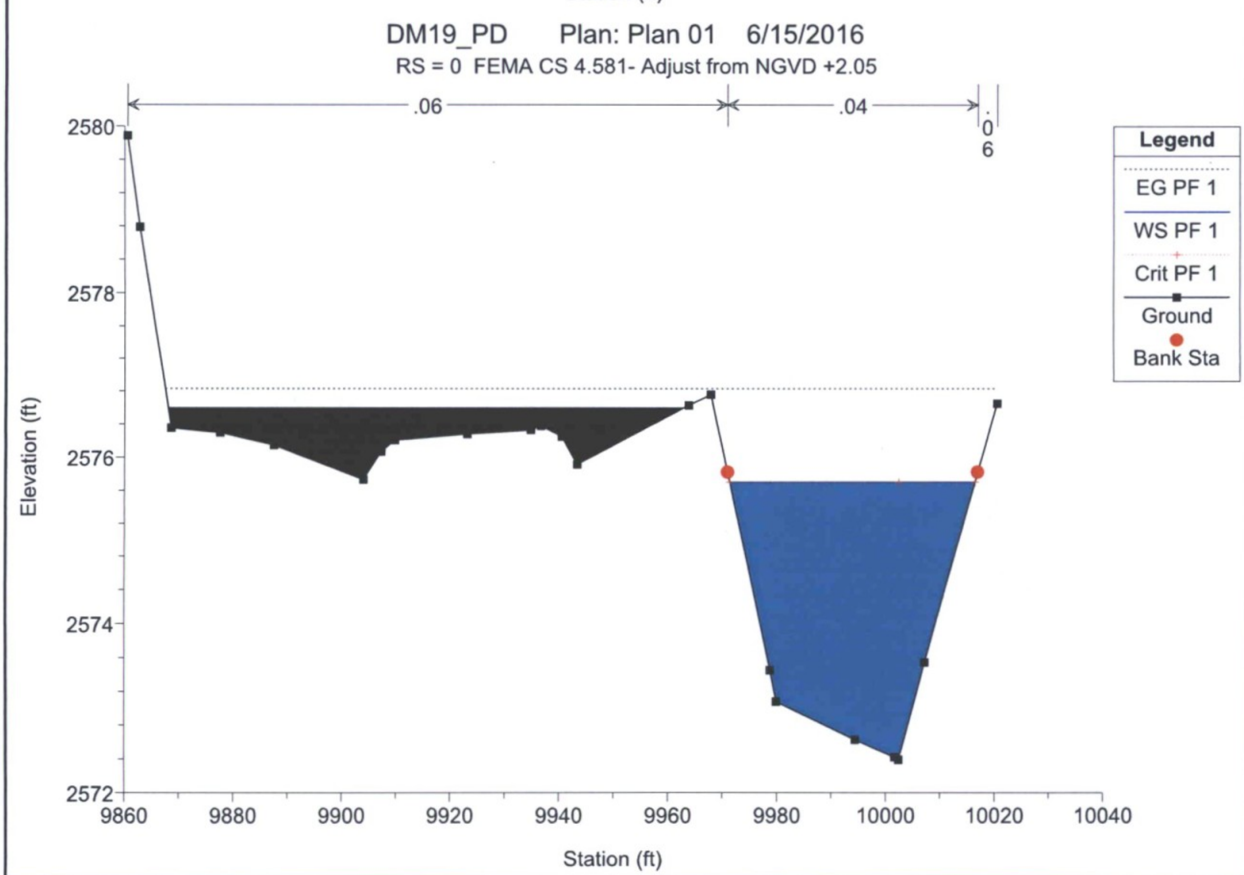

DM19_PD Plan: Plan 01 6/15/2016
RS = 716 Updated CS with new 1 ft topo = FEMA CS 4.694
.05
.03
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2606
2604
2602
2600
2598
2596
2594
2592
2590
0
100
200
300
400
Station (ft)


DM19_PD Plan: Plan 01 6/15/2016
RS = 645 New Cross Section
.05
.03
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2606
2604
2602
2600
2598
2596
2594
2592
2590
2588
0
100
200
300
400
500
Station (ft)


DM19_PD Plan: Plan 01 6/15/2016
RS = 518 Updated CS with new 1 ft topo = FEMA CS 4.656
.05
.03
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2594
2592
2590
2588
2586
2584
0
50
100
150
200
250
300
Station (ft)


DM19_PD Plan: Plan 01 6/15/2016
RS = 317 FEMA CS 4.639 - Adjust from NGVD +2.05
.06
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2589
2588
2587
2586
2585
2584
2583
9860
9880
9900
9920
9940
9960
9980
10000
10020
10040
10060
Station (ft)


DM19_PD Plan: Plan 01 6/15/2016
RS = 197 FEMA CS 4.618- Adjust from NGVD +2.05
.06
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2586
2585
2584
2583
2582
2581
2580
2579
2578
9850
9900
9950
10000
10050
10100
Station (ft)


DM19_PD Plan: Plan 01 6/15/2016
RS = 0 FEMA CS 4.581- Adjust from NGVD +2.05
.06
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2580
2578
2576
2574
2572
9860
9880
9900
9920
9940
9960
9980
10000
10020
10040
Station (ft)

HEC-RAS Plan: Plan 01 River: DM19 Reach: Profile baseline Profile: PF 1

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)	
Profile baseline	2774	1012.00	2641.90	2643.86	2643.86	2644.66	0.020167	7.19	140.92	90.46	1.00
Profile baseline	2678	1012.00	2639.92	2641.86	2641.86	2642.59	0.016480	6.99	163.50	132.82	0.92
Profile baseline	2578	1012.00	2634.45	2638.99		2639.35	0.003594	4.82	209.95	64.34	0.47
Profile baseline	2540	1012.00	2633.32	2638.68	2636.62	2639.21	0.002881	5.88	172.24	72.12	0.46
Profile baseline	2520	Culvert									
Profile baseline	2500	1012.00	2633.00	2636.01	2636.01	2637.53	0.016380	9.90	102.20	64.35	1.01
Profile baseline	2405	1012.00	2630.14	2633.15	2633.09	2634.22	0.016536	8.31	123.48	55.97	0.96
Profile baseline	2250	1012.00	2626.98	2630.28	2630.28	2631.62	0.016755	9.27	110.19	46.98	0.98
Profile baseline	2130	1012.00	2624.00	2626.99	2626.98	2628.02	0.018886	8.14	124.27	60.32	1.00
Profile baseline	2056	1012.00	2623.00	2625.66	2625.66	2626.51	0.020458	7.42	136.31	81.23	1.01
Profile baseline	2014	1012.00	2622.00	2624.73	2624.73	2625.66	0.017239	8.15	134.02	71.27	0.97
Profile baseline	1952	1012.00	2620.00	2623.56	2623.56	2624.38	0.011822	7.94	153.49	107.14	0.83
Profile baseline	1891	1012.00	2619.00	2621.45	2621.41	2622.13	0.019903	6.64	152.39	105.72	0.97
Profile baseline	1791	1012.00	2617.00	2619.35	2619.35	2620.09	0.020971	6.90	146.65	100.43	1.01
Profile baseline	1705	1012.00	2615.00	2617.29	2617.29	2618.13	0.020197	7.35	137.63	83.30	1.01
Profile baseline	1614.9	1012.00	2613.00	2614.81	2614.81	2615.66	0.019987	7.40	136.75	81.17	1.00
Profile baseline	1602.9	1012.00	2610.00	2614.83		2615.03	0.001702	3.61	280.14	73.48	0.33
Profile baseline	1570	Lat Struct									
Profile baseline	1566.5	1022.00	2609.00	2614.46	2612.03	2614.93	0.002280	5.50	185.74	71.00	0.41
Profile baseline	1500	Culvert									
Profile baseline	1481	1022.00	2608.00	2611.03	2611.03	2612.56	0.016291	9.93	102.97	65.17	1.01
Profile baseline	1447	1022.00	2607.90	2610.82	2610.82	2611.88	0.009809	8.30	125.44	189.41	0.98
Profile baseline	1257	1022.00	2603.00	2605.85	2605.85	2606.71	0.009504	7.59	153.46	115.91	0.95
Profile baseline	1119	1022.00	2600.00	2603.09	2603.09	2603.92	0.008530	7.50	155.99	104.42	0.91
Profile baseline	918	1022.00	2595.00	2598.20	2598.20	2598.78	0.008361	6.33	197.76	197.40	0.86
Profile baseline	716	1022.00	2591.19	2593.82	2593.82	2594.52	0.011845	6.70	153.95	114.34	1.00
Profile baseline	645	1022.00	2588.78	2591.34	2591.34	2591.98	0.008972	7.19	199.69	156.65	0.92
Profile baseline	518	1022.00	2585.00	2587.54	2587.51	2587.99	0.009998	5.52	210.58	224.44	0.90
Profile baseline	317	861.00	2583.05	2584.65	2584.65	2585.31	0.019510	6.57	136.54	114.75	0.97
Profile baseline	197	861.00	2578.39	2580.92	2580.92	2582.00	0.018503	8.34	103.55	49.95	1.00
Profile baseline	0	861.00	2572.39	2575.70	2575.70	2576.83	0.018487	8.54	100.84	45.09	1.01

Scour Calculations

GALLOWAY WASH

Level 1 Analysis of Stream Degradation

Reference: ADWR, Flood Warning and Dam Safety Section, 1996.
State Standard 5-96: "Watercourse System Sediment Balance - Guideline 2:
Channel Degradation Estimation for Alluvial Channels in Arizona"

Assumptions: Channel reaches without major disturbances, such as dams and bridges.

Equations:

Ds = Dgs + Dlts

where:
Ds = total scour depth, in feet;
Dgs = general degradation, in feet;
Dlts = long term degradation, in feet;

For straight channel reaches:
Dgs = 0.157*Q100^0.4

For channel reaches with curvature:
Dgs = 0.219*Q100^0.4

Long term degradation:
Dlts = 0.02*Q100^0.6

Project Name: DM 19 **Location:** Galloway Wash

Input Data:
Q100 = 1025 cfs

Ds = 3.79 ft for straight channel
Ds = 4.79 ft otherwise

Recommended Scour Depth = 5.0 ft

Note: the minimum total scour depth, Ds, shall be 3 feet.

WASH A

Level 1 Analysis of Stream Degradation

Reference: ADWR, Flood Warning and Dam Safety Section, 1996.
State Standard 5-96: "Watercourse System Sediment Balance - Guideline 2:
Channel Degradation Estimation for Alluvial Channels in Arizona"

Assumptions: Channel reaches without major disturbances, such as dams and bridges.

Equations:

$$Ds = Dgs + Dlts$$

where:
- Ds = total scour depth, in feet;
- Dgs = general degradation, in feet;
- Dlts = long term degradation, in feet;

For straight channel reaches:

$$Dgs = 0.157*Q100^{0.4}$$

For channel reaches with curvature:

$$Dgs = 0.219*Q100^{0.4}$$

Long term degradation:

$$Dlts = 0.02*Q100^{0.6}$$

Project Name: DM 19 **Location:** Wash A

Input Data:

Q100 = 468 cfs

Ds = 2.64 ft for straight channel
Ds = 3.36 ft otherwise

Recommended Scour Depth = 4.0 ft

Note: the minimum total scour depth, Ds, shall be 3 feet.

Erosion Hazard Setback Calculations

GALLOWAY WASH

WOOD/PATEL

CIVIL ENGINEERS * HYDROLOGISTS * LAND SURVEYORS * CONSTRUCTION MANAGERS

Project:	*Desert Mountain Parcel 19*
Location:	*Phoenix, Maricopa County Arizona*
Date:	*16-Jun-16*
References:	Storm Water Policies & Standards, City of Phoenix (12/2013)

ADWR Erosion Hazard Setback Equations
State Standard for Watercourse System Sediment Balance
SSA 5-96, LMSA-5, September 1996

For straight channel reaches or reaches with minor curvature	*setback = 1.0(Q100)^0.5*
For channels with obvious curvature or channel bend	*setback = 2.5(Q100)^0.5*

The setback allowance is to be measured outward from the 100-year floodway
Or the top of the channel bank, whichever is greater

EROSION HAZARD SETBACK CALCULATIONS

Wash Name	Q100 Discharge (cfs)	ADWR Erosion Hazard Setback (EHS) (ft)
Galloway Wash		
Off-Site Wash	1025	80.0
(bend)		
Off-Site Wash	1025	32.0

Note:
The minimum EHS is 20' for Straight Channels

WASH A

WOOD/PATEL

CIVIL ENGINEERS * HYDROLOGISTS * LAND SURVEYORS * CONSTRUCTION MANAGERS

Project:	*Desert Mountain Parcel 19*
Location:	*Phoenix, Maricopa County Arizona*
Date:	*16-Jun-16*
References:	Storm Water Policies & Standards, City of Phoenix (12/2013)

ADWR Erosion Hazard Setback Equations
State Standard for Watercourse System Sediment Balance
SSA 5-96, LMSA-5, September 1996

For straight channel reaches or reaches with minor curvature	*setback = 1.0(Q100)^0.5*
For channels with obvious curvature or channel bend	*setback = 2.5(Q100)^0.5*

The setback allowance is to be measured outward from the 100-year floodway
Or the top of the channel bank, whichever is greater

EROSION HAZARD SETBACK CALCULATIONS

Wash Name	Q100 Discharge (cfs)	ADWR Erosion Hazard Setback (EHS) (ft)
Wash A		
Off-Site Wash	468	54
(bend)		
Off-Site Wash	468	22

Note:
The minimum EHS is 20' for Straight Channels

APPENDIX E

Electronic Versions:

PDF of DM 19 Preliminary Drainage Report

DDMSW DM 19 Existing & Proposed ZIP files

Existing & Proposed 2-year, 10-year & 100-year HEC-1 Files

Existing Wash A & Existing & Proposed Galloway Wash HEC-RAS Files

Electronic Files READ ME.txt
City of Scottsdale, Arizona
Project Name: PRELIMINARY DRAINAGE REPORT FOR DESERT MOUNTAIN PARCEL 19
PREPARED BY WOOD/PATEL

Date Prepared: 06/16/2016

LIST OF ITEMS ON CD:

PDF OF DRAINAGE REPORT FOR DESERT MOUNTAIN PARCEL 19

Computer Program Files
DDMSW BACKUP FILES SUBMITTED:

DM 19 EX.ZIP
DM 19 PROP.ZIP

HEC-1 FILES SUBMITTED:

PDR EXISTING MODELS HEC1
2-YEAR MODEL: DM19EX2.DAT
DM19EX2.OH1
10-YEAR MODEL: DM19EX10.DAT
DM19EX10.OH1
100-YEAR MODEL: DM19EX100.DAT
DM19EX100.OH1

PDR POST DEVELOPMENT MODELS HEC1
2-YEAR MODEL: DM19FT2.DAT
DM19FT2.OH1
10-YEAR MODEL: DM19FT10.DAT
DM19FT10.OH1
100-YEAR MODEL: DM19FT100.DAT
DM19FT100.OH1

HEC-RAS EXISTING CONDITION PROJECT Files SUBMITTED:
GALLOWAY WASH
DM19EXISTING.PRJ
DM19EXISTING.F01
DM19EXISTING.G01
DM19EXISTING.P01
DM19EXISTING.R01
DM19EXISTING.O01

WASH A
WASHA.PRJ
WASHA.F01
WASHA.G01
WASHA.P01
WASHA.R01
WASHA.O01

HEC-RAS POST-DEVELOPMENT PROJECT Files SUBMITTED:
GALLOWAY WASH
DM19_PD.PRJ
DM19_PD.F01
DM19_PD.G01
DM19_PD.P01
DM19_PD.R01
DM19_PD.O01

EXHIBIT 1

Vicinity Map

VICINITY MAP

N.T.S.

N

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WWW.WOODPATEL.COM
PHOENIX - MESA - TUCSON

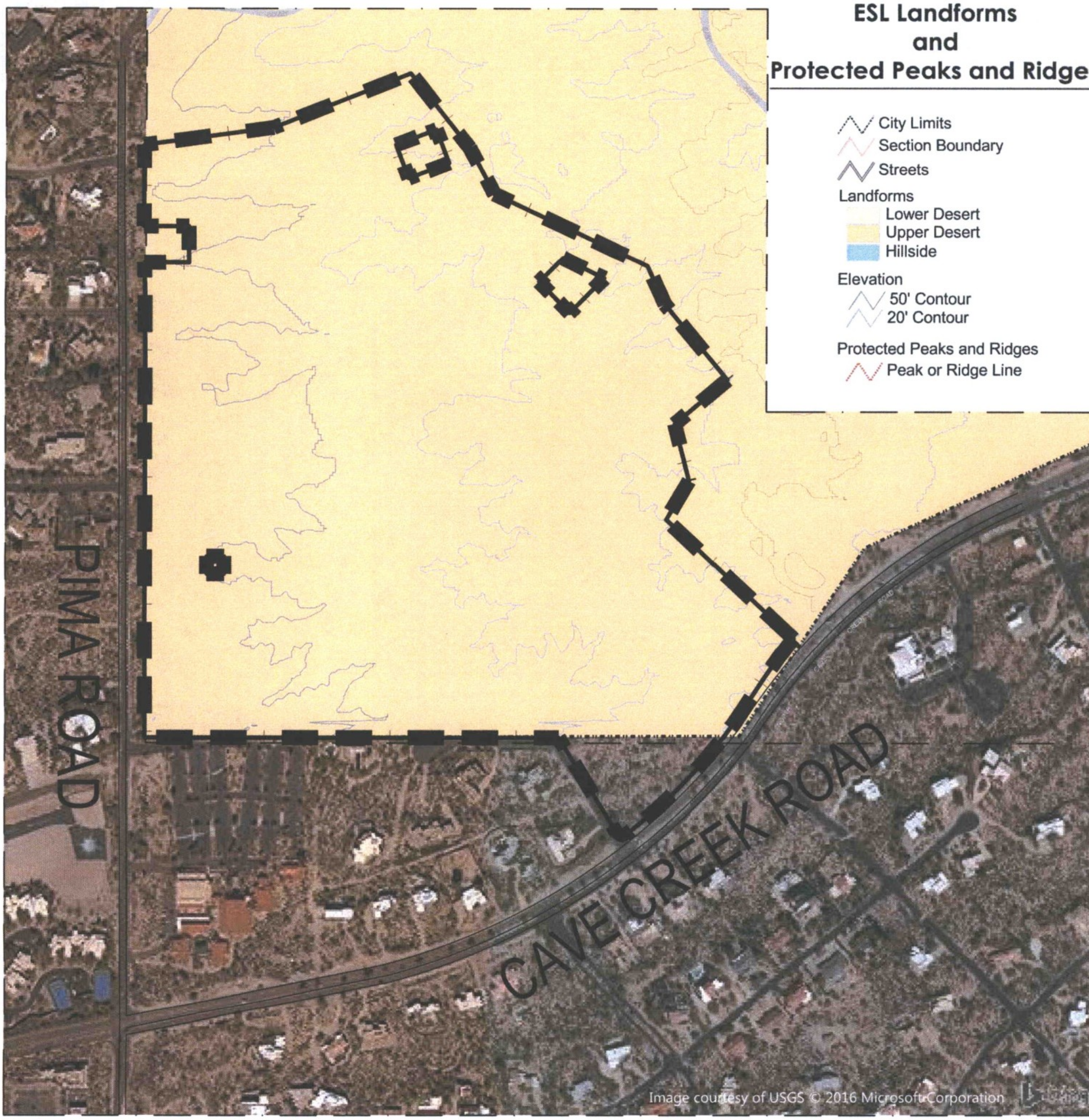
DESERT MOUNTAIN 19

EXHIBIT 1
VICINITY MAP

DATE: 06/15/2016	SCALE: N.T.S.	SHEET 1 OF 1
JOB NO.: 164434	DESIGN: RMH DRAWN: RMH	

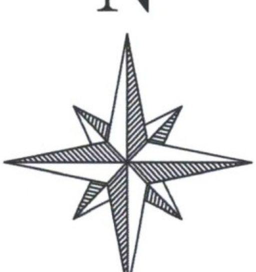
EXHIBIT 2

ESL Classification Map



VICINITY MAP

N.T.S.



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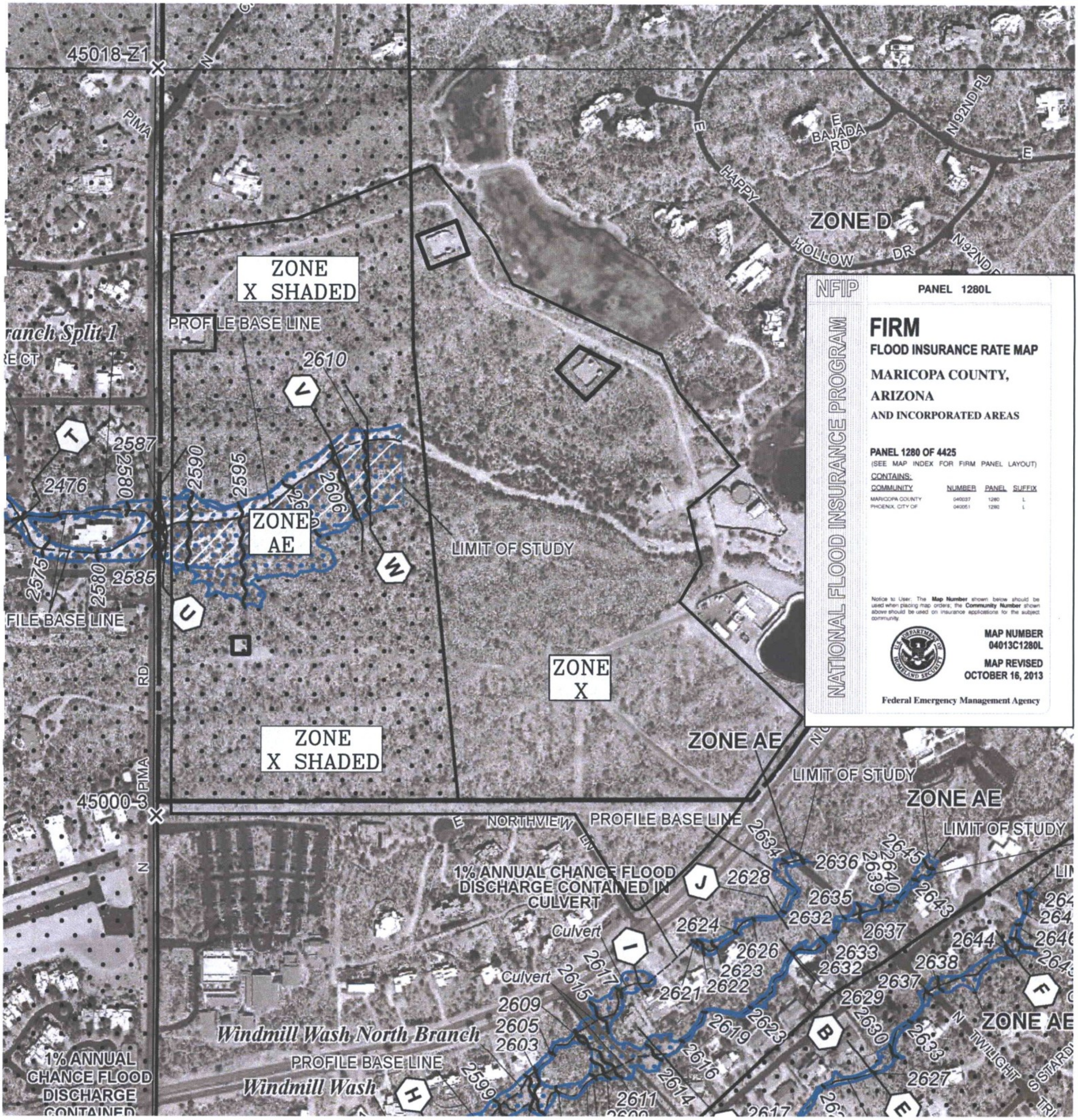
DESERT MOUNTAIN 19

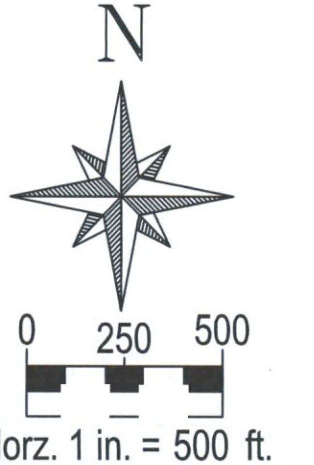
EXHIBIT 2
ESL Classification Map

DATE: 06/09/2016	SCALE: N.T.S.	SHEET 1 OF 1
JOB NO.: 164434	DESIGN: SES DRAWN: SES	

EXHIBIT 3

Flood Insurance Rate Map (FIRM)





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DESERT MOUNTAIN 19

EXHIBIT 3
FLOOD INSURANCE RATE MAP

DATE	SCALE	SHEET
6/15/2016	1" = 500'	1 OF 1
JOB NO.	DESIGN RMH	CHECK JCD
164434	DRAWN RMH	RFI #

EXHIBIT 4

Soils Classification Map

N

LEGEND

- NRCS MAP UNIT LEGEND
- SUB BASIN ID
- SOIL BOUNDARY
- SUB BASIN BOUNDARY

0 1200 2400

Horz. 1 in. = 1200 ft.

NOT

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EXHIBIT 4
SOILS CLASSIFICATION MAP

DATE	SCALE	SHEET
06/09/2016	1" = 1200'	1 OF 1
JOB NO.	DESIGN JCD	CHECK ???
164434	DRAWN SES	RFI #

EXHIBIT 5

Aerial Map

DESERT MOUNTAIN 19

EXHIBIT 5
AERIAL MAP

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DATE: 06/15/2016	SCALE: 1" = 500'	SHEET 1 OF 1
JOB NO.: 164434	DESIGN: RMH	
	DRAWN: RMH	

EXHIBIT 6

Developed Conditions Land Use Map

N:\2016\164434\Project Support\Reports\Drainage\PDR\Exhibits\4434-Exhibit 6-Developed Conditions Land Use Map.dwg

0 250 500

Horz. 1 in. = 250 ft.

N

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DESERT MOUNTAIN 19

EXHIBIT 6
POST DEVELOPMENT LAND USE MAP

DATE 6/15/2016	SCALE 1" = 500'	SHEET 1 OF 1
JOB NO. 164434	DESIGN SES DRAWN SES	CHECK JCD RFI #

EXHIBIT 7

Existing Conditions Sub-Basin HEC-1 Map

LEGEND

Symbol	Description
K1	SUB-BASIN
R-CPE4	CHANNEL ROUTING
DET OD	STORAGE ROUTING
CP E5	HYDROGRAPH COMBINING
DV B7	FLOW DIVERSION
——	DRAINAGE AREA BOUNDARY

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DESERT MOUNTAIN 19

EXHIBIT 7
EXISTING CONDITIONS
SUB-BASIN HEC-1 MAP

DATE: 06-16-2016	SCALE: VARIES	SHEET 1 OF 1
JOB NO.: 164434	DESIGN: SES	
	DRAWN: SES	

EXHIBIT 8

Developed Conditions Sub-Basin HEC-1 Map

LEGEND

C1	SUB-BASIN
R-CPE4	CHANNEL ROUTING
DET OD	STORAGE ROUTING
CP E5	HYDROGRAPH COMBINING
DV B7	FLOW DIVERSION
	DRAINAGE AREA BOUNDARY

N

0 500 1000

Horz. 1 in. = 500 ft.

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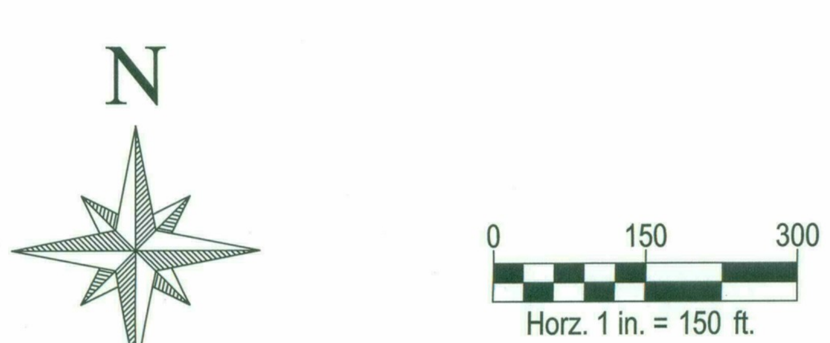
DESERT MOUNTAIN 19

EXHIBIT 8
DEVELOPED CONDITIONS
SUB-BASIN HEC-1 MAP

DATE: 06-16-2016	SCALE: 1" = 250'	SHEET 1 OF 1
JOB NO.: 164434	DESIGN: SES DRAWN: SES	

EXHIBIT 9

Existing Conditions Hydraulics Map



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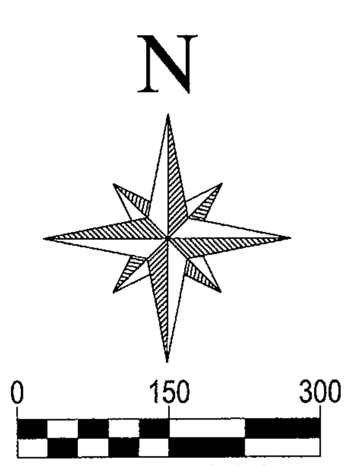
DESERT MOUNTAIN 19

EXHIBIT 9
EXISTING CONDITIONS
HYDRAULICS MAP

DATE: 06-16-2016	SCALE: 1" = 150	SHEET 1 OF 1
JOB NO.: 164434	DESIGN: SES DRAWN: SES	

EXHIBIT 10

Developed Conditions Hydraulics Map



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DESERT MOUNTAIN 19

EXHIBIT 10
DEVELOPED CONDITIONS
HYRAULICS MAP

DATE: 06-16-2016	SCALE: 1" = 150'	SHEET 1 OF 1
JOB NO.: 164434	DESIGN: JCD	
	DRAWN: JCD	

EXHIBIT 11

Preliminary Grading Plan

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DESERT MOUNTAIN PARCEL 19

PRELIMINARY GRADING PLAN

DATE	SCALE	SHEET
6/16/16	1" = 80'	1 OF 1
JOB NO.	DESIGN DC	CHECK DC
164434	DRAWN CD	RFI #

SCHOOL DISTRICT
Determination of Adequate Facilities

City of Scottsdale Project Number: 279 -PA- 2016

Project name: Desert Mountain - Parcel 19

Project Location North of NEC Pima Road & Cave Creek Road

Applicant Name: John Berry Phone: (480) 385-2727

Applicant E-mail: JB@berryriddell.com Fax: (480) 385-2757

School District: Cave Creek Unified

I, Kent Frison hereby certify that the following determination has been made in regards to the Referenced project:

- [x] The school district had adequate school facilities to accommodate the projected number of additional students generated by the proposed rezoning within the school district's attendance area; or
- [ ] The school district will have adequate school facilities via a planned capital improvement to be constructed within one year of the date of notification of the district and located within the school district's attendance area; or
- [ ] The school district has determined an existing or proposed charter school as contracted by the district can be provide adequate school facilities for the projected increase in students; or
- [ ] The applicant and the school district have entered into an agreement to provide, or help to provide, adequate school facilities within the school district's attendance area in a timely manner (a copy said agreement is attached hereto); or
- [ ] The school district does not have adequate school facilities to accommodate projected growth attributable to the rezoning.

Attached are the following documents supporting the above certification:

- [ ] Maps of the attendance areas for elementary, middle and high schools for this location.
- [ ] Calculations of the number of students that would be generated by the additional homes.
- [ ] School capacity and attendance trends for the past three years.

Or;

I, ______________________, hereby request a thirty (30) day extension of the original discussion and response time.

Kent Frison (signature)
Superintendent or Designee

8/15/16
Date

Planning, Neighborhood and Transportation Division

7447 E. Indian School Road, Suite 105, Scottsdale, AZ 85251 ♦ Phone: 480-312-7000 ♦ Fax: 480-312-7088

A Work Plan for National Register of Historic Places Eligibility Testing at AZ U:1:433(ASM), Desert Mountain Parcel 19 Northeast of Pima and Cave Creek Roads, Scottsdale, Maricopa County, Arizona

Prepared for:
DM 19, LLC

Prepared by:
Mark R. Hackbarth, M.A., RPA

Submitted by:
Erick Laurila, M.A., RPA

LOGAN SIMPSON

51 West Third Street, Suite 450
Tempe, AZ 85281

September 13, 2016
Submittal 2

Technical Report No. 165088b

ABSTRACT AND MANAGEMENT SUMMARY

Report Title	A Work Plan for National Register of Historic Places Eligibility Testing at AZ U:1:433(ASM), Desert Mountain Parcel 19 Northeast of Pima and Cave Creek Roads, Scottsdale, Maricopa County, Arizona
Agency/ Legal Nexus	City of Scottsdale (COS) Revised Code, Chapter 46, Article VI.
Project Location	City of Scottsdale, Maricopa County, Arizona
ARI Accession No.	To be obtained
Project No.	165088
City of Scottsdale Project No.	Case 17-ZN-2016
Report Date	August 1, 2016
Project Description	DM19, LLC is proposing to develop a 91-acre property for housing near the intersection of Cave Creek Road and Pima Road in Scottsdale, Maricopa County, Arizona. Construction of the housing development cannot avoid a previously recorded archaeological site, AZ U:1:433(ASM). The site's location on private property was recognized during an archaeological survey conducted before DM19, LLC purchased the property (Hill 2016). The survey reported that a formal recommendation of eligibility for AZ U:1:433(ASM) could not be made based on surface observations. An eligibility recommendation would be possible only following the implementation of a National Register of Historic Places (NRHP)-eligibility testing program. Therefore, DM 19, LLC requested Logan Simpson prepare a work plan to assess the NRHP-eligibility status of AZ U:1:433(ASM). The proposed housing development is subject to compliance with the COS Revised Code, Chapter 46, Article VI and compliance with the Arizona Burial Law (A.R.S. §41-865). This plan provides a research design and plan of work for conducting NRHP-eligibility testing of AZ T:12:19(PG) and complies with the Arizona Burial Law (A.R.S. §41-865).
Location	Within portions of the NW¼ and the N½ of the SW¼ of Section 31, T6N, R5E, Gila and Salt River Baseline and Meridian (USGS 7.5' Quadrangle Cave Creek, Ariz., 1965/1981).
Site UTM	Easting / Northing 418035 / 3743030 418065 / 3743030 418065 / 3743004 418035 / 3743004
Land Ownership	Private
Number of Sites	1
Eligibility Status	AZ U:1:433(ASM) has not been evaluated
Human Remains	In the unlikely event that human remains are discovered during Phase I testing, Logan Simpson will comply with the stipulations of the Arizona Burial Law (A.R.S. §41-865). All ground-disturbing work within 30 m (98 ft) of the discovery will cease and Logan Simpson will secure the remains from further disturbance. Logan Simpson will contact the City of Scottsdale and the Arizona State Museum to alert them of the discovery and request recommendation for further work. Following

discovery, all human remains and associated funerary objects will be treated with respect and dignity at all times and will remain protected and covered until consultation can be undertaken with concerned Tribes to ensure that appropriate procedures for the recovery, treatment, and disposition of the remains, associated funerary objects, and objects of cultural patrimony are implemented.

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SECTION I. INTRODUCTION

DM19, LLC is proposing to construct a 91-acre housing development near the intersection of Pima Road and Cave Creek Road in north Scottsdale, Maricopa County, Arizona (Figure 1). The housing development, Desert Mountain Parcel 19 (Case 17-ZN-2016), will affect one previously reported site on private land, AZ U:1:433(ASM), a prehistoric Hohokam artifact scatter dating to A.D. 200–1500. The private land is subject to City of Scottsdale (COS) regulations that implement the COS Revised Code, Chapter 46, Article VI and in compliance with the Arizona Burial Law (A.R.S. §41-865).

The area of potential effects (APE) is located in Scottsdale, Maricopa County (Figure 2). The site is located within portions of the NW¼ and the N½ of the SW¼ of Section 31, T6N, R5E, Gila and Salt River Baseline and Meridian (USGS 7.5' Quadrangle Cave Creek, Ariz., 1965/1981). Currently, the site is situated in open desert adjacent to an existing storage yard. The proposed site area measures approximately 30 m by 17 m, encompassing 0.13 acres of private land.

Based on a 2016 survey of the proposed land transfer property (Hill 2016), one previously recorded prehistoric site, AZ U:1:433(ASM), is situated within the proposed APE. An archaeological records search completed before the archaeological survey revealed that the site originally was reported during an 8-acre survey (Lausten 2004). The site has not been evaluated for eligibility for listing in the National Register of Historic Places (NRHP).

Logan Simpson has prepared this testing work plan at the request of DM19, LLC to evaluate the NRHP-eligibility of site AZ U:1:433(ASM). The testing work plan is consistent with the stipulations of the Secretary of the Interior's Standards and Guidelines for Archaeological Documentation (Federal Register, 49 FR 44734–37) and takes into account the Advisory Council on Historic Preservation's 1980 publication, *Treatment of Archaeological Properties: A Handbook.*

The testing work plan includes the following:

- An overview of previous cultural resource studies and an assessment of prehistoric cultural development in the foothills of north Scottsdale.
- A research design outlining the research themes and questions that will guide the NRHP-eligibility testing efforts and specify the data requirements to address these questions.
- A work plan specifying the NRHP-eligibility testing methods to be employed.
- The analytical methods that will be used to evaluate the site.
- The work plan also provides a schedule for the expected work and the preparation of a preliminary report draft and consultation with the COS.

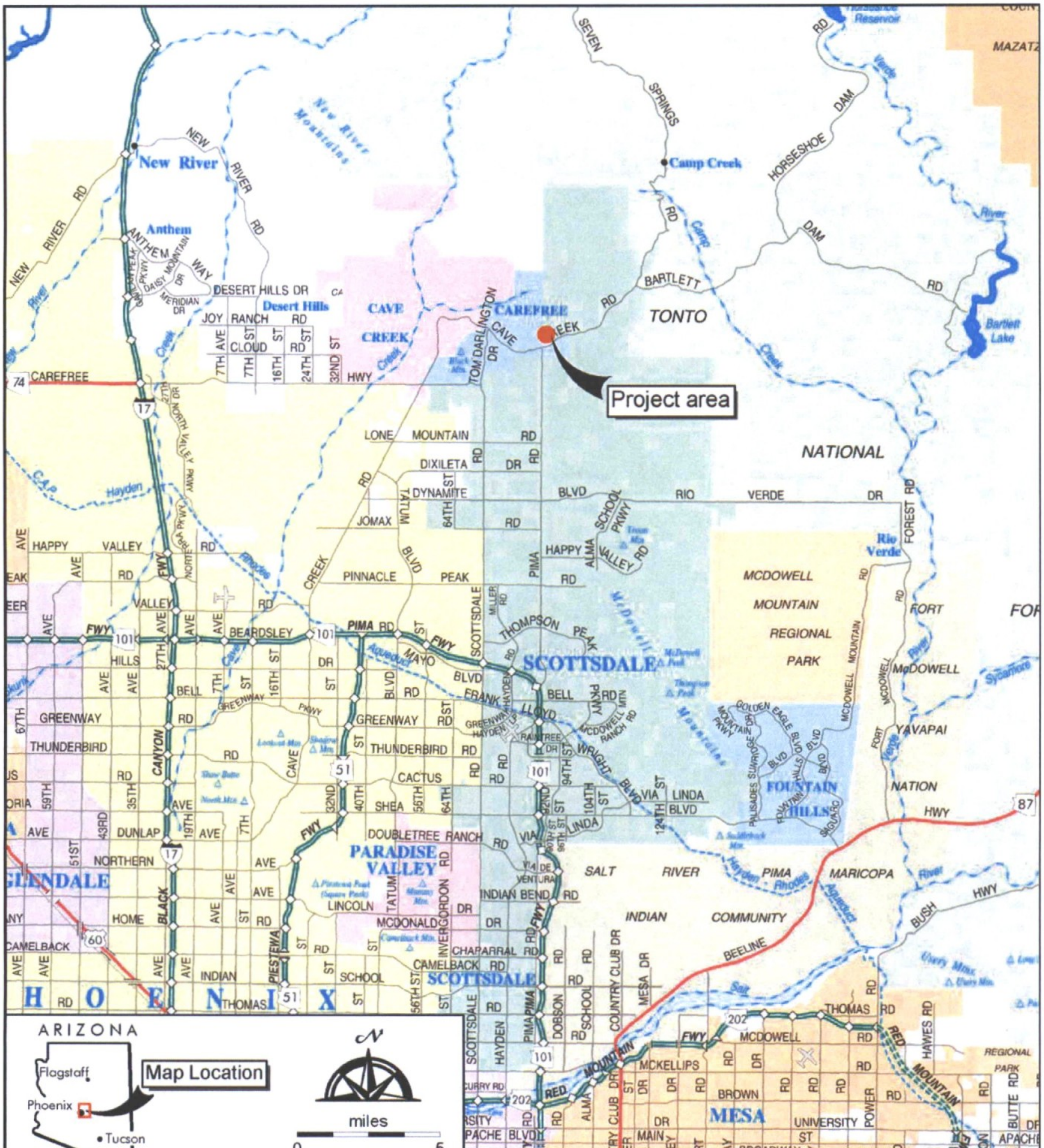

Figure 1. Location of the DM19, LLC project area.

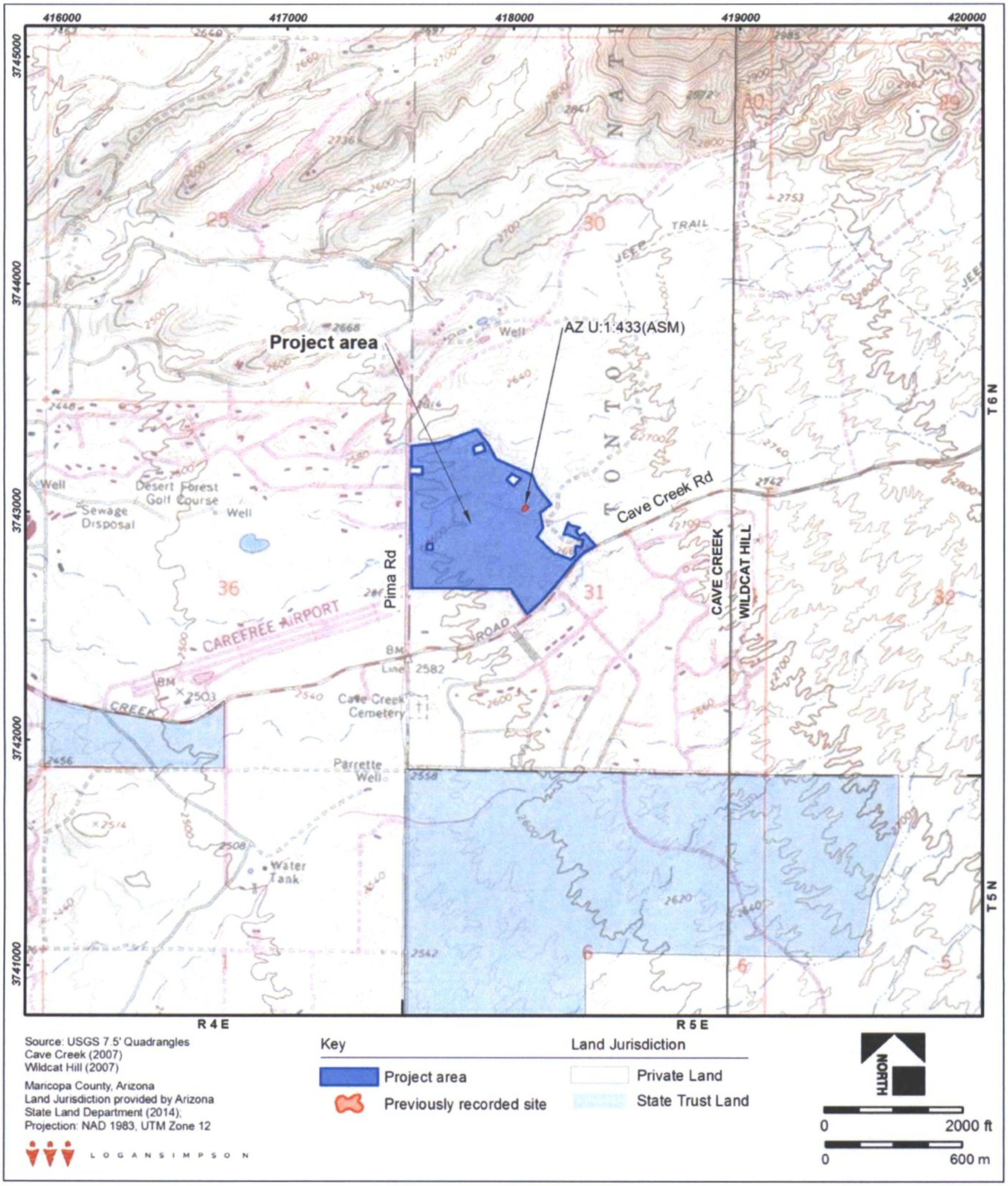

Figure 2. Location of AZ U:1:433(ASM) within DM19, LLC project area.

Section II. Project Impacts

DM19, LLC requested Logan Simpson prepare this work plan for NRHP-eligibility testing of AZ U:1:433(ASM) within the proposed housing development. NRHP-eligibility testing investigations will involve site mapping and photographic documentation, in-field analysis of selected surface artifacts, and backhoe test trench excavations totaling approximately 3 percent of the site area to assess subsurface conditions and identify subsurface features, if present. The test excavations will provide a basis for determining the location, integrity, and distribution of surface artifacts and subsurface cultural features, if present.

Based on the results of the NRHP-eligibility testing investigations, Logan Simpson may propose no further data recovery excavations if intact cultural deposits are absent. Alternatively, data recovery excavations may be recommended if intact features and cultural deposits are found that have the potential for yielding significant archaeological information rendering the site eligible for listing in the NRHP under Criterion D. A data recovery treatment plan will be needed if subsurface cultural deposits are identified that qualify the site for listing in the NRHP.

Section III. Natural and Cultural Environmental Contexts

Environmental Setting

The archaeological site is situated at an approximate elevation of 2,640 ft above mean sea level (amsl) within the Basin and Range Physiographic Province of central Arizona, a zone of parallel fault-block mountain ranges that alternate with sediment-filled basins (Chronic 1983). Topographic features surrounding the project area include Lone Mountain approximately 1.5 miles to the northeast and Black Mountain approximately 3 miles to the southwest.

The local geology consists of pre-Cambrian granite and metasedimentary rocks and Cenozoic alluvial deposits on a Pleistocene-age alluvial fan (Reynolds 1988). The site is situated on a landform developed through erosion and weathering of parent material from the mountain bedrock that provides sediment to bajadas (alluvial fans) surrounding the mountains. Washes that descend the hill slopes deposit increasingly finer-grained materials farther away from mountains as the erosive energy of the wash dissipates across level surfaces. Water flowing down the alluvial fan near AZ U:1:433(ASM) joins Cave Creek and eventually the Salt River. The site is on a dissected upland adjacent to Galloway Wash, a Pleistocene-aged alluvial fan intergraded with bajada deposits. Water was previously available from seasonal seeps and springs approximately 2 mile to the northwest in Galloway Wash (Schoonover 2002).

Temperature in the desert region is one of extremes; highs of 120° F are recorded in the hottest summers and occasional below-freezing temperatures in the winters (Seller and Hill 1972). The region has a bimodal distribution of precipitation almost equally divided between summer and winter. Winter storms cover broad fronts and provide gentle rains that may continue for days, which allow the water to soak into the ground. In contrast, the summer monsoon often brings brief, violent, localized storms that deposit large amounts of rain in a short period of time and create flash floods (Brown 1982).

The region is part of the Lower Colorado River Valley subdivision of the Sonoran Desertscrub biotic community (Turner and Brown 1994). Vegetation found in the area consists of paloverde and ironwood trees, plus cactus and other xeric-adapted species, e.g., saguaro, cholla, prickly pear, creosote bush, and bursage. Riparian species—reeds, cattail, desert willow, and sycamore—previously occurred along the Cave Creek floodplain and near springs (Brown 1982).

Animals that live in the Sonoran desert tend to be small and adapted to extreme heat and limited moisture regimes. Many of the small mammals, e.g., mice, rats, ground squirrels, have physical adaptations that help conserve water. Larger mammals found in the region, e.g., cottontails, black-tailed jackrabbits, radiate heat through special anatomical features. Other animals have adapted to the environment by remaining inactive in the heat of the day, e.g., coyotes, fox, and bobcat. The largest mammals in the area are deer and bighorn sheep, which require a plentiful supply of water (Rea 1997).

Cultural Setting

The earliest confirmed occupations in the Southwest during the Paleoindian period date from approximately 9500–8500 B.C., but very few archaeological remains from this period have been detected in the Phoenix Basin, which implies intermittent and brief occupations. Recovered artifacts mostly consists of isolated surface finds of Clovis points (Crownover 1994; Huckell 1982; North et al. 2004, 2005) and a few buried megafaunal kill sites in alluvial contexts with associated lithic assemblages (Gaines et al. 2009; Haury et al. 1994; Haynes 1980, 2011). Based on these scant data, the Paleoindian period in the region appears to be characterized by dispersed mobile groups that primarily hunted now-extinct megafauna and possibly supplemented their diet with collected wild plants (Waters 1986). Likely most Paleoindian period remains are either buried beneath substantial Holocene alluvial deposits or have been destroyed as a result of millennia of consistent erosion.

A period of climatic amelioration set in around 8500 B.C., triggering substantial changes in subsistence practices. This period (8500 B.C.–A.D. 1), known as the Southwestern Archaic, is characterized by small, mobile groups that exploited a variety of plant resources and hunted medium-sized to small game. This subsistence pattern persisted through the Early Archaic (8500–5000 B.C.) and Middle Archaic (5000–1500 B.C.) periods. The Archaic period is largely characterized by a trend of cyclical migratory patterns that allowed mobile groups to procure plant and animal resources that were available in various upland and lowland environmental settings at different times of the year. An Early Archaic habitation, including two non-contemporaneous pit structures and several pits, was recently identified in the western Phoenix Basin near the confluence of the Salt, Gila, and Agua Fria rivers (Graves et al. 2009). This site has provided the only solid evidence published to date for seasonal habitation during the Early Archaic period in the Phoenix basin. Unfortunately, few artifacts were found in association with these features, which limited the project team's ability to interpret subsistence and land use patterns. Also, sites with extensive Early, Middle, and Late Archaic period components—including Middle and Late Archaic period residential features and thousands of extramural-pit features—were recently investigated along the Agua Fria River in the western Phoenix Basin (Hall and Wegener 2015).

The subsistence economy during the Early and Middle Archaic periods was predicated on hunting and plant-processing, especially in areas along primary or secondary drainages, which may have drawn these mobile groups to locations along floodplains that were suitable for the later development of agriculture (Roth and Freeman 2008). During the Late Archaic/Early Agricultural period (1500 B.C.–A.D. 1), mobile groups increasingly established occupations in locations that could sustain plant cultivation along those drainages. Late Archaic/Early Agricultural period groups residing in these areas practiced low-level maize horticulture and constructed substantial storage facilities, resulting in semi-sedentary settlements (Huckell 1995; Mabry 1998). Starting around 500 B.C., several large and seasonally occupied villages with communal structures and small irrigation networks were established along the Santa Cruz River floodplain in the Tucson Basin (Mabry 1998). These villages were supported by maize agriculture and collection of riparian resources, but seasonal exploitation of upland bajada resources persisted.

Few sites with Late Archaic/Early Agricultural period components have been documented in the Phoenix Basin. Moreover, those few sites produced little or no evidence for crop cultivation. Recent investigations at multiple sites with Late Archaic/Early Agricultural period components in the western Phoenix Basin produced no evidence for crop cultivation (Hall and Wegener 2015). Two recently investigated Late Archaic/Early Agricultural period sites along Queen Creek also produced no evidence for crop cultivation, although it is possible that groups in the Queen Creek area actively encouraged mesquite growth (Wegener and Ciolek-Torrello 2011). Based on this limited evidence, it appears that Late Archaic/Early Agricultural period inhabitants in the Phoenix basin did not invest heavily in food production; rather, these groups appears to have maintained a mobile subsistence strategy focused on procurement of wild plant resources, such as cactus and mesquite.

The succeeding Early Formative period (A.D. 1–750) is characterized primarily by the introduction and early development of development of semi-sedentary agrarian villages and early ceramic container technologies (Garraty 2011; Lindeman and Wallace 2004). The Early Formative period can be considered a period of transition, during which the reliance on maize farming increased throughout southern and central Arizona (Mabry 2000). In specific areas—such as the Tucson Basin, where both Late Archaic/Early Agricultural and Early Formative villages have been recorded—settlement locations reflect a general continuity from the Late Archaic/Early Agricultural period settlement pattern. In the Phoenix Basin, however current understanding of the initial phase of the early Formative period in the Salt-Gila River area (Red Mountain phase; A.D. 1–450) is limited to data derived from a few sites (Mabry 2000). The Red Mountain phase is evidenced by the site components at Pueblo Patricio (Cable and Doyel 1987; Henderson 1995), La Escuela Cuba (Hackbarth 1992), the Red Mountain Site (Morris 1969), Finch Camp along middle Queen Creek (Wegener and Ciolek-Torrello 2011), and various briefly occupied limited-activity sites (Hackbarth 1998; Kenny 1987; Phillips et al. 2001; Rogge 2009). The evidence from these sites suggests habitation in small hamlets composed of groups of pit houses, many of which included flexed inhumations beneath the house floors (Mabry 2000).

The latter half of the Early Formative encompasses the Vahki, Estrella, Sweetwater, and Snaketown, collectively defined as the Pioneer period, A.D. 450–750 (Gladwin et al. 1937; Haury 1976). The date range for these phases is based on limited excavation and artifact data and is best characterized as a continuation of the broad regional Early Formative period cultural development in the Phoenix Basin. Irrigation was developed in the Phoenix Basin by the Vahki phase (A.D. 450–650/700), which opened up farming opportunities on the terraces above the floodplain (Henderson 1989; Woodson 2010:13–14); however, some archaeologists have argued that irrigation canals were not constructed on the terraces before the Snaketown phase (Doyel 1993; Wilcox and Shenk 1977). These phases also witnessed the earliest painted pottery traditions, starting with a red ware tradition during the Vahki phase and development of the Hohokam Red-on-buff/gray tradition during the later Estrella, Sweetwater, and Snaketown phases. In addition, Abbott (2009:543, 546) has shown that a specialized craft production community located in the eastern South Mountain area began manufacturing and exporting plain ware jars on a large-scale to communities throughout the Phoenix Basin during the Vahki phase, which persisted through the end of the early Sacaton phase around A.D. 1020. Other characteristics of these phases include settlements with plaza-oriented layouts, the construction of square Type P-4 houses (first identified at the village of Snaketown in the middle Gila River valley; Gladwin et al. 1937; Haury 1976:68; Wilcox et al. 1981), and a mortuary pattern that incorporated a combination of pit or trench cremations and flexed or semiflexed inhumations (Doyel 1991).

Recent assessments have suggested that the suite of cultural traits and developments that marked the beginnings of the regional Hohokam cultural tradition does not appear to have been fully crystallized until the Snaketown phase or possibly as late as the middle of the Gila Butte phase of the Colonial period around A.D. 750 (Dean 1991; Doyel 1991; Wallace et al. 1995; Wilcox 1979; Wilcox and Sternberg 1983). Elements of an integrated cultural tradition started as early as A.D. 700 during the Snaketown phase (Doyel 1991) or by the end of that phase (Wallace et al. 1995), although a much earlier origin beginning in the Vahki phase originally was proposed (Gladwin et al. 1937). These traits reflect the development of a widely shared and integrated belief and ritual system and the inception of a regional interaction system, including widespread adoption of public architectural forms, such as ballcourts, and development of a mortuary cremation complex, large-scale irrigation agriculture, and naturalistic iconography.

During the Pre-Classic period (A.D. 750–1150), the Phoenix Basin was the primary hub of Hohokam regional development and expansion. The emerging Hohokam cultural pattern during the Snaketown phase of the Pioneer period was manifested by continued construction of canals (Wilcox and Shenk 1977) and urn burials (Haury 1976). Trash mounds first appeared during this span, and one at Snaketown was capped with caliche, possibly a precursor to the later platform mounds (Haury 1976). The earliest evidence of Hohokam occupation or interaction is first identified outside the Phoenix Basin during this span in locations such as the lower Verde River, Queen Creek area, San Pedro River valley, and Tucson Basin (Crown 1991). Dry-farming methods became common at sites in these peripheral areas (bajadas), which documents a trend of population growth and expansion.

The first half of the Pre-Classic, the Colonial period (A.D. 750–950), is characterized by the establishment of large villages throughout much of central and southern Arizona. Habitations typically consisted of courtyard groups, which generally include several houses surrounding on a common living or workspace (Howard 1985; Wilcox et al. 1981). Small hamlets and villages typically consisted of an informal arrangement of one or two courtyard groups, with associated trash mounds, cemetery areas, and roasting pits arrayed around the margins of courtyards. Larger villages are characterized by formal arrangements of courtyard groups surrounding one or more large plazas and communal cemeteries (Howard 1985; Wilcox and Sternberg 1983). The introduction of ballcourts in some larger villages by the early Colonial period (Gila Butte phase) indicates the beginnings of hierarchical site differentiation and intercommunity integration. Ballcourts increased in number, becoming the principal form of public architecture during the Colonial period.

The late Colonial period (Santa Cruz phase) and subsequent Sedentary period (also known as the Sacaton phase; A.D. 950–1150) were marked by substantial growth in the number and size of Hohokam settlements and an expansion of the many canal networks in the Phoenix Basin (Doyel 1991). Densely populated villages with Hohokam-style village layouts proliferated throughout much of present-day Arizona. By the Sedentary period, ballcourts were represented not only in the Phoenix Basin but throughout much of central and southern Arizona. The extensive ballcourt village system likely integrated large portions of Arizona into an exchange network that moved commodities between settlements and possibly served to diffuse intercommunity strife. The number of villages, hamlets, and farmsteads also increased along peripheral drainages, such as Queen Creek. Non-irrigation agricultural intensification and the extensive use of agricultural rock pile fields in upland and bajada locations for cultivation of xerophytic crops (agave and cholla) developed at least by the late Sedentary or early Classic periods (Fish et al. 1992; Masse 1991). Pre-Classic sites have been found west of AZ U:1:433(ASM) (Schoonover 2002).

The Pre-Classic trend of increasing habitation size and outward expansion of Hohokam traits became untenable by the latter half of the Sedentary period (after ca. A.D. 1060). During the latter Sedentary period, the regional system of interconnected ballcourt villages collapsed (Abbott 2006). The collapse may have been prompted by a period of persistent agricultural shortfalls related to a multiyear episode of downcutting and widening of the Salt and Gila river channels, causing unstable and unpredictable flow regimes for canal irrigation (Waters and Ravesloot 2001). Hence, the latter part of the Sacaton phase (ca. A.D. 1060–1150) appears to have been a time of economic and demographic disruption, leading to widespread migration and reorganization. Warfare or low-level conflict and associated dislocations have been posited as a contributing cause of the collapse of the ballcourt system (Rice and LeBlanc 2001). Other possible problems contributing to the system collapse is heavy flooding and arroyo-cutting resulting in reduced access to resources, as reported at various sites in the Tucson Basin during the Sedentary period (Doelle and Wallace 1986) and along Cave Creek during the late Sedentary and early Classic period (Phillips 1998; Schaafsma and Briggs 2007).

By the beginning of the early Classic period (Soho phase; A.D. 1150–1300), change in the structure of Hohokam communities is evidenced by a shift in burial practices from cremations to inhumations, a more localized exchange network (Abbott 2000), and the development of new domestic and public architectural forms, including post-reinforced and adobe-walled structures and walled compounds (Bayman 2001;

Crown 1991). Construction of large platform mounds in the more prominent villages started during the late Sedentary period. Platform mounds represented an important public component of a new community organization pattern manifested not only in the Phoenix Basin but in other settlements over a much wider region, including the Tonto and Tucson basins and lower San Pedro River valley. The platform mound apparently evolved in function from an initial nonresidential, special-purpose facility to a residence used by a specific residential group (Gregory 1991). A study of the Pueblo Grande platform mound in Phoenix challenged the idea that the late Classic period (Civano phase; A.D. 1300–1450) platform mounds provided full-time residences for elite households, and it further supports the proposition that power was diffuse and non-centralized (see Downum and Bostwick 2003).

A hierarchy of settlement types emerged in conjunction with the Classic-period community restructuring. These included villages with only one or a few walled residential compounds; villages with one or more platform mound compounds as well as other compounds; and large settlements, such as Casa Grande with a platform mound and numerous compounds and a Great House (Wilcox 1991). These various Classic period settlements that formed the site hierarchy comprised distinct and socially integrated canal communities: sociopolitical organizations consisting of a number of integrated villages that included one or more platform mound villages serving as administrative centers and distributed along a single canal or canal system (Abbott 2000; Howard 1987). North of the Salt River valley the Classic period is characterized by masonry pueblo architecture (Bruder 2002; Cox 2005), possible evidence of a culture distinct from the Hohokam.

The decline of buff wares and replacement with polychromes in the later phase may represent a change in religious belief systems (Crown 1994). People throughout much of central and southern Arizona may have very deliberately procured and used Roosevelt Red Ware as a means of expressing a tangible symbolic affiliation and association with a new and growing religious or ritual tradition. Crown (1994) makes a credible argument that Roosevelt Red Ware pottery and the motifs depicted in them expressed specific religious ideas and concepts, thus communicating the pottery users' participation in a regional movement, which she labeled the "Southwestern Cult." Deteriorating social or environmental conditions during the late Soho phase or Civano phase could have stimulated involvement in a cult and religious movement (Abbott 2000:202–206; Crown 1994). The pan-regional "Southwestern Cult" functioned partially to mediate human relationships with the natural and supernatural realms (Crown 1994). This widespread belief system helped integrate migrant communities and facilitate aggregation of previously unaffiliated families and groups. Cult beliefs were partly expressed through painted designs on the elaborate polychrome serving vessels.

Roosevelt Red Ware production was not centralized in one a few locations, according to Crown (1994), as was the case with buff wares during the Preclassic period, but likely manufactured on a small scale for low-level exchanges, suggesting participation among a decentralized and extensive network of potters.

The period of Hohokam decline during the late Classic period has long been a focus intense interest and debate among archaeologist. Sires (1983) tentatively defined the Polvorón phase to define a terminal Classic period occupation represented by dispersed ranchería-style settlements consisting of individual pit structures arranged in clusters (Doyel 1995). This phase might represent a period of abrupt change in community organization and integration following the collapse of the late Classic platform mound communities after a period of drought and flooding destroyed the canal systems (Doyel 1995; Nials et al. 1989). However, researchers continue to debate whether the phase is valid. Chenault (2000), for example, argues "… that not to separate Polvorón from the Civano phase obscures variability and change at the end of the cultural sequence that may relate to the nature and causes of the Hohokam collapse." Henderson and Hackbarth (2000), on the basis of overlapping dates between the Civano and Polvorón phases, argue instead that the characteristics of the latter are not temporally discrete but a reflection of cultural variability within the Classic period.

Protohistoric and Historic

Archaeological evidence from the Salt River Valley demonstrates that the region was largely abandoned after the Classic period. During the protohistoric period the area was used as a resource zone and travel corridor. Historic groups to the north of the valley were Yavapai (Gilpin and Phillips 1999) and Apache to the east and northeast (Gifford 1936). Both groups tended to be mobile and relied upon a mix of hunted and collected resources with some bands also planting small fields of domestic crops. Gifford (1932, 1936) considered the Yavapai most closely aligned in terms of cultural traits with the upland Yuman Walapai and Havasupai of northwestern Arizona.

By the time of Spanish contact in the mid to late sixteenth century, most *Akimel O'odham* (Pima) settlements were heavily concentrated the middle Gila River valley and relied upon irrigation agriculture along with collection of plant resources and hunting (Spicer 1962). The *Akimel O'odham* are considered the descendants of the Hohokam in the Phoenix Basin (Doyel 1991; Haury 1976). Loendorf and colleagues (2013:279–281) offer multiple lines of archaeological evidence for continuity in economic practices, settlement patterns, and house-construction techniques from the late prehistoric through early historic periods in the middle Gila River valley, making a strong case for Hohokam-O'odham continuity. Likely the prehistoric-historic transition is marked by some combination of continuous occupation and limited inward and outward migration by individuals or families seeking new socioeconomic opportunities. Historic Pima settlements were small rancheriás composed of individual households living near fields close to the river and reliant upon small-scale irrigation ditches. During the historic period, the Pima and their allies the Maricopa (*Pee Posh*) provided crucial resources to immigrants along the Gila Trail as early as 1848 (DeJong 2007, 2009). Pima and Maricopa migrants from the Gila River expanded into the Salt River Valley in the 1870s after a military base, Fort McDowell, was established on the Verde River to disrupt Apache raiding parties traveling through the Salt River Valley.

The protohistoric antecedents of the Yavapai and Apache migrated seasonally between different environmental zones in the uplands, as suggested by the temporary nature of the occupied sites north and northeast of the Salt River (Wright 2002). Small, triangular projectile points used during the protohistoric period are similar to point styles the historic Yavapai used (Moreno 2002). Likewise, ceramics associated with the Yavapai are Tizon Brown Ware, a paddle-and-anvil, hand-smoothed, sand-tempered, and poorly oxidized vessel type that has continuity with the protohistoric and historic occupation. Surfaces of Tizon ceramics often exhibit distinctive wiping marks similar to protohistoric ceramics (Dobyns and Euler 1958; Euler and Dobyns 1985; Pilles 1981; Whittlesey and Benaron 1997). Yavapai sites have been found in the uplands north and east of AZ U:1:433(ASM).

Historic Euro-American

Spanish Colonial (1591–1821) and Mexican Republic (1821–1848) influence ostensibly extended into the Salt River Valley. In reality, however, Euro-American settlement near the project area did not start in earnest until the nineteenth century when gold was discovered in Arizona (Keane and Rogge 1992). Placer deposits at Rich Hill near Wickenburg—the first gold strike in the central Arizona Territory—and later at Lynx Creek near Prescott, were the reason miners entered the areas northwest of Phoenix (Johnson 1972). Farms and ranches in the Salt River Valley were established to feed the prospectors, beginning with the farms that were irrigated by a prehistoric canal that was reopened in 1867 by the Swilling Irrigating and Canal Company (Zarbin 1997). The influx of miners and ranchers created conflict with the indigenous Yavapai and Apache as their traditional lands and water sources were usurped. Raids and counter raids made life in the region tenuous and led to the miners' demand that the military provide protection. In the late 1860s a sizable military presence was established in Arizona to engage the Indians, but it was not until 1871 that the Apache and Yavapai were defeated, opening the Salt River Valley to extensive Anglo and Hispanic farming.

SECTION IV. PREVIOUS RESEARCH

Thirty-one previous archaeological investigations have been conducted within one mile of AZ U:1:433(ASM) (Hill 2016). Six of the previous surveys have occurred wholly or partially within a 91-acre parcel owned by DM19, LLC (Davis 2003a, 2003b; Lausten 2004, Lundin 2001, 2002; Webb and Courtright 2002). Few cultural resources were encountered in the 91 acres; however, one site (AZ U:1:433[ASM]) was recorded previously (Lausten 2004).

The site is situated between a wash and an existing development used as a storage yard. The boundary of AZ U:1:433(ASM) is an oval approximately 30 m by 17 m (Figure 3). One artifact concentration is located within the site, near the southeastern site boundary. A low- to moderate-density artifact assemblage in the site consists of an estimated 300 sherds and 10 flakes (Table 1). The ceramic assemblage largely consists of Wingfield Plain, Gila Plain sherds, and a few red ware sherds. Flaked-stone artifacts are mainly secondary flakes; basalt and quartzite are the material types represented. Most of the artifacts are concentrated in the northeastern portion of the site, bordered by the wash to the north and the fence to the southeast. The artifact concentration (AC1) contains approximately 150 to 200 sherds within a 5 m area.

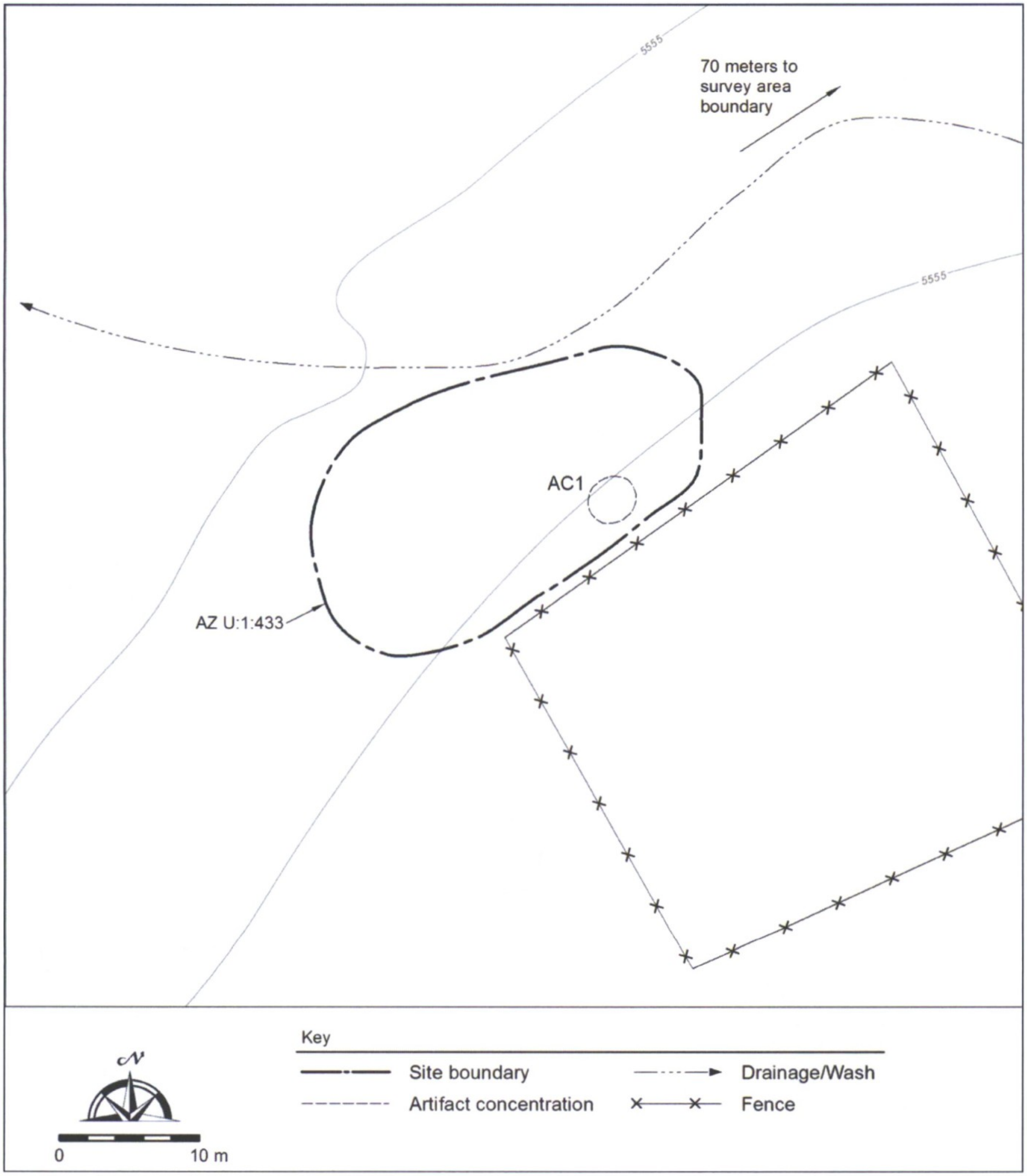

Figure 3. Site boundary and nearby disturbance.

Table 1. Surface artifacts.

Site location	Ceramics	Flaked stone	Other	Comment
Artifact concentration 1	150–200[a]	0	0	Near a disturbed area.
General site	100–150[a]	10[b]	0	Most artifacts are near wash

[a] Wingfield Plain, Gila Plain, and red ware.
[b] Secondary flakes of basalt and quartzite.

The site has experienced some disturbance during previous construction of the adjoining storage yard. Ground cover outside of the disturbance is moderate to heavy and visibility ranges from 50 to 75 percent open. In addition to the relatively dense vegetation, some construction materials and scattered debris obscure the modern ground surface.

Sites within one mile of AZ U:1:433(ASM) include one prehistoric artifact scatter (AZ U:1:391[ASM]), one historic road (AZ U:1:134[ASM]), and one historic dump (AZ U:1:136[ASM]). The nearest prehistoric site is an artifact scatter with a rock ring (a possible basket rest), suggesting the site was a resource collection loci. The resource collection hypothesis is based on Goodyear (1975), which documented the traditional *O'odham* use of rock rings during saguaro fruit collection. Beyond the one-mile radius study area are several large Pre-Classic and Classic period habitation sites that are surrounded by collection and processing sites, such as AZ U:1:433(ASM). The largest sites in the vicinity are AZ U:1:30(ASU), AZ U:1:31(ASU), and AZ U:1:129(ASM), and located 2–3 miles northeast of the project area. These sites are Pre-Classic and Classic period villages plus the associated field houses and collection/processing sites (Bruder 2002). Three miles to the west-northwest is a Colonial and Sedentary hamlet (Schoonover 2002), and 6.5 miles to the northwest is the large complex of Pre-Classic and Classic period sites in the Spur Cross Conservation Area (North 2002). Prehistoric residents of these sites would have exploited resources in the areas near their habitation sites, creating small artifact scatters across the landscape, occasionally with features. The resources they exploited at these sites are unknown, but thought to be a wide range of plant products (saguaro fruit, cholla buds, prickly pear, and others).

SECTION V. RESEARCH DESIGN

Investigations of AZ U:1:433(ASM) will be conducted under the theme and context, *Prehistoric Resource Exploitation of the North Scottsdale Uplands, A.D. 200 to A.D. 1500*. This theme has research domains that are appropriate for investigating the NRHP eligibility of AZ U:1:433(ASM). The NRHP-eligibility testing will determine whether subsurface features are preserved at the site that can contribute important information within the theme and context above.

Site Setting

The site's setting on the alluvial fan in an upland resource zone of North Scottsdale suggests prehistoric residents of the area exploited resources in the area and returned the resources to their village. Buried deposits related to collection and possible processing of resources may be present at AZ U:1:433(ASM), and could inform about what resources were collected/hunted and/or processed. The small size of the artifact scatter suggests limited use of the area, but multiple visits to the same location could account for the hundreds of artifacts reported at the site. Repeated reuse of the area by small groups could have occurred during sequential years. Alternatively, the site could be a single use but with a large number of people that left behind a moderate number of ceramics.

Chronology

The presence of red ware sherds implies a Classic period (A.D. 1250–1450) occupation of AZ U:1:433(ASM). However, plain ware was more common and could indicate use of the site over a wide range of time (A.D. 200–1500, or later). Chronological investigations during NRHP-eligibility testing will be designed to inspect a sample of the ceramics and other artifact classes that may inform about the age of the site. Chronological information will be sought from surface and subsurface artifacts, and subsurface features.

Stratigraphy at the site is anticipated to be relatively simple. However, the proximity of a small wash to the site indicates fluvial deposition may have covered artifacts and features over time. If the site was reused frequently, there even may be horizontal clustering of features created during each site use. If the site was used over the course of several years there could be evidence of multiple sequential site uses. Carefully evaluation of trench profiles may discover strata that could provide relative dates of features and artifacts. Chronometric samples may be collected and submitted for analysis to assist in defining the age of the site.

To determine if AZ U:1:433(ASM) is eligible for listing in the NRHP the following research questions will be examined during the site assessment:

Research Questions:

- *Are subsurface features preserved at AZ U:1:433(ASM)?*
- *Is there evidence for fluvial (or colluvial) deposition covering the features?*
- *Are the features associated one or more soil strata?*
- *What is the age of the subsurface features and artifacts?*

Data Requirements

Backhoe trench excavations will provide information about the horizontal distribution of subsurface features, if present. Features exposed in the profile of trenches will indicate the spatial extent of the site's subsurface context and possibly document the relationship of surface artifacts to subsurface features. Features and artifacts may not be in the same locations. Therefore, backhoe trenches may extend outside of the surface artifact scatter. For example, resource processing features such as thermal pits may have been placed away from locations where people conducted other activities (sleeping, food consumption, socializing) while at the site.

Trenches may expose multiple features in profile. Careful inspection of the backhoe trench profiles and correlation of soil strata between the trenches will be used to assess the site's natural and cultural formation processes and soil composition. The archaeologists will examine the geomorphological context of features exposed in trench profiles for chronological evidence including differences in vertical strata and the presence of potential radiocarbon samples.

Backhoe trench profiles will be drawn to scale and soils described. The elevation of the highest point of all subsurface pits will be recorded and correlated with soil strata. The location of temporally diagnostic artifacts will be documented from surface and subsurface contexts. Potential radiocarbon samples may be recovered from the backhoe trench profiles and assessed for their potential to date archaeological or natural contexts. Careful inspection of soil horizons exposed in the trenches will be made to assess the potential that fluvial or colluvial deposits have preserved features or soil strata.

SECTION VI. WORK PLAN

This proposed eligibility testing work plan is consistent with the Secretary of the Interior's Standards and Guidelines (48 CFR §44716–42), and takes into account the Advisory Council on Historic Preservation's (1980) publication, *Treatment of Archaeological Properties: A Handbook,* and the reporting standards developed by the ASLD, SHPO, and the Arizona State Museum (ASM), *Recommended Standards for Monitoring, Testing, and Data Recovery*.

This work plan details excavation methods and archaeological feature recording methods to be used at AZ U:1:433(ASM) during the NRHP-eligibility testing. The goals of the testing are to assess the natural and cultural context of the site, assess and document subsurface preservation, and collect chronological information about processing and cooking facilities or other features, if present.

The NRHP-eligibility investigations will characterize and map the extent of surface artifacts, assess the artifact's distribution relative to natural strata exposed in backhoe trenches, determine whether any intact subsurface structures, artifact concentrations, or other features are present, and assess the data potential of any subsurface deposits.

If the eligibility testing discovers subsurface features with associated intact cultural deposits Logan Simpson may recommend that AZ U:1:433(ASM) is eligible for listing in the NRHP under Criterion D (information potential). Alternatively, the test excavations may determine the site has no preserved subsurface features, either because there is no subsurface component or possible erosion or modern disturbances have destroyed prehistoric features.

NRHP Eligibility Testing Methods

NRHP-eligibility testing will include mapping and surface assessment, in-field analysis of selected surface artifacts, and backhoe trenching.

Site Assessment and Mapping

The first stage of investigation will include a thorough site recording and surface assessment effort within the site boundary. This stage will involve systematic mapping of the site's vicinity and surface artifact distribution. Resurvey of the site will use survey transects no more than 2 m apart to identify the extent of surface artifacts, disturbances, and locate temporally and functionally diagnostic artifacts. The maximum extent of the site will be reestablished, and this surface assessment may provide for discovery of previously unrecognized aspects of the site that may be explore during subsurface excavations.

The location of a site datum, excavation units and backhoe trenches will be established using a Nikon NPL-352 total station and a Trimble GeoXT global positioning system (GPS) unit with sub-meter real-time correction. A site base map will be developed to guide possible future data recovery efforts.

Surface Artifacts

After completing the surface reassessment and site mapping tasks, a sample of surface artifacts will be subject to in-field analysis. Minimally, all diagnostic artifacts will be point-located and analyzed. Surface artifacts will be assessed for temporal information.

Backhoe Trenching

Backhoe trenching is proposed to investigate soil depth and assess natural and cultural deposits. Systematic and judgmental trenching will be used to investigate the site, search for subsurface cultural features, define the depositional stratigraphy of the site and its features, and assess the extent of subsurface cultural deposits. All OSHA Subpart P Excavation Standards will be followed throughout the project.

The identification of subsurface features found during backhoe trenching will be undertaken in a multistage process that will begin with monitoring during trench excavation. During excavation, the trench wall and floor will be constantly examined for the presence of artifacts, macrobotanical material, and features. The backdirt will be scanned for artifacts, and the locations of features and significant in situ artifacts discovered during trench monitoring will be noted and marked for subsequent documentation.

Following the completion of trench excavation, both walls of the trench will be faced with hand tools and left exposed to dry. The profiles will be inspected for cultural features under different moisture and light conditions. Possible features identified during this work will be noted and marked. After drying, the trenches will be reexamined for subsurface cultural deposits and features. A representative profile of each trench will be mapped and drawn to scale. Identified features will be numbered in a Feature Log, marked on the trench wall(s), and recorded on a Feature Profile Form. Each feature will be photographed, profiled with one or more scale drawings, and described with regard to its morphology, the natural and cultural fill, and any associated artifacts. Features and trench profiles will be located on the site map with the total station. Artifacts and macrobotanical materials may be collected if the material might be damaged, displaced or lost through subsequent disturbance.

Section VII. Site-Specific NRHP Eligibility Testing Procedures

AZ U:1:433(ASM) consists of an artifact scatter adjacent to a shallow wash. An artifact concentration is within the southeast portion of the site. The proposed work will consist of the following tasks:

NRHP Eligibility Testing Tasks:

- Conduct a systematic, 2-m-interval survey of the site to reestablish the density and distribution of artifacts within the site, and locate and map temporally and functionally diagnostic artifacts.
- Establish a site datum and map site disturbances and planned backhoe trench locations using the total station; the APE will be photographed prior to testing.
- Excavate three systematic, 20-m-long backhoe trenches to assess depositional depth and presence of subsurface cultural deposits. The proposed trench locations may be altered to avoid vegetation or modern infrastructure. In total, 60 m will be excavated to a maximum depth of 4.5 ft (1.4 m) (Figure 4). All backhoe trenches will be evaluated for the presence of cultural deposits and trench profiles will be drawn of all cultural resources and representative soil strata. The trenches may extend outside of the surface artifact scatter to assess the relationship of surface materials to subsurface strata.
- All identified features will be documented, profiled, and photographed. Artifacts from backhoe trenches and from defined features may be collected.

If archaeological testing identifies significant preserved features during subsurface testing, then the site will be recommended eligible for listing in the NRHP and data recovery excavations will be recommended.

Section VIII. In-field Artifact Analyses

In-field analyses of prehistoric artifacts will be completed during eligibility testing. Photographs and line drawings may be collected for selected artifacts.

Ceramics within the site will be subjected to in-field analysis during fieldwork. All analyzed ceramics will be categorized based on vessel part (rims, necks, shoulders, and bodies) and basic ware class (plain ware, red ware, or other). All decorated ceramics, including those of non-local manufacture, will be classified by basic form, ware, and type whenever possible. The goal of this analysis is to assess the range of variability in local and non-local ceramics and examine potential temporal variation in the site's assemblage. We will record any worked sherds, non-vessel ceramics (e.g., figurines), and other unique artifacts.

The lithic analysis will include coding flaked-stone tools and the debitage. The analysis of debitage will record size grade, raw material type, presence/absence of a platform, platform type, flake type, break type, portion, and percentage of cortex. Lithic tools will be coded using functional, morphological, and technological variables and traditional typologies. The following variables will be recorded: completeness, technological class, morphological class, functional class, length, width, thickness, raw material type, retouch, flaws/possible reason for rejection, reworking, cortex, patination, break type, and edge grinding. Representative and outstanding examples of flaked-stone tools will be illustrated.

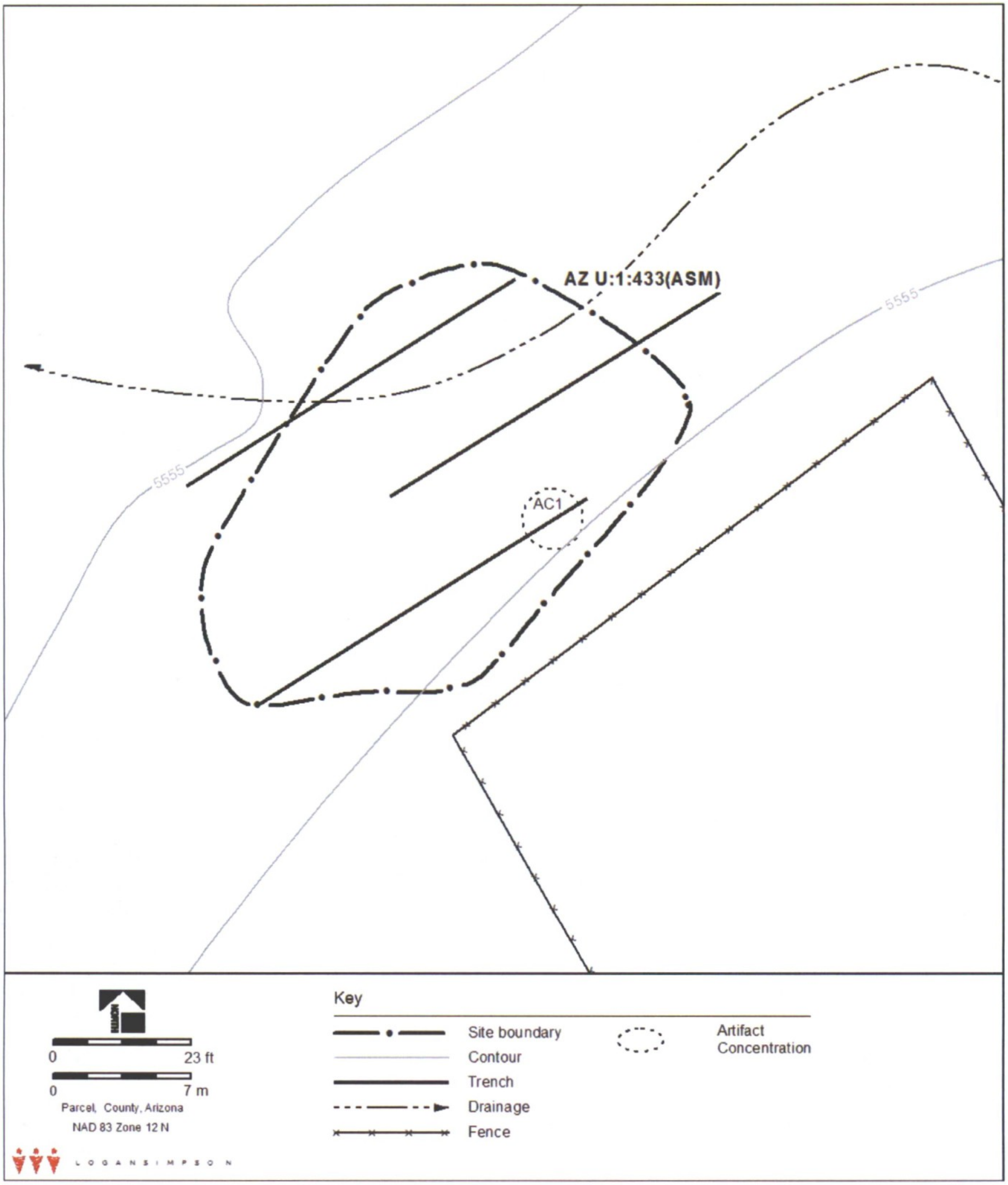

Figure 4. Location of proposed trenches within AZ U:1:433(ASM).

Seven variables will be recorded during in-field analysis of ground-stone objects and tools: length, width, thickness, raw material, condition, surface use-wear, and grinding. The analysis will focus on determining tool function as it relates to site and feature function.

Other artifact classes may be identified (e.g. shell, faunal, mineral, macrobotanical). For shell and fauna discoveries, the genus and species will be determined, if possible. Whole or partial tools and decorative elements will be described individually. Minerals will be described using standard petrography references and any evidence for working will be indicated. Macrobotanical samples are anticipated to be rare, but if present may be collected for identification and radiocarbon analysis, if recovered from a significant context.

SECTION IX. DATA MANAGEMENT AND DISSEMINATION

All project-related records will be temporarily stored in Logan Simpson's Phoenix laboratory. All paperwork will be checked for accuracy, completeness, and proper coding before being scanned. All documentation and processing will be accomplished according to the *Arizona State Museum Collections Repository Manual for Archaeologists* if any artifact collections are made.

All records generated as a result of the NRHP-eligibility testing investigations will be curated at the ASU's SHESC/ARI Center for Archaeology and Society repository, located at 734 W. Alameda, Suite 120, Tempe, Arizona. A curation agreement will be established with ARI Director, Dr. Arleyn Simon. All materials will be handled and processed according to guidelines established by ASM and the SHESC/ARI Center for Archaeology and Society repository.

SECTION X. SCHEDULE

Logan Simpson will maintain effective communication with DM19, LLC and the COS. Project management tasks will be conducted throughout the course of the project and will include communication about the project's status and project milestones. Our staff will always be available to attend meetings with DM19, LLC, COS, or other parties to review the project status or resolve any questions concerning the project.

Preparation for fieldwork will begin immediately following issuance of a written notice to proceed and is anticipated to require 5 calendar days (Week 1). Revisions to the treatment plan and underground utility marking will be completed before fieldwork commences (Week 2). Although subject to weather and other fieldwork considerations, it is anticipated that eligibility testing field work will require 1 day (Week 3). Report preparation will commence immediately following completion of the fieldwork and a preliminary field report will be completed ten (10) days (Weeks 3–5) following the end of fieldwork. The preliminary report will be reviewed by the COS within a 30-day agency review period (Weeks 6–10). Logan Simpson will respond to agency comments within 10 days of receipt of comments (Weeks 11–12).

SECTION XI. REPORTS

Two reports will be submitted in conjunction with NRHP-eligibility testing. First, a preliminary report will be submitted to DM19, LLC, and the COS within 10 business days following the completion of the NRHP-eligibility testing fieldwork. The preliminary report will briefly summarize results of the testing, any fieldwork inconsistencies with the treatment plan, and provide a recommendation about the NRHP eligibility of AZ U:1:433(ASM). If the site is recommended eligible for inclusion in the NRHP, then the preliminary report will also include a recommendation on the need for any mitigation efforts such as data recovery.

Second, a draft final testing report will be completed that describes results of the resurvey, mapping, in-field artifact analysis, and trenching at the site. The draft final report will incorporate research analyses and synthetic discussions, and will be submitted for agency review within 30 days after the completion of the fieldwork. The COS will review and comment upon the draft final testing report within 30 days. Logan Simpson will address all reviewer comments for incorporation into the final report. The final report will be published as a Logan Simpson technical report within 10 days of receipt of the review comments. Three copies of the final report will be distributed: one each to DM19, LLC and COS. Additional copies will be provided to ASM and the SHESC/ARI in accordance with the curation agreement and Logan Simpson's blanket permit. The report also will be digitally curated through tDAR – the Digital Archaeological Record, where it will be available online in perpetuity.

SECTION XII. HUMAN REMAINS

In the unlikely event that human remains are discovered during Phase I testing, Logan Simpson will comply with the stipulations of the Arizona Burial Law (A.R.S. §41-865). All ground-disturbing work within 30 m (98 ft) of the discovery will cease and Logan Simpson will secure the remains from further disturbance. Logan Simpson will contact the COS and the ASM to alert them of the discovery and request directions for further work. All human remains and associated funerary objects will be treated with respect and dignity at all times and will remain protected and covered until consultation can be undertaken with concerned Tribes to ensure that appropriate procedures for the recovery, treatment, and disposition of the remains, associated funerary objects, and objects of cultural patrimony are implemented.

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A Work Plan for National Register of Historic Places Eligibility Testing at AZ U:1:433(ASM), Desert Mountain Parcel 19 Northeast of Pima and Cave Creek Roads, Scottsdale, Maricopa County, Arizona

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September 13, 2016
Submittal 2

Technical Report No. 165088b

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September 13, 2016
Submittal 2

Technical Report No. 165088b

ABSTRACT AND MANAGEMENT SUMMARY

Report Title	A Work Plan for National Register of Historic Places Eligibility Testing at AZ U:1:433(ASM), Desert Mountain Parcel 19 Northeast of Pima and Cave Creek Roads, Scottsdale, Maricopa County, Arizona
Agency/ Legal Nexus	City of Scottsdale (COS) Revised Code, Chapter 46, Article VI.
Project Location	City of Scottsdale, Maricopa County, Arizona
ARI Accession No.	To be obtained
Project No.	165088
City of Scottsdale Project No.	Case 17-ZN-2016
Report Date	August 1, 2016
Project Description	DM19, LLC is proposing to develop a 91-acre property for housing near the intersection of Cave Creek Road and Pima Road in Scottsdale, Maricopa County, Arizona. Construction of the housing development cannot avoid a previously recorded archaeological site, AZ U:1:433(ASM). The site's location on private property was recognized during an archaeological survey conducted before DM19, LLC purchased the property (Hill 2016). The survey reported that a formal recommendation of eligibility for AZ U:1:433(ASM) could not be made based on surface observations. An eligibility recommendation would be possible only following the implementation of a National Register of Historic Places (NRHP)-eligibility testing program. Therefore, DM 19, LLC requested Logan Simpson prepare a work plan to assess the NRHP-eligibility status of AZ U:1:433(ASM). The proposed housing development is subject to compliance with the COS Revised Code, Chapter 46, Article VI and compliance with the Arizona Burial Law (A.R.S. §41-865). This plan provides a research design and plan of work for conducting NRHP-eligibility testing of AZ T:12:19(PG) and complies with the Arizona Burial Law (A.R.S. §41-865).
Location	Within portions of the NW¼ and the N½ of the SW¼ of Section 31, T6N, R5E, Gila and Salt River Baseline and Meridian (USGS 7.5' Quadrangle Cave Creek, Ariz., 1965/1981).
Site UTM	Easting / Northing 418035 / 3743030 418065 / 3743030 418065 / 3743004 418035 / 3743004
Land Ownership	Private
Number of Sites	1
Eligibility Status	AZ U:1:433(ASM) has not been evaluated
Human Remains	In the unlikely event that human remains are discovered during Phase I testing, Logan Simpson will comply with the stipulations of the Arizona Burial Law (A.R.S. §41-865). All ground-disturbing work within 30 m (98 ft) of the discovery will cease and Logan Simpson will secure the remains from further disturbance. Logan Simpson will contact the City of Scottsdale and the Arizona State Museum to alert them of the discovery and request recommendation for further work. Following

discovery, all human remains and associated funerary objects will be treated with respect and dignity at all times and will remain protected and covered until consultation can be undertaken with concerned Tribes to ensure that appropriate procedures for the recovery, treatment, and disposition of the remains, associated funerary objects, and objects of cultural patrimony are implemented.

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SECTION I. INTRODUCTION

DM19, LLC is proposing to construct a 91-acre housing development near the intersection of Pima Road and Cave Creek Road in north Scottsdale, Maricopa County, Arizona (Figure 1). The housing development, Desert Mountain Parcel 19 (Case 17-ZN-2016), will affect one previously reported site on private land, AZ U:1:433(ASM), a prehistoric Hohokam artifact scatter dating to A.D. 200–1500. The private land is subject to City of Scottsdale (COS) regulations that implement the COS Revised Code, Chapter 46, Article VI and in compliance with the Arizona Burial Law (A.R.S. §41-865).

The area of potential effects (APE) is located in Scottsdale, Maricopa County (Figure 2). The site is located within portions of the NW¼ and the N½ of the SW¼ of Section 31, T6N, R5E, Gila and Salt River Baseline and Meridian (USGS 7.5' Quadrangle Cave Creek, Ariz., 1965/1981). Currently, the site is situated in open desert adjacent to an existing storage yard. The proposed site area measures approximately 30 m by 17 m, encompassing 0.13 acres of private land.

Based on a 2016 survey of the proposed land transfer property (Hill 2016), one previously recorded prehistoric site, AZ U:1:433(ASM), is situated within the proposed APE. An archaeological records search completed before the archaeological survey revealed that the site originally was reported during an 8-acre survey (Lausten 2004). The site has not been evaluated for eligibility for listing in the National Register of Historic Places (NRHP).

Logan Simpson has prepared this testing work plan at the request of DM19, LLC to evaluate the NRHP-eligibility of site AZ U:1:433(ASM). The testing work plan is consistent with the stipulations of the Secretary of the Interior's Standards and Guidelines for Archaeological Documentation (Federal Register, 49 FR 44734–37) and takes into account the Advisory Council on Historic Preservation's 1980 publication, *Treatment of Archaeological Properties: A Handbook*.

The testing work plan includes the following:

- An overview of previous cultural resource studies and an assessment of prehistoric cultural development in the foothills of north Scottsdale.
- A research design outlining the research themes and questions that will guide the NRHP-eligibility testing efforts and specify the data requirements to address these questions.
- A work plan specifying the NRHP-eligibility testing methods to be employed.
- The analytical methods that will be used to evaluate the site.
- The work plan also provides a schedule for the expected work and the preparation of a preliminary report draft and consultation with the COS.

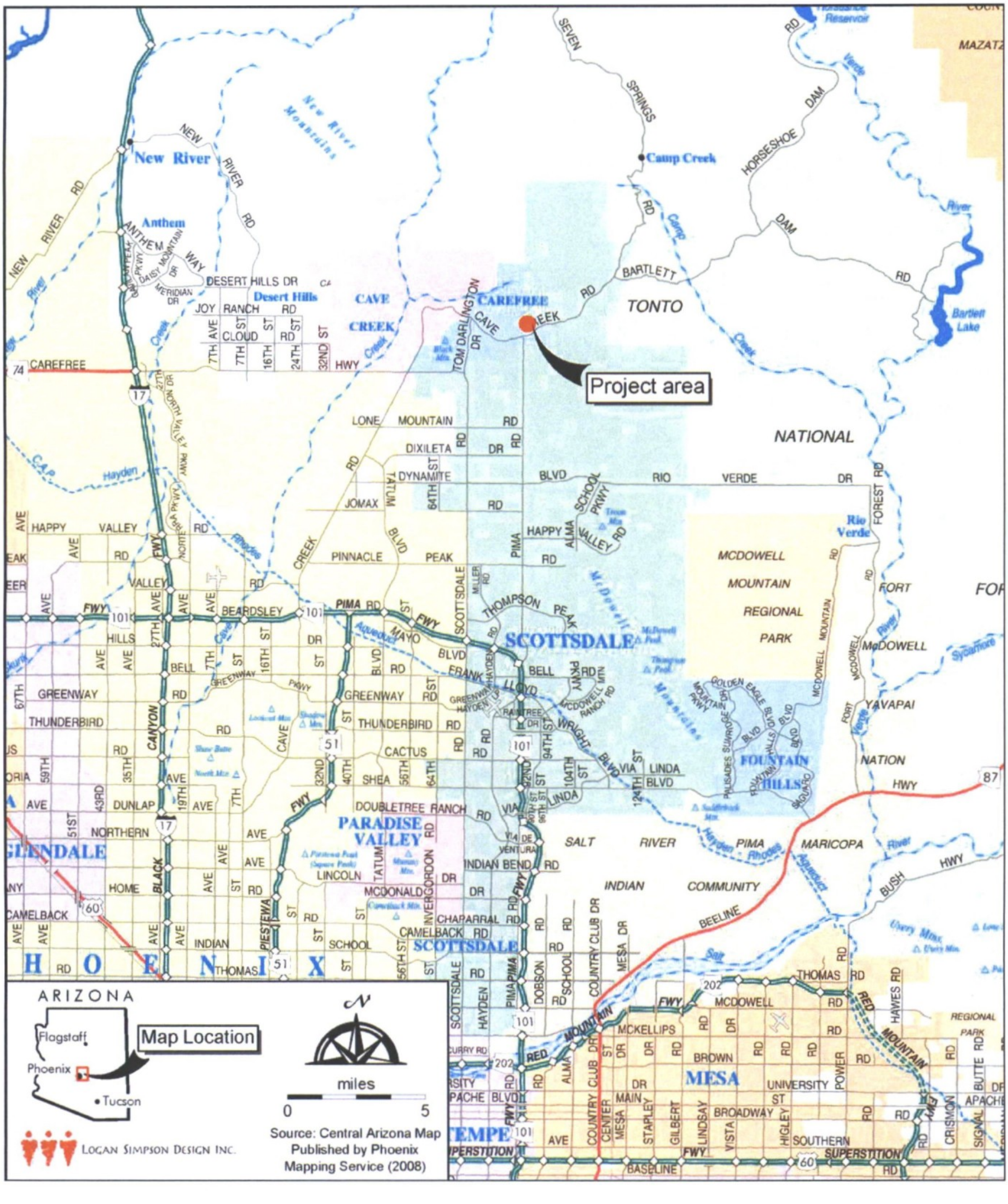

Figure 1. Location of the DM19, LLC project area.

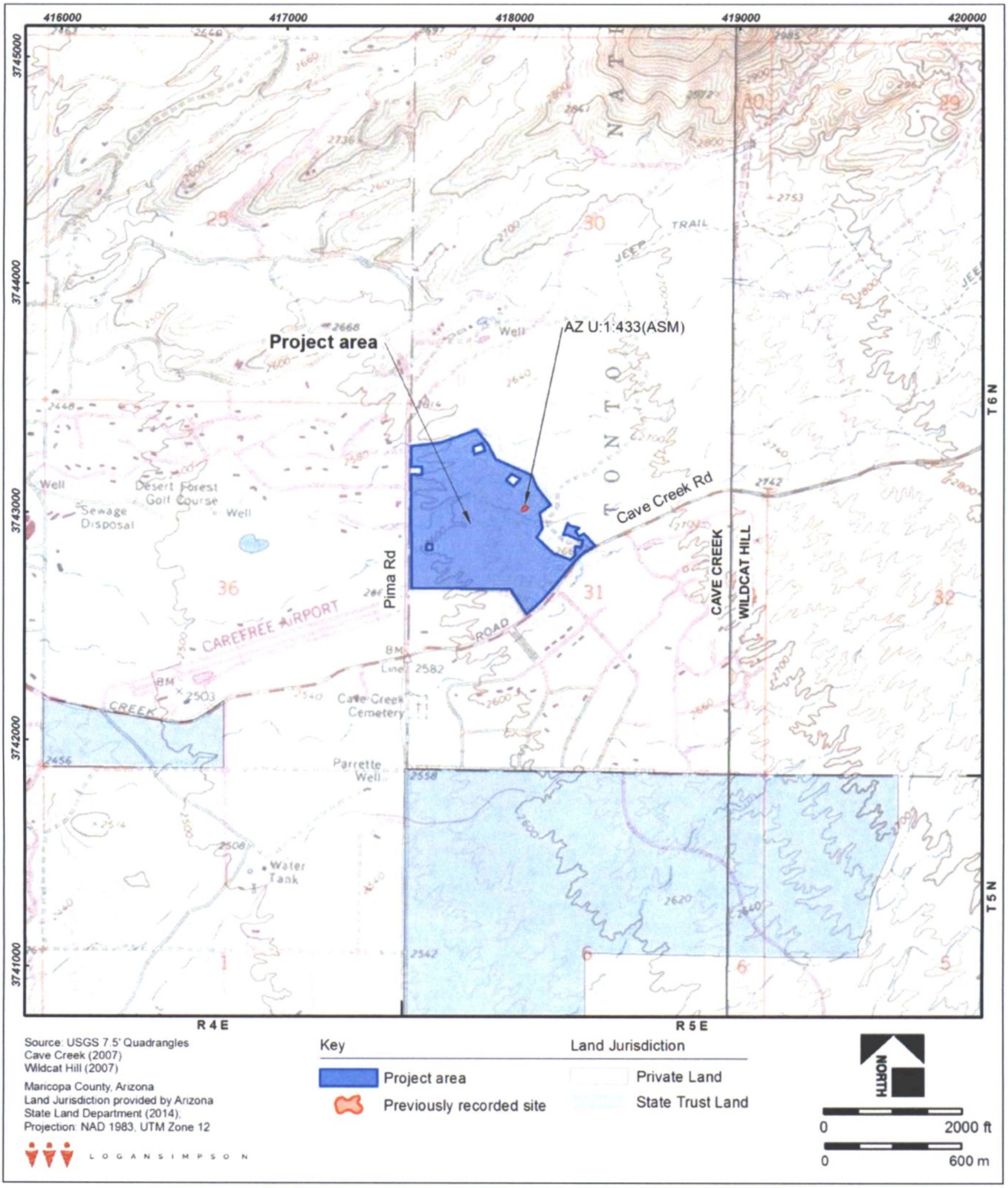

Figure 2. Location of AZ U:1:433(ASM) within DM19, LLC project area.

SECTION II. PROJECT IMPACTS

DM19, LLC requested Logan Simpson prepare this work plan for NRHP-eligibility testing of AZ U:1:433(ASM) within the proposed housing development. NRHP-eligibility testing investigations will involve site mapping and photographic documentation, in-field analysis of selected surface artifacts, and backhoe test trench excavations totaling approximately 3 percent of the site area to assess subsurface conditions and identify subsurface features, if present. The test excavations will provide a basis for determining the location, integrity, and distribution of surface artifacts and subsurface cultural features, if present.

Based on the results of the NRHP-eligibility testing investigations, Logan Simpson may propose no further data recovery excavations if intact cultural deposits are absent. Alternatively, data recovery excavations may be recommended if intact features and cultural deposits are found that have the potential for yielding significant archaeological information rendering the site eligible for listing in the NRHP under Criterion D. A data recovery treatment plan will be needed if subsurface cultural deposits are identified that qualify the site for listing in the NRHP.

SECTION III. NATURAL AND CULTURAL ENVIRONMENTAL CONTEXTS

Environmental Setting

The archaeological site is situated at an approximate elevation of 2,640 ft above mean sea level (amsl) within the Basin and Range Physiographic Province of central Arizona, a zone of parallel fault-block mountain ranges that alternate with sediment-filled basins (Chronic 1983). Topographic features surrounding the project area include Lone Mountain approximately 1.5 miles to the northeast and Black Mountain approximately 3 miles to the southwest.

The local geology consists of pre-Cambrian granite and metasedimentary rocks and Cenozoic alluvial deposits on a Pleistocene-age alluvial fan (Reynolds 1988). The site is situated on a landform developed through erosion and weathering of parent material from the mountain bedrock that provides sediment to bajadas (alluvial fans) surrounding the mountains. Washes that descend the hill slopes deposit increasingly finer-grained materials farther away from mountains as the erosive energy of the wash dissipates across level surfaces. Water flowing down the alluvial fan near AZ U:1:433(ASM) joins Cave Creek and eventually the Salt River. The site is on a dissected upland adjacent to Galloway Wash, a Pleistocene-aged alluvial fan intergraded with bajada deposits. Water was previously available from seasonal seeps and springs approximately 2 mile to the northwest in Galloway Wash (Schoonover 2002).

Temperature in the desert region is one of extremes; highs of 120° F are recorded in the hottest summers and occasional below-freezing temperatures in the winters (Seller and Hill 1972). The region has a bimodal distribution of precipitation almost equally divided between summer and winter. Winter storms cover broad fronts and provide gentle rains that may continue for days, which allow the water to soak into the ground. In contrast, the summer monsoon often brings brief, violent, localized storms that deposit large amounts of rain in a short period of time and create flash floods (Brown 1982).

The region is part of the Lower Colorado River Valley subdivision of the Sonoran Desertscrub biotic community (Turner and Brown 1994). Vegetation found in the area consists of paloverde and ironwood trees, plus cactus and other xeric-adapted species, e.g., saguaro, cholla, prickly pear, creosote bush, and bursage. Riparian species—reeds, cattail, desert willow, and sycamore—previously occurred along the Cave Creek floodplain and near springs (Brown 1982).

Animals that live in the Sonoran desert tend to be small and adapted to extreme heat and limited moisture regimes. Many of the small mammals, e.g., mice, rats, ground squirrels, have physical adaptations that help conserve water. Larger mammals found in the region, e.g., cottontails, black-tailed jackrabbits, radiate heat through special anatomical features. Other animals have adapted to the environment by remaining inactive in the heat of the day, e.g., coyotes, fox, and bobcat. The largest mammals in the area are deer and bighorn sheep, which require a plentiful supply of water (Rea 1997).

Cultural Setting

The earliest confirmed occupations in the Southwest during the Paleoindian period date from approximately 9500–8500 B.C., but very few archaeological remains from this period have been detected in the Phoenix Basin, which implies intermittent and brief occupations. Recovered artifacts mostly consists of isolated surface finds of Clovis points (Crownover 1994; Huckell 1982; North et al. 2004, 2005) and a few buried megafaunal kill sites in alluvial contexts with associated lithic assemblages (Gaines et al. 2009; Haury et al. 1994; Haynes 1980, 2011). Based on these scant data, the Paleoindian period in the region appears to be characterized by dispersed mobile groups that primarily hunted now-extinct megafauna and possibly supplemented their diet with collected wild plants (Waters 1986). Likely most Paleoindian period remains are either buried beneath substantial Holocene alluvial deposits or have been destroyed as a result of millennia of consistent erosion.

A period of climatic amelioration set in around 8500 B.C., triggering substantial changes in subsistence practices. This period (8500 B.C.–A.D. 1), known as the Southwestern Archaic, is characterized by small, mobile groups that exploited a variety of plant resources and hunted medium-sized to small game. This subsistence pattern persisted through the Early Archaic (8500–5000 B.C.) and Middle Archaic (5000–1500 B.C.) periods. The Archaic period is largely characterized by a trend of cyclical migratory patterns that allowed mobile groups to procure plant and animal resources that were available in various upland and lowland environmental settings at different times of the year. An Early Archaic habitation, including two non-contemporaneous pit structures and several pits, was recently identified in the western Phoenix Basin near the confluence of the Salt, Gila, and Agua Fria rivers (Graves et al. 2009). This site has provided the only solid evidence published to date for seasonal habitation during the Early Archaic period in the Phoenix basin. Unfortunately, few artifacts were found in association with these features, which limited the project team's ability to interpret subsistence and land use patterns. Also, sites with extensive Early, Middle, and Late Archaic period components—including Middle and Late Archaic period residential features and thousands of extramural-pit features—were recently investigated along the Agua Fria River in the western Phoenix Basin (Hall and Wegener 2015).

The subsistence economy during the Early and Middle Archaic periods was predicated on hunting and plant-processing, especially in areas along primary or secondary drainages, which may have drawn these mobile groups to locations along floodplains that were suitable for the later development of agriculture (Roth and Freeman 2008). During the Late Archaic/Early Agricultural period (1500 B.C.–A.D. 1), mobile groups increasingly established occupations in locations that could sustain plant cultivation along those drainages. Late Archaic/Early Agricultural period groups residing in these areas practiced low-level maize horticulture and constructed substantial storage facilities, resulting in semi-sedentary settlements (Huckell 1995; Mabry 1998). Starting around 500 B.C., several large and seasonally occupied villages with communal structures and small irrigation networks were established along the Santa Cruz River floodplain in the Tucson Basin (Mabry 1998). These villages were supported by maize agriculture and collection of riparian resources, but seasonal exploitation of upland bajada resources persisted.

Few sites with Late Archaic/Early Agricultural period components have been documented in the Phoenix Basin. Moreover, those few sites produced little or no evidence for crop cultivation. Recent investigations at multiple sites with Late Archaic/Early Agricultural period components in the western Phoenix Basin produced no evidence for crop cultivation (Hall and Wegener 2015). Two recently investigated Late Archaic/Early Agricultural period sites along Queen Creek also produced no evidence for crop cultivation, although it is possible that groups in the Queen Creek area actively encouraged mesquite growth (Wegener and Ciolek-Torrello 2011). Based on this limited evidence, it appears that Late Archaic/Early Agricultural period inhabitants in the Phoenix basin did not invest heavily in food production; rather, these groups appears to have maintained a mobile subsistence strategy focused on procurement of wild plant resources, such as cactus and mesquite.

The succeeding Early Formative period (A.D. 1–750) is characterized primarily by the introduction and early development of development of semi-sedentary agrarian villages and early ceramic container technologies (Garraty 2011; Lindeman and Wallace 2004). The Early Formative period can be considered a period of transition, during which the reliance on maize farming increased throughout southern and central Arizona (Mabry 2000). In specific areas—such as the Tucson Basin, where both Late Archaic/Early Agricultural and Early Formative villages have been recorded—settlement locations reflect a general continuity from the Late Archaic/Early Agricultural period settlement pattern. In the Phoenix Basin, however current understanding of the initial phase of the early Formative period in the Salt-Gila River area (Red Mountain phase; A.D. 1–450) is limited to data derived from a few sites (Mabry 2000). The Red Mountain phase is evidenced by the site components at Pueblo Patricio (Cable and Doyel 1987; Henderson 1995), La Escuela Cuba (Hackbarth 1992), the Red Mountain Site (Morris 1969), Finch Camp along middle Queen Creek (Wegener and Ciolek-Torrello 2011), and various briefly occupied limited-activity sites (Hackbarth 1998; Kenny 1987; Phillips et al. 2001; Rogge 2009). The evidence from these sites suggests habitation in small hamlets composed of groups of pit houses, many of which included flexed inhumations beneath the house floors (Mabry 2000).

The latter half of the Early Formative encompasses the Vahki, Estrella, Sweetwater, and Snaketown, collectively defined as the Pioneer period, A.D. 450–750 (Gladwin et al. 1937; Haury 1976). The date range for these phases is based on limited excavation and artifact data and is best characterized as a continuation of the broad regional Early Formative period cultural development in the Phoenix Basin. Irrigation was developed in the Phoenix Basin by the Vahki phase (A.D. 450–650/700), which opened up farming opportunities on the terraces above the floodplain (Henderson 1989; Woodson 2010:13–14); however, some archaeologists have argued that irrigation canals were not constructed on the terraces before the Snaketown phase (Doyel 1993; Wilcox and Shenk 1977). These phases also witnessed the earliest painted pottery traditions, starting with a red ware tradition during the Vahki phase and development of the Hohokam Red-on-buff/gray tradition during the later Estrella, Sweetwater, and Snaketown phases. In addition, Abbott (2009:543, 546) has shown that a specialized craft production community located in the eastern South Mountain area began manufacturing and exporting plain ware jars on a large-scale to communities throughout the Phoenix Basin during the Vahki phase, which persisted through the end of the early Sacaton phase around A.D. 1020. Other characteristics of these phases include settlements with plaza-oriented layouts, the construction of square Type P-4 houses (first identified at the village of Snaketown in the middle Gila River valley; Gladwin et al. 1937; Haury 1976:68; Wilcox et al. 1981), and a mortuary pattern that incorporated a combination of pit or trench cremations and flexed or semiflexed inhumations (Doyel 1991).

Recent assessments have suggested that the suite of cultural traits and developments that marked the beginnings of the regional Hohokam cultural tradition does not appear to have been fully crystallized until the Snaketown phase or possibly as late as the middle of the Gila Butte phase of the Colonial period around A.D. 750 (Dean 1991; Doyel 1991; Wallace et al. 1995; Wilcox 1979; Wilcox and Sternberg 1983). Elements of an integrated cultural tradition started as early as A.D. 700 during the Snaketown phase (Doyel 1991) or by the end of that phase (Wallace et al. 1995), although a much earlier origin beginning in the Vahki phase originally was proposed (Gladwin et al. 1937). These traits reflect the development of a widely shared and integrated belief and ritual system and the inception of a regional interaction system, including widespread adoption of public architectural forms, such as ballcourts, and development of a mortuary cremation complex, large-scale irrigation agriculture, and naturalistic iconography.

During the Pre-Classic period (A.D. 750–1150), the Phoenix Basin was the primary hub of Hohokam regional development and expansion. The emerging Hohokam cultural pattern during the Snaketown phase of the Pioneer period was manifested by continued construction of canals (Wilcox and Shenk 1977) and urn burials (Haury 1976). Trash mounds first appeared during this span, and one at Snaketown was capped with caliche, possibly a precursor to the later platform mounds (Haury 1976). The earliest evidence of Hohokam occupation or interaction is first identified outside the Phoenix Basin during this span in locations such as the lower Verde River, Queen Creek area, San Pedro River valley, and Tucson Basin (Crown 1991). Dry-farming methods became common at sites in these peripheral areas (bajadas), which documents a trend of population growth and expansion.

The first half of the Pre-Classic, the Colonial period (A.D. 750–950), is characterized by the establishment of large villages throughout much of central and southern Arizona. Habitations typically consisted of courtyard groups, which generally include several houses surrounding on a common living or workspace (Howard 1985; Wilcox et al. 1981). Small hamlets and villages typically consisted of an informal arrangement of one or two courtyard groups, with associated trash mounds, cemetery areas, and roasting pits arrayed around the margins of courtyards. Larger villages are characterized by formal arrangements of courtyard groups surrounding one or more large plazas and communal cemeteries (Howard 1985; Wilcox and Sternberg 1983). The introduction of ballcourts in some larger villages by the early Colonial period (Gila Butte phase) indicates the beginnings of hierarchical site differentiation and intercommunity integration. Ballcourts increased in number, becoming the principal form of public architecture during the Colonial period.

The late Colonial period (Santa Cruz phase) and subsequent Sedentary period (also known as the Sacaton phase; A.D. 950–1150) were marked by substantial growth in the number and size of Hohokam settlements and an expansion of the many canal networks in the Phoenix Basin (Doyel 1991). Densely populated villages with Hohokam-style village layouts proliferated throughout much of present-day Arizona. By the Sedentary period, ballcourts were represented not only in the Phoenix Basin but throughout much of central and southern Arizona. The extensive ballcourt village system likely integrated large portions of Arizona into an exchange network that moved commodities between settlements and possibly served to diffuse intercommunity strife. The number of villages, hamlets, and farmsteads also increased along peripheral drainages, such as Queen Creek. Non-irrigation agricultural intensification and the extensive use of agricultural rock pile fields in upland and bajada locations for cultivation of xerophytic crops (agave and cholla) developed at least by the late Sedentary or early Classic periods (Fish et al. 1992; Masse 1991). Pre-Classic sites have been found west of AZ U:1:433(ASM) (Schoonover 2002).

The Pre-Classic trend of increasing habitation size and outward expansion of Hohokam traits became untenable by the latter half of the Sedentary period (after ca. A.D. 1060). During the latter Sedentary period, the regional system of interconnected ballcourt villages collapsed (Abbott 2006). The collapse may have been prompted by a period of persistent agricultural shortfalls related to a multiyear episode of downcutting and widening of the Salt and Gila river channels, causing unstable and unpredictable flow regimes for canal irrigation (Waters and Ravesloot 2001). Hence, the latter part of the Sacaton phase (ca. A.D. 1060–1150) appears to have been a time of economic and demographic disruption, leading to widespread migration and reorganization. Warfare or low-level conflict and associated dislocations have been posited as a contributing cause of the collapse of the ballcourt system (Rice and LeBlanc 2001). Other possible problems contributing to the system collapse is heavy flooding and arroyo-cutting resulting in reduced access to resources, as reported at various sites in the Tucson Basin during the Sedentary period (Doelle and Wallace 1986) and along Cave Creek during the late Sedentary and early Classic period (Phillips 1998; Schaafsma and Briggs 2007).

By the beginning of the early Classic period (Soho phase; A.D. 1150–1300), change in the structure of Hohokam communities is evidenced by a shift in burial practices from cremations to inhumations, a more localized exchange network (Abbott 2000), and the development of new domestic and public architectural forms, including post-reinforced and adobe-walled structures and walled compounds (Bayman 2001;

Crown 1991). Construction of large platform mounds in the more prominent villages started during the late Sedentary period. Platform mounds represented an important public component of a new community organization pattern manifested not only in the Phoenix Basin but in other settlements over a much wider region, including the Tonto and Tucson basins and lower San Pedro River valley. The platform mound apparently evolved in function from an initial nonresidential, special-purpose facility to a residence used by a specific residential group (Gregory 1991). A study of the Pueblo Grande platform mound in Phoenix challenged the idea that the late Classic period (Civano phase; A.D. 1300–1450) platform mounds provided full-time residences for elite households, and it further supports the proposition that power was diffuse and non-centralized (see Downum and Bostwick 2003).

A hierarchy of settlement types emerged in conjunction with the Classic-period community restructuring. These included villages with only one or a few walled residential compounds; villages with one or more platform mound compounds as well as other compounds; and large settlements, such as Casa Grande with a platform mound and numerous compounds and a Great House (Wilcox 1991). These various Classic period settlements that formed the site hierarchy comprised distinct and socially integrated canal communities: sociopolitical organizations consisting of a number of integrated villages that included one or more platform mound villages serving as administrative centers and distributed along a single canal or canal system (Abbott 2000; Howard 1987). North of the Salt River valley the Classic period is characterized by masonry pueblo architecture (Bruder 2002; Cox 2005), possible evidence of a culture distinct from the Hohokam.

The decline of buff wares and replacement with polychromes in the later phase may represent a change in religious belief systems (Crown 1994). People throughout much of central and southern Arizona may have very deliberately procured and used Roosevelt Red Ware as a means of expressing a tangible symbolic affiliation and association with a new and growing religious or ritual tradition. Crown (1994) makes a credible argument that Roosevelt Red Ware pottery and the motifs depicted in them expressed specific religious ideas and concepts, thus communicating the pottery users' participation in a regional movement, which she labeled the "Southwestern Cult." Deteriorating social or environmental conditions during the late Soho phase or Civano phase could have stimulated involvement in a cult and religious movement (Abbott 2000:202–206; Crown 1994). The pan-regional "Southwestern Cult" functioned partially to mediate human relationships with the natural and supernatural realms (Crown 1994). This widespread belief system helped integrate migrant communities and facilitate aggregation of previously unaffiliated families and groups. Cult beliefs were partly expressed through painted designs on the elaborate polychrome serving vessels.

Roosevelt Red Ware production was not centralized in one a few locations, according to Crown (1994), as was the case with buff wares during the Preclassic period, but likely manufactured on a small scale for low-level exchanges, suggesting participation among a decentralized and extensive network of potters.

The period of Hohokam decline during the late Classic period has long been a focus intense interest and debate among archaeologist. Sires (1983) tentatively defined the Polvorón phase to define a terminal Classic period occupation represented by dispersed ranchería-style settlements consisting of individual pit structures arranged in clusters (Doyel 1995). This phase might represent a period of abrupt change in community organization and integration following the collapse of the late Classic platform mound communities after a period of drought and flooding destroyed the canal systems (Doyel 1995; Nials et al. 1989). However, researchers continue to debate whether the phase is valid. Chenault (2000), for example, argues "… that not to separate Polvorón from the Civano phase obscures variability and change at the end of the cultural sequence that may relate to the nature and causes of the Hohokam collapse." Henderson and Hackbarth (2000), on the basis of overlapping dates between the Civano and Polvorón phases, argue instead that the characteristics of the latter are not temporally discrete but a reflection of cultural variability within the Classic period.

Protohistoric and Historic

Archaeological evidence from the Salt River Valley demonstrates that the region was largely abandoned after the Classic period. During the protohistoric period the area was used as a resource zone and travel corridor. Historic groups to the north of the valley were Yavapai (Gilpin and Phillips 1999) and Apache to the east and northeast (Gifford 1936). Both groups tended to be mobile and relied upon a mix of hunted and collected resources with some bands also planting small fields of domestic crops. Gifford (1932, 1936) considered the Yavapai most closely aligned in terms of cultural traits with the upland Yuman Walapai and Havasupai of northwestern Arizona.

By the time of Spanish contact in the mid to late sixteenth century, most *Akimel O'odham* (Pima) settlements were heavily concentrated the middle Gila River valley and relied upon irrigation agriculture along with collection of plant resources and hunting (Spicer 1962). The *Akimel O'odham* are considered the descendants of the Hohokam in the Phoenix Basin (Doyel 1991; Haury 1976). Loendorf and colleagues (2013:279–281) offer multiple lines of archaeological evidence for continuity in economic practices, settlement patterns, and house-construction techniques from the late prehistoric through early historic periods in the middle Gila River valley, making a strong case for Hohokam-O'odham continuity. Likely the prehistoric-historic transition is marked by some combination of continuous occupation and limited inward and outward migration by individuals or families seeking new socioeconomic opportunities. Historic Pima settlements were small rancheriás composed of individual households living near fields close to the river and reliant upon small-scale irrigation ditches. During the historic period, the Pima and their allies the Maricopa (*Pee Posh*) provided crucial resources to immigrants along the Gila Trail as early as 1848 (DeJong 2007, 2009). Pima and Maricopa migrants from the Gila River expanded into the Salt River Valley in the 1870s after a military base, Fort McDowell, was established on the Verde River to disrupt Apache raiding parties traveling through the Salt River Valley.

The protohistoric antecedents of the Yavapai and Apache migrated seasonally between different environmental zones in the uplands, as suggested by the temporary nature of the occupied sites north and northeast of the Salt River (Wright 2002). Small, triangular projectile points used during the protohistoric period are similar to point styles the historic Yavapai used (Moreno 2002). Likewise, ceramics associated with the Yavapai are Tizon Brown Ware, a paddle-and-anvil, hand-smoothed, sand-tempered, and poorly oxidized vessel type that has continuity with the protohistoric and historic occupation. Surfaces of Tizon ceramics often exhibit distinctive wiping marks similar to protohistoric ceramics (Dobyns and Euler 1958; Euler and Dobyns 1985; Pilles 1981; Whittlesey and Benaron 1997). Yavapai sites have been found in the uplands north and east of AZ U:1:433(ASM).

Historic Euro-American

Spanish Colonial (1591–1821) and Mexican Republic (1821–1848) influence ostensibly extended into the Salt River Valley. In reality, however, Euro-American settlement near the project area did not start in earnest until the nineteenth century when gold was discovered in Arizona (Keane and Rogge 1992). Placer deposits at Rich Hill near Wickenburg—the first gold strike in the central Arizona Territory—and later at Lynx Creek near Prescott, were the reason miners entered the areas northwest of Phoenix (Johnson 1972). Farms and ranches in the Salt River Valley were established to feed the prospectors, beginning with the farms that were irrigated by a prehistoric canal that was reopened in 1867 by the Swilling Irrigating and Canal Company (Zarbin 1997). The influx of miners and ranchers created conflict with the indigenous Yavapai and Apache as their traditional lands and water sources were usurped. Raids and counter raids made life in the region tenuous and led to the miners' demand that the military provide protection. In the late 1860s a sizable military presence was established in Arizona to engage the Indians, but it was not until 1871 that the Apache and Yavapai were defeated, opening the Salt River Valley to extensive Anglo and Hispanic farming.

Section IV. Previous Research

Thirty-one previous archaeological investigations have been conducted within one mile of AZ U:1:433(ASM) (Hill 2016). Six of the previous surveys have occurred wholly or partially within a 91-acre parcel owned by DM19, LLC (Davis 2003a, 2003b; Lausten 2004, Lundin 2001, 2002; Webb and Courtright 2002). Few cultural resources were encountered in the 91 acres; however, one site (AZ U:1:433[ASM]) was recorded previously (Lausten 2004).

The site is situated between a wash and an existing development used as a storage yard. The boundary of AZ U:1:433(ASM) is an oval approximately 30 m by 17 m (Figure 3). One artifact concentration is located within the site, near the southeastern site boundary. A low- to moderate-density artifact assemblage in the site consists of an estimated 300 sherds and 10 flakes (Table 1). The ceramic assemblage largely consists of Wingfield Plain, Gila Plain sherds, and a few red ware sherds. Flaked-stone artifacts are mainly secondary flakes; basalt and quartzite are the material types represented. Most of the artifacts are concentrated in the northeastern portion of the site, bordered by the wash to the north and the fence to the southeast. The artifact concentration (AC1) contains approximately 150 to 200 sherds within a 5 m area.

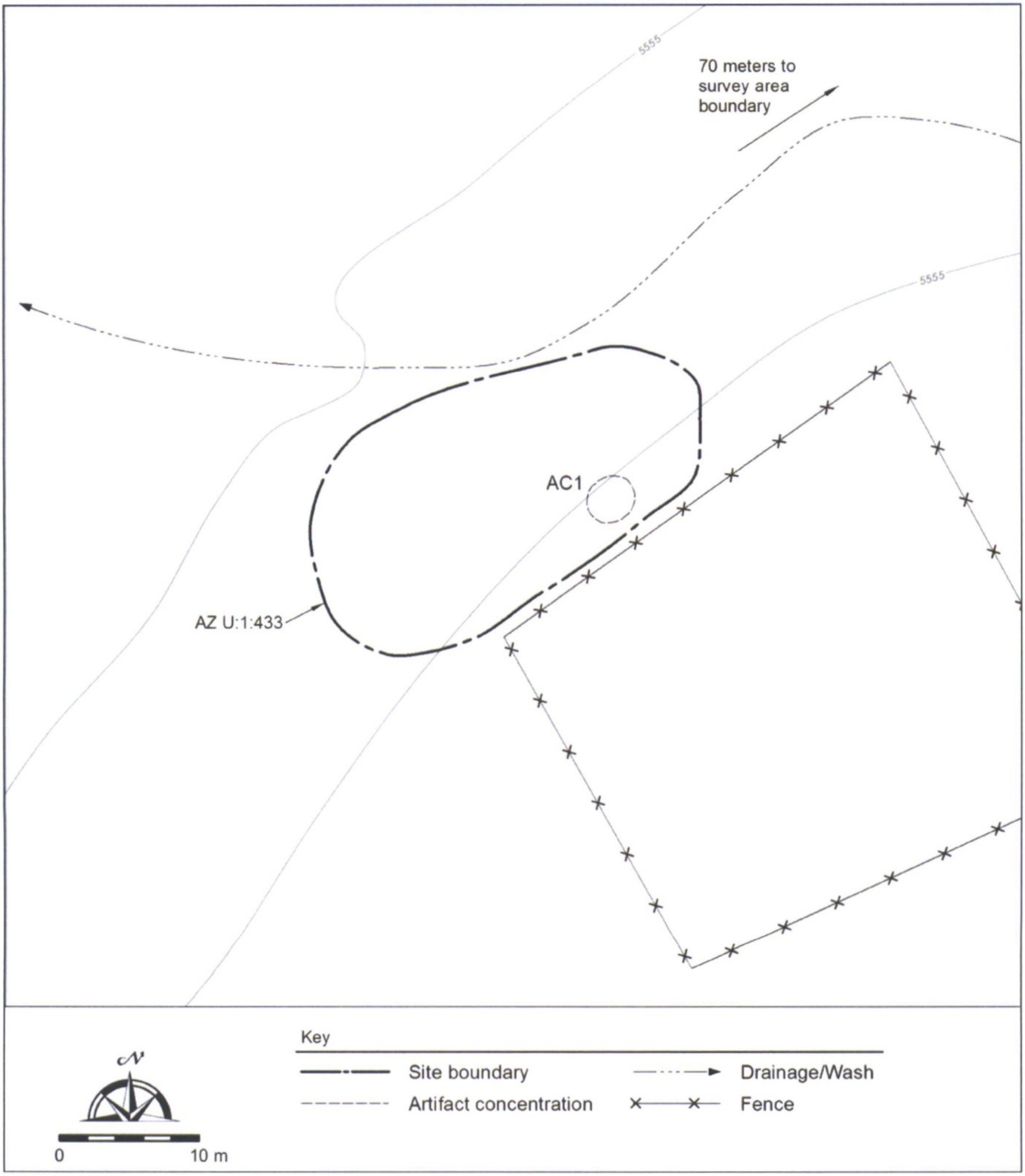

Figure 3. Site boundary and nearby disturbance.

Table 1. Surface artifacts.

Site location	Ceramics	Flaked stone	Other	Comment
Artifact concentration 1	150–200[a]	0	0	Near a disturbed area.
General site	100–150[a]	10[b]	0	Most artifacts are near wash

[a] Wingfield Plain, Gila Plain, and red ware.
[b] Secondary flakes of basalt and quartzite.

The site has experienced some disturbance during previous construction of the adjoining storage yard. Ground cover outside of the disturbance is moderate to heavy and visibility ranges from 50 to 75 percent open. In addition to the relatively dense vegetation, some construction materials and scattered debris obscure the modern ground surface.

Sites within one mile of AZ U:1:433(ASM) include one prehistoric artifact scatter (AZ U:1:391[ASM]), one historic road (AZ U:1:134[ASM]), and one historic dump (AZ U:1:136[ASM]). The nearest prehistoric site is an artifact scatter with a rock ring (a possible basket rest), suggesting the site was a resource collection loci. The resource collection hypothesis is based on Goodyear (1975), which documented the traditional *O'odham* use of rock rings during saguaro fruit collection. Beyond the one-mile radius study area are several large Pre-Classic and Classic period habitation sites that are surrounded by collection and processing sites, such as AZ U:1:433(ASM). The largest sites in the vicinity are AZ U:1:30(ASU), AZ U:1:31(ASU), and AZ U:1:129(ASM), and located 2–3 miles northeast of the project area. These sites are Pre-Classic and Classic period villages plus the associated field houses and collection/processing sites (Bruder 2002). Three miles to the west-northwest is a Colonial and Sedentary hamlet (Schoonover 2002), and 6.5 miles to the northwest is the large complex of Pre-Classic and Classic period sites in the Spur Cross Conservation Area (North 2002). Prehistoric residents of these sites would have exploited resources in the areas near their habitation sites, creating small artifact scatters across the landscape, occasionally with features. The resources they exploited at these sites are unknown, but thought to be a wide range of plant products (saguaro fruit, cholla buds, prickly pear, and others).

SECTION V. RESEARCH DESIGN

Investigations of AZ U:1:433(ASM) will be conducted under the theme and context, *Prehistoric Resource Exploitation of the North Scottsdale Uplands, A.D. 200 to A.D. 1500*. This theme has research domains that are appropriate for investigating the NRHP eligibility of AZ U:1:433(ASM). The NRHP-eligibility testing will determine whether subsurface features are preserved at the site that can contribute important information within the theme and context above.

Site Setting

The site's setting on the alluvial fan in an upland resource zone of North Scottsdale suggests prehistoric residents of the area exploited resources in the area and returned the resources to their village. Buried deposits related to collection and possible processing of resources may be present at AZ U:1:433(ASM), and could inform about what resources were collected/hunted and/or processed. The small size of the artifact scatter suggests limited use of the area, but multiple visits to the same location could account for the hundreds of artifacts reported at the site. Repeated reuse of the area by small groups could have occurred during sequential years. Alternatively, the site could be a single use but with a large number of people that left behind a moderate number of ceramics.

Chronology

The presence of red ware sherds implies a Classic period (A.D. 1250–1450) occupation of AZ U:1:433(ASM). However, plain ware was more common and could indicate use of the site over a wide range of time (A.D. 200–1500, or later). Chronological investigations during NRHP-eligibility testing will be designed to inspect a sample of the ceramics and other artifact classes that may inform about the age of the site. Chronological information will be sought from surface and subsurface artifacts, and subsurface features.

Stratigraphy at the site is anticipated to be relatively simple. However, the proximity of a small wash to the site indicates fluvial deposition may have covered artifacts and features over time. If the site was reused frequently, there even may be horizontal clustering of features created during each site use. If the site was used over the course of several years there could be evidence of multiple sequential site uses. Carefully evaluation of trench profiles may discover strata that could provide relative dates of features and artifacts. Chronometric samples may be collected and submitted for analysis to assist in defining the age of the site.

To determine if AZ U:1:433(ASM) is eligible for listing in the NRHP the following research questions will be examined during the site assessment:

Research Questions:

- *Are subsurface features preserved at AZ U:1:433(ASM)?*
- *Is there evidence for fluvial (or colluvial) deposition covering the features?*
- *Are the features associated one or more soil strata?*
- *What is the age of the subsurface features and artifacts?*

Data Requirements

Backhoe trench excavations will provide information about the horizontal distribution of subsurface features, if present. Features exposed in the profile of trenches will indicate the spatial extent of the site's subsurface context and possibly document the relationship of surface artifacts to subsurface features. Features and artifacts may not be in the same locations. Therefore, backhoe trenches may extend outside of the surface artifact scatter. For example, resource processing features such as thermal pits may have been placed away from locations where people conducted other activities (sleeping, food consumption, socializing) while at the site.

Trenches may expose multiple features in profile. Careful inspection of the backhoe trench profiles and correlation of soil strata between the trenches will be used to assess the site's natural and cultural formation processes and soil composition. The archaeologists will examine the geomorphological context of features exposed in trench profiles for chronological evidence including differences in vertical strata and the presence of potential radiocarbon samples.

Backhoe trench profiles will be drawn to scale and soils described. The elevation of the highest point of all subsurface pits will be recorded and correlated with soil strata. The location of temporally diagnostic artifacts will be documented from surface and subsurface contexts. Potential radiocarbon samples may be recovered from the backhoe trench profiles and assessed for their potential to date archaeological or natural contexts. Careful inspection of soil horizons exposed in the trenches will be made to assess the potential that fluvial or colluvial deposits have preserved features or soil strata.

SECTION VI. WORK PLAN

This proposed eligibility testing work plan is consistent with the Secretary of the Interior's Standards and Guidelines (48 CFR §44716–42), and takes into account the Advisory Council on Historic Preservation's (1980) publication, *Treatment of Archaeological Properties: A Handbook,* and the reporting standards developed by the ASLD, SHPO, and the Arizona State Museum (ASM), *Recommended Standards for Monitoring, Testing, and Data Recovery*.

This work plan details excavation methods and archaeological feature recording methods to be used at AZ U:1:433(ASM) during the NRHP-eligibility testing. The goals of the testing are to assess the natural and cultural context of the site, assess and document subsurface preservation, and collect chronological information about processing and cooking facilities or other features, if present.

The NRHP-eligibility investigations will characterize and map the extent of surface artifacts, assess the artifact's distribution relative to natural strata exposed in backhoe trenches, determine whether any intact subsurface structures, artifact concentrations, or other features are present, and assess the data potential of any subsurface deposits.

If the eligibility testing discovers subsurface features with associated intact cultural deposits Logan Simpson may recommend that AZ U:1:433(ASM) is eligible for listing in the NRHP under Criterion D (information potential). Alternatively, the test excavations may determine the site has no preserved subsurface features, either because there is no subsurface component or possible erosion or modern disturbances have destroyed prehistoric features.

NRHP Eligibility Testing Methods

NRHP-eligibility testing will include mapping and surface assessment, in-field analysis of selected surface artifacts, and backhoe trenching.

Site Assessment and Mapping

The first stage of investigation will include a thorough site recording and surface assessment effort within the site boundary. This stage will involve systematic mapping of the site's vicinity and surface artifact distribution. Resurvey of the site will use survey transects no more than 2 m apart to identify the extent of surface artifacts, disturbances, and locate temporally and functionally diagnostic artifacts. The maximum extent of the site will be reestablished, and this surface assessment may provide for discovery of previously unrecognized aspects of the site that may be explore during subsurface excavations.

The location of a site datum, excavation units and backhoe trenches will be established using a Nikon NPL-352 total station and a Trimble GeoXT global positioning system (GPS) unit with sub-meter real-time correction. A site base map will be developed to guide possible future data recovery efforts.

Surface Artifacts

After completing the surface reassessment and site mapping tasks, a sample of surface artifacts will be subject to in-field analysis. Minimally, all diagnostic artifacts will be point-located and analyzed. Surface artifacts will be assessed for temporal information.

Backhoe Trenching

Backhoe trenching is proposed to investigate soil depth and assess natural and cultural deposits. Systematic and judgmental trenching will be used to investigate the site, search for subsurface cultural features, define the depositional stratigraphy of the site and its features, and assess the extent of subsurface cultural deposits. All OSHA Subpart P Excavation Standards will be followed throughout the project.

The identification of subsurface features found during backhoe trenching will be undertaken in a multistage process that will begin with monitoring during trench excavation. During excavation, the trench wall and floor will be constantly examined for the presence of artifacts, macrobotanical material, and features. The backdirt will be scanned for artifacts, and the locations of features and significant in situ artifacts discovered during trench monitoring will be noted and marked for subsequent documentation.

Following the completion of trench excavation, both walls of the trench will be faced with hand tools and left exposed to dry. The profiles will be inspected for cultural features under different moisture and light conditions. Possible features identified during this work will be noted and marked. After drying, the trenches will be reexamined for subsurface cultural deposits and features. A representative profile of each trench will be mapped and drawn to scale. Identified features will be numbered in a Feature Log, marked on the trench wall(s), and recorded on a Feature Profile Form. Each feature will be photographed, profiled with one or more scale drawings, and described with regard to its morphology, the natural and cultural fill, and any associated artifacts. Features and trench profiles will be located on the site map with the total station. Artifacts and macrobotanical materials may be collected if the material might be damaged, displaced or lost through subsequent disturbance.

Section VII. Site-Specific NRHP Eligibility Testing Procedures

AZ U:1:433(ASM) consists of an artifact scatter adjacent to a shallow wash. An artifact concentration is within the southeast portion of the site. The proposed work will consist of the following tasks:

NRHP Eligibility Testing Tasks:

- Conduct a systematic, 2-m-interval survey of the site to reestablish the density and distribution of artifacts within the site, and locate and map temporally and functionally diagnostic artifacts.
- Establish a site datum and map site disturbances and planned backhoe trench locations using the total station; the APE will be photographed prior to testing.
- Excavate three systematic, 20-m-long backhoe trenches to assess depositional depth and presence of subsurface cultural deposits. The proposed trench locations may be altered to avoid vegetation or modern infrastructure. In total, 60 m will be excavated to a maximum depth of 4.5 ft (1.4 m) (Figure 4). All backhoe trenches will be evaluated for the presence of cultural deposits and trench profiles will be drawn of all cultural resources and representative soil strata. The trenches may extend outside of the surface artifact scatter to assess the relationship of surface materials to subsurface strata.
- All identified features will be documented, profiled, and photographed. Artifacts from backhoe trenches and from defined features may be collected.

If archaeological testing identifies significant preserved features during subsurface testing, then the site will be recommended eligible for listing in the NRHP and data recovery excavations will be recommended.

Section VIII. In-field Artifact Analyses

In-field analyses of prehistoric artifacts will be completed during eligibility testing. Photographs and line drawings may be collected for selected artifacts.

Ceramics within the site will be subjected to in-field analysis during fieldwork. All analyzed ceramics will be categorized based on vessel part (rims, necks, shoulders, and bodies) and basic ware class (plain ware, red ware, or other). All decorated ceramics, including those of non-local manufacture, will be classified by basic form, ware, and type whenever possible. The goal of this analysis is to assess the range of variability in local and non-local ceramics and examine potential temporal variation in the site's assemblage. We will record any worked sherds, non-vessel ceramics (e.g., figurines), and other unique artifacts.

The lithic analysis will include coding flaked-stone tools and the debitage. The analysis of debitage will record size grade, raw material type, presence/absence of a platform, platform type, flake type, break type, portion, and percentage of cortex. Lithic tools will be coded using functional, morphological, and technological variables and traditional typologies. The following variables will be recorded: completeness, technological class, morphological class, functional class, length, width, thickness, raw material type, retouch, flaws/possible reason for rejection, reworking, cortex, patination, break type, and edge grinding. Representative and outstanding examples of flaked-stone tools will be illustrated.

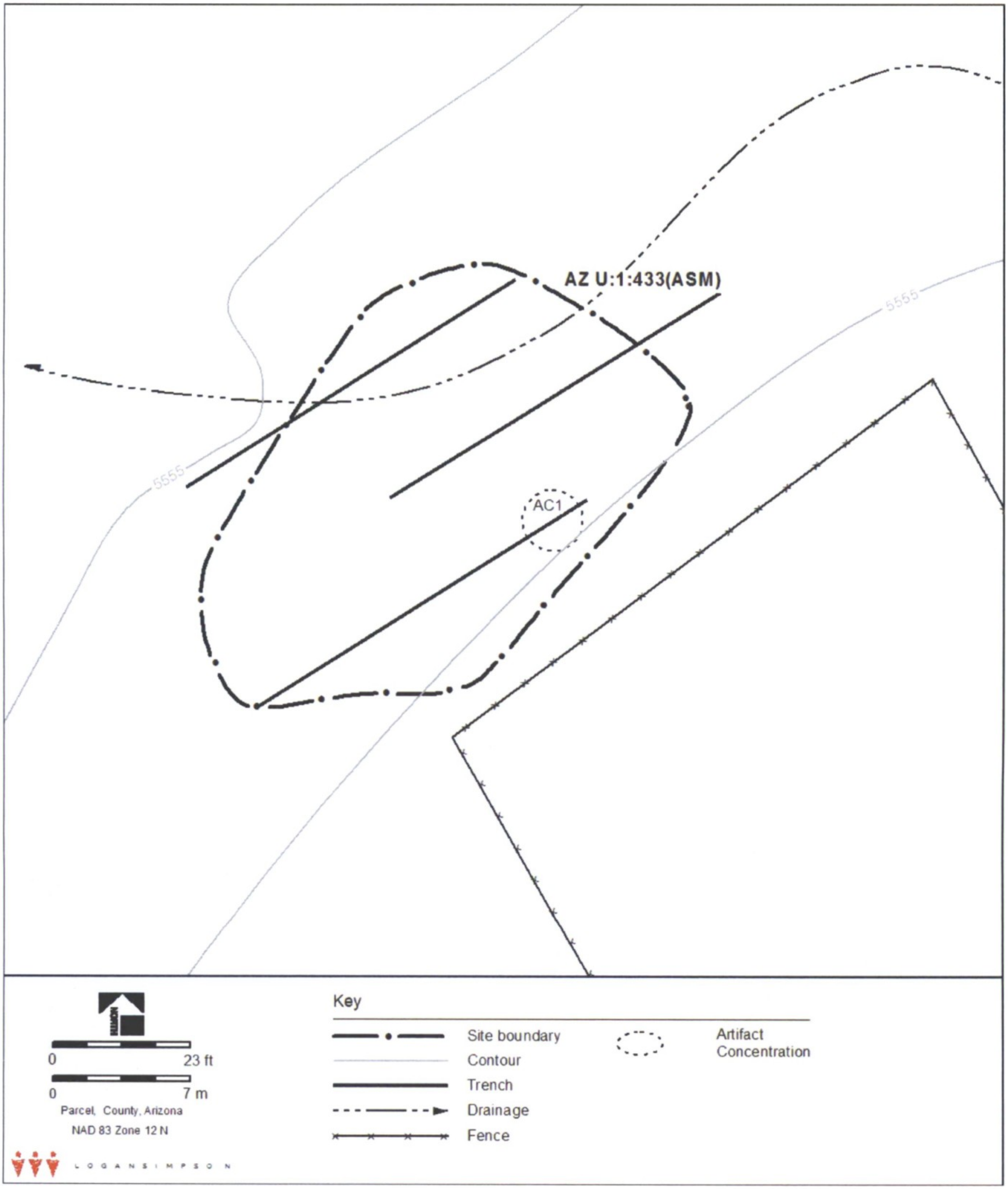

Figure **4**. Location of proposed trenches within AZ U:1:433(ASM).

Seven variables will be recorded during in-field analysis of ground-stone objects and tools: length, width, thickness, raw material, condition, surface use-wear, and grinding. The analysis will focus on determining tool function as it relates to site and feature function.

Other artifact classes may be identified (e.g. shell, faunal, mineral, macrobotanical). For shell and fauna discoveries, the genus and species will be determined, if possible. Whole or partial tools and decorative elements will be described individually. Minerals will be described using standard petrography references and any evidence for working will be indicated. Macrobotanical samples are anticipated to be rare, but if present may be collected for identification and radiocarbon analysis, if recovered from a significant context.

Section IX. Data Management and Dissemination

All project-related records will be temporarily stored in Logan Simpson's Phoenix laboratory. All paperwork will be checked for accuracy, completeness, and proper coding before being scanned. All documentation and processing will be accomplished according to the *Arizona State Museum Collections Repository Manual for Archaeologists* if any artifact collections are made.

All records generated as a result of the NRHP-eligibility testing investigations will be curated at the ASU's SHESC/ARI Center for Archaeology and Society repository, located at 734 W. Alameda, Suite 120, Tempe, Arizona. A curation agreement will be established with ARI Director, Dr. Arleyn Simon. All materials will be handled and processed according to guidelines established by ASM and the SHESC/ARI Center for Archaeology and Society repository.

Section X. Schedule

Logan Simpson will maintain effective communication with DM19, LLC and the COS. Project management tasks will be conducted throughout the course of the project and will include communication about the project's status and project milestones. Our staff will always be available to attend meetings with DM19, LLC, COS, or other parties to review the project status or resolve any questions concerning the project.

Preparation for fieldwork will begin immediately following issuance of a written notice to proceed and is anticipated to require 5 calendar days (Week 1). Revisions to the treatment plan and underground utility marking will be completed before fieldwork commences (Week 2). Although subject to weather and other fieldwork considerations, it is anticipated that eligibility testing field work will require 1 day (Week 3). Report preparation will commence immediately following completion of the fieldwork and a preliminary field report will be completed ten (10) days (Weeks 3–5) following the end of fieldwork. The preliminary report will be reviewed by the COS within a 30-day agency review period (Weeks 6–10). Logan Simpson will respond to agency comments within 10 days of receipt of comments (Weeks 11–12).

Section XI. Reports

Two reports will be submitted in conjunction with NRHP-eligibility testing. First, a preliminary report will be submitted to DM19, LLC, and the COS within 10 business days following the completion of the NRHP-eligibility testing fieldwork. The preliminary report will briefly summarize results of the testing, any fieldwork inconsistencies with the treatment plan, and provide a recommendation about the NRHP eligibility of AZ U:1:433(ASM). If the site is recommended eligible for inclusion in the NRHP, then the preliminary report will also include a recommendation on the need for any mitigation efforts such as data recovery.

Second, a draft final testing report will be completed that describes results of the resurvey, mapping, in-field artifact analysis, and trenching at the site. The draft final report will incorporate research analyses and synthetic discussions, and will be submitted for agency review within 30 days after the completion of the fieldwork. The COS will review and comment upon the draft final testing report within 30 days. Logan Simpson will address all reviewer comments for incorporation into the final report. The final report will be published as a Logan Simpson technical report within 10 days of receipt of the review comments. Three copies of the final report will be distributed: one each to DM19, LLC and COS. Additional copies will be provided to ASM and the SHESC/ARI in accordance with the curation agreement and Logan Simpson's blanket permit. The report also will be digitally curated through tDAR – the Digital Archaeological Record, where it will be available online in perpetuity.

Section XII. Human Remains

In the unlikely event that human remains are discovered during Phase I testing, Logan Simpson will comply with the stipulations of the Arizona Burial Law (A.R.S. §41-865). All ground-disturbing work within 30 m (98 ft) of the discovery will cease and Logan Simpson will secure the remains from further disturbance. Logan Simpson will contact the COS and the ASM to alert them of the discovery and request directions for further work. All human remains and associated funerary objects will be treated with respect and dignity at all times and will remain protected and covered until consultation can be undertaken with concerned Tribes to ensure that appropriate procedures for the recovery, treatment, and disposition of the remains, associated funerary objects, and objects of cultural patrimony are implemented.

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SCHOOL DISTRICT
Determination of Adequate Facilities

City of Scottsdale Project Number: 279 -PA- 2016

Project name: Desert Mountain - Parcel 19

Project Location North of NEC Pima Road & Cave Creek Road

Applicant Name: John Berry Phone: (480) 385-2727

Applicant E-mail: JB@berryriddell.com Fax: (480) 385-2757

School District: Cave Creek Unified

I, ______________ hereby certify that the following determination has been made in regards to the Referenced project:

- ☐ The school district had adequate school facilities to accommodate the projected number of additional students generated by the proposed rezoning within the school district's attendance area; or
- ☐ The school district will have adequate school facilities via a planned capital improvement to be constructed within one year of the date of notification of the district and located within the school district's attendance area; or
- ☐ The school district has determined an existing or proposed charter school as contracted by the district can be provide adequate school facilities for the projected increase in students; or
- ☐ The applicant and the school district have entered into an agreement to provide, or help to provide, adequate school facilities within the school district's attendance area in a timely manner (a copy said agreement is attached hereto); or
- ☐ The school district does not have adequate school facilities to accommodate projected growth attributable to the rezoning.

Attached are the following documents supporting the above certification:

- ☐ Maps of the attendance areas for elementary, middle and high schools for this location.
- ☐ Calculations of the number of students that would be generated by the additional homes.
- ☐ School capacity and attendance trends for the past three years.

Or;
I, ______________________, hereby request a thirty (30) day extension of the original discussion and response time.

______________________ ______________________
Superintendent or Designee Date

Planning, Neighborhood and Transportation Division

7447 E. Indian School Road, Suite 105, Scottsdale, AZ 85251 ♦ Phone: 480-312-7000 ♦ Fax: 480-312-7088

17-ZN-2016
6/17/16

Planning & Development Services

7447 E. Indian School Road, Suite 105
Scottsdale, AZ 85251

October 12, 2016

John Berry
Berry Riddell, LLC
6750 East Camelback Road, Suite 100
Scottsdale, AZ 85251

RE: Desert Mountain Parcel 19 - Case 5-GP-2016, Case 17-ZN-2016 and Case 6-UP-2016

John,

This letter is to inform you that the Work Plan for National Register of Historic Places Eligibility Testing at AZ U:1:433(ASM), Desert Mountain Parcel 19 (Work Plan), dated September 13, 2016 Submittal 2, has been accepted by me.

Please advise your client to direct Logan Simpson to proceed with the eligibility testing as identified in Sections VI through XII of the Work Plan.

Steve Venker

Steve Venker
City Archaeologist

Copy: Jesus Murrillo

ORIGINAL

Market Analysis of
Desert Mountain Parcel 19

Scottsdale, Arizona

Prepared for:

M3 Companies

DM19, LLC

May 2016

Prepared by:

Elliott D. Pollack & Company
7505 East 6th Avenue, Suite 100
Scottsdale, Arizona 85251

17-ZN-2016
09/19/16

Table of Contents

Executive Summary

Purpose of Study

Elliott D. Pollack and Company was retained by DM19, LLC to conduct a market analysis related to a proposed Major General Plan Amendment for Parcel 19 in the Desert Mountain Master Planned Community. The amendment request is from the land use categories of Employment, Commercial, Office, Developed Open Space and Rural Neighborhoods to the Suburban Neighborhoods (approximately 54 acres) and Developed Open Space/Golf (approximately 39 acres). A companion rezoning request will also be submitted for the property from the current Industrial and Commercial uses to R-4 for a residential development and a short-game par 3 golf course with clubhouse.

This study analyzes the supply and demand for employment and commercial uses within the market area surrounding the intersection of Pima and Cave Creek Roads with particular focus in the viability of developing such uses on Parcel 19. A summary of existing commercial centers in the north Scottsdale market area is provided including their size, occupancy and vacancy status, the types of anchor tenants in the centers, and similar information. A broad overview of the Greater Phoenix commercial markets is also provided.

Property Description

The property is located in the far southwest corner of Desert Mountain, north and east of the intersection of Cave Creek Road and Pima Road. The municipal boundary of the Town of Carefree adjoins the subject property on its west and south. The subject property has approximately 1,900 feet of frontage on Pima Road and 400 feet on Cave Creek Road. The original zoning of the property for C-0, C-2 and I-1 uses was approved in 1987.

Parcel 19 is located just to the east of the SkyRanch Carefree private airport. The original zoning plan for Parcel 19 includes 6.06 acres of I-1 zoning, 29.9 acres of C-2 zoning and 29.9 acres of C-O zoning. A total of 600,000 square feet of commercial building square footage can be placed on the property. No other parcels in the Carefree and North Scottsdale area can or have reached this level of development.

Primary Market Area Identification

The Primary Market Area (PMA) is the region that will generate most of the demand for a particular real estate product. For this particular analysis, the PMA is defined as a three mile radius surrounding the intersection of Pima and Cave Creek Roads. The PMA encompasses the Town of Carefree, the eastern part of Cave Creek and the northern part of the City of Scottsdale. In 2015, the 3-mile PMA contained a population of 9,245 persons in 4,528 households. The median age of residents is nearly 60 years, well in excess of the County's median age of 34.6 years. The median household income of residents is $115,000 compared to the County's $57,400.

PMA Retail Market

An inventory of the retail market data collected from broker websites, site visits and other resources conclude that the PMA has approximately 658,000 square feet of retail space (centers and complexes over 10,000 square feet in size). The market area has a vacancy rate of 17.9% which is significantly higher than Maricopa County vacancy rate of 9.1%. Altogether, the PMA has 118,000 square feet of vacant retail space.

Much of the retail inventory in the PMA is concentrated in the Town of Carefree or just outside town boundaries. Two properties in the area with the highest vacancy rates include Terravita Marketplace located at the intersection of Scottsdale Road and Carefree Highway and Spanish Village in Downtown Carefree. In particular, Terravita Marketplace lost its anchor grocery store tenant after Albertson's sold the property to Haggen Foods which subsequently closed the store. The shopping center that is dominating the North Scottsdale retail market area is The Summit at Scottsdale located at the northeast corner of Scottsdale Road and Ashler Hills Drive. The center is anchored by Target and Safeway and is fully leased.

In our opinion, the current zoning and acreage of the property designated for commercial retail uses (C-2) is not warranted relative to the demand generated from the residents living within the PMA. Existing retail centers in the PMA are currently operating at high vacancies and at least two grocery-anchored centers are more than 45% vacant. In addition, the C-2 property within Parcel 19 has limited access and visibility to Cave Creek Road, an important consideration in the development and marketing of a retail center.

North Scottsdale/Carefree Office Market

The North Scottsdale and Carefree office markets consist of approximately 362,000 square feet of space with an overall vacancy rate of 23%, higher than the County-wide rate of 19%. Most of the buildings are clustered in Downtown Carefree in relatively small buildings. The largest complexes are Stagecoach Village in Cave Creek and Scottsdale Westland, an office condo complex. Stagecoach Village has an estimated 40% vacancy, partly due to its location in a ravine off of Cave Creek Road. Built prior to the recession, the property has never performed to expectations and large parts of the complex were sold at a sheriff's sale in 2013. Scottsdale Westland is essentially fully occupied.

Pima Norte is an office condo complex located at the southwest corner of Pima and Cave Creek Roads just west of Desert Mountain Parcel 19. The complex was constructed in 2005 and was the subject of a distressed sale in 2007. Nine suites are available for lease with a vacancy rate of 23%.

The PMA office market is limited in size and provides space for small local businesses such as attorneys, CPAs, real estate agents, dentists and doctors. The size of the C-O office site in Parcel 19 is capable of accommodating 400,000 square feet of office space, an amount larger than the entire PMA office market of 362,000 square feet. In our opinion, the current zoning and acreage of the property designated for commercial office uses (C-O) is not warranted relative to demand.

Industrial Market Summary

The industrial market in the Carefree and North Scottsdale area is essentially non-existent. The only property that could be considered industrial in character is the complex of aircraft hangars at the SkyRanch airport. The Town of Carefree does not permit industrial uses in the community and there are no industrial uses within the PMA in Scottsdale. Industrial uses typically locate along major thoroughfares with convenient access to the wider metro area. Business uses in industrial parks also depend on access to a labor force to fill jobs. Based upon the typical criteria mentioned above, industrial uses are not appropriate for Desert Mountain Parcel 19 given the residential uses in the immediate vicinity.

1.0 Introduction

1.1 Purpose of Study

Elliott D. Pollack and Company was retained by DM19, LLC to conduct a market analysis related to a proposed Major General Plan Amendment for Parcel 19 in the Desert Mountain Master Planned Community. The amendment request is from the land use categories of Employment, Commercial, Office, Developed Open Space and Rural Neighborhoods to the Suburban Neighborhoods (approximately 54 acres) and Developed Open Space/Golf (approximately 39 acres). A companion rezoning request will also be submitted for the property from the current Industrial and Commercial uses to R-4 for a residential development and short-course par 3 golf course with clubhouse.

This study analyzes the supply and demand for employment and commercial uses within the market area surrounding the intersection of Pima and Cave Creek Roads with particular focus in the viability of developing such uses on Parcel 19. A summary of existing commercial centers in the north Scottsdale market area is provided including their size, occupancy and vacancy status, the types of anchor tenants in the centers, and similar information. A broad overview of the Greater Phoenix employment and commercial markets is also provided.

1.2 Property Description

The property is located in the far southwest corner of Desert Mountain, north and east of the intersection of Cave Creek Road and Pima Road. The municipal boundary of the Town of Carefree adjoins the subject property on its west and south. The subject property has approximately 1,900 feet of frontage on Pima Road and 400 feet on Cave Creek Road. The original zoning of the property for C-0, C-2 and I-1 uses was approved in 1987.

Parcel 19 is directly east of SkyRanch at Carefree, a private airport that serves the area. Use of the airport is restricted to members with landing permission required of transient aircraft 24 hours prior to landing. The airport has 101 based aircraft with an average of 66 operations per week. Due to the slope of the runway from its high point on the east, the preferred direction of takeoff is to the west; preferred landings are to the east. This could direct most of the traffic at the airport to its west side away from Parcel 19. The airport has variety of homes and home sites adjacent to the runway. Hangars are available for rent or purchase.

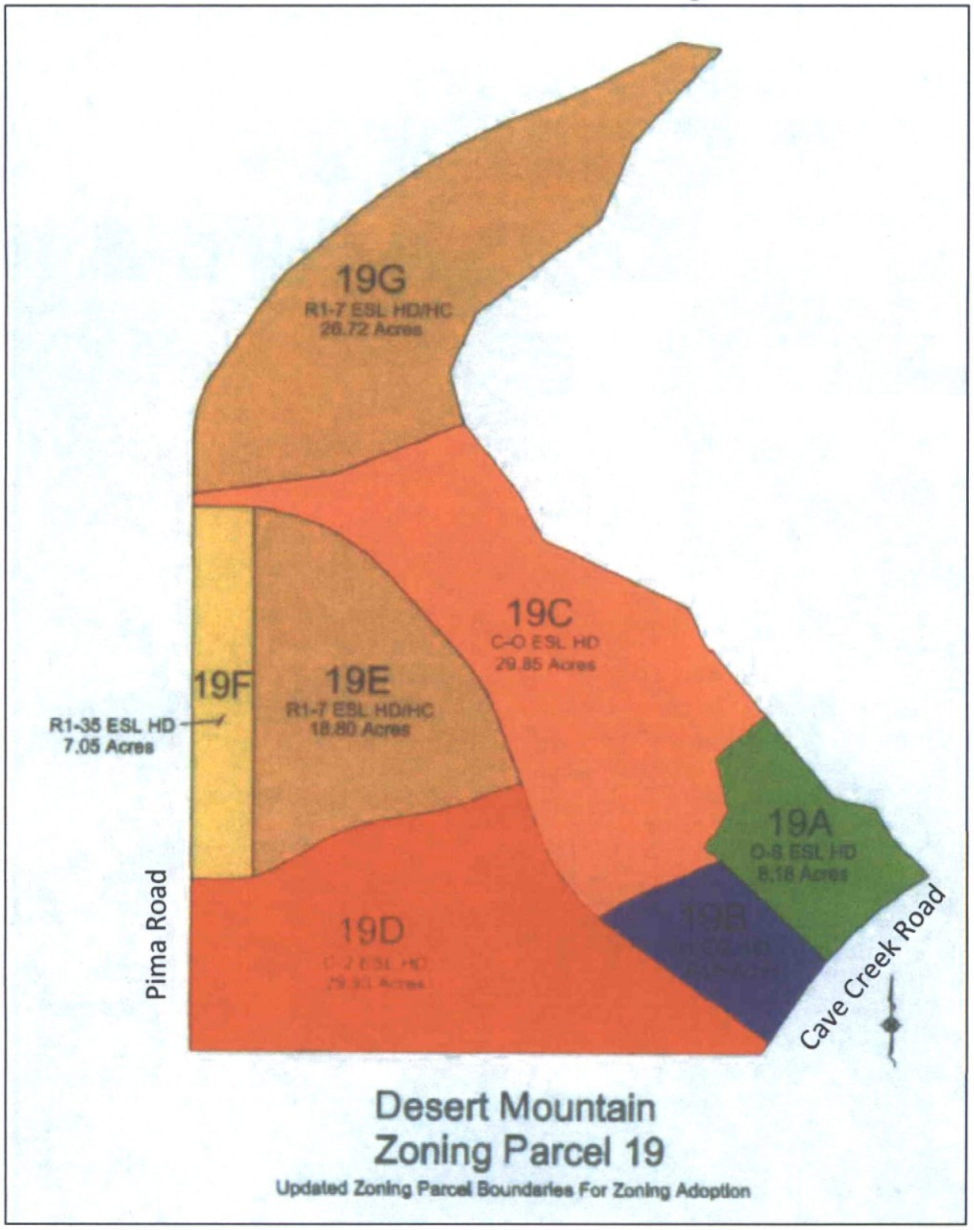
An aerial photo of Desert Mountain Parcel 19 follows.

To the east of SkyRanch is a church with a large parking lot directly in line with the runway. Single family homes are located east of the church. The proposed golf course to be located in Parcel 19 would be located along the southern boundary of the property in line with the extension of the SkyRanch runway to the east.

The original zoning plan for the property is shown on the following exhibit. Parcel 19A includes the City's fire station and water infrastructure facilities as well as improvements for Desert Mountain. Parcel 19B is the I-1 zoned property at 6.06 acres in size with 366 feet of frontage on Cave Creek Road. According to the City staff report from 1987, uses permitted in the I-1 parcel are limited to warehouse, storage and other low occupancy uses. Parcel 19C is the proposed C-O office parcel north of the Industrial site. Parcel 19D is the C-2 commercial site that has only 50 feet of frontage onto Cave Creek Road.

At the acreages shown on the following exhibit, a total of 600,000 square feet of commercial square footage can be placed on the property. No other parcels in the Carefree and North Scottsdale area can or have reached this level of development.

Desert Mountain Parcel 19 Zoning



Potential Building Square Footage Desert Mountain Parcel 19		
Use	Net Acres	Potential Building SF
Industrial (I-1)	4.74	100,000
Commercial Retail (C-2)	23.35	100,000
Commercial Office (C-O)	25.56	400,000
Totals	**53.65**	**600,000**

Traffic volumes in the area are available from the City of Scottsdale, however, Carefree has not updated traffic counts since 2008. Unfortunately, the intersection of Pima and Cave Creek Roads is not located within Scottsdale. The following table outlines the most currently available average daily traffic counts.

Average Daily Traffic Counts Near Pima and Cave Creek Roads

City	Type of Count	Segment or Intersection	2008	2012	2014
Carefree	Segment	Cave Creek Rd. East of Pima Rd.	11,373		
Carefree	Segment	Cave Creek Rd. West of Pima Rd.	6,215		
Carefree	Segment	Pima Rd. South of Cave Creek Rd.	9,695		
Carefree	Segment	Pima Rd. North of Cave Creek Rd.	1,524		
Scottsdale	Segment	Cave Creek Rd. at Lone Mountain Pkwy.		1,400	2,200
Scottsdale	Segment	Pima Rd. South of Stagecoach Pass		10,400	11,200
Scottsdale	Intersection	Pima Rd. & Stagecoach Pass		11,600	11,900

Sources: City of Scottsdale, Town of Carefree

The only currently available traffic count for Cave Creek Road from Scottsdale is approximately 2.5 miles east of the intersection of Pima and Cave Creek Roads at Lone Mountain Parkway. Those counts are very low at 2,200 vehicles per day in 2014 and do not account for intervening traffic entering or exiting Desert Mountain or subdivisions to the south. The counts from the Town of Carefree show more than 11,000 trips on Cave Creek Road just east of Pima Road in 2008. The Carefree data appears to show most west-bound traffic turning south onto Pima Road. Scottsdale data also suggests that much of the traffic in the area is using Pima Road. The Scottsdale traffic counts also show an increase in traffic between 2012 and 2014.

The traffic counts for the intersection of Pima and Cave Creek Roads are meaningful, but the area to the east of Pima Road has little room for additional housing development and population growth. The traffic counts on Cave Creek Road pale in comparison to Scottsdale Road. For instance, between Westland Boulevard and Lone Mountain Road, more than 24,000 cars per day on average used Scottsdale Road in 2014.

1.3 Proposed General Plan Amendment and Rezoning

DM19, LLC is proposing the development of a 190-unit single family residential community at an overall density of 2.04 units per acre for the approximate 93-acre site. Home sites would be developed along the par-3 golf course. The property also includes four separate recharge well sites, a fire station and other water infrastructure facilities operated by the City of Scottsdale. The well sites are proposed for relocation. Fire Station 16 is a temporary station that will be moving three miles east on Cave Creek Road in the future to better serve city residents.

2.0 Greater Phoenix and Carefree/North Scottsdale Retail Market

This section provides an overview of the broader Greater Phoenix commercial trends and analysis of the retail market in the Carefree/North Scottsdale area. The market area surrounding Desert Mountain Parcel 19 will be identified along with the demographic characteristics of the population living within the market area.

2.1 Greater Phoenix Retail Market

Over the past six years, the Maricopa County retail market has experienced some of its highest vacancy rates in history resulting from the effects of the Great Recession. According to CBRE, the vacancy rate across the Valley reached 12.2% in 2010 and 2011, the highest vacancy rate for retail space ever recorded in the region. Since that time, the vacancy rate has trended downward to less than 10% at the end of 2014 and 9.1% as of the fourth quarter of 2015. Over 84% of the vacant retail space is in neighborhood and unanchored strip retail space as retailers either went out of business, closed non-performing stores or exited the Greater Phoenix market.

Retail Market Statistics
Greater Phoenix

Year	Total SF	Vacant SF	Occupied SF	Percent Vacant	SF Under Construction	SF Completed	Net Absorption (SF)
2000	93,634,900	4,919,085	88,715,815	5.3%	6,169,321	4,529,029	4,130,567
2001	101,091,384	6,658,568	94,432,816	6.6%	2,230,257	7,568,331	5,500,963
2002	104,978,951	7,662,407	97,316,544	7.3%	3,573,033	4,266,275	3,041,142
2003	109,992,060	8,119,612	101,872,448	7.4%	3,297,567	5,013,109	4,118,612
2004	115,493,766	6,983,293	108,510,473	6.1%	6,191,363	5,639,916	6,664,812
2005	121,742,555	6,390,301	115,352,254	5.3%	4,319,527	6,517,045	6,708,155
2006	126,325,173	6,487,730	119,837,443	5.1%	9,996,355	4,511,645	5,244,597
2007	137,430,038	8,445,939	128,984,099	6.1%	6,133,316	11,555,084	9,424,362
2008	143,659,243	10,774,443	132,884,800	7.5%	6,008,998	5,202,267	3,395,986
2009	148,065,228	16,879,436	131,185,792	11.4%	757,511	708,920	(1,117,100)
2010	148,967,608	18,174,048	130,793,560	12.2%	315,590	380,032	(75,352)
2011	148,992,151	18,177,042	130,815,109	12.2%	395,281	362,590	(152,647)
2012	149,177,083	16,409,479	132,767,604	11.0%	463,775	727,175	1,879,005
2013	148,851,124	15,182,815	133,668,309	10.2%	125,400	512,000	1,579,202
2014	148,801,899	14,284,982	134,516,917	9.6%	458,413	285,400	1,487,313
2015	148,966,758	13,555,975	135,410,783	9.1%	1,324,537	552,000	1,150,192

Source: CBRE

As a result of the recession and high vacancy rates, shopping center construction activity has declined dramatically. According to CBRE, between 2000 and 2008, an average of 6.1 million square feet of retail space was constructed each year in Maricopa County with 11.6 million square feet constructed in 2007 alone. Since 2008, only 3.53 million square feet of retail space have been completed or an average of 504,000 square feet each year. In addition, at the end of 2015, there were 120 vacant buildings greater than 20,000 square feet in size or a total of 4.5 million square feet. The majority of these buildings have limited opportunity for releasing or development because of their location, size of the building or age of the building. The reason for the high vacancy in big box buildings is the trend of retailers to downsize their space needs. Except for grocery stores and supercenters, nearly every major big box retail category is shrinking their brick-and-mortar footprint.

Some of the major trends that have affected the local retail industry over the last decade are:

Domination by Big Box Retailers

One of the most important trends in retailing over the past two decades has been the rise of big box retailers led predominantly by Wal-Mart Supercenters and Target. Warehouse clubs such as Costco have also contributed to the rise of big box domination. Most importantly, many of the big box retailers have also transitioned into the grocery business, severely impacting the traditional neighborhood grocery industry. Wal-Mart, in particular, has penetrated the Greater Phoenix retail market so deeply that there are just as many Wal-Mart stores as there are Safeway groceries in the region. Big box retailers have also had a significant influence on sales at regional malls and traditional department stores.

Obsolescence

The retail industry is constantly changing due to the threat of obsolescence. Obsolescence can occur due to the demands of consumers preferring one retail format over another (such as the recent misfortunes of JC Penney and Sears) or it can occur as a retailer transitions to a different format to avoid obsolescence. In the past year, a number of national retail chains, particular in the apparel industry, have announced store closings and, in some cases, declared bankruptcy including Abercrombie and Fitch, Aeropostale, American Eagle, Chico's, Express and Juicy Couture.

Over-Supply of Retail

National retail chains need to grow their businesses by growing their number of outlets. As one of the country's fastest growing regions, Greater Phoenix drew a wide variety of national retailers to the area over the last ten to twenty years, all hoping to take advantage of the rapidly growing population base. The Great Recession demonstrated the hazards of this strategy and the resulting high levels of vacancy in retail space that persist in the market today.

Consolidation

A common outcome of a highly competitive retail environment is consolidation and one of the best examples is the grocery industry. In fact, Albertson's corporate owner recently purchased Safeway which could lead to store closures over time. Consolidation has primarily occurred in the grocery industry due to inroads made by Wal-Mart, Target and Costco in the grocery business. Natural foods companies such as Whole Foods and Sprouts have also placed additional pressure on traditional grocery chains. Few new grocery stores have been built in recent years and the area will likely see few built in the future except in select areas where demand is growing and a market area is underserved.

For the far north Scottsdale/Carefree area, consolidation in the grocery market has resulted in the former Albertson's in the Terravita Marketplace shopping center at Scottsdale Road and Carefree Highway being sold to Haggen Foods. Shortly after the sale, the grocery store was closed by Haggen. Albertson's disposed of the store because of the Safeway located just one mile south on Scottsdale Road. As a result, there are only three groceries currently serving the immediate Carefree and north Scottsdale market – the Safeway on Scottsdale Road, a Bashas' in Carefree and an AJ's at Scottsdale and Lone Mountain Roads.

E-Commerce Sales

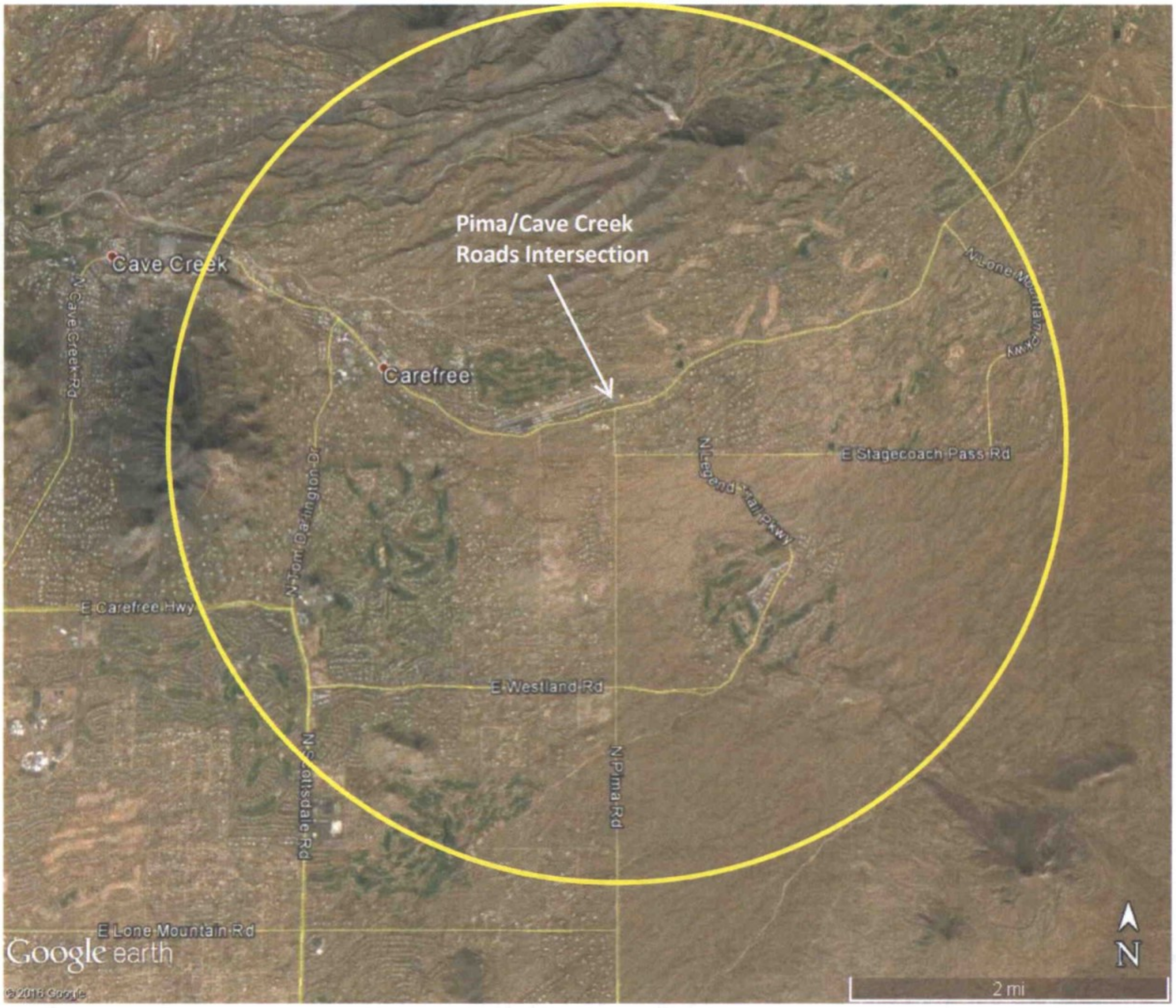
Bricks and mortar retailing has been significantly affected over the past decade by internet sales and the trend is expected to continue in the future. E-Commerce sales have increased from 1.8% of retail sales in 2000 to 11.2% in 2013. Most affected are book stores, department stores, discount stores (those not selling perishable foods), florists, and office supply stores. Traditional department stores recorded the most loss of retail sales of any other type of store, with overall sales more than 39% lower in 2013 compared to 2000. Some of this decline can also be attributed to the rise of the big box value retailers as well.

The above trends are expected to persist into the future making retailing a dynamic industry that will continuous evolve and change with new retailers entering markets and others leaving as trends change.

2.2 Primary Market Area Identification

The Primary Market Area (PMA) is the region that will generate most of the demand for a particular real estate product. It is also the area that contains most of the properties that will compete against the subject property. For this particular analysis, the PMA is defined as a three mile radius surrounding the intersection of Pima and Cave Creek Roads. The PMA encompasses the Town of Carefree, the eastern part of Cave Creek and the northern part of the City of Scottsdale. It is generally a sparsely populated area with large lot subdivisions and above average home values. The following aerial photo outlines the location of the PMA. The market area will be referred to in this report as the Desert Mountain Parcel 19 PMA.

Desert Mountain Parcel 19 PMA



The following table outlines the demographic characteristics of residents living in the PMA. For comparison purposes, a 2-mile radius summary is also provided as well as Maricopa County data.

According to the U.S. Census and EASI Demographics, the 3-mile PMA contains a population of 9,245 persons and 4,528 households in 2015. The median age of residents is nearly 60 years, well in excess of the County's median age of 34.6 years. Nearly 30% of all units in the PMA are noted as vacant by the U.S. Census indicating that many of the homes are occupied on a part-time basis. There are few multi-family units in the PMA. The median household income of residents is $115,000 compared to the County's $57,400. Overall, the PMA demonstrates a much older and wealthier population than the typical County household.

The table also demonstrates that the immediate 2-mile radius around the intersection of Pima and Cave Creek Roads has a limited population of less than 4,700 persons. This level of population restricts the potential demand for retail uses on the DM Parcel 19 site.

Population and Housing Characteristic
Pima and Cave Creek Roads Market Area

	2-Mile Radius		3-Mile Radius		Maricopa County	
	Total	% of Total	Total	% of Total	Total	% of Total
Population 2010	4,322		8,549		3,824,058	
Population 2015	4,675		9,245		4,076,438	
Population 2020	4,937		9,763		4,480,899	
Households 2015	2,101		4,279		1,526,756	
Households 2020	2,223		4,528		1,678,240	
Average Household Size	2.22		2.15		2.67	
Median Age	56.0		57.8		34.6	
Housing Units	2,754		5,640		1,639,279	
Occupied Units	1,944	70.6%	3,962	70.2%	1,411,583	86.1%
Vacant Units	810	29.4%	1,678	29.8%	227,696	13.9%
Owner Occupied Units	1,708	87.9%	3,550	89.6%	910,320	64.5%
Renter Occupied Units	236	12.1%	412	10.4%	501,263	35.5%
Occupied Units	1,944		3,962		1,411,583	
Single Family Detached	1,628	83.7%	3,276	82.7%	924,478	65.5%
Single Family Attached	171	8.8%	475	12.0%	76,281	5.4%
Multi-Family	145	7.5%	211	5.3%	410,824	29.1%
Median Household Income	$128,922		$115,366		$57,354	
Average Household Income	$188,421		$162,443		$77,656	

Sources: MAG, EASI, U.S. Census, AZ Dept. of Administration

2.3 PMA Retail Market

An inventory of the retail market data from broker websites, site visits and other resources conclude that the PMA has approximately 658,000 square feet of retail space (centers and complexes over 10,000 square feet in size). The market area has a vacancy rate of 17.9% which is significantly higher than Maricopa County vacancy rate of 9.1%. Altogether, the PMA has 118,000 square feet of vacant retail space.

Much of the retail inventory in the PMA is concentrated in the Town of Carefree or just outside town boundaries. Two of the problem properties in the area include Terravita Marketplace located at the intersection of Scottsdale Road and Carefree Highway and Spanish Village in Downtown Carefree. In particular, Terravita Marketplace lost its anchor grocery store tenant after Albertson's sold the property to Haggen Foods which subsequently closed the store. This shopping center was at one time a fully leased property.

Another historically-problem retail center has been the Scottsdale North Marketplace located at the southeast corner of Lone Mountain and Scottsdale Roads. While outside the boundaries of the PMA, the center has never performed to expectations and today carries a 45% vacancy rate.

The shopping center that is dominating the North Scottsdale market area is The Summit at Scottsdale located at the northeast corner of Scottsdale Road and Ashler Hills Drive. The center is anchored by Target and Safeway and is fully leased. Another healthy center is Carefree Marketplace in Carefree anchored by Bashas' and Ace Hardware.

The following table illustrates the inventory and availability of retail space in the market area. As noted previously, except for The Summit at Scottsdale and Carefree Marketplace, all other centers are experiencing vacancy rates above 25%.

Retail Inventory & Vacancies
Desert Mountain Parcel 19 Market Area

Center	Location	Total SF	Vacant SF	Vacant %	Anchor Tenants/Notes
El Pedregal	34505 N. Scottsdale Rd	82,175	25,060	30.5%	
Terravita Marketplace	34402 North Scottsdale Road	102,733	55,287	53.8%	Wells Fargo, Walgreens
The Summit at Scottsdale	32331 N. Scottsdale Road	322,908	4,498	1.4%	Target, Safeway, CVS, Office Max
Carefree Marketplace	36889 North Tom Darlington Dr	84,951	8,942	10.5%	Bashas', Ace Hardware
Spanish Village	7208 E. Ho Road	21,013	12,331	58.7%	
Mariachi Plaza	7171 E. Cave Creek Road	27,630	6,848	24.8%	
Carefree Galleria	3755 Hum Road	16,775	4,595	27.4%	mixed office and retail space
Total Retail		**658,185**	**117,561**	**17.9%**	

Sources: Colliers International; Whitestone REIT; Commercial Properties Incorporated (CPI); Diamond Pacific Investments, Inc.; North Bay Commercial; BGA Realty Partners; Plaza Companies; The Hogan Group; Weingarten Realty; Coldwell Banker; Henstra Hounds Realty; CBRE; Westwood Financial Corp.; SoHo International; Donahue Shriber; Desert Capital Venture; Tony Cox & Associates.; Cushman & Wakefield; LoopNet.com; PropertyLine.com; CommercialSearch.com; Elliott D. Pollack & Co.; Landiscor; Maricopa County Assessor

An important anchor for any neighborhood or community shopping center is a grocery store. The Desert Mountain Parcel 19 site is 23 acres in size and could accommodate upwards of 100,000 square feet of building space. In order to function properly as a retail center it would require an anchor tenant of some type. Within the PMA, the retail centers that are performing at high occupancy rates are those with a grocery anchor.

A simple measure of demand for grocery stores in the Greater Phoenix region is the number of persons per store. For instance, of the top four grocery chains in the region (Bashas'(including Food City and AJ's), Safeway, Albertsons and Fry's), there are approximately 17,800 persons per store. In Scottsdale, the ratio is much lower at 8,600 persons per store. Scottsdale has 28 grocery stores for its 231,000 residents. The reasons for this low ratio of grocery stores could be several including:

- The above average incomes of Scottsdale households that produces more disposable income and spending in grocery stores.
- The linear geography of Scottsdale which means that the stores provide service to residents living outside of the city.

The demand for grocery stores in the PMA is outlined on the following table using both county-wide demand estimates and City of Scottsdale demand estimates. The Market Area should be able to support just one grocery store today even though it has two currently in operation. Part of the demand for these grocery stores appears to be coming from residents living outside of the PMA and Scottsdale.

Grocery Store Demand Desert Mountain Parcel 19 Market Area		
	2015*	2020**
Market Area Population	9,245	9,763
County Grocery Store Demand/Person	17,800	17,800
Scottdale Grocery Store Demand/Person	8,600	8,600
PMA Grocery Store Demand at County Average	**0.5**	**0.5**
PMA Grocery Store Demand at Scottsdale Average	**1.1**	**1.1**
Sources: EASI, Elliott D. Pollack & Co.		

2.4 Conclusions

In our opinion, the current zoning and acreage of the property designated for commercial retail uses (C-2) is not warranted relative to the demand generated from the residents living within the PMA. Existing retail centers in the PMA are currently operating at high vacancies and at least two grocery-anchored centers are more than 45% vacant. The PMA can only support one grocery store, although two are currently operating in the area. A third grocery-anchored center cannot be supported. In addition, the C-2 property has limited access and visibility to Cave Creek Road, an important consideration in the development and marketing of a retail center.

3.0 Maricopa County and Carefree/North Scottsdale Office Market

3.1 Office Market Overview

The Maricopa County office market is comprised of two types of buildings: speculative buildings and owner-occupied buildings. Speculative office buildings are owned by an investor and leased to tenants. Owner–occupied buildings are just that: owned by the company that occupies the building. The speculative or spec office market is the sector that is followed by most commercial office brokers because it contains the inventory of space that is available to companies and corporations.

The office market in Greater Phoenix is comprised of approximately 85 million square feet of space according to CBRE. The office sector has historically been subject to significant cycles and swings in vacancy. Coming out of the recession of the early 1990s, vacancy rates were well above 20%. Construction activity was non-existent between 1990 and 1996 until vacancy rates fell below 10%. Finally in 1997, construction activity resumed. Since then, construction activity has been highly variable with 5 million square feet developed in 2001 and 2007. However, the Great Recession had a significant effect on office employment with the metro-wide vacancy rate rising to more than 26%. At the end of 2015, the Maricopa County office vacancy rate declined to 19.3%.

While vacancy rates are high today by historic standards, construction activity began again in earnest in 2013. At the end of 2014, approximately 3.15 million square feet was under construction. The rate of construction accelerated into 2015 and at the end of the first quarter a total of 4.00 million square feet was under construction. All of the construction activity today is occurring in Scottsdale or in the Southeast Valley.

The majority of projects under construction, however, are not the typical speculative office building. Instead, a variety of companies are constructing their own buildings or contracting with development companies for build-to-suit complexes. Some of development projects include:

- The State Farm Regional office in Tempe at 2.1 million square feet.
- The GM Information Center in Chandler at 170,000 square feet.
- The GoDaddy 150,000 square foot campus at the ASU Research Park in Tempe.
- A 60,000 square foot build-to-suit for Garmin in Chandler.
- A build-to-suit for Isagenix in Gilbert at 150,000 square feet.
- Expansion of the Wells Fargo campus in Chandler at 205,000 square feet.
- A 70,000 square foot build-to-suit for Crown Castle in Chandler.

In addition, several speculative buildings are currently also under construction or recently completed in the Southeast Valley.

- SkySong in Scottsdale which completed a 140,000 square foot building for WebFilings and the ASU Foundation.
- A spec office building in the Scottsdale Quarter at 170,000 square feet.
- A 125,000 square foot building at the Rivulon project in Gilbert.
- A 155,000 square foot building at the Reserve at San Tan in Gilbert.
- A 48,000 square foot building known as Portico Place in Chandler.

Office brokers indicate that no new office construction is occurring outside of the Southeast Valley and Scottsdale.

As a result of the demand for office space in Tempe, Scottsdale and Chandler, vacancy rates have fallen dramatically while other parts of the metro area still retain high rates. Generally, office brokers believe that vacancy rates below 15% stimulate construction activity. This appears true for parts of the Southeast Valley and Scottsdale. The market areas with the highest vacancy rates are the Phoenix CBD along Central Avenue and in the West Valley.

Maricopa County Office Market Status
2015 Quarter 4

Market Area	Total SF	Vacant SF	Vacancy Rate	Net Absorption (SF)	SF Under Construction	Average Asking Rate Per SF
Tempe	6,470,568	815,292	12.6%	937,209	1,827,000	$23.86
Central/South Scottsdale	9,093,953	1,154,932	12.7%	106,504	145,000	$24.07
Southeast Valley	10,112,527	2,012,393	19.9%	324,194	291,712	$21.29
Scottsdale Airpark/Desert Ridge	10,866,162	2,162,366	19.9%	374,569	39,750	$25.38
Phoenix CBD	16,569,756	3,529,358	21.3%	582,458	-	$22.57
East Phoenix/Sky Harbor	9,205,616	1,638,600	17.8%	172,192	-	$21.64
Camelback/Piestewa Peak	9,760,583	2,235,174	22.9%	128,357	-	$26.16
West/Northwest Valley	13,054,150	2,845,805	21.8%	553,556	150,000	$18.74
Maricopa County	**85,133,315**	**16,393,919**	**19.3%**	**3,179,039**	**2,453,462**	**$22.90**

Source: CBRE

While the above office market dynamics appear to defy logic given the high vacancy rates in the Greater Phoenix area, according to brokerage companies, recent construction activity is driven by two factors:

- Corporate balance sheets that are flush with cash combined with the low interest rate environment. Companies are growing and they are making significant investments for the future. Brokers indicate there is a shortage of class A office product that is driving the construction activity for high quality space.
- The emergence of the local technology sector. Tech companies prefer office space that is located in high tech corridors with nearby walkable amenities. The Southeast Valley, predominantly Tempe, Scottsdale and Chandler, offer the environment conducive to the needs of these companies.

The following tables outline the composition of the office market by class of building according to CBRE. Overall, the Class A market accounts for approximately 28% of all square footage and carries the lowest vacancy rate. Class B buildings represent the majority of the building inventory, but have a 22.2% vacancy rate as of the first quarter of 2015. Class C buildings have the highest vacancy rate at 24.2%.

Maricopa County Office Market By Building Class
2nd Quarter 2015

Class	Buildings	SF	Vacant SF	% Vacant
Class A	141	23,542,737	3,670,976	15.6%
Class B	638	45,942,411	10,216,512	22.2%
Class C	460	12,668,859	3,067,664	24.2%
Totals	**1,239**	**82,154,007**	**16,955,152**	**20.6%**

Source: CBRE

The following table illustrates the dynamics of office market for each city in the County by building type for the second quarter of 2015. Typically the office market tends to cluster in central Maricopa County. **Approximately 87% of the spec office market is found in just three cities: Phoenix, Scottsdale and Tempe.** These three cities also account for 95% of the Class A office market. In suburban parts of the metro area, the office market is typically the last sector of the commercial real estate market to make an appearance. Retail uses usually follow population growth. The suburban office market, however, grows much more slowly and provides building space for small businesses such as accountants, insurance agents, lawyers and similar occupations. Alternatively, most large corporations still desire a central location near amenities, access to Sky Harbor and transportation corridors.

Class A buildings have the lowest vacancy rate. Cities with the lowest vacancy rates include Chandler, Scottsdale and Tempe.

Office Market Status By City and Building Class
Maricopa County
2nd Quarter 2015

City/Area	Class A Buildings				Class B Buildings			
	Buildings	SF	Vacant SF	% Vacant	Buildings	SF	Vacant SF	% Vacant
Ahwatukee					1	13,100	5,824	44.5%
Anthem					1	65,000	59,200	91.1%
Avondale					2	82,000	24,583	30.0%
Buckeye					2	36,000	-	0.0%
Chandler	4	672,500	26,861	4.0%	33	2,323,915	303,803	13.1%
Fountain Hills					4	70,402	21,645	30.7%
Gilbert	**2**	**287,835**	**128,416**	**44.6%**	**21**	**755,135**	**203,287**	**26.9%**
Glendale	3	438,280	171,898	39.2%	13	786,369	336,512	42.8%
Goodyear					6	227,300	51,332	22.6%
Mesa					36	2,012,672	442,017	22.0%
Peoria					6	342,203	60,981	17.8%
Phoenix	59	12,629,591	2,355,773	18.7%	273	25,042,199	6,251,386	25.0%
Scottsdale	63	7,412,542	935,364	12.6%	149	8,204,186	1,430,996	17.4%
Sun City								
Surprise					7	223,262	59,164	26.5%
Tempe	10	2,101,989	52,664	2.5%	84	5,758,668	965,782	16.8%
TOTAL	**141**	**23,542,737**	**3,670,976**	**15.6%**	**638**	**45,942,411**	**10,216,512**	**22.2%**

City/Area	Class C Buildings				Totals			
	Buildings	SF	Vacant SF	% Vacant	Buildings	SF	Vacant SF	% Vacant
Ahwatukee					1	13,100	5,824	44.5%
Anthem					1	65,000	59,200	91.1%
Avondale	1	12,900	3,519	27.3%	3	94,900	28,102	29.6%
Buckeye					2	36,000	-	0.0%
Chandler	3	33,114	900	2.7%	40	3,029,529	331,564	10.9%
Fountain Hills	1	11,695	9,116	77.9%	5	82,097	30,761	37.5%
Gilbert	**1**	**10,625**	**521**	**4.9%**	**24**	**1,053,595**	**332,224**	**31.5%**
Glendale	22	613,339	162,232	26.5%	38	1,837,988	670,642	36.5%
Goodyear	2	27,492	7,109	25.9%	8	254,792	58,441	22.9%
Mesa	45	1,173,923	303,897	25.9%	81	3,186,595	745,914	23.4%
Peoria	2	61,191	8,146	13.3%	8	403,394	69,127	17.1%
Phoenix	244	7,422,876	1,898,168	25.6%	576	45,094,666	10,505,327	23.3%
Scottsdale	82	1,866,204	341,631	18.3%	294	17,482,932	2,707,991	15.5%
Sun City	7	181,410	52,135	28.7%	7	181,410	52,135	28.7%
Surprise	1	15,800	4,146	26.2%	8	239,062	63,310	26.5%
Tempe	49	1,238,290	276,144	22.3%	143	9,098,947	1,294,590	14.2%
TOTAL	**460**	**12,668,859**	**3,067,664**	**24.2%**	**1,239**	**82,154,007**	**16,955,152**	**20.6%**

Source: CBRE

3.2 Carefree/North Scottsdale Office Market

The North Scottsdale and Carefree office markets consist of approximately 362,000 square feet of space with an overall vacancy rate of 23%, higher than the County-wide rate of 19%. Most of the buildings are clustered in Downtown Carefree in relatively small buildings. The largest complexes are Stagecoach Village in Cave Creek (a condo complex that is included in the office inventory although a portion of the property is used for retail purposes) and Scottsdale Westland, an office condo complex. Stagecoach Village has an estimated 40% vacancy, partly due to its location in a ravine off of Cave Creek Road. Built prior to the recession, the property has never performed to expectations and large parts of the complex were sold at a sheriff's sale in 2013. Scottsdale Westland is essentially fully occupied.

Pima Norte is an office condo complex located at the southwest corner of Pima and Cave Creek Roads just west of Desert Mountain Parcel 19. The complex was constructed in 2005 and was the subject of a distressed sale in 2007. Nine suites are available for lease with a vacancy rate of 23%.

Office Inventory & Vacancies
Desert Mountain Parcel 19 Market Area

Center	Location	Total SF	Vacant SF	Vacant %	Anchor Tenants/Notes
Stagecoach Village	7100 E. Cave Creek Road	105,000	42,000	40%	Mixed office/retail
Scottsdale Bank Branch	34252 N. Scottsdale Road	10,000	10,000	100%	
Scottsdale Westland	33747 N Scottsdale Road	74,000	1,109	1%	
Carefree Business Center	7202 E. Carefree Drive	13,619	-	0%	
One Carefree Place	36800 Sidewinder Road	21,741	6,475	30%	
Carefree Corners	7509 E. Cave Creek Rd	14,575	2,885	20%	
Carefree Office Center	7518 E. Elbow Bend Road	15,734	4,753	30%	
Sundance Gardens	7301 E. Sundance Trail	26,650	965	4%	
Montana Vista	7208 E Cave Creek Road	12,000	1,222	10%	
Montana Vista Studios	7209 E Cave Creek Road	24,888	2,240	9%	Flex office
Pima Norte	36600 N. Pima Road	43,560	9,809	23%	
Total Office		**361,767**	**81,458**	**23%**	

Sources: Colliers International; Whitestone REIT; Commercial Properties Incorporated (CPI); Diamond Pacific Investments, Inc.; North Bay Commercial; BGA Realty Partners; Plaza Companies; The Hogan Group; Weingarten Realty; Coldwell Banker; Henstra Hounds Realty; CBRE; Westwood Financial Corp.; SoHo International; Donahue Shriber; Desert Capital Venture; Tony Cox & Associates.; Cushman & Wakefield; LoopNet.com; PropertyLine.com; CommercialSearch.com; Elliott D. Pollack & Co.; Landiscor; Maricopa County Assessor

3.3 Office Market Summary

The PMA office market is limited in size and provides space for small local businesses such as attorneys, CPAs, real estate agents, dentists and doctors. Corporate offices are not found in the PMA because of its location and distance from potential clients and employees. As noted previously, the size of the C-O office site in Parcel 19 is capable of accommodating 400,000 square feet of office space, an amount larger than the entire PMA office market of 362,000 square feet. In addition, the PMA office market has a 23% vacancy rates with more than 81,000 square feet of vacant space available. In our opinion, the current zoning and acreage of the property designated for commercial office uses (C-O) is not warranted relative to demand.

3.4 Industrial Market Summary

The industrial market in the Carefree and North Scottsdale area is essentially non-existent. The only property that could be considered industrial in character is the complex of aircraft hangars at the SkyRanch airport. The Town of Carefree does not permit industrial uses in the community and there are no industrial uses within the PMA in Scottsdale. Industrial uses typically locate along major thoroughfares with convenient access to the wider metro area. Business uses in industrial parks also depend on access to a labor force to fill jobs. Based upon the typical criteria mentioned above, industrial uses are not appropriate for Desert Mountain Parcel 19 given the residential uses in the immediate vicinity.

4.0 Limiting Conditions

This study prepared by Elliott D. Pollack & Company is subject to the following considerations and limiting conditions.

- It is our understanding that this study is for the client's due diligence and other planning purposes. Neither our report, nor its contents, nor any of our work were intended to be included and, therefore, may not be referred to or quoted in whole or in part, in any registration statement, prospectus, public filing, private offering memorandum, or loan agreement without our prior written approval.

- The reported recommendation(s) represent the considered judgment of Elliott D. Pollack and Company based on the facts, analyses and methodologies described in the report.

- Except as specifically stated to the contrary, this study will not give consideration to the following matters to the extent they exist: (i) matters of a legal nature, including issues of legal title and compliance with federal, state and local laws and ordinances; and (ii) environmental and engineering issues, and the costs associated with their correction. The user of this study will be responsible for making his/her own determination about the impact, if any, of these matters.

- This study is intended to be read and used as a whole and not in parts.

- This study has not evaluated the feasibility or marketability of any site for planned uses.

- Our analysis is based on currently available information and estimates and assumptions about long-term future development trends. The data is considered current as of May 2016. Such estimates and assumptions are subject to uncertainty and variation. Accordingly, we do not represent them as results that will be achieved. Some assumptions inevitably will not materialize and unanticipated events and circumstances may occur; therefore, the actual results achieved may vary materially from the forecasted results.